



Request for Bids

Tulane Road Siphon Replacement

January 12, 2023

Authority General Office
12777 Hwy. 87 N.
Orange, TX 77632
409.746.2192

Gulf Coast Division
1922 IP Way
Orange, TX 77632
409.746.2111

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00 01 07 DESIGN PROFESSIONAL SEALS

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FREESE AND NICHOLS, INC. TEXAS REGISTERED ENGINEERING FIRM F- 2144	

	Specification Sections Sealed
	Division 33 – Utilities
FREESE AND NICHOLS, INC. TEXAS REGISTERED ENGINEERING FIRM F- 2144	

END OF SECTION

NOTICE TO BIDDERS

Sabine River Authority of Texas Tulane Road Siphon Replacement

General Notice

Sabine River Authority of Texas (Owner) is requesting Bids for the construction of the following Project:

Tulane Road Siphon Replacement RFB 23-0203

Sealed bids for the construction of the Project will be received at the **Office of the Division Manager** located at **1922 IP Way, Orange, Texas, 77632**, until **Tuesday, February 7, 2023 at 10:00 a.m.** local time. At that time the Bids received will be **publicly** opened and read.

Bids must be submitted and received no later than the opening date and time specified above. Any Bid received later than the specified time will not be considered and will be returned unopened. The SRA is not responsible for ensuring the delivery of Bids to our offices. Bids shall be sealed and clearly marked, "Request for Bid – Tulane Road Siphon Replacement & RFB 23-0203".

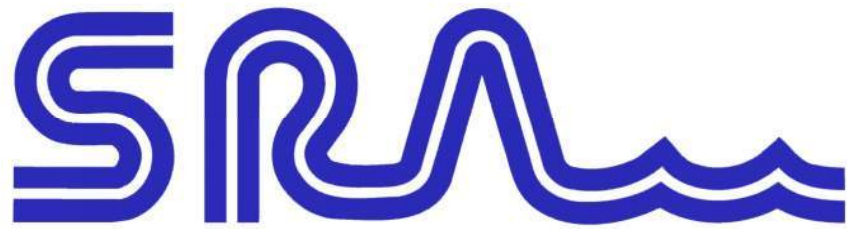
A mandatory Pre-Bid Conference between the SRA, prospective bidders, suppliers, etc. will be held on January 24, 2023, at 10:00 a.m. at the SRA Division Office, 1922 IP Way, TX to make certain that the scope of work is fully understood. All interested parties are requested to attend.

The Sabine River Authority reserves the right to adopt the most advantageous interpretation of the bids submitted in the case of ambiguity or lack of clearness in stating proposal prices, to reject any or all bids, and/or waive any formalities.

Contract documents may be obtained by downloading (1) from www.sratx.org under doing business "bid opportunities" or (2) from CIVCAST USA Website. Hard copies of plans will not be made available for purchase.

Questions regarding contract documents may be sent via CIVCAST Website or emailed to purchasing@sratx.org.

Dates: First Publication January 12, 2023
Second Publication January 19, 2023



INSTRUCTION to BIDDERS

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 (refer to the Notice to Bidders).

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 Owner has established a Bidding Documents Website (CIVCAST USA) as indicated in the Notice to Bidders. Owner recommends that Bidder register as a plan holder with the Issuing Office at such website, and obtain a complete set of the Bidding Documents from such website. Bidders may rely that sets of Bidding Documents obtained from the Bidding Documents Website are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.
- 2.04 Bidder may register as a plan holder and obtain complete sets of Bidding Documents, in the number and format stated in the notice to bid, from the Issuing Office. Bidders may rely that sets of Bidding Documents obtained from the Issuing Office are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.
- 2.05 Plan rooms (including construction information subscription services, and electronic and virtual plan rooms) may distribute the Bidding Documents, or make them available for examination. Those prospective bidders that obtain an electronic (digital) copy of the Bidding Documents from a plan room are encouraged to register as 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.
- 2.06 *Electronic Documents*
- A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to 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. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of

the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

- B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.06.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

ARTICLE 3—QUALIFICATIONS OF BIDDERS

- 3.01 Bidder is to submit the following information with its Bid to demonstrate Bidder's qualifications to perform the Work:
 - A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.
 - B. A written statement that Bidder is authorized to do business in the state where the Project is located, or a written certification that Bidder will obtain such authority prior to the Effective Date of the Contract.
 - C. Bidder's state or other contractor license number, if applicable.
 - D. Subcontractor and Supplier qualification information.
 - E. Other required information regarding qualifications.
- 3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- 3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 4—PRE-BID CONFERENCE

- 4.01 A mandatory pre-bid conference will be held at the time and location indicated in the notice to bid. Representatives of Owner and Engineer will be present to discuss the Project. Proposals will not be accepted from Bidders who do not attend the conference. It is each Bidder's responsibility to sign in at the pre-bid conference to verify its participation. Bidders must sign in using the name of the organization that will be submitting a Bid. A list of qualified Bidders that attended the pre-bid conference and are eligible to submit a Bid for this Project, will be made available upon request.
- 4.02 Information presented at the pre-Bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions

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

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

5.01 *Site and Other Areas*

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

5.02 *Existing Site Conditions*

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

1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:
 - a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.
 - b. Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.
 - c. Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.
 - d. Technical Data contained in such reports and drawings.
2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.
3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.
4. *Geotechnical Baseline Report/Geotechnical Data Report*: The Bidding Documents contain a Geotechnical Baseline Report (GBR) and Geotechnical Data Report (GDR).
 - a. As set forth in the Supplementary Conditions, the GBR describes certain select subsurface conditions that are anticipated to be encountered by Contractor during construction in specified locations ("Baseline Conditions"). The GBR is a Contract Document.
 - b. The Baseline Conditions in the GBR are intended to reduce uncertainty and the degree of contingency in submitted Bids. However, Bidders cannot rely solely on

the Baseline Conditions. Bids should be based on a comprehensive approach that includes an independent review and analysis of the GBR, all other Contract Documents, Technical Data, other available information, and observable surface conditions. Not all potential subsurface conditions are baselined.

- c. Nothing in the GBR is intended to relieve Bidders of the responsibility to make their own determinations regarding construction costs, bidding strategies, and Bid prices, nor of the responsibility to select and be responsible for the means, methods, techniques, sequences, and procedures of construction, and for safety precautions and programs incident thereto.
 - d. As set forth in the Supplementary Conditions, the GDR is a Contract Document containing data prepared by or for the Owner in support of the GBR.
- 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. There are no additional documents.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.
- E. No other Site-related documents are available.

5.04 *Site Visit and Testing by Bidders*

- A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit the Bidder must not disturb any ongoing operations at the Site.
- B. Bidders visiting the Site are required to arrange their own transportation to the Site.
- C. All access to the Site other than during a regularly scheduled Site visit must be coordinated through the following Owner or Engineer contact for visiting the Site: David Williams (SRA), 409-746-2111. Bidder must conduct the required Site visit during normal working hours.

- D. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.
- E. 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.
- F. Bidder must comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.
- G. 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. All questions shall be received no later than 10 days prior to the bid opening date. Contact information and submittal procedures for such questions are as follows:
- A. **Questions shall be submitted via CIVCAST USA Website.**
- 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. Bidder must meet the following bid security requirements as set forth in Texas Water Code Chapter 49 Subchapter I. If the Bid proposal exceeds \$50,000 up to \$250,000, the Bidder must submit a bid security in the amount of at least two (2%) percent of the amount of the maximum total bid in the form of a certified or cashier's check on a responsible bank in the state. If the Bid exceeds \$250,000, the Bidder must submit a bid bond in the amount of five (5%) percent of the amount of the maximum total bid in the form of an approved Bidder's Bond underwritten by a surety authorized to conduct business in the State of Texas. The surety must also meet 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 after the Contract Award.

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 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those “or-equal” or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an “or-equal” or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer prior to the pre-bid meeting. Each such request must comply with the requirements of Paragraphs 7.05 and 7.06 of the General Conditions, and the review of the request will be governed by the principles in those paragraphs. The burden of proof of the merit of the proposed item is upon Bidder. Engineer’s decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all registered Bidders. Bidders cannot rely upon approvals made in any other manner.
- 10.03 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, 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 A Bidder must be prepared to retain specific Subcontractors and Suppliers for the performance of the Work if required to do so by the Bidding Documents or in the Specifications. If a prospective

Bidder objects to retaining any such Subcontractor or Supplier and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

- 11.02 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed for the following portions of the Work with the qualifications statement or within 5 days of Owner's request.
- 11.03 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.
- 11.04 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. In case of discrepancy between the written amounts and figures, the written amounts shall govern.

13.02 *Allowances*

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

ARTICLE 14—SUBMITTAL OF BID

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

ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID

- 15.01 An unopened Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.
- 15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.
- 15.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, the Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the Work.

ARTICLE 16—OPENING OF BIDS

- 16.01 Bids will be opened at the time and place indicated in the advertisement or notice to bid and, unless obviously non-responsive, read aloud publicly. A summary of the amounts of the base Bids

and major alternates, if any, will be made available to Bidders after the opening of Bids. Bidders and other interested parties may be present at the public bid opening.

ARTICLE 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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

ARTICLE 18—EVALUATION OF BIDS AND AWARD OF CONTRACT

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

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

18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.

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

18.05 *Evaluation of Bids*

A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award. The Owner may consider the following in determining the best value:

- In the comparison of Bids, The amount bid;
- Reputation of the bidder and the bidder's goods or services;
- Quality of the bidder's goods or services;
- Extent to which the goods or services meet the needs of SRA;
- Bidder's past relationship with SRA;
- Total long-term cost to SRA to acquire the bidder's goods or services;
- Bidder's past experience in performing similar work;
- Bidder's financial record indicating the stability of the bidder;
- Bidder's history of successfully completing projects; and
- Any relevant criteria specifically listed in the request for bids or proposals.

B. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.

18.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for

those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

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

ARTICLE 19—BONDS AND INSURANCE

- 19.01 Article 6 of the General Conditions and 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 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 by law from **State of Texas** sales and Use Tax Laws, and Federal Excise Tax on materials and equipment to be incorporated in the Work. Said taxes must not be included in the Bid. Refer to Paragraph SC-7.10 of the Supplementary Conditions for additional information.

ARTICLE 22—CONFIDENTIALITY OF DOCUMENTS

- 22.01 The SRA is subject to the Texas Public Information Act (PIA). Any information submitted to the SRA by the Bidder shall be considered non-confidential and available to the public, except as follows:
- 22.02 In the event a Bidder considers a specific portion of their Bid to be confidential and subject to an exception to disclosure under the PIA, such portion must be clearly identified and marked "CONFIDENTIAL". Do not mark an entire proposal confidential, as this is not in conformance with the PIA and is not acceptable. Only the specific portion or portions of the Bid that the Bidder considers to be confidential pursuant to the PIA should be marked. IF AN ENTIRE BID IS MARKED CONFIDENTIAL, THE SRA WILL NOT TREAT ANY PORTION OF THE BID AS CONFIDENTIAL AND THE BID MAY BE REJECTED AS NON-CONFORMING. The SRA will honor notations of confidentiality in accordance with this paragraph and decline to release such information initially; however, final

determination of whether a particular portion of a Bid may in fact be withheld pursuant to the PIA will be made by the Texas Attorney General or a court of competent jurisdiction.

- 22.03 In the event a public information request is received for a portion of a Bid that has been marked confidential, the SRA will ask the affected Bidder if the information may be released. If the release is agreed to, the SRA shall release the information.
- 22.04 If the release is denied, the matter shall be referred to the Texas Attorney General's Office in accordance with the process set forth in the PIA. The Bidder shall be fully and solely responsible for submitting arguments and evidence within the statutory timeframes to the Texas Attorney General's Office regarding its claim of confidentiality. The SRA will NOT submit arguments on behalf of the Bidder.
- 22.05 The Texas Attorney General's Office shall rule on the matter. In the event that it is determined by opinion of the Texas Attorney General or court of competent jurisdiction that such information may not be withheld, then such information will be made available to the requestor. If it is determined that the information may be withheld, SRA will withhold the information from the requestor.
- 22.06 Pricing information contained in bids or contracts is not considered confidential under the PIA and will be disclosed without making a request to the Texas Attorney General.

ARTICLE 23—CONFLICT OF INTEREST

- 23.01 Pursuant to Chapter 176 of the Local Government Code, any person or agent of a person who contracts or seeks to contract for the sale or purchase of property, goods, or services with a local government entity (i.e. Sabine River Authority) must disclose in the Conflicts of Interest Questionnaire Form (CIQ) the person's affiliation or business relationship that might cause a conflict of interest with the local government entity. By law, the CIQ must be filed with the SRA Records Management Officer no later than seven (7) days after the date the person begins contract discussions or negotiations with the SRA, or submits an application or response to a Request for Bids, correspondence, or another writing related to a potential agreement with SRA. Updated Questionnaires must be filed in conformance with Chapter 176.
- 23.02 A copy of the CIQ is included. If you have any questions about compliance, please consult your own legal counsel. Compliance is the individual responsibility of each person or agent of a person who is subject to the filing requirement. An offense under Chapter 176 carries a penalty up to a Class A misdemeanor.

ARTICLE 24—EQUAL OPPORTUNITY

- 24.01 *Sabine River Authority provides for equal opportunity for all qualified parties including Historically Underutilized Business (HUBs). If your organization or any associated sub-contractor on the project area a certified HUB with the State of Texas, please submit documentation of the certified organization, including description of the work, percentage of the contract expected to be completed by the HB, and the certification number of the HUB.*



BID PROPOSAL

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: **Sabine River Authority of Texas: Gulf Coast Division**
- 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. All prices shall be stated in both words and figures; however, do not extend the unit price. If the unit price is extended, the extension shall be ignored in tabulating the bids(*). In case of discrepancy between the written amounts and the figures, the written amounts shall govern.

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. Vendor Certification to State Law;
 - C. Conflict of Interest;
 - D. Required Bidder Qualification Statement with supporting data;
 - E. Form W-9;
 - F. Bonding Company Information
 - G. Bid Opening Sheet
 - H. Non-Collusion Affidavit(s)
 - I. Additional Items as stipulated in the request

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

3.01 *Base Bid*

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

1.	1	LS	Mobilization (Not to Exceed 3% of Contract Amount)			

				DOLLARS		

				CENTS	\$ _____	\$ _____ *
			Lump Sum			

2.	1	LS	Clearing and Grubbing			

				DOLLARS		

				CENTS	\$ _____	\$ _____ *
			Lump Sum			

3.	1	LS	Stormwater Pollution Prevention Plan			

				DOLLARS		

				CENTS	\$ _____	\$ _____ *
			Lump Sum			

4.	1	LS	Care of Water During Construction			
				DOLLARS		
				CENTS	\$	\$ *
			Lump Sum			
5.	1	LS	Temporary Cofferdams			
				DOLLARS		
				CENTS	\$	\$ *
			Lump Sum			
6.	225	LF	Barbed Wire Fencing			
				DOLLARS		
				CENTS	\$	\$ *
			Linear Foot			
7.	1	AC	Final Grading and Hydro Mulching			
				DOLLARS		
				CENTS	\$	\$ *
			Acre			

8.	4305	CY	Excavation		
				<u>DOLLARS</u>	
				<u>CENTS</u>	\$ <u> </u> \$ * <u> </u>
			Cubic Yard		
9.	1560	CY	Haul Off and Disposal of Excess Excavated Materials		
				<u>DOLLARS</u>	
				<u>CENTS</u>	\$ <u> </u> \$ * <u> </u>
			Cubic Yard		
10.	1	LS	Demolition		
				<u>DOLLARS</u>	
				<u>CENTS</u>	\$ <u> </u> \$ * <u> </u>
			Lump Sum		
11.	1	LS	Plug and Abandon Existing Western Siphon Pipes		
				<u>DOLLARS</u>	
				<u>CENTS</u>	\$ <u> </u> \$ * <u> </u>
			Lump Sum		

12.	157	LF	Remove Existing Eastern Siphon Pipes North of UPRR Right of Way		
			DOLLARS		
			CENTS	\$	\$ *
			Linear Foot		
13.	200	LF	Grout and Abandon Existing Eastern Siphon Pipes under UPRR Right of Way		
			DOLLARS		
			CENTS	\$	\$ *
			Linear Foot		
14.	3000	CY	Class 1 Earth Fill (On Site Reuse)		
			DOLLARS		
			CENTS	\$	\$ *
			Cubic Yard		
15.	1440	CY	Class 4 Earth Fill		
			DOLLARS		
			CENTS	\$	\$ *
			Cubic Yard		

16.	168	CY	Concrete Headwall Structures		
				DOLLARS	
				CENTS	\$ \$ *
			Cubic Yard		
17.	1	LS	Galvanized Grating		
				DOLLARS	
				CENTS	\$ \$ *
			Lump Sum		
18.	234	LF	72" FRP Pipe (Trenchless Installation)		
				DOLLARS	
				CENTS	\$ \$ *
			Linear Foot		
19.	168	LF	72" FRP Direct Bury Pipe		
				DOLLARS	
				CENTS	\$ \$ *
			Linear Foot		

20.	260	CY	Riprap Erosion Protection (12 IN)			
				DOLLARS		
				CENTS	\$	\$ *
				Cubic Yard		

21.	145	SY	Roadway Repair			
				DOLLARS		
				CENTS	\$	\$ *
				Square Yard		

3.02 Alternate Bid No. 1

A-1.	1	LS	Stop Logs			
				DOLLARS		
				CENTS	\$	\$ *
				Lump Sum		

- A. 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 agrees that the Work will be substantially complete as indicated in the Agreement, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions.
- 4.03 Bidder agrees that the Work will be substantially complete within the time stipulated in the Agreement and as provided in Paragraph 4.01 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions.
- 4.04 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	Received

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 visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
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 8.02.A:
 - a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
 - b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
 - c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
 - d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

BIDDER hereby submits this Bid as set forth above:

Bidder:

(typed or printed name of organization)

By: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(typed or printed)

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

Attest: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(typed or printed)

Address for giving notices:

Bidder's Contact:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Phone: _____

Email: _____

Address: _____

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

BID BOND (PENAL SUM FORM)

Bidder Name: Address <i>(principal place of business)</i> :	Surety Name: Address <i>(principal place of business)</i> :
Owner Name: Sabine River Authority of Texas Address <i>(principal place of business)</i> : 12777 Hwy 87 N Orange, Texas 77632	Bid Project <i>(name and location)</i> : Tulane Road Siphon Replacement Orange County, Texas Bid Due Date: February 7, 2023
Bond Penal Sum: Date of Bond:	
Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.	
Bidder	Surety
_____ <i>(Full formal name of Bidder)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature) (Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<i>Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.</i>	

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

BID OPENING

In the space provided below, enter your total Base Bid and Alternate Bid amounts for this project. Only these figures will be read publicly at the public bid opening.

It is understood and agreed by the bidder in signing the proposal that the total bid amount entered below is not binding on either the bidder or the Owner. It is further agreed that the official total bid amount for this proposal will be determined by multiplying the unit prices for each unit price pay item by the respective estimated quantities shown in this proposal, and then totaling all of the extended amounts plus the amounts bid for all lump sum items.

Project: Tulane Road Siphon Replacement
 Project No. RFP 23-0203

Owner: Sabine River Authority of Texas
 Orange County, Texas

\$

Total Base Bid Amount

\$

Total Alternate Bid Amount

Name of Bidder

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:			

ARTICLE 2—DIVERSE BUSINESS CERTIFICATIONS

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

Certification	Certifying Agency	Certification Date
<input type="checkbox"/> Disadvantaged Business Enterprise		
<input type="checkbox"/> Minority Business Enterprise		
<input type="checkbox"/> Woman-Owned Business Enterprise		
<input type="checkbox"/> Small Business Enterprise		
<input type="checkbox"/> Disabled Business Enterprise		
<input type="checkbox"/> Veteran-Owned Business Enterprise		
<input type="checkbox"/> Service-Disabled Veteran-Owned Business		
<input type="checkbox"/> HUBZone Business (Historically Underutilized) Business		
<input type="checkbox"/> Other		
<input type="checkbox"/> None		

ARTICLE 3—CONSTRUCTION EXPERIENCE

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

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

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

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

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

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

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

ARTICLE 4—REQUIRED ATTACHMENTS

4.01 Provide the following information with the Statement of Qualifications:

- A. Schedule A (Current Projects) as required by Paragraph 8.03.
- B. Schedule B (Previous Experience with Similar Projects) as required by Paragraph 8.04.
- C. Schedule C (Key Individuals) and resumes for the key individuals listed, as required by Paragraph 8.05.
- D. Financial Statements shall be provided upon request.

This Statement of Qualifications is offered by:

Business: _____
(typed or printed name of organization)

By: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(date signed)

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

Attest: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address for giving notices:

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address: _____

Phone: _____

Email: _____

Schedule A—Current Projects

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

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

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

Schedule B—Previous Experience with Similar Projects

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

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

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

Schedule B—Previous Experience with Similar Projects

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

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

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

Schedule C—Key Individuals

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

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

VENDOR COMPLIANCE TO STATE LAW

Chapter 2252.002, of the Texas Government Code applies to the award of government contract to non-resident bidders. This law provides that:

“A government entity may not award a governmental contract to a nonresident bidder unless the nonresident underbids the lowest bid submitted by a responsible resident bidder by an amount that is less than the greater of the amount by which a resident bidder would be required to underbid the nonresident bidder to obtain a comparable contract in the state in which the nonresident’s principal place of business is located

“Nonresident Bidder” refers to a person who is not a resident of Texas

“Resident Bidder” refers to a person whose principal place of business is in this state, including a contractor whose ultimate parent company or majority owner has its principal place of business in this state.

Check the statement that is correct for Bidder.

- Non-resident bidders in _____ (give state), our principal place of business, are required to be _____ percent lower than resident bidders by state law. A copy of the statute is attached.
- Non-resident bidders in _____ (give state), our principal place of business, are not required to underbid resident bidders.
- Our principal place of business or corporate offices is in the State of Texas.

BIDDER:

By: _____

Signature: _____

Title: _____

Address: _____



BONDING COMPANY INFORMATION

The following person, firm, or corporation has agreed to execute the required payment and performance bonds in the event this contract is awarded to the bidder:

Name of Surety: _____

Mailing Address: _____

City, State, Zip: _____

Telephone Number: _____

Is surety authorized to operate in Texas? _____

Is surety aware of size of project? _____

Does surety have adequate authorization and resources to cover bonds for the amount of this contract? _____

Rating from Best's Key Rating Guide _____

Project: **Tulane Road Siphon Replacement**
Project No. RFP 23-0203

Name of Bidder



Request for Taxpayer Identification Number and Certification

**Give Form to the
requester. Do not
send to the IRS.**

▶ Go to www.irs.gov/FormW9 for instructions and the latest information.

Print or type. See Specific Instructions on page 3.	<p>1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.</p> <hr/> <p>2 Business name/disregarded entity name, if different from above</p> <hr/> <p>3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only one of the following seven boxes.</p> <p><input type="checkbox"/> Individual/sole proprietor or single-member LLC <input type="checkbox"/> C Corporation <input type="checkbox"/> S Corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Trust/estate</p> <p><input type="checkbox"/> Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ▶ _____</p> <p>Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is another LLC that is not disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner.</p> <p><input type="checkbox"/> Other (see instructions) ▶ _____</p>	<p>4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):</p> <p>Exempt payee code (if any) _____</p> <p>Exemption from FATCA reporting code (if any) _____</p> <p><small>(Applies to accounts maintained outside the U.S.)</small></p>
	<p>5 Address (number, street, and apt. or suite no.) See instructions.</p> <hr/> <p>6 City, state, and ZIP code</p> <hr/> <p>7 List account number(s) here (optional)</p> <hr/>	<p>Requester's name and address (optional)</p> <hr/>

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN*, later.

Note: If the account is in more than one name, see the instructions for line 1. Also see *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number									
				-			-		
or									
Employer identification number									
				-					

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here	Signature of U.S. person ▶	Date ▶
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General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to www.irs.gov/FormW9.

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)

- Form 1099-DIV (dividends, including those from stocks or mutual funds)
 - Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
 - Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
 - Form 1099-S (proceeds from real estate transactions)
 - Form 1099-K (merchant card and third party network transactions)
 - Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
 - Form 1099-C (canceled debt)
 - Form 1099-A (acquisition or abandonment of secured property)
- Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.
- If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, later.*

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and
4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct. See *What is FATCA reporting*, later, for further information.

Note: If you are a U.S. person and a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien;
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States;
- An estate (other than a foreign estate); or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax under section 1446 on any foreign partners' share of effectively connected taxable income from such business. Further, in certain cases where a Form W-9 has not been received, the rules under section 1446 require a partnership to presume that a partner is a foreign person, and pay the section 1446 withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid section 1446 withholding on your share of partnership income.

In the cases below, the following person must give Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States.

- In the case of a disregarded entity with a U.S. owner, the U.S. owner of the disregarded entity and not the entity;
- In the case of a grantor trust with a U.S. grantor or other U.S. owner, generally, the U.S. grantor or other U.S. owner of the grantor trust and not the trust; and
- In the case of a U.S. trust (other than a grantor trust), the U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person or the U.S. branch of a foreign bank that has elected to be treated as a U.S. person, do not use Form W-9. Instead, use the appropriate Form W-8 or Form 8233 (see Pub. 515, *Withholding of Tax on Nonresident Aliens and Foreign Entities*).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items.

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.
2. The treaty article addressing the income.
3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.
4. The type and amount of income that qualifies for the exemption from tax.
5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity, give the requester the appropriate completed Form W-8 or Form 8233.

Backup Withholding

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS 24% of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, payments made in settlement of payment card and third party network transactions, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,
2. You do not certify your TIN when required (see the instructions for Part II for details),
3. The IRS tells the requester that you furnished an incorrect TIN,
4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or
5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See *Exempt payee code*, later, and the separate Instructions for the Requester of Form W-9 for more information.

Also see *Special rules for partnerships*, earlier.

What is FATCA Reporting?

The Foreign Account Tax Compliance Act (FATCA) requires a participating foreign financial institution to report all United States account holders that are specified United States persons. Certain payees are exempt from FATCA reporting. See *Exemption from FATCA reporting code*, later, and the Instructions for the Requester of Form W-9 for more information.

Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you no longer are tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account; for example, if the grantor of a grantor trust dies.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of \$50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a \$500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Line 1

You must enter one of the following on this line; **do not** leave this line blank. The name should match the name on your tax return.

If this Form W-9 is for a joint account (other than an account maintained by a foreign financial institution (FFI)), list first, and then circle, the name of the person or entity whose number you entered in Part I of Form W-9. If you are providing Form W-9 to an FFI to document a joint account, each holder of the account that is a U.S. person must provide a Form W-9.

a. **Individual.** Generally, enter the name shown on your tax return. If you have changed your last name without informing the Social Security Administration (SSA) of the name change, enter your first name, the last name as shown on your social security card, and your new last name.

Note: ITIN applicant: Enter your individual name as it was entered on your Form W-7 application, line 1a. This should also be the same as the name you entered on the Form 1040/1040A/1040EZ you filed with your application.

b. **Sole proprietor or single-member LLC.** Enter your individual name as shown on your 1040/1040A/1040EZ on line 1. You may enter your business, trade, or "doing business as" (DBA) name on line 2.

c. **Partnership, LLC that is not a single-member LLC, C corporation, or S corporation.** Enter the entity's name as shown on the entity's tax return on line 1 and any business, trade, or DBA name on line 2.

d. **Other entities.** Enter your name as shown on required U.S. federal tax documents on line 1. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on line 2.

e. **Disregarded entity.** For U.S. federal tax purposes, an entity that is disregarded as an entity separate from its owner is treated as a "disregarded entity." See Regulations section 301.7701-2(c)(2)(iii). Enter the owner's name on line 1. The name of the entity entered on line 1 should never be a disregarded entity. The name on line 1 should be the name shown on the income tax return on which the income should be reported. For example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a single owner that is a U.S. person, the U.S. owner's name is required to be provided on line 1. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity's name on line 2, "Business name/disregarded entity name." If the owner of the disregarded entity is a foreign person, the owner must complete an appropriate Form W-8 instead of a Form W-9. This is the case even if the foreign person has a U.S. TIN.

Line 2

If you have a business name, trade name, DBA name, or disregarded entity name, you may enter it on line 2.

Line 3

Check the appropriate box on line 3 for the U.S. federal tax classification of the person whose name is entered on line 1. Check only one box on line 3.

IF the entity/person on line 1 is a(n) . . .	THEN check the box for . . .
• Corporation	Corporation
• Individual • Sole proprietorship, or • Single-member limited liability company (LLC) owned by an individual and disregarded for U.S. federal tax purposes.	Individual/sole proprietor or single-member LLC
• LLC treated as a partnership for U.S. federal tax purposes, • LLC that has filed Form 8832 or 2553 to be taxed as a corporation, or • LLC that is disregarded as an entity separate from its owner but the owner is another LLC that is not disregarded for U.S. federal tax purposes.	Limited liability company and enter the appropriate tax classification. (P= Partnership; C= C corporation; or S= S corporation)
• Partnership	Partnership
• Trust/estate	Trust/estate

Line 4, Exemptions

If you are exempt from backup withholding and/or FATCA reporting, enter in the appropriate space on line 4 any code(s) that may apply to you.

Exempt payee code.

- Generally, individuals (including sole proprietors) are not exempt from backup withholding.
- Except as provided below, corporations are exempt from backup withholding for certain payments, including interest and dividends.
- Corporations are not exempt from backup withholding for payments made in settlement of payment card or third party network transactions.
- Corporations are not exempt from backup withholding with respect to attorneys' fees or gross proceeds paid to attorneys, and corporations that provide medical or health care services are not exempt with respect to payments reportable on Form 1099-MISC.

The following codes identify payees that are exempt from backup withholding. Enter the appropriate code in the space in line 4.

- 1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2)
- 2—The United States or any of its agencies or instrumentalities
- 3—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities
- 4—A foreign government or any of its political subdivisions, agencies, or instrumentalities
- 5—A corporation
- 6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a U.S. commonwealth or possession
- 7—A futures commission merchant registered with the Commodity Futures Trading Commission
- 8—A real estate investment trust
- 9—An entity registered at all times during the tax year under the Investment Company Act of 1940
- 10—A common trust fund operated by a bank under section 584(a)
- 11—A financial institution
- 12—A middleman known in the investment community as a nominee or custodian
- 13—A trust exempt from tax under section 664 or described in section 4947

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 13.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 7
Broker transactions	Exempt payees 1 through 4 and 6 through 11 and all C corporations. S corporations must not enter an exempt payee code because they are exempt only for sales of noncovered securities acquired prior to 2012.
Barter exchange transactions and patronage dividends	Exempt payees 1 through 4
Payments over \$600 required to be reported and direct sales over \$5,000 ¹	Generally, exempt payees 1 through 5 ²
Payments made in settlement of payment card or third party network transactions	Exempt payees 1 through 4

¹ See Form 1099-MISC, Miscellaneous Income, and its instructions.

² However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney reportable under section 6045(f), and payments for services paid by a federal executive agency.

Exemption from FATCA reporting code. The following codes identify payees that are exempt from reporting under FATCA. These codes apply to persons submitting this form for accounts maintained outside of the United States by certain foreign financial institutions. Therefore, if you are only submitting this form for an account you hold in the United States, you may leave this field blank. Consult with the person requesting this form if you are uncertain if the financial institution is subject to these requirements. A requester may indicate that a code is not required by providing you with a Form W-9 with "Not Applicable" (or any similar indication) written or printed on the line for a FATCA exemption code.

- A—An organization exempt from tax under section 501(a) or any individual retirement plan as defined in section 7701(a)(37)
- B—The United States or any of its agencies or instrumentalities
- C—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities
- D—A corporation the stock of which is regularly traded on one or more established securities markets, as described in Regulations section 1.1472-1(c)(1)(i)
- E—A corporation that is a member of the same expanded affiliated group as a corporation described in Regulations section 1.1472-1(c)(1)(i)
- F—A dealer in securities, commodities, or derivative financial instruments (including notional principal contracts, futures, forwards, and options) that is registered as such under the laws of the United States or any state
- G—A real estate investment trust
- H—A regulated investment company as defined in section 851 or an entity registered at all times during the tax year under the Investment Company Act of 1940
- I—A common trust fund as defined in section 584(a)
- J—A bank as defined in section 581
- K—A broker
- L—A trust exempt from tax under section 664 or described in section 4947(a)(1)

M—A tax exempt trust under a section 403(b) plan or section 457(g) plan

Note: You may wish to consult with the financial institution requesting this form to determine whether the FATCA code and/or exempt payee code should be completed.

Line 5

Enter your address (number, street, and apartment or suite number). This is where the requester of this Form W-9 will mail your information returns. If this address differs from the one the requester already has on file, write NEW at the top. If a new address is provided, there is still a chance the old address will be used until the payor changes your address in their records.

Line 6

Enter your city, state, and ZIP code.

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN.

If you are a single-member LLC that is disregarded as an entity separate from its owner, enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note: See *What Name and Number To Give the Requester*, later, for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local SSA office or get this form online at www.SSA.gov. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at www.irs.gov/Businesses and clicking on Employer Identification Number (EIN) under Starting a Business. Go to www.irs.gov/Forms to view, download, or print Form W-7 and/or Form SS-4. Or, you can go to www.irs.gov/OrderForms to place an order and have Form W-7 and/or SS-4 mailed to you within 10 business days.

If you are asked to complete Form W-9 but do not have a TIN, apply for a TIN and write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note: Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: A disregarded U.S. entity that has a foreign owner must use the appropriate Form W-8.

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if item 1, 4, or 5 below indicates otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on line 1 must sign. Exempt payees, see *Exempt payee code*, earlier.

Signature requirements. Complete the certification as indicated in items 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments made in settlement of payment card and third party network transactions, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), ABL accounts (under section 529A), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account) other than an account maintained by an FFI	The actual owner of the account or, if combined funds, the first individual on the account ¹
3. Two or more U.S. persons (joint account maintained by an FFI)	Each holder of the account
4. Custodial account of a minor (Uniform Gift to Minors Act)	The minor ²
5. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee ¹
b. So-called trust account that is not a legal or valid trust under state law	The actual owner ¹
6. Sole proprietorship or disregarded entity owned by an individual	The owner ³
7. Grantor trust filing under Optional Form 1099 Filing Method 1 (see Regulations section 1.671-4(b)(2)(i)(A))	The grantor*

For this type of account:	Give name and EIN of:
8. Disregarded entity not owned by an individual	The owner
9. A valid trust, estate, or pension trust	Legal entity ⁴
10. Corporation or LLC electing corporate status on Form 8832 or Form 2553	The corporation
11. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
12. Partnership or multi-member LLC	The partnership
13. A broker or registered nominee	The broker or nominee

For this type of account:	Give name and EIN of:
14. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
15. Grantor trust filing under the Form 1041 Filing Method or the Optional Form 1099 Filing Method 2 (see Regulations section 1.671-4(b)(2)(i)(B))	The trust

¹ List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

² Circle the minor's name and furnish the minor's SSN.

³ You must show your individual name and you may also enter your business or DBA name on the "Business name/disregarded entity" name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

⁴ List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships*, earlier.

*Note: The grantor also must provide a Form W-9 to trustee of trust.

Note: If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records From Identity Theft

Identity theft occurs when someone uses your personal information such as your name, SSN, or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity or credit report, contact the IRS Identity Theft Hotline at 1-800-908-4490 or submit Form 14039.

For more information, see Pub. 5027, Identity Theft Information for Taxpayers.

Victims of identity theft who are experiencing economic harm or a systemic problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

Protect yourself from suspicious emails or phishing schemes. Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to phishing@irs.gov. You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration (TIGTA) at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at spam@uce.gov or report them at www.ftc.gov/complaint. You can contact the FTC at www.ftc.gov/idtheft or 877-IDTHEFT (877-438-4338). If you have been the victim of identity theft, see www.IdentityTheft.gov and Pub. 5027.

Visit www.irs.gov/IdentityTheft to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. commonwealths and possessions for use in administering their laws. The information also may be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payers must generally withhold a percentage of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to the payer. Certain penalties may also apply for providing false or fraudulent information.

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

FORM CIQ

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. See Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY

Date Received

1 Name of vendor who has a business relationship with local governmental entity.

2 **Check this box if you are filing an update to a previously filed questionnaire.** (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 Name of local government officer about whom the information is being disclosed.

Name of Officer

4 Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?

Yes No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?

Yes No

5 Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.

6 Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).

7

Signature of vendor doing business with the governmental entity

Date

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

A complete copy of Chapter 176 of the Local Government Code may be found at <http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.176.htm>. For easy reference, below are some of the sections cited on this form.

Local Government Code § 176.001(1-a): "Business relationship" means a connection between two or more parties based on commercial activity of one of the parties. The term does not include a connection based on:

- (A) a transaction that is subject to rate or fee regulation by a federal, state, or local governmental entity or an agency of a federal, state, or local governmental entity;
- (B) a transaction conducted at a price and subject to terms available to the public; or
- (C) a purchase or lease of goods or services from a person that is chartered by a state or federal agency and that is subject to regular examination by, and reporting to, that agency.

Local Government Code § 176.003(a)(2)(A) and (B):

(a) A local government officer shall file a conflicts disclosure statement with respect to a vendor if:

(2) the vendor:

(A) has an employment or other business relationship with the local government officer or a family member of the officer that results in the officer or family member receiving taxable income, other than investment income, that exceeds \$2,500 during the 12-month period preceding the date that the officer becomes aware that

- (i) a contract between the local governmental entity and vendor has been executed;
- or
- (ii) the local governmental entity is considering entering into a contract with the vendor;

(B) has given to the local government officer or a family member of the officer one or more gifts that have an aggregate value of more than \$100 in the 12-month period preceding the date the officer becomes aware that:

- (i) a contract between the local governmental entity and vendor has been executed; or
- (ii) the local governmental entity is considering entering into a contract with the vendor.

Local Government Code § 176.006(a) and (a-1)

(a) A vendor shall file a completed conflict of interest questionnaire if the vendor has a business relationship with a local governmental entity and:

- (1) has an employment or other business relationship with a local government officer of that local governmental entity, or a family member of the officer, described by Section 176.003(a)(2)(A);
- (2) has given a local government officer of that local governmental entity, or a family member of the officer, one or more gifts with the aggregate value specified by Section 176.003(a)(2)(B), excluding any gift described by Section 176.003(a-1); or
- (3) has a family relationship with a local government officer of that local governmental entity.

(a-1) The completed conflict of interest questionnaire must be filed with the appropriate records administrator not later than the seventh business day after the later of:

(1) the date that the vendor:

- (A) begins discussions or negotiations to enter into a contract with the local governmental entity; or
- (B) submits to the local governmental entity an application, response to a request for proposals or bids, correspondence, or another writing related to a potential contract with the local governmental entity; or

(2) the date the vendor becomes aware:

- (A) of an employment or other business relationship with a local government officer, or a family member of the officer, described by Subsection (a);
- (B) that the vendor has given one or more gifts described by Subsection (a); or
- (C) of a family relationship with a local government officer.



STANDARD FORM OF AGREEMENT (CONTRACT)

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

This Agreement is by and between **Sabine River Authority of Texas**, a Texas governmental entity (“Owner”) and **[name of contracting entity]**, a _____ (“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: Canal excavation, sheet pile and roadway demolition, removal of existing pipe, grouting and abandoning existing pipe, placing pipe in open cut trenches, installing pipe under Union Pacific Railroad by trenchless methods, construction of concrete headwalls, construction of canal embankments, placing geotextile riprap, and filling existing canal sections.

ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **Tulane Road Siphon Replacement**.

ARTICLE 3—ENGINEER

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

ARTICLE 4—CONTRACT TIMES

4.01 *Time is of the Essence*

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

4.03 *Contract Times: Days*

A. The Work will be substantially complete within **200** consecutive calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **230** consecutive calendar days after the date when the Contract Times commence to run.

4.05 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also

recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

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

ARTICLE 5—CONTRACT PRICE

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

- A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit. Total Contract Amount: \$_____.

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 within 30 days of receiving engineer approved pay request, as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.
1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited

to liquidated damages, in accordance with the Contract and Texas Water Code Chapter 49.276 .

- a. **90%** percent of the value of the Work completed (with the balance being retainage).
 - b. **90%** percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 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 lowest amount allowed by law.

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 25 sheets with each sheet bearing the following general title: Tulane Road Siphon Replacement.
 7. Addenda (numbers **[number]** to **[number]**, inclusive).
 8. Exhibits to this Agreement (enumerated as follows):
 - a. **Contractors Bid (C-410)**

10. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
 - d. Field Orders.
 - e. Warranty Bond, if any.
- B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 7.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 Contractor's Representations

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

procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.

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

8.02 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:
 1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 *Standard General Conditions*

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

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

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

Owner:

Sabine River Authority of Texas
(typed or printed name of organization)

By: _____
(individual's signature)

Date: _____
(date signed)

Name: David Montagne
(typed or printed)

Title: General Manager
(typed or printed)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Address for giving notices:

Sabine River Authority of Texas

PO Box 579

Orange Texas, 77631

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

Phone: _____

Email: _____

Contractor:

(typed or printed name of organization)

By: _____
(individual's signature)

Date: _____
(date signed)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

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

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Address for giving notices:

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

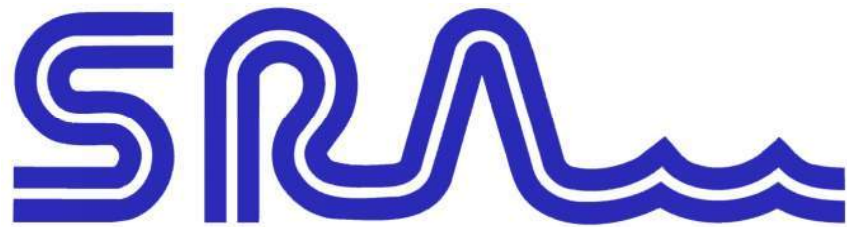
Address:

Phone: _____

Email: _____

License No.: _____
(where applicable)

State: _____



INSURANCE CERTIFICATES
(TO BE INSERTED AT TIME OF EXECUTION)

NOTICE TO PROCEED

Owner: Sabine River Authority of Texas Owner's Project No.: RFB 23-0203
Engineer: Freese and Nichols, Inc. Engineer's Project No.: SRA22674
Contractor: _____ Contractor's Project No.: _____
Project: Tulane Road Siphon Replacement
Contract Name: _____
Effective Date of Contract: _____

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

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

In accordance with the Agreement:

The number of days to achieve Substantial Completion is **200** from the date stated above for the commencement of the Contract Times, resulting in a date for Substantial Completion of **[date, calculated from commencement date above]**; and the number of days to achieve readiness for final payment is **230** from the commencement date of the Contract Times, resulting in a date for readiness for final payment of **[date, calculated from commencement date above]**.

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

Notify Owner and Engineer Project Representative and Project Manager when work will begin.

By *(signature)*: _____
Name *(printed)*: _____
Title: _____
Date Issued: _____

Copy: Sabine River Authority of Texas



PERFORMANCE and PAYMENT BONDS

PERFORMANCE BOND

Contractor Name: Address <i>(principal place of business)</i> :	Surety Name: Address <i>(principal place of business)</i> :
Owner Name: Sabine River Authority of Texas Mailing address <i>(principal place of business)</i> : 12777 Highway 87 N Orange, Texas 77632	Contract Description <i>(name and location)</i> : Tulane Road Siphon Replacement Orange County, Texas Contract Price: Effective Date of Contract:
Bond Bond Amount: Date of Bond: <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i> Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 16	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
_____ <i>(Full formal name of Contractor)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <div style="text-align: center;"><i>(Signature)</i></div>	By: _____ <div style="text-align: center;"><i>(Signature)(Attach Power of Attorney)</i></div>
Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div>	Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div>
Title: _____	Title: _____
Attest: _____ <div style="text-align: center;"><i>(Signature)</i></div>	Attest: _____ <div style="text-align: center;"><i>(Signature)</i></div>
Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div>	Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div>
Title: _____	Title: _____
<i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i>	

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

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

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

14. Definitions

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

PAYMENT BOND

<p>Contractor</p> <p>Name: _____</p> <p>Address <i>(principal place of business)</i>: _____</p>	<p>Surety</p> <p>Name: _____</p> <p>Address <i>(principal place of business)</i>: _____</p>
<p>Owner</p> <p>Name: Sabine River Authority of Texas</p> <p>Mailing address <i>(principal place of business)</i>: 12777 Highway 87 N Orange, Texas 77632</p>	<p>Contract</p> <p>Description <i>(name and location)</i>: Tulane Road Siphon Replacement Orange County, Texas</p> <p>Contract Price: _____</p> <p>Effective Date of Contract: _____</p>
<p>Bond</p> <p>Bond Amount: _____</p> <p>Date of Bond: _____ <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 18</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.</p>	
Contractor as Principal	Surety
_____ <i>(Full formal name of Contractor)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	

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

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

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

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner: Sabine River Authority of Texas Owner's Project No.: RFB 23-02-3
Engineer: Freese and Nichols, Inc. Engineer's Project No.: SRA22674
Contractor: Contractor's Project No.:
Project:
Contract Name:

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: Sabine River Authority of Texas Owner’s Project No.: RFB 23- 0203
Engineer: Freese and Nichols, Inc. Engineer’s Project No.: SRA22674
Contractor: Contractor’s Project No.:
Project:
Contract Name:
Notice Date: Effective Date of the Construction Contract:

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

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

Engineer

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



GENERAL CONTRACT CONDITIONS

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 (the "Indemnified Parties"), 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 laws of the State of Texas, 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

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

SC1.01 – Add the following:

51. Working Day- Any day in which weather or other conditions, not under the control of the CONTRACTOR, will permit construction of the principal units of work for a period of not less than 7 hours between 7:00 am and 6:00 pm. Saturdays, Sundays, and legal holidays will not be counted as a work day if not worked. If the CONTRACTOR works any of these days, he will be charged a working day. Work will not be permitted on Saturdays, Sundays, or legal holidays without the prior written approval of the OWNER.

52. Calendar Day – Every day of the month including Saturday, Sunday, legal holidays, rain days, or other adverse weather days.

ARTICLE 2—PRELIMINARY MATTERS

2.01 Add the following:

D. Texas Ethics Commission – Contractor and Owner shall complete all documentation required to conform with HB 1295 including but not limited to Form 1295 “Certificate of Interested Parties”.

E. Prohibition on Boycotting Israel – In accordance with Section 2270.002 of the Texas Government Code, Contractor hereby represents and warrants that Contractor: 1) Does not boycott Israel; and 2) will not boycott Israel during the term of this contract.

F. Prohibition on Boycotting Power Companies – In accordance with Section 2274.001 of the Texas Government Code, Contractor hereby represents and warrants that Contractor: 1) Does not boycott power companies and 2) will not boycott power companies during the term of this contract.

G. Prohibition on Companies that discriminate against firearm and ammunition industries - In accordance with Section 2274.002 of the Texas Government Code, Contractor hereby represents and warrants that Contractor: 1) Does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association; and 2) Will not discriminate during the term of the contract against a firearm entity or firearm trade association.

H. Posting of certain information at Commercial Building Construction Site Required – In accordance with Section 116.001 of the Texas Government Code, Contractor hereby represents and warrants that Contractor: 1) As soon as practicable after beginning construction of a commercial building project located in this state, the developer of the project shall visibly post the following information at the entrance to the construction site: a) the name and contact information of the developer; and b) a brief description of the project.

2.02 *Copies of Documents*

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

Owner shall furnish to Contractor 3 printed copies of the Contract Documents (including one fully signed counterpart of the Agreement). Electronic portable document format (PDF) shall be available upon request.

ARTICLE 4—NO CHANGES

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
Tolunay-Wong Engineers, Inc		Geotechnical Exploration and Data Report

- 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
GeoSolutions, LLC		Topographic Survey

- G. Contractor may examine copies of reports and drawings identified in SC-5.03.E and SC-5.03.F that were not included with the Bidding Documents at SRA Gulf Coast Division office located at 1922 IP Way, Orange, Texas during regular business hours, or may request copies from Engineer.

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:

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. *Required Performance Bond Form:* The performance bond that Contractor furnishes will be in the form of EJCDC® C-610, Performance Bond (2010, 2013, or 2018 edition). Performance Bond: By State statute, local governments must require a performance bond from all contractors where such contracts involve construction, alteration, or repair of buildings or other public works projects in excess of \$100,000.00. Such bonds must be executed by a corporate surety authorized to do business in the State of Texas in accordance with Article 7.19-1 Bond of Surety Company; Chapter 7 of the Insurance Code, must be for not less than one-hundred percent (100%) of the contract price, and remain in effect for one year beyond the date of acceptance by the Owner. Performance bonds are conditioned upon "the faithful performance of the work in accordance with the drawings, specifications, and contract documents". These are in effect performance guarantees to assure completion of construction. These bonds are solely for the protection of the Owner. (Texas Government Code 2253.021)

2. *Required Payment Bond Form:* The payment bond that Contractor furnishes will be in the form of EJCDC® C-615, Payment Bond (2010, 2013, or 2018 edition). Payment Bond: A payment bond is one executed in connection with a contract (construction, alteration, or repair) to assure payment as required by law to all persons supplying labor and materials in the execution of work provided for in the contract. These bonds are required solely for the protection of all such claimants. These, like performance bonds, must be issued by a State approved corporate surety in accordance with Article 7.19-1 Bond of Surety Company; Chapter 7 of the Insurance Code, must also be for not less than one hundred percent (100%) of the contract price, and remain in effect for one year beyond the date of acceptance by the Owner. The \$25,000.00 State requirement (i.e., all contracts over that amount will require the Owner to have one hundred percent (100%) payment bonds) is also the same. (Texas Government Code 2253.021)

3. *Required Orange County Bond:* Orange County requires that the Contractor furnish a bond or other guarantee acceptable to the County to insure that the crossing site(s) will be maintained and left in a condition satisfactory to the County during and after construction. The required value of such bond or guarantee will be \$20,000.00 per crossing.

6.03 *Contractor's Insurance*

Add the following language to 6.03.A.

- a) The Contractor shall not commence work under this contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the Owner.
- b) *Worker's Compensation Insurance:* The Contractor shall procure and shall maintain during the life of this Contract Worker's Compensation Insurance, including employer liability insurance and coverages for occupational illness or disease with an available limit of at least \$1,000,000 per occurrence for all of its employees to be engaged in work at the site of the project under this Contract and, in case of any such work sublet, the Contractor shall require the subcontractor similarly to provide Worker's Compensation Insurance for all of the employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Worker's Compensation Insurance.
- c) *Commercial General Liability Insurance:* including products/completed operation and broad form property damage limits with an available limit of at least \$2,000,000 per occurrence with a \$4,000,000 aggregate. The policy shall not exclude coverage for explosion, collapse or underground hazards, and pollution, or shall be endorsed for explosion, collapse or underground hazards, and pollution.
- d) *Automobile Liability Insurance:* including use of all owned, non-owned and hired vehicles with an available limit of not less than: Bodily Injury \$1,000,000 each person, \$1,000,000 each occurrence: Property Damage \$1,000,000 each occurrence, combined limit \$2,000,000.
- e) *Longshoremen's and Harborworkers' Compensation Act insurance:* to the extent required under such Act with regard to the work to be performed under the Contract.
- f) *Excess liability insurance or Umbrella insurance:* over all of the foregoing primary policies with an available limit of at least \$5,000,000.00 which follows form on Contractor's other policies.
- g) Owner and Engineer shall be listed as additional insured on all insurance, except for Worker's Compensation and Employer's Liability insurance. Contractor shall provide a waiver of subrogation in favor of the Sabine River Authority on all policies.
- h) *Proof of Insurance:* The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates and date of expiration of policies. Such certificates shall also contain substantially the following statement: "The insurance covered by this certificate will not be canceled or materially altered, except after ten (10) days written notice has been received by the Owner."

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.10 *Taxes*

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

- A. Owner is exempt by law from **State of Texas** sales and Use Tax Laws, and Federal Excise Tax on materials and equipment to be incorporated in the Work. Said taxes must not be included in the Bid.

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.

SC-7.18 Add a new paragraph immediately after Paragraph 7.1B:

C. NOTWITHSTANDING ANYTHING IN PARAGRAPH 7.18.A TO THE CONTRARY, IN THE EVENT A CLAIM ARISES FROM BODILY INJURY (INCLUDING, WITHOUT LIMITATION, SICKNESS OR DISEASE) OR DEATH SUFFERED OR SUSTAINED BY AN EMPLOYEE OF CONTRACTOR OR ANY OF ITS AGENTS OR ITS SUBCONTRACTORS OF ANY TIER, THEN, TO THE FULLEST EXTENT PERMITTED BY LAW, CONTRACTOR AGREES TO INDEMNIFY AND SAVE HARMLESS THE INDEMNIFIED PARTIES, FROM AND AGAINST ANY AND ALL SUCH CLAIMS, WHICH ANY AND ALL OF THEM MAY HEREAFTER SUFFER, INCUR, BE RESPONSIBLE FOR OR PAY OUT, EVEN IF THE CLAIM WAS CAUSED, OR WAS ALLEGED TO BE CAUSED, IN WHOLE OR IN PART, BY THE NEGLIGENCE, FAULT, OMISSION, STRICT LIABILITY, STRICT PRODUCTS LIABILITY, OR NEGLIGENCE PER SE, OF THE INDEMNIFIED PARTIES, IT BEING THE EXPRESS INTENT OF OWNER AND CONTRACTOR THAT CONTRACTOR SHALL BE OBLIGATED TO INDEMNIFY THE INDEMNIFIED PARTIES IN THE MANNER PROVIDED IN THIS PARAGRAPH 7.18.C EVEN FOR THE CONSEQUENCES OF THE INDEMNIFIED PARTIES' OWN NEGLIGENCE, FAULT, OMISSION, STRICT LIABILITY, STRICT PRODUCTS LIABILITY, OR NEGLIGENCE PER SE, WHETHER OR NOT IT IS OR IS ALLEGED TO BE THE SOLE OR A CONCURRING CAUSE OF THE LOSSES GIVING RISE TO THE INDEMNIFIED CLAIMS.

ARTICLE 8—OTHER WORK AT THE SITE

8.02 Coordination

SC-8.02 Add the following new Paragraph 8.02.C immediately after Paragraph 8.02.B:

- C. Owner intends to contract with others for the performance of other work at or adjacent to the Site.
 1. As of the date written, the Owner does not intend to perform any other work at or adjacent to the site.

ARTICLE 10—ENGINEERS STATUS DURING CONSTRUCTION

10.03 Resident Project Representative

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

- C. The Resident Project Representative (RPR) will be Engineer's representative at the Site. RPR's dealings in matters pertaining to the Work in general will be with Engineer and Contractor. RPR's dealings with Subcontractors will only be through or with the full knowledge or approval of Contractor. The RPR will:
 1. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings (but not including Contractor's safety meetings).

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

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

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

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

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

SC 15.01.D.1. Replace paragraph in its entirety with the following:

Payment shall be made within 30 days of presentation of the application for Payment to the 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.

ARTICLE 17 FINAL RESOLUTIONS OF DISPUTES

Add the following to 17.01

- C. All disputes arising under this Contract or its interpretation except those disputes covered by FEDERAL LABOR STANDARDS PROVISIONS whether involving law or fact or both, or extra work, and all claims for alleged breach of contract shall, within ten (10) days of commencement of the dispute, be presented by the Contractor to the Owner for decision. Any claim not presented within the time limit specified in this paragraph shall be deemed to have been waived, except that if the claim is of a continuing character and notice of the claim is not given within ten (10) days of its commencement, the claim will be considered only for a period commencing ten (10) days prior to the receipt of the Owner.
- D. The Contractor shall submit in detail his claim and his proof thereof.
- E. If the Contractor does not agree with any decision of the Owner, he shall in no case allow the dispute to delay the work but shall notify the Owner promptly that he is proceeding with the work under protest.
- F. Venue for disputes shall lie exclusively in Orange County, Texas and none other.

ARTICLE 18 MISCELLANEOUS

Add the following Section:

18.11 Contractors Field Office

The contractor is not required to furnish, during construction of the Improvements embraced in this Contract, a Contractors or Engineers office. Contractor shall have at least one printed copy of the Contract Documents (Drawings and Specifications) on site at all times that work is being performed.

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

Owner: Sabine River Authority of Texas Owner's Project No.: RFB 23-0203
Engineer: Freese and Nichols, Inc. Engineer's Project No.: SRA22674
Contractor: Contractor's Project No.:
Project:
Contract Name:
Date Issued: Effective Date of Work Change Directive:

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

Description:

[Description of the change to the Work]

Attachments:

[List documents related to the change to the Work]

Purpose for the Work Change Directive:

[Describe the purpose for the change to the Work]

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

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: _____

FIELD ORDER NO.: [Number of Field Order]

Owner: Sabine River Authority of Texas Owner's Project No.: RFB 23-0203
Engineer: Freese and Nichols, Inc. Engineer's Project No.: SRA22674
Contractor: Contractor's Project No.:
Project:
Contract Name:
Date Issued: Effective Date of Field Order:

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

Reference:

Specification Section(s):

Drawing(s) / Details (s):

Description:

[Description of the change to the Work]

Attachments:

[List documents supporting change]

Issued by Engineer

By: _____

Title: _____

Date: _____



WAGE RATE DETERMINATION

"General Decision Number: TX20220061 12/16/2022

Superseded General Decision Number: TX20210061

State: Texas

Construction Type: Heavy

Counties: Hardin, Jefferson and Orange Counties in Texas.

HEAVY CONSTRUCTION PROJECTS (Industrial and Processing Plants, and Refineries)

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2022.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <https://www.dol.gov/agencies/whd/government-contracts>.

1 02/25/2022
 2 03/11/2022
 3 09/09/2022
 4 09/16/2022
 5 12/16/2022

ASBE0022-001 06/01/2022

	Rates	Fringes
Insulator/asbestos worker (includes application of all insulating materials, protective coverings, coatings and finishing to all types of mechanical systems).....	\$ 26.88	15.41

* BRTX0001-009 06/01/2022

	Rates	Fringes
BRICKLAYER.....	\$ 29.60	14.52

CARP2484-001 01/03/2000

	Rates	Fringes
MILLWRIGHT.....	\$ 19.72	3.73

SHEE0054-001 04/01/2020

	Rates	Fringes
Sheet metal worker (Including HVAC Duct work).....	\$ 29.70	13.85

* SUTX2000-003 02/11/2000

	Rates	Fringes
ELECTRICIAN (Including Low Voltage wiring).....	\$ 15.20	0.40

LABORER
 Common.....\$ 10.00 **

PIPEFITTER (Including HVAC
work).....\$ 13.20 ** 0.34

Power Equipment Operator
 CRANE.....\$ 15.20 0.40

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

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** Workers in this classification may be entitled to a higher
 minimum wage under Executive Order 14026 (\$15.00) or 13658
 (\$11.25). Please see the Note at the top of the wage
 determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave
 for Federal Contractors applies to all contracts subject to the

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

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

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

Union Rate Identifiers

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

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

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average

calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

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

Union Average Rate Identifiers

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

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

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

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

Wage and Hour Administrator

U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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

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

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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

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END OF GENERAL DECISIO"



Division 01 – General Requirements



SCOPE OF WORK

01 11 00 SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY

- A. Construct Work as described in the Contract Documents.
 - 1. Provide the materials, equipment, and incidentals required to make the Project completely and fully operable.
 - 2. Provide the labor, equipment, tools, and consumable supplies required for a complete Project.
 - 3. Provide the civil, architectural, structural, mechanical, electrical, instrumentation, and all other Work required for a complete and operable Project.
 - 4. Test and place the completed Project in operation.
 - 5. Provide the special tools, spare parts, lubricants, supplies, or other materials as indicated in the Contract Documents for the operation and maintenance of the Project.
 - 6. The Contract Documents do not indicate or describe all Work required to complete the Project. Additional details required for the correct installation of selected products are to be provided by the Contractor and coordinated with the Construction Manager.

1.02 DESCRIPTION OF WORK

- A. Work is described in general, non-inclusive terms as:
 - 1. Installation of two (2) – 72” diameter FRP siphon pipes. Pipes shall be installed by trenchless methods through Union Pacific ROW and by open cut method elsewhere.
 - 2. Construction of two reinforced concrete headwalls.
 - 3. Excavation and fill for realignment of the canal.
 - 4. Removal of two sheet pile headwalls and two existing siphon pipes under Tulane Road.
 - 5. Grout and abandon two existing siphon pipes under the UPRR.
 - 6. Place concrete plug in two existing siphon pipes.
- B. Alternates
 - 1. Work under Alternate No. 1 includes furnishing two sets of stop logs.

1.03 WORK UNDER OTHER CONTRACTS

- A. Owner has no knowledge of work, other than the Work included in this Contract, which may impact construction scheduling, testing, and startup.

1.04 WORK BY OWNER

- A. Owner has no knowledge of work, other than the Work included in this Contract that may impact construction scheduling, testing, and startup.

- B. Owner will provide normal operation and maintenance of the existing facilities during construction, unless otherwise stated.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 29 01 MEASUREMENT AND BASIS FOR PAYMENT

PART 1 - GENERAL

1.01 PAYMENT FOR MATERIALS AND EQUIPMENT

- A. Payment will be made for materials and equipment materials properly stored and successfully incorporated into the Project less the specified retainage.
- B. Provide a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of Liens. Provide documentation of payment for materials and equipment with the next Application for Payment. Remove items from the tabulation of materials and equipment if this documentation is not provided with the next Application for Payment.
- C. Provide evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest.
- D. The Work covered by progress payments becomes the property of the Owner at the time of payment. The Contractor's obligations with regard to proper care and maintenance, insurance, and other requirements are not changed by this transfer of ownership until final acceptance in accordance with the General Conditions.
- E. Payment for materials and equipment does not constitute acceptance of the product.

1.02 MEASUREMENT AND BASIS FOR PAYMENTS ON LUMP SUM ITEMS

- A. Measurement for progress payments is the invoice value for stored materials and the earned value for all other cost for constructing each item. Earned value is expressed as the value of the Work completed divided by the total value of installation cost. The total amount paid will be equal to the total lump sum amount for that item.

1.03 MEASUREMENT AND BASIS FOR PAYMENTS ON UNIT PRICE ITEMS

- A. Measure the Work using the unit of measure indicated in this Section for each unit price line item. Payment will be made only for the actual measured unit and/or computed length, area, solid contents, number, and weight unless other provisions are made in the Contract Documents. Payment on a unit price basis will not be made for Work outside dimensions shown in the Contract Documents.
- B. Payment will be made for the actual quantity of Work completed and for materials and equipment stored during the payment period. Payment amount is the Work quantity measured per Paragraph A above multiplied by the unit price for that line item in the Agreement.

1.04 MEASUREMENT AND BASIS FOR PAYMENT FOR BASE BID ITEMS

- A. Item 1 – Mobilization (Not to Exceed 3% of Total Contract Amount)
 - 1. Measuring for payment is on a lump sum basis. Payment for mobilization will be based on the earned value of Work completed.

B. Item 2- Clearing and Grubbing

1. Measurement for payment is on a lump sum basis. Payment for the work specified will be made at the lump sum price bid for "Clearing and Grubbing", which payment shall constitute full compensation for labor, equipment, tools, and incidentals necessary to complete the specified work, including refilling of depressions. No payment will be made for clearing and grubbing in the borrow or waste disposal areas, and all costs thereof shall be included in the appropriate bid price of the type of work involved.

C. Item 3 – Stormwater Pollution Prevention Plan

1. Measurement for payment is on a lump sum basis. Payment shall be made at the lump sum price proposed and shall include, but is not limited to, all labor, material, equipment, transportation, submittals, and incidentals required for the required preparation of the SWPPP and for the installation, maintenance, and removal of erosion control measures, including but not limited to, reinforced filter fabric fence and construction entrances.

D. Item 4 – Care of Water During Construction

1. Measurement for payment is on a lump sum basis. Payment for the work covered under this section of the specifications will be made at the lump sum price proposed, which payment shall constitute full compensation for all costs of furnishing all labor, equipment, and materials for any temporary diversions and drainage channels, installing pumps and other equipment as required, maintaining the work free from water, maintaining groundwater 3' below excavations, handling contaminated water, and removing all temporary protective works. Payment shall be made in even installments over the duration of the contract, unless otherwise approved by the Engineer and Owner.

E. Item 5 – Temporary Cofferdams

Measurement for payment is on a lump sum basis. Payment shall be made at the lump sum price proposed for the preparation, installation, maintenance, removal, and any other work associated with the cofferdams during construction.

F. Item 6 – Barbed Wire Fencing

1. Measurement for payment is on a linear foot basis. Payment shall be made at the unit price per linear foot proposed and shall include all labor, material, equipment, transportation, submittals, and incidentals required for the required for the installation of the barbed wire fence.

G. Item 7 – Final Grading and Hydro Mulching

1. Measurement for payment is on an acreage basis. Payment shall be made at the unit price per acre proposed for all labor, materials, preparation, maintenance and any other work necessary to final grade, seed and hydro mulch the project site.

H. Item 8 – Excavation

1. Measurement for payment is on a cubic yard basis. Measurement shall be made in a horizontal and vertical projection based on the dimensions and material types indicated in the Drawings. After completion of Clearing and Grubbing, the contractor shall make a survey of the excavations, and the measurements will be based on this

survey. In areas where the engineer has requested excavation beyond that shown on the plans, a survey shall be made to determine the extent of the excavation. Volumes will be computed using the "Average End Area" method. No allowance will be made for unauthorized over-excavation and the satisfactory replacement of such overcut with appropriate materials will be required and performed at the Contractor's expense. The Contractor shall coordinate and cooperate with the Engineer in order that the Engineer may verify the adequacy and accuracy of the survey. Payment shall be made at the unit price per cubic yard proposed for all labor, equipment, and preparation for stripping, removing, stockpiling and/or rehandling stockpiled materials suitable for reuse, disposing of unsuitable or excess excavated materials in the appropriate spoil area, dressing of the spoil areas, maintenance of the approved subgrade, and any other work to perform excavation at the site.

I. Item 9 – Haul-off and Disposal of Excess Excavated Materials

1. Measurement for payment is on a cubic yard basis. Volumes will be computed by truck measure. Payment shall be made at the unit price proposed per cubic yard for loading, transporting, and disposing of unsuitable or excess materials to the completion of the work as shown on the drawings and as specified.

J. Item 10 – Demolition

1. Measurement for payment is on a lump sum basis. Payment shall be made at the lump sum price proposed for all labor, equipment, preparation for removal of the steel sheet pile headwalls, backfill of cavities, haul off and disposal of removed materials including existing pipes, and any other items necessary to perform demolition as shown on the drawings and as specified.

K. Item 11 – Plug and Abandon Existing Western Siphon Pipes

1. Measurement for payment is on a lump sum basis. Payment shall be made at the lump sum price proposed for removing water and debris from the western siphon pipes and plugging with three feet of concrete.

L. Item 12 – Remove Existing Eastern Siphon Pipes North of UPRR Right of Way

1. Measurement for this item is on a linear foot basis. Payment shall be made at the unit price per linear foot for all labor, materials, and equipment to remove portions of Tulane Road, excavate to expose existing pipes, remove, haul off and dispose of existing pipes offsite, and any other items necessary to perform removal of the existing pipes.

M. Item 13 – Grout and Abandon Existing Eastern Siphon Pipes under UPRR Right of Way

1. Measurement for this item is on a linear foot basis. Payment shall be made at the unit price per linear foot for all labor, materials, and equipment to empty, grout fill, cap, and any other items necessary to perform grouting of the existing pipes.

N. Item 14 – Class 1 Earth Fill (On Site Reuse)

1. Measurement for payment is on a cubic yard basis. The embankments will be measured to the neat lines, slopes, and grades indicated on the drawings. After each stage of work, make a survey of the site of the embankment work. The volumes will be computed by the average end area method. No allowance will be made for

unauthorized over-excavation and the satisfactory replacement of such overcut with appropriate materials will be required and performed at the Contractor's expense. The Contractor shall coordinate and cooperate with the Engineer in order that the Engineer may verify the adequacy and accuracy of the surveys. Payment shall be made at the unit price proposed per cubic yard and shall be full compensation for furnishing all labor and equipment and for performing all operations necessary to properly place and compact all Class 1 earth fill.

O. Item 15 – Class 4 Earth Fill

1. Measurement for payment is on a cubic yard basis. The embankments will be measured to the neat lines, slopes, and grades indicated on the drawings. After each stage of work, make a survey of the site of the embankment work. The volumes will be computed by the average end area method. No allowance will be made for unauthorized over-excavation and the satisfactory replacement of such overcut with appropriate materials will be required and performed at the Contractor's expense. The Contractor shall coordinate and cooperate with the Engineer in order that the Engineer may verify the adequacy and accuracy of the surveys. Payment shall be made at the unit price proposed per cubic yard and shall be full compensation for furnishing all labor, materials, and equipment and for performing all operations necessary to properly place and compact all Class 4 earth fill.

P. Item 16 – Concrete Headwall Structures

1. Measurement for payment is on a cubic yard basis. The item shall consist of the completion of the headwalls, footings, wingwalls, sidewalls, splitter walls, and cutoff walls of the headwall structures. Payment shall be made at the unit price per cubic yard proposed and shall include, but is not limited to, all labor, materials, mixing and transporting equipment and incidentals necessary to proportion, mix, transport, place, consolidate, finish, and cure concrete and mud slabs in the project.

Q. Item 17 – Galvanized Grating

1. Measurement for payment is on a lump sum basis. Payment shall be made at the lump sum price proposed and shall include all labor, material, equipment, transportation, submittals, and incidentals required for furnishing and installing grating per details, including all fastening hardware and all other appurtenances, complete in place.

R. Item 18 – 72" FRP Pipe (Trenchless Installation)

1. Measurement for payment is on a linear foot basis. Payment shall be made at the unit price per linear foot proposed for trenchless installation under the UPRR right of way. This item shall consist of providing the applicable length of pipe, number of FRP rings and FWC couplings, and all labor and equipment for trenchless installation of the pipe.

S. Item 19 – 72" FRP Direct Bury Pipe

1. Measurement for payment is on a linear foot basis. Payment shall be made at the unit price per linear foot proposed for placement in a horizontal and vertical projection based on the dimensions indicated in the drawings. This item shall consist of providing the applicable length of pipe, number of FRP rings and FWC couplings, and backfill material. This item shall include, but is not limited to, all labor, equipment, materials,

transportation, submittals, and incidentals for excavating and backfilling pipe trench based on the details and dimensions indicated in the drawings.

T. Item 20 – Riprap Erosion Protection (12”)

1. Measurement for payment is on a cubic foot basis. Measurement shall be to the neat lines and grades indicated on the drawings or as modified by the owner, and on the basis of the prescribed thickness measured perpendicular to the slope or surface on which it is placed. Geotextile fabric shall not be measured but shall be considered subsidiary to the riprap. Payment for riprap shall be made at the unit price proposed per cubic yard for which payment shall be full compensation for labor, equipment, and materials and for performing all operations necessary to furnish, transport, haul, handle, place and test the riprap as specified and as indicated on the drawings.

U. Item 21 – Roadway Repair

1. Measurement for payment is on a square yard basis. Payment shall be made at the unit price per square yard proposed and shall include all labor, materials, equipment, and incidentals to repair Tulane Road pavement as shown on the drawings.

1.05 MEASUREMENT AND BASIS FOR PAYMENT FOR ALTERNATE ITEM NO. 1

A. Item A-1 – Stop Logs

1. Measurement for payment is on a lump sum basis. Payment shall be made at the lump sum price proposed and shall include all labor, materials, equipment, transportation, submittals, and incidentals required to furnish and install two sets of aluminum stop logs and all stop log frames per details, including all fastening hardware and all other necessary appurtenances, complete in place.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 31 13 PROJECT ADMINISTRATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Administer contract requirements to construct the Project. Provide documentation per the requirements of this Section. Provide information as requested by the OPT.

1.02 DOCUMENTATION

- A. Provide documents in accordance with Section 01 33 00 "Document Management."

1.03 COMMUNICATION DURING THE PROJECT

- A. Construction Manager is to be the first point of contact for all parties on matters concerning this Project.
- B. Construction Manager will coordinate correspondence concerning:
 - 1. Contract administration;
 - 2. Clarification and interpretation of the Contract Documents;
 - 3. Contract modifications;
 - 4. Observation of Work and testing; and
 - 5. Claims.
- C. Construction Manager will normally communicate only with the Contractor. Any required communication with Subcontractors or Suppliers will only be with the direct involvement of the Contractor.
- D. Direct written communications to the Construction Manager at the address indicated at the pre-construction conference. Include the following with communications as a minimum:
 - 1. Name of the Owner;
 - 2. Project name;
 - 3. Contract title;
 - 4. Project number;
 - 5. Date; and
 - 6. A reference statement.
- E. Submit communications on the forms referenced in this Section or in Section 01 33 00 "Document Management."

1.04 PROJECT MEETINGS

- A. Pre-Construction Conference:
 - 1. Attend a pre-construction conference;
 - 2. The location of the conference will be determined by the Construction Manager;

3. The time of the conference will be determined by the Construction Manager, but will be after the Notice of Award is issued and not later than 15 days after the Notice to Proceed is issued;
 4. OPT, Contractor's project manager and superintendent, representatives of utility companies, and representatives from major Subcontractors and Suppliers may attend the conference; and
 5. Provide and be prepared to discuss:
 - a. Preliminary construction schedule per Section 01 33 05 "Construction Progress Schedule";
 - b. Preliminary Schedule of Documents per Section 01 33 00 "Document Management";
 - c. Schedule of Values and anticipated schedule of payments per Section 01 29 01 "Measurement and Basis for Payment";
 - d. List of Subcontractors and Suppliers;
 - e. Contractor's organizational chart as it relates to this Project; and
 - f. Letter indicating the agents of authority for the Contractor and the limit of that authority with respect to the execution of legal documents, contract modifications, and payment requests.
- B. Progress Meetings:
1. Attend meetings with the Construction Manager, Design Professional, and Owner.
 - a. Meet monthly or as requested by the Construction Manager to discuss the Project.
 - b. Meet at the Site or other location as designated by the Construction Manager.
 - c. Contractor's superintendent and other key personnel are to attend the meeting. Other individuals may be requested to attend to discuss specific matters.
 - d. Notify the Construction Manager of any specific items to be discussed a minimum of 1 week prior to the meeting.
 2. Provide information as requested by the Construction Manager, Design Professional or Owner concerning this Project. Prepare to discuss:
 - a. Status of overall project schedule;
 - b. Contractor's detailed schedule for the next month;
 - c. Anticipated delivery dates for equipment;
 - d. Coordination with the Owner;
 - e. Status of documents;
 - f. Information or clarification of the Contract Documents;
 - g. Claims and proposed modifications to the Contract;
 - h. Field observations, problems, or conflicts; and

- i. Maintenance of quality standards.
 3. Construction Manager will prepare a record of meeting proceedings. Review the record of the meeting and notify the Construction Manager of any discrepancies within 10 days of the date the record of the meeting is provided. The record will not be corrected after the 10 days have expired. Corrections will be reflected in the record of the following meeting.
- C. Pre-Documentation and Pre-Installation Meetings:
 1. Conduct pre-documentation and pre-installation meetings as required in the individual technical Specifications or as determined necessary by the Construction Manager (for example, instrumentation, roofing, concrete mix design, etc.).
 2. Set the time and location of the meetings when ready to proceed with the associated Work. Submit a Notification by Contractor in accordance with Paragraph 1.07 for the meeting 2 weeks before the meeting. OPT must approve of the proposed time and location.
 3. Attend the meeting and require the participation of appropriate Subcontractors and Suppliers in the meeting.
 4. Construction Manager will prepare a record of meeting proceedings. Review the record of the meeting and notify the Construction Manager of any discrepancies within 10 days of the date the record of the meeting is provided. The record will not be corrected after the 10 days have expired. Corrections will be reflected in the record of the following meeting.
- D. Weekly Coordination Meetings: Meet on a weekly basis with the Construction Manager or designated on-site representative of the OPT to discuss Work planned for the following week, review coordination issues, testing required, or other issues. Records of these meetings are not required.

1.05 REQUESTS FOR INFORMATION

- A. Submit a Request for Information to the Construction Manager to obtain additional information or clarification of the Contract Documents.
 1. Submit a separate Request for Information for each item on the form provided by the Construction Manager.
 2. Attach adequate information to permit a response without further clarification. Construction Manager will return requests that do not have adequate information to the Contractor for additional information. Contractor is responsible for all delays resulting from multiple reviews due to inadequate information.
 3. A response will be made when adequate information is provided. The response will be made on the Request for Information form provided by the Construction Manager.
- B. Response to a Request for Information is given to provide additional information, interpretation, or clarification of the requirements of the Contract Documents, and does not modify the Contract Documents.
 1. Submit a Change Proposal per Section C700 "General Conditions" if a contract modification is suggested or required.

- C. Use the Decision Register to document decisions made at meetings and actions to be taken in accordance with Paragraph 1.06.
- D. Use the Action Item Register to document assignments for actions to be taken in accordance with Paragraph 1.06.

1.06 DECISION AND ACTION ITEM REGISTER

- A. Construction Manager will maintain a Decision Register to document key decisions made during meetings, telephone conversations, or visits to the Site using the format provided by the Construction Manager:
 - 1. Review the Decision Register prior to each regular meeting.
 - 2. Report any discrepancies to the Construction Manager for correction or discussion at the next monthly meeting.
- B. Construction Manager will maintain an Action Item Register in conjunction with the Decision Register to track assignments made during meetings, telephone conversations or visits to the Site using the format provided by the Construction Manager:
 - 1. Review the Action Item Register prior to each regular meeting.
 - 2. Report actions taken after the previous progress meeting on items in the register assigned to the Contractor or through the Contractor to a Subcontractor or Supplier to the Construction Manager. Report on status of progress 1 week prior to each progress meeting established in Paragraph 1.04 to allow Construction Manager to update the register prior to the Progress Meetings.
 - 3. Be prepared to discuss the status at each meeting.
- C. Decisions or action items in the register that require a change in the Contract Documents will have the preparation of a Modification as an action items if appropriate. The Contract Documents can only be changed by a Modification.

1.07 NOTIFICATION BY CONTRACTOR

- A. Notify the Construction Manager of:
 - 1. Need for testing;
 - 2. Intent to work outside regular working hours;
 - 3. Request to shut down facilities or utilities;
 - 4. Proposed utility connections;
 - 5. Required observation by Construction Manager, Engineer, or inspection agencies prior to covering Work; and
 - 6. Training.
- B. Provide notification a minimum of 2 weeks in advance to allow OPT time to respond appropriately to the notification.
- C. Use the Notification by Contractor form provided by the Construction Manager.

1.08 REQUESTS FOR MODIFICATIONS

- A. Submit requests for Modifications per C700 “General Conditions of the Construction Contract.”

1.09 RECORD DATA

- A. Submit information required by the Contract Documents that is not related to a product as Record Data using the form provided by the Construction Manager.

1.10 RECORD DOCUMENTS

- A. Maintain one complete set of printed Record Documents at the Site including:
 - 1. Drawings;
 - 2. Specifications;
 - 3. Addenda;
 - 4. Modifications;
 - 5. Product Data and approved Shop Drawings;
 - 6. Construction photographs;
 - 7. Test Reports;
 - 8. Clarifications and other information provided in Request for Information responses; and
 - 9. Reference standards.
- B. Store printed Record Documents and Samples in the Contractor’s field office.
 - 1. Record Documents are to remain separate from documents used for construction.
 - 2. Provide files and racks for the storage of Record Documents.
 - 3. Provide a secure storage space for the storage of Samples.
 - 4. Maintain Record Documents in clean, dry, legible conditions, and in good order.
 - 5. Make Record Documents and Samples available at all times for inspection by the OPT.
- C. Maintain an electronic record of Specifications and Addenda to identify products provided in PDF format.
 - 1. Reference the Product Data number, Shop Drawing number, and O&M manual number for each product and item of equipment furnished or installed.
 - 2. Reference Modifications by type and number for all changes.
- D. Maintain an electronic record of Drawings in PDF format.
 - 1. Reference the Product Data number, Shop Drawing number, and O&M manual number for each product and item of equipment furnished or installed.
 - 2. Reference Modifications by type and number for all changes.

3. Record information as construction is being performed. Do not conceal any Work until the required information is recorded.
 4. Mark drawings to record actual construction.
 - a. Depths of various elements of the foundation in relation to finished first floor datum or the top of walls.
 - b. Horizontal and vertical locations of underground utilities and appurtenances constructed, and existing utilities encountered during construction.
 - c. Location of utilities and appurtenances concealed in the Work. Refer measurements to permanent structures on the surface. Include the following equipment:
 - 1) Piping;
 - 2) Ductwork;
 - 3) Equipment and control devices requiring periodic maintenance or repair;
 - 4) Valves, unions, traps, and tanks;
 - 5) Services entrance;
 - 6) Feeders; and
 - 7) Outlets.
 - d. Changes of dimension and detail.
 - e. Changes by Modifications.
 - f. Information in Requests for Information or included in the Decision Register.
 - g. Details not on the original Drawings. Include field verified dimensions and clarifications, interpretations, and additional information issued in response to Requests for Information.
 5. Mark Drawings with the following colors:
 - a. Highlight references to other documents, including Modifications in blue.
 - b. Highlight mark ups for new or revised Work (lines added) in yellow.
 - c. Highlight items deleted or not installed (lines to be removed) in red.
 - d. Highlight items constructed per the Contract Documents in green.
 6. Submit Record Documents to Construction Manager for review and acceptance 30 days prior to Final Completion of the Project.
- E. Applications for Payment will not be recommended for payment if Record Documents are found to be incomplete or not in order. Final payment will not be recommended without complete Record Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 33 00 DOCUMENT MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Submit documentation as required by the Contract Documents and as requested by the Construction Manager.
- B. Use the Project Management Information System (PMIS) provided by the Construction Manager. Software for the PMIS is FNiManager which has the following system requirements:
 - 1. Operating Systems: Windows 7 or later and OS X v10.8 or later.
 - 2. Supported Internet Browsers: Internet Explorer 11.0 or later, Google Chrome 70.0 or later, Firefox 63.0 or later, Safari 11.0 or later, and Microsoft Edge 17.0 or later.
 - 3. Screen Resolution: The recommended screen resolution is 1280 x 1024 or higher. The minimum screen resolution required to support all features is 1024 x 768.

1.02 QUALITY ASSURANCE

- A. Submit legible, accurate, complete documents presented in a clear, easily understood manner. Documents not meeting these criteria will be returned without review as “Not Approved.”

1.03 CONTRACTOR’S RESPONSIBILITIES

- A. Review documents prior to submission. Make certifications as required by the Contract Documents and as indicated on Construction Manager provided forms.
- B. Provide a Schedule of Documents to list the documents that are to be submitted and the dates on which documents are to be sent to the Construction Manager for review. Use the form provided by the Construction Manager for this list.
- C. Incorporate the dates for processing documents into the Progress Schedule required by Section 01 33 05 “Construction Progress Schedule.”
 - 1. Provide documents in accordance with the schedule so construction of the Project is not delayed.
 - 2. Allow a reasonable time for the review of documents when preparing the Progress Schedule. Assume a 14-day review cycle for each document unless a longer period of time is indicated in the Contract Documents or agreed to by Construction Manager and Contractor.
 - 3. Schedule delivery of review documents to provide all information for interrelated Work at one time.
 - 4. Allow adequate time for processing documents so construction of the Project is not delayed.

1.04 FORMS AND WORKFLOWS

- A. Use the forms or workflow process provided by the Construction Manager for project documentation.

1.05 DOCUMENT PREPARATION AND DELIVERY PROCEDURES

- A. Deliver documents in electronic format as directed by the Construction Manager.
 - 1. Do not leave any blanks incomplete. If information is not applicable, enter NA in the space provided.
 - 2. Deliver all documents in Portable Document Format (PDF).
 - a. Create PDF document using Bluebeam Revu software.
 - b. Create PDF documents from native format files unless files are only available from scanned documents.
 - c. Rotate pages so that the top of each document appears at the top of the monitor screen when opened in PDF viewing software.
 - d. Provide PDF document with adequate resolution to allow documents to be printed in a format equivalent to the document original. Documents are to be scalable to allow printing on standard 8-1/2 x 11 or 11 x 17 paper.
 - e. Submit color PDF documents where color is required to interpret the document.
 - f. Create or convert documents to allow text to be selected for comments or searched using text search features. Run scanned documents through Optical Character Recognition (OCR) software if necessary.
 - g. Flatten markups in documents to prevent markups made by Contractor from being moved or deleted. Flatten documents to allow markup recovery.
 - h. Use Bluebeam Revu software to reduce file size using default settings except the option for "Drop Metadata". Uncheck the "Drop Metadata" box when reducing file size.
 - i. Add footers to each document with the name of the Project.

1.06 DOCUMENTATION

- A. Furnish documents as indicated in the individual Specification Sections. Submit documents per the procedures described in the Contract Documents.
- B. Submit documents per the Specification Sections shown in the following table:

Document Type	Specification Section
Application for Payment	01 29 01
Certified Test Report	C700 for approval of product 01 40 00 to demonstrate compliance
Change Management	C700 and C940
Graphic Documentation	01 33 06
Notification by Contractor	01 31 13

Document Type	Specification Section
Product Data	C700
Progress Schedules	01 33 05
Record Data	01 31 13
Request for Information	01 31 13
Schedule of Values	01 29 01
Shop Drawing	C700
Substitutions	C700
Suppliers and Subcontractors	01 31 13 C700

1.07 Electronic Documents Protocol

- A. The parties shall follow the provisions in this Section, referred to as the Electronic Documents Protocol (“EDP”), for exchange of electronic transmittals.
- B. Basic Requirements:
 - 1. Except as otherwise stated elsewhere in the Contract Documents, the OPT and Contractor will send and accept Electronic Documents sent by Electronic Means using the protocols provided in this Section.
 - 2. The contents of the information in any Electronic Document will be the responsibility of the transmitting party. Electronic Documents may be used in the same manner as the printed versions of the same documents that are exchanged using non-electronic format and methods, and are subject to the same governing requirements, limitations, and restrictions, set forth in the Contract Documents.
 - 3. Provisions of this Contract regarding Electronic Documents must be incorporated into other agreements or subcontracts on the Project. Nothing in this paragraph reduces or eliminates requirements:
 - a. to create, provide, or maintain an original printed record version of Drawings and Specifications, signed and sealed according to applicable Laws and Regulations;
 - b. to comply with any applicable Law or Regulation governing the signing and sealing of design documents and related Modifications or the signing and electronic transmission of any other documents; or
 - c. to comply with the notice requirements.
 - 4. When sending Electronic Documents by Electronic Means the sending 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 sending Electronic Documents.
- C. System Infrastructure for Electronic Document Exchange:
 - 1. Contractor will provide hardware, operating system(s) software, internet, e-mail, and large file transfer functions (“System Infrastructure”) at its own cost. System Infrastructure must comply with these requirements.

2. The maximum size of an email attachment for exchange of Electronic Documents under this EDP is 25 MB. Attachments larger than that may be exchanged in parts or by using large file transfer functions or physical media.
3. Contractor assumes full and complete responsibility for its own costs, delays, deficiencies, and errors associated with converting, translating, updating, verifying, licensing, or otherwise enabling its System Infrastructure, including operating systems and software.
4. Contractor is responsible for its own system operations, security, back-up, archiving, audits, printing resources, and other Information Technology ("IT") for maintaining operations of its System Infrastructure during the Project, including coordination with individual(s) or entity responsible for managing its System Infrastructure and capable of addressing routine communications and other IT issues affecting the exchange of Electronic Documents.
5. Contractor will operate and maintain industry-standard, industry-accepted, ISO standard, commercial-grade security software and systems that are intended to protect others from: software viruses and other malicious software like worms, trojans, adware; data breaches; loss of confidentiality; and other threats in the transmission to or storage of information from the other parties, including transmission of Electronic Documents by physical media such as CD/DVD/flash drive/hard drive. Contractor will not be liable to others for any breach of system security to the extent that Contractor maintains and operates required security software and systems.
6. In the case of disputes, conflicts, or modifications to the use of Electronic Documents required to address issues affecting System Infrastructure, Contractor and OPT will cooperatively resolve the issues; but, failing resolution, OPT is authorized to make and require reasonable and necessary changes meet its original intent. Contractor may submit a Change Proposal if the changes cause additional cost or time to Contractor that could not have reasonably been anticipated.
7. Contractor and OPT are both responsible for their own back-up and archive of documents sent and received during the term of the contract. Contractor and OPT remain solely responsible for its own post-Project back-up and archive of Project documents after the term of the Contract as each party deems necessary for its own purposes.
8. If a Contractor or OPT receives an obviously corrupted, damaged, or unreadable Electronic Document, the receiving party will advise the sending party of the incomplete transmission. The parties will attempt to complete a successful transmission of the Electronic Document or use an alternative delivery method to complete the communication.
9. OPT will operate a project information management system (Project Website) for use of OPT and Contractor during the Project for exchange and storage of Project-related communications and information. Except as otherwise provided in this Contract, use of the Project Website will be mandatory for exchange of Project documents, communications, submittals, and other Project-related information.

D. Software Requirements:

1. OPT and Contractor will each acquire the software and software licenses necessary to create and transmit Electronic Documents and to read and to use any Electronic Documents received from the other party (and if relevant from third parties), using the following software formats:

Document	Document Format
Email	.htm, .rtf, or .txt without formatting that impair legibility of content on screen or in printed copies
Submittals	Bluebeam PDF
Applications for Payment	Bluebeam PDF and Microsoft® Excel
Progress Schedules	PDF and Schedule in Schedule in Native Format
Layouts and drawings to be submitted to Owner for future use and modification	Autodesk® AutoCAD .dwg format
Document submitted to OPT for future word processing use and modification	Microsoft® Word
Spreadsheets and data submitted to OPT for future data processing use and modification	Microsoft® Excel
Photographs	.jpg or .jpeg
Videos	.mp4, .mpeg, or .avi

2. Software will be the version currently published at the time Contract is signed, unless a specific software version is listed in the Supplementary Conditions. Prior to using any updated version of the software required in this section for sending Electronic Documents to the other party, the originating party will first notify and receive concurrence from the other party for use of the updated version or convert to comply with this Section.
3. The parties agree not to intentionally edit, reverse engineer, decrypt, remove security or encryption features, or convert to another format for modification purposes any Electronic Document or information contained therein that was transmitted in a software data format, including Portable Document Format (PDF), intended by sender not to be modified, unless the receiving party obtains the permission of the sending party or is citing or quoting excerpts of the Electronic Document for Project purposes.

E. Requests by Contractor for Electronic Documents in Other Formats:

1. Release of any Electronic Documents developed during the design process (including Contract Documents, Technical Data, Drawings, and computer models) in formats other than those identified in this Section will be at the discretion of the OPT.
2. To the extent determined by OPT, release of Electronic Documents and other project information requested by Contractor (“Request”) in formats other than those

identified in this Section will be subject to the provisions of Owner's response to the Request, and to the following conditions:

- a. The content included in the Electronic Documents covered by the Request was prepared by Design Professional as an internal working document or electronic computer model solely for Design Professional's purposes and not for any construction processes and is being provided to Contractor on an "AS IS" basis without any warranties of any kind, including, any implied warranties of fitness for any purpose. Contractor is advised and acknowledges that the content may not be suitable for Contractor's application or may require substantial modification and independent verification by Contractor. The content may include limited resolution of models, not-to-scale schematic representations and symbols, use of notes to convey design concepts in lieu of accurate graphics, approximations, graphical simplifications, undocumented intermediate revisions, and other devices that may affect subsequent reuse.
 - b. Electronic Documents containing text, graphics, metadata, or other types of data that are provided by Design Professional to Contractor under the Request are only for convenience of Contractor. Any conclusion or information obtained or derived from such data will be at the Contractor's sole risk and Contractor waives any claims against the Design Professional or Owner arising from use of data in Electronic Documents covered by the Request.
 - c. **CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS THE OWNER AND DESIGN PROFESSIONAL AND THEIR SUBCONSULTANTS FROM ALL CLAIMS, DAMAGES, LOSSES, AND EXPENSES, INCLUDING ATTORNEYS' FEES AND DEFENSE COSTS ARISING OUT OF OR RESULTING FROM THE CONTRACTOR'S USE, ADAPTATION, OR DISTRIBUTION OF ANY ELECTRONIC DOCUMENTS PROVIDED UNDER THE REQUEST.**
 - d. Contractor agrees not to sell, copy, transfer, forward, give away or otherwise distribute this information (in source or modified file format) to any third party without the direct written authorization of Design Professional, unless such distribution is specifically identified in the Request and is limited to the Contractor's subcontractors. Contractor warrants that subsequent use by the Contractor's subcontractors complies with all terms of the Contract Documents and the Owner's response to Request.
3. In the event that Owner elects to provide or directs Design Professional to provide to Contractor any Contractor-requested Electronic Document versions of project information that is not explicitly identified in the Contract Documents as being available to Contractor, Owner shall be reimbursed by Contractor on an hourly basis for any costs necessary to create or otherwise prepare the data in a manner deemed appropriate by Design Professional in accordance with the General Conditions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 33 05 CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.01 SUMMARY

- A. Prepare and submit a Progress Schedule for the Work and update the schedule on a monthly basis for the duration of the Project.
- B. Provide Progress Schedule in adequate detail to allow Owner to monitor progress and to relate submittal processing to sequential activities of the Work.
- C. Incorporate Contract Milestones into the schedule and show activities leading to achievement of these milestones.
- D. Assume complete responsibility for maintaining the progress of the Work per the Progress Schedule submitted.

1.02 DOCUMENTATION

- A. Submit the schedules to the Construction Manager. Send all documents in digital format for processing.
- B. Do not leave any blanks incomplete. If information is not applicable, enter NA in the space provided.
- C. Provide schedules, schedule updates and revisions to the Construction Manager in electronic format in its originating software and in Portable Document Format (PDF) as required by Section 01 33 00 "Document Management."
- D. Submit a preliminary Progress Schedule at the pre-construction conference.
- E. Submit a detailed Progress Schedule at least 10 days prior to the first payment request.
- F. Submit Progress Schedule updates monthly within 10 days after submitting Applications for Payment to indicate the progress made on the Project to the closing date for the Application for Payment. Failure to submit Progress Schedules will cause delay in the review and approval of subsequent Applications for Payment.

1.03 PROGRESS SCHEDULE REQUIREMENTS

- A. Progress Schedule is to be in adequate detail to:
 - 1. Ensure adequate planning, scheduling, and reporting during the execution of the Work;
 - 2. Ensure the coordination of the Work of the Contractor and the various Subcontractors and Suppliers;
 - 3. Monitor the progress of the Work; and
 - 4. Evaluate the impact of proposed changes to the Contract Times and Project Schedule.
- B. Provide personnel with 5 years' minimum experience in scheduling construction work comparable to this Project. Prepare the Progress Schedule using acceptable scheduling software.

- C. Provide the Progress Schedule in the form of a computer-generated critical path schedule which includes Work to be performed on the Project. It is intended that the Progress Schedule accomplish the following:
 - 1. Give early warning of delays in time for correction.
 - 2. Provide detailed plans for the execution of the Work in the form of future activities and events in sequential relationships.
 - 3. Establish relationships of significant planned Work activities and provide a logical sequence for planned Work activities.
 - 4. Provide continuous current status information.
 - 5. Allow analysis of the Contractor's program for the completion of the Project.
 - 6. Permit schedules to be revised when the existing schedule is not achievable.
 - 7. Log the progress of the Work as it actually occurs.

- D. Provide a time-scaled horizontal bar chart which indicates graphically the Work scheduled at any time during the Project. The chart is to indicate:
 - 1. Complete sequence of construction by activity;
 - 2. Identification of the activity by structure, location, and type of Work;
 - 3. Chronological order of the start of each item of Work;
 - 4. The activity start and stop dates;
 - 5. The activity duration; and production rates used to determine the duration;
 - 6. Successor and predecessor relationships for each activity;
 - 7. A clearly indicated single critical path; and
 - 8. Projected percentage of completion, based on dollar value of the Work included in each activity as of the first day of each month.

- E. Provide a Progress Schedule for Submittals:
 - 1. Indicate the specific dates each document is to be delivered to the Construction Manager.
 - 2. Allow a reasonable time to review each document, taking into consideration the size and complexity of the document, other documents being processed, and other factors that may affect review time.
 - 3. Include time for making revisions to the Shop Drawings and resubmitting the Shop Drawing for at least a second review.
 - 4. Assume a 14-day review cycle for each time a Shop Drawing is submitted for review unless a longer period is indicated in the Contract Documents or provided by the Construction Manager.
 - 5. Contractor is responsible for delays associated with additional time required to review incomplete or erroneous documents and for time lost when documents are submitted for products that do not meet specification requirements.

1.04 PROGRESS SCHEDULE REVISIONS

- A. Revise the Progress Schedule if it appears that the schedule no longer represents the actual progress of the Work.
 - 1. Submit a Plan of Action for schedule recovery if the Progress Schedule or earned value analysis indicates that the Project is more than 30 days behind schedule. The report is to include:
 - a. Number of days behind schedule;
 - b. Narrative description of the steps to be taken to bring the Project back on schedule; and
 - c. Anticipated time required to bring the Project back on schedule.
 - 2. Submit a revised Progress Schedule indicating the action that the Contractor proposes to take to bring the Project back on schedule.
- B. Revise the Progress Schedule to indicate any adjustments in Contract Times approved by a Modification.
 - 1. Include a revised Progress Schedule with Change Proposals if a change in Contract Times is requested.
 - 2. Construction Manager will deem any Change Proposal that does not have a revised Progress Schedule and request for a change in Contract Times as having no impact on the ability of the Contractor to complete the Project within the Contract Times.
- C. Updating the Progress Schedule to reflect actual progress is not considered a revision to the schedule.
- D. Applications for Payment will not be recommended for payment without a revised Progress Schedule and if required, the report indicating the Contractor's plan for bringing the Project back on schedule.

1.05 FLOAT TIME

- A. Define float time as the amount of time between the earliest start date and the latest start date of a chain of activities on the construction schedule.
- B. Float time is not for the exclusive use or benefit of either the Contractor or Owner.
- C. Where several subsystems each have a critical path, the subsystem with the longest time of completion is the critical path and float time is to be assigned to other subsystems.
- D. Schedule completion date must be the same as the Contract completion date. Time between the end of construction and the Contract completion date is float time.

1.06 MODIFICATION OF CONTRACT TIMES

- A. Contract Times cannot be changed by the submission of a Progress Schedule. Contract Times can only be modified by a Change Order or Contract Amendment.
- B. Submit a Change Proposal for any proposed change in Contract Times, and include justification for the change in accordance with the provisions of the Contract Documents.

1.07 NEAR-TERM LOOK AHEAD SCHEDULES

- A. Provide a near-term look ahead schedule (NTLA Schedule) every 30 days, typically at periodic coordination meetings, using the form provided by the Construction Manager which shows the days of planned activity for the following:
 - 1. Submittals to be provided and day of anticipated return;
 - 2. Equipment and material deliveries;
 - 3. Arrival and departure of key construction equipment; and
 - 4. Activities for the Contractor and each Subcontractor.
- B. Coordinate NTLA Schedule with Project Schedule. Submit a report with each NTLA Schedule identifying deviations from the Project Schedule.
- C. Submit a report of near-term work planned in the previous NTLA Schedule that was delayed or not executed by marking actual activity on the previous near term look ahead schedule. Provide explanation of why planned work was not executed and plan to execute in the future and regain time lost.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 33 06 GRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish an adequate number of photographs of the Site to clearly depict the completed Project.
 - 1. Provide aerial photographs of the completed Project from an angle and height to include the entire Site.
 - 2. Provide a minimum of four different views.
 - 3. Photograph a panoramic view of the entire Site.
 - 4. Photograph all significant areas of completed construction.
 - 5. Do not take completion photographs until all construction trailers, excess materials, trash, and debris have been removed.
 - 6. Employ a professional photographer approved by the Construction Manager to photograph the Project.
- B. Provide video recordings of the Site.
 - 1. Record the condition of all existing facilities in or abutting the construction area (right-of-way) including streets, curb and gutter, utilities, driveways, fencing, landscaping, etc., prior the beginning of construction. Provide one copy of the dated and labeled recording to the Construction Manager before the start of construction. Provide additional recording as directed by the Construction Manager if the recording provided is not considered suitable for the purpose of recording pre-existing conditions.
 - 2. Provide a video recording of the Site after the Project is complete and all construction trailers, excess materials, trash, and debris have been removed. Provide a 360-degree view of the Project from a consistent height and angle.
 - 3. Format must allow photographic still shots to be extracted from the video recording.
- C. All photographs and video recordings are to become the property of the Owner. Photographs or recordings may not be used for public or private publication or display without the written consent of the Owner.
- D. Unmanned Aerial Vehicles used for aerial photography must be registered and piloted by licensed individuals in accordance with Laws and Regulations.

1.02 DOCUMENTATION

- A. Submit photographic documentation in accordance with Section 01 33 00 "Document Management."

1.03 QUALITY ASSURANCE

- A. Provide clear photographs and video recordings taken with proper exposure. View photographs and video recordings in the field and take new photographs or video

recordings immediately if photos of an adequate print quality cannot be produced or video quality is not adequate. Provide photographs with adequate quality and resolution to permit enlargements.

PART 2 - PRODUCTS

2.01 PHOTOGRAPHS

- A. Provide photographs in digital format with a minimum resolution of 1280x960, accomplished without a digital zoom.
- B. Take photographs at locations acceptable to the Construction Manager.
- C. Provide a digital copy of each photograph taken.
- D. Identify each photograph with:
 - 1. Name of the Project.
 - 2. Date, time, location, and orientation of the exposure.
 - 3. Description of the subject of photograph.

2.02 VIDEO RECORDING

- A. Provide video recordings in digital format that can be played with Windows Media Player in full screen mode without loss of resolution.
- B. Identify Project on video by audio or visual means.
- C. Provide video with file size that does not exceed 1 GB.
- D. Provide video resolution of at least 1080p.
- E. The quality of the video must be adequate to determine the existing conditions of the construction area. Camera panning must be performed while at rest; do not pan the camera while walking or driving. Camera pans should be performed at intervals to clearly view the entire construction area.
- F. Construction stationing is to be annotated in the video.
- G. The entire construction area recording must be submitted at once. Sections submitted separately will not be accepted.
- H. Site components must be video recorded in an organized sequential order with major components identified.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 35 00 SPECIAL PROCEDURES

PART 1 - GENERAL

1.01 CONSTRUCTION SEQUENCE

- A. Perform the Work as required to complete the entire Project within the Contract Times and in the sequence stipulated below:

Sequence No.	Description	Predecessor Condition
1	Install two 72-inch diameter CCFRPM pipes under UPRR using trenchless methods.	
2	Install remaining two 72-inch diameter CCFRPM pipes under Tulane Road using open cut method.	1
3	Install two concrete headwalls.	1,2
4	Excavate and fill to realign canal.	3
5	Remove/abandon existing siphon pipes.	2,4
6	Repair Tulane Road.	2,5

- B. Consider the sequences, duration limitations, and governing factors outlined in this Section to prepare the schedule for the Work.
- C. Perform the Work not specifically described in this Section as required to complete the entire Project within the Contract Times.

1.02 CRITICAL OPERATIONS

- A. Owner has identified critical operations that must not be out of service longer than the designated maximum out of service time and/or must be performed only during the designated times. These have been identified in the table below:

Critical Operation	Max. Time Out of Operation	Liquidated Damages (\$/hour)
Existing siphon operation – two western pipes may be placed out of service with prior permission of Owner	10 hours	\$500

- B. Submit a written Plan of Action per Section 01 31 13 “Project Administration” for approval for critical operations.
- C. Work affecting critical operations is to be performed on a 24-hour a day basis until Owner’s normal operations have been restored.
- D. Provide additional manpower and equipment as required to complete the Work affecting critical operations within the allotted time.

- E. Liquidated damages will be assessed if Work on critical operations is not completed within the time indicated.
 - 1. These items are critical to the Owner to supply raw water to downstream customers.
 - 2. Loss of raw water supply can subject the Owner to loss of revenue, additional operations cost, and fines from regulatory agencies.
 - 3. Liquidated damages have been established for each critical operation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 40 00 QUALITY MANAGEMENT

PART 1 - GENERAL

1.01 OVERVIEW

- A. Quality management refers to the overall process of delivering a completed Project to the Owner that complies with the requirements of the Contract Documents. Quality management applies to documentation, products, services, and the Work.
- B. Contractor is responsible for the quality of documentation, products, services, and the Work provided.
 - 1. Contractor is to integrate quality control procedures into the execution of the Work that are adequate to produce a Project that meets the requirements of the Contract Documents, while minimizing loss of time and increased costs. Contractor is solely responsible for time and cost impacts of correcting Defective Work.
 - 2. Contractor is to provide all testing and inspection required to control the quality of the Work in progress to determine that completed Work will comply with the requirements of the Contract Documents.
 - 3. Contractor is to provide verification or acceptance testing as required by the Contract Documents to demonstrate that the completed Work complies with the requirements of the Contract Documents, except for those test that the Owner has determined are to be conducted independent of the Contractor and identified as Owner testing in the Owner's Quality Management Plan.

1.02 STANDARDS

- A. Provide testing laboratories that comply with the American Council of Independent Laboratories (ACIL) "Recommended Requirements for Independent Laboratory Qualifications."
- B. Perform testing in accordance with the published standards and procedures for testing listed in the Specifications and applicable Laws and Regulations.

1.03 DOCUMENTATION

- A. Provide documentation which includes:
 - 1. Contractor's Quality Management Plan that establishes the methods of ensuring compliance with the Contract Documents. Submit this plan as Product Data per Section 01 31 13 "Project Administration."
 - 2. A statement of qualifications for any proposed testing laboratory that includes a list of the engineers and technical staff that will provide testing services on the Project, descriptions of the qualifications of these individuals, list of tests that can be performed, equipment used with date of last certification, and a list of recent projects for which testing has been performed with references for those projects.
 - 3. Certified Test Reports for products to be incorporated into the Project. Provide reports to indicate that the proposed products comply with the Contract Documents or

indicate that the proposed products do not comply with the Contract Documents and why those products do not comply. Submit Certified Test Reports as part of a Shop Drawing submitted per Section C700 "General Conditions."

4. Certified Test Reports for inspections and testing required in this Section and in other Sections of the Specifications. Provide reports to indicate that the Work complies with the Contract Documents or indicate that the Work does not comply with the Contract Documents and why the Work does not comply. Submit these test reports on forms provided by the Construction Manager per Section 01 33 00 "Document Management."
5. Certified Test Reports of Defective Work and Certified Test Reports documenting that successful corrective action has produced Work that complies with the Contract Documents. Construction Manager will maintain a Defective Work register. Progress on correction of Defective Work will be discussed at progress meetings as described in Paragraph 1.05.E. The final Defective Work register will be incorporated into closeout documentation required per Section C700 "General Conditions" as a record that all Defective Work has been corrected.

1.04 OWNER'S QUALITY MANAGEMENT ACTIVITIES

- A. Owner may perform its own verification testing independent of the Contractor. The Owner's Quality Management Plan describes the Owner's anticipated verification testing program for this Project. The preliminary testing plan is provided as Paragraph 3.04. This plan outlines the anticipated testing in general terms and may not reflect the actual testing performed by the Owner. Actual testing will depend on the Contractor's means, methods, and procedures of construction which will not be known until the Contractor submits the Contractor's Quality Control Plan (CQCP) to the Construction Manager. There is no guarantee that all testing in the preliminary OQMP included in the Bidding/Proposal Documents will be performed by the Owner. Contractor will arrange and pay for all production control testing deemed necessary by the Contractor to produce quality results.
- B. Quality management activities of the Owner are for verifying the results of the Contractor's Work complies with the requirements of the Contract Documents. Performance or non-performance of verification activities by the Owner:
 1. Does not relieve the Contractor of its responsibility to provide Work and furnish products that comply with the requirements of the Contract Documents;
 2. Does not relieve the Contractor of its responsibility to provide adequate quality control measures to produce quality documents, products, services, or Work;
 3. Does not relieve the Contractor of its responsibility for damage to or loss of Work or products before Owner's acceptance; and
 4. Does not affect the continuing rights of the Owner after acceptance of the completed Work.
- C. The Work is subject to observations or testing at any time by the OPT. Products which have been tested or inspected and accepted by the Owner at a supply source or staging area may be inspected or tested again by the OPT before, during, or after incorporation into the Work and rejected if products do not comply with the Contract Documents.

- D. Verification testing performed by the OPT will be paid for by the Owner, except for testing related to Defective Work as discussed in Paragraph 3.03.

1.05 CONTRACTOR'S RESPONSIBILITIES

- A. Review the OQMP and provide a Contractor's Quality Control Plan (CQCP) outlining testing to be provided by the Contractor per Paragraph 1.07.
- B. Implement the CQCP to provide Work that complies with the requirements of the Contract Documents.
 - 1. Provide quality documents meeting the requirements of the Contract Documents.
 - 2. Provide services meeting the requirements of the Contract Documents.
 - 3. Provide the services of a Construction Materials Inspection and Testing (CMIT) provider meeting the requirements of this Section to provide testing required by the Contract Documents to demonstrate that products proposed for the Project in Shop Drawings and Product Data fully comply with the Contract Documents.
 - 4. Inspect and test products to be incorporated into the Project to identify defects before installing them. Do not install Defective products. Conspicuously mark Defective products and remove from the Site. If products are installed before the defect is recognized, remove the Defective products, mark them as Defective and remove them from the Site when the defect is recognized.
 - 5. Integrate production quality control measures into construction activities to produce Work meeting the requirements of the Contract Documents. Inspect self-performed Work and the Work of Subcontractors and Suppliers to identify defects. Correct or replace Defective Work.
 - 6. Provide facilities, equipment, and Samples required for inspections and tests.
 - a. Give the Construction Manager adequate notice before proceeding with Work that would interfere with inspections or testing.
 - b. Notify the Construction Manager and CMIT provider prior to the time that testing is required, providing adequate lead time to allow arrangements for inspections or testing to be performed.
 - c. Do not proceed with Work that would impact the ability to correct defects, or with Work that would require that it be removed to correct defects, until testing is complete, and test results indicate that the corrected Work is acceptable.
 - d. Provide safe access for all CMIT activities, including those to be conducted as part of the Owner's Quality Management Program.
 - e. Cooperate fully with the performance of sampling, inspection, and testing. Provide personnel to assist with sampling or to assist in making inspections and field tests.
 - f. Provide Samples and products in adequate quantities for testing at the Site or at the production source of the product for testing.
 - g. Provide facilities required to store and cure test Samples.

- h. Provide calibrated scales and measuring devices for OPT's use in performing inspections and testing.
 - i. Provide adequate lighting to allow OPT observations.
 - j. Make Contract Documents available to testing agencies when requested.
- C. Perform tests as indicated in Contract Documents. All verification testing is to be observed by the Construction Manager or its designated representative.
 - D. Submit test reports to the Construction Manager.
 - E. Provide an update on quality control activities performed the previous month and planned for the coming month at monthly progress meetings required by Section 01 31 13 "Project Administration."
 - F. Determine testing or inspections required to implement the CQCP. Include costs for additional testing and inspections required to meet the Contractor's quality control obligations in the Contract Price.

1.06 CONTRACTOR'S QUALITY CONTROL MANAGER

- A. Provide a Quality Control Manager for the Project. Quality Control Manager must have authority to reject Defective Work, redirect the efforts of the Contractor, Subcontractor and Suppliers to correct Defective Work, and implement steps to prevent future Defective Work.
- B. The resident superintendent or an approved assistant can serve as Quality Control Manager, provided other duties will allow adequate time to serve in this capacity.

1.07 CONTRACTOR'S QUALITY CONTROL PLAN

- A. Provide a CQCP that describes testing and inspections for Work performed at the Site and at remote locations. Include Work by Subcontractors and Suppliers. The CQCP is to include:
 - 1. A description of the quality control organization, including an organization chart showing lines of authority to control the quality of Work.
 - 2. Documentation describing name, qualifications (in resume format), duties, responsibilities, and level of authority of the Quality Control Manager.
 - 3. The name, qualifications (in resume format), duties, responsibilities, and authorities of other persons assigned a quality control function.
 - 4. Procedures for scheduling, reviewing, certifying, and managing documentation including documentation provided by Subcontractors and Suppliers.
 - 5. Control, verification, and acceptance testing procedures for each specific test. Include:
 - a. Name of tests to be performed;
 - b. Specification paragraph requiring test;
 - c. Parameters of Work to be tested;
 - d. Test frequency;
 - e. Persons responsible for each test; and

- f. Applicable industry testing standards and laboratory facilities to be used for the test.
- 6. Incorporate the testing specified in the OQMP into the CQCP, specifically identifying the tests or inspections that will be provided by the OQMP;
- 7. Procedures for tracking and documenting quality management efforts per Paragraph 1.03.
- 8. Reporting procedures which incorporate the use of forms provided by the Construction Manager.
- 9. The name of the proposed testing laboratories along with documentation of qualifications per Paragraph 1.03.
- B. Use the Contractor's Quality Control Plan Checklist provided by the Construction Manager to review the CQCP before submitting and include a copy of the completed checklist with the CQCP. Do not begin Work until the CQCP is accepted. Submit an interim plan covering only the portion of Work to be performed if the Contractor plans to begin Work prior to submitting the complete CQCP for the Project. Do not begin Work on other parts of the Project until the complete CQCP is accepted.
- C. Meet with the OPT 7 days after CQCP is submitted and before start of construction to discuss the CQCP.
- D. Notify the Construction Manager of any changes to the CQCP or quality control personnel.

1.08 CONTRACTOR'S USE OF OWNER'S TEST REPORTS

- A. Contractor will receive copies of all test reports documenting the Owner's verification tests. Contractor is entitled to rely on the accuracy of these tests results and use these as part of its quality control efforts.
- B. Contractor may submit a Change Proposal if the Owner's testing program deviates significantly from the OQMP. Contractor must demonstrate that actual testing and inspection costs were incurred implementing the CQCP as a result of Owner's decision to not provide testing described in the OQMP.

1.09 LIMITATION OF AUTHORITY OF THE TESTING LABORATORY

- A. The testing laboratory representatives are limited to providing testing services and interpreting the results of the test performed.
- B. The testing laboratory is not authorized to:
 - 1. Alter the requirements of the Contract Documents;
 - 2. Accept or reject any portion of the Work;
 - 3. Perform any of the duties of the Contractor; or
 - 4. Direct or stop the Work.

1.10 TEST REPORTS

- A. Certified Test Reports are to be prepared for all tests.

1. Tests performed by testing laboratories may be submitted on their standard test report forms if acceptable to the Owner using the process directed by the Construction Manager. These reports must include the following:
 - a. Name of the Owner, Project title and number, and name of the Contractor;
 - b. Name, address, and telephone number of the laboratory;
 - c. Name and signature of the laboratory personnel performing the test;
 - d. Description of the product being sampled or tested;
 - e. Date and time of sampling, inspection, and testing;
 - f. Date the report was issued;
 - g. Description of the test performed;
 - h. Weather conditions and temperature at time of test or sampling;
 - i. Location at the Site or structure where the test was taken;
 - j. Standard or test procedure used in making the test;
 - k. A description of the results of the test;
 - l. Statement of compliance or non-compliance with the Contract Documents; and
 - m. Interpretations of test results, if appropriate.
 2. Submit reports on tests performed by the Contractor, Subcontractors, or Suppliers as directed by the Construction Manager.
 3. OPT will prepare test reports on tests performed by the OPT.
- B. Submit test reports as directed by the Construction Manager within 24 hours of completing the test. Flag tests reports with results that do not comply with Contract Documents for immediate attention. Notify the Construction Manager, using acceptable means other than the test report, immediately of any test that fails to comply with the Contract Documents.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Handle and protect test specimens of products and construction materials at the Site in accordance with recognized test procedures. Provide facilities for storing, curing, and processing test specimens as required by test standards to maintain the integrity of Samples. Transport test specimens in a manner to prevent damage to specimens while in transit.

PART 2 - PRODUCTS

2.01 TESTING APPARATUS

- A. Furnish testing apparatus and related accessories necessary to perform the tests.

2.02 SAMPLE PRODUCTS

- A. Provide Samples of products in adequate quantity for testing.

PART 3 - EXECUTION

3.01 IMPLEMENTING CONTRACTOR'S QUALITY CONTROL PLAN

- A. Perform quality control observations and testing as required in each Section of the Specifications and where indicated on the Drawings.
- B. Include the phases listed below for each definable work task. A definable work task is one which is separate and distinct from other tasks, has separate control requirements, may be provided by different trades or disciplines, or may be work by the same trade in a different environment.
 - 1. Planning Phase: Perform the following before beginning each definable work task:
 - a. Review the Contract Documents.
 - b. Review documents the Contractor will submit and determine that they are complete in accordance with the Contract Documents.
 - c. Check to ensure that all materials and/or equipment have been tested, submitted, and approved.
 - d. Examine the work area to ensure that all required preliminary Work has been completed and complies with the Contract Documents.
 - e. Examine required materials, equipment, and sample Work to ensure that they are on hand, conform to Contract Documents, Shop Drawings and Product Data, and are properly stored.
 - f. Review requirements for quality control inspection and testing.
 - g. Discuss procedures for controlling quality of the Work. Document construction tolerances and workmanship standards for the work task.
 - h. Check that the portion of the plan for the Work to be performed incorporates document review comments.
 - i. Discuss results of planning phase with the Construction Manager. Conduct a meeting attended by the Construction Manager, Quality Control Manager, superintendent, other quality control personnel as applicable, and the foreman responsible for the work task. Instruct applicable workers as to the acceptable level of workmanship required to meet the requirements of the Contract Documents. Document the results of the planning phase actions by separate meeting minutes prepared by the Quality Control Manager and attached to the quality control report.
 - j. Do not move to the next phase unless results of investigations required for the planning phase indicate that requirements have been met.
 - 2. Work Phase: Complete this phase after the planning phase.
 - a. Notify the Construction Manager at least 1 week in advance of beginning the Work and discuss the review of the planning phase effort to indicate that requirements have been met.

- b. Check the Work to ensure that it is in full compliance with the Contract Documents.
 - c. Verify adequacy of controls to ensure full compliance with the Contract Documents. Verify required control inspection and testing is performed.
 - d. Verify that established levels of workmanship meet acceptable workmanship standards. Compare with required Sample panels as appropriate.
 - e. Repeat the work phase for each new crew to work on-site, or any time acceptable specified quality standards are not being met.
3. Follow-Up Phase: Perform daily checks to ensure control activities, including control testing, are providing continued compliance with contract requirements.
- a. Make checks daily and record observations in the quality control documentation.
 - b. Conduct follow-up checks and correct all defects prior to the start of additional work tasks that may be affected by the Defective Work. Do not build upon nor conceal Defective Work.
 - c. Conduct a review of the Work at least 1 month prior to the expiration of the correction period prescribed in the General Conditions with the OPT. Correct defects as noted during the review.
- C. Conduct additional planning and work phases if:
- 1. The quality of on-going Work is unacceptable;
 - 2. Changes are made in applicable quality control staff, on-site production supervision, or crews;
 - 3. Work on a task is resumed after a substantial period of inactivity; or
 - 4. Other quality problems develop.

3.02 DEFECTIVE WORK

- A. Immediately correct any Defective Work or notify the Construction Manager why the Work is not to be corrected immediately and when corrective action will be completed.
- B. Work performed that is connected or adjacent to Defective Work or Work that would have to be removed to correct Defective Work is also considered to be Defective. Contractor is responsible for all costs associated with replacing any acceptable Work that must be removed, or might be damaged by corrective actions.
- C. Document Defective Work, corrective actions taken to correct defects, and that corrected Work complies with the Contract Documents.
- D. Implement countermeasures to prevent future Defective Work.
- E. No payment will be made for Defective Work. Remove Work from the Application for Payment if Work paid for on a previous Application for Payment is found to be Defective.
- F. Owner will withhold payment for Defective Work or Work that has not been tested or inspected in accordance with the CQCP, OQCP, or the Contract Documents.

3.03 VERIFICATION TESTING FOR CORRECTED DEFECTS

- A. Provide verification testing on corrected Work when corrective action is complete to demonstrate that the corrected Work complies with the Contract Documents. Conduct the same tests or inspections used to determine that the original Work was Defective. Different tests or methods may be used if approved by the Owner. Document that Defective Work has been corrected with the Construction Manager.
- B. Pay for verification testing until Work meets quality requirement set forth in the Contract Documents. OPT may perform verification testing as part of the Owner's Quality Management Program and impose a set-off to recover the cost for this testing.

END OF SECTION

01 57 00 TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide labor, materials, equipment, and incidentals necessary to construct temporary facilities to provide and maintain control over environmental conditions at the Site. Remove temporary facilities when no longer needed.
- B. Construct temporary impounding works, channels, diversions, furnishing, and operation of pumps, installing piping and fittings, and other construction for control of conditions at the Site. Remove temporary controls at the end of the Project.

1.02 DOCUMENTATION

- A. Provide Shop Drawings in accordance with Section C700 "General Conditions."
- B. Provide copies of notices, records, and reports required by the Contract Documents or Laws and Regulations as Product Data in accordance with Section 01 31 13 "Project Administration."

1.03 QUALITY ASSURANCE

- A. Construct and maintain temporary controls with adequate workmanship using durable materials to provide effective environmental management systems meeting the requirements of the Contract Documents and Laws and Regulations. Use materials that require minimal maintenance to prevent disruption of construction activities while providing adequate protection of the environment.
- B. Periodically inspect systems to determine that they are meeting the requirements of the Contract Documents.

1.04 POLLUTION CONTROL

- A. Prevent the contamination of soil, water, or atmosphere by the discharge of noxious substances from construction operations. Provide adequate measures to prevent the creation of noxious air-borne pollutants. Prevent dispersal of pollutants into the atmosphere. Do not dump or otherwise discharge noxious or harmful fluids into drains or sewers, nor allow noxious liquids to contaminate public waterways in any manner.
- B. Provide equipment and personnel and perform emergency measures necessary to contain any spillage.
 - 1. Contain chemicals in protective areas and do not dump on soil. Dispose of such materials at off-site locations in an acceptable manner.
 - 2. Excavate contaminated soil and dispose at an off-site location if contamination of the soil does occur. Fill resulting excavations with suitable backfill and compact to the density of the surrounding undisturbed soil.
 - 3. Provide documentation to the Owner which states the nature and strength of the contaminant, method of disposal, and the location of the disposal site.

4. Comply with Laws and Regulations regarding the disposal of pollutants.
- C. Groundwater or run-off water which has come into contact with noxious chemicals, sludge, or contaminated soil is considered contaminated. Do not allow contaminated water to enter streams or water courses, leave the Site in a non-contained form, or enter non-contaminated areas of the Site.
1. Construct temporary holding ponds or take other precautions and measures as required to contain the contaminated water and pump to a designated storage area.
 2. Wash any equipment used for handling contaminated water or soil within contaminated areas three times with uncontaminated water prior to using such equipment in an uncontaminated area. Dispose of wash water used to wash such equipment as contaminated water.

1.05 EARTH CONTROL

- A. Remove excess soil, spoil materials, and other earth not required for backfill. Control stockpiled materials to eliminate interference with Contractor and Owner's operations.
- B. Dispose of excess earth off the Site. Provide written approval from the property owner for soils deposited on private property as Product Data per Section 01 31 13 "Project Administration." Obtain approval of the OPT if this disposal impacts the use of Site or other easements.

1.06 AIR POLLUTION CONTROL

- A. Air Pollution Watch Days:
 1. Air Pollution Watch Days (APWD) may occur in the following times:
 - a. Typical Ozone Season: May 1 through October 31.
 - b. Critical Emission Time: 6:00 a.m. to 10:00 a.m.
 2. Watch Days:
 - a. State or local environmental regulatory agencies, in coordination with the National Weather Service, may designate the following day as an APWD by 3:00 p.m. on the prior afternoon.
 - b. Begin work after 10:00 a.m. on designated APWD if work requires the use of heavy construction equipment for run times in excess of 1 hour prior to 10:00 a.m. Heavy construction equipment may be used prior to 10:00 a.m. if equipment is certified by EPA as "Low Emitting" or equipment burns Ultra Low Sulfur Diesel (ULSD), diesel emulsions, or alternative fuels such as CNG.
- B. Obtain air permit for construction activities per requirements of Laws and Regulations.

1.07 TEMPORARY STORMWATER POLLUTION CONTROL

- A. Provide temporary stormwater pollution control per Section 01 57 23 "Temporary Stormwater Pollution Control."

1.08 MANAGEMENT OF WATER

- A. Manage water resulting from rains or ground water at the Site. Maintain trenches and excavations free of water at all times.
- B. Lower the water table in the construction area by acceptable means if necessary to maintain a dry and workable condition at all times. Provide drains, sumps, casings, well points, and other water control devices as necessary to remove excess water.
- C. Provide continuous operation of water management actions. Maintain standby equipment to provide proper and continuous operation for water management.
- D. Ensure that water drainage does not damage adjacent property. Divert water into the same natural watercourse in which its headwaters are located, or other natural stream or waterway as approved by the Owner. Assume responsibility for the discharge of water from the Site.
- E. Remove the temporary construction and restore the Site in a manner acceptable to the Construction Manager and to match surrounding material at the conclusion of the Work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide materials that comply with Laws and Regulations.

PART 3 - EXECUTION

3.01 CONSTRUCTING, MAINTAINING, AND REMOVING TEMPORARY CONTROLS

- A. Construct temporary controls in accordance with Laws and Regulations.
- B. Maintain controls in accordance with regulatory requirements where applicable or in accordance with the requirements of the Contract Documents.
- C. Remove temporary control when no longer required, but before the Project is complete. Correct any damage or pollution that occurs as the result of removing controls while they are still required.

END OF SECTION

01 57 23 TEMPORARY STORMWATER POLLUTION CONTROL

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish labor, materials, equipment, and incidentals necessary to provide stormwater pollution prevention for the duration of the construction period including furnishing, installing, and maintaining erosion and sediment control structures and procedures and properly removing the features when no longer required.
- B. Develop, implement, and maintain a stormwater pollution prevention plan (SWPPP) in compliance with local, state, and federal Laws and Regulations. Provide preventive measures to keep sediment and other pollutants from the construction activity from entering any stormwater system, including open channels.
- C. Comply with the Texas Commission on Environmental Quality General Permit, TXR150000, (General Permit) for storm water discharges from construction activities under the Texas Pollutant Discharge Elimination System (TPDES) program. File all required legal notices and obtain required permits prior to beginning any construction activity.
- D. This Section provides guidelines and Best Management Practices information for the Contractor to use in adhering to all local, state, and federal environmental Laws and Regulations with respect to stormwater pollution prevention during construction activities.

1.02 DOCUMENTATION

- A. Documentation must be provided in accordance with Section 01 33 00 "Document Management."
- B. Submit copies of required notices and reports to the Construction Manager as Product Data in accordance with Section 01 33 03 "Product Data." Retain copies of these documents at the Site for review and inspection by the OPT or regulatory agencies at all times.
- C. Submit copies of required notices to local, state, and federal authorities and any other entity as required by the General Permit and applicable Laws and Regulations.
- D. Post a copy of required notices at the Site in a location where it is readily available for viewing by the general public and local, state, and federal authorities prior to starting construction activities and maintain the posting until completion of the construction activities.
- E. Maintain copies of a schedule of major construction activities, inspection reports, and revision documentation with the SWPPP required under the General Permit.
- F. Provide schedules in accordance with Paragraph 3.05.

1.03 QUALITY ASSURANCE

- A. Comply with applicable requirements of all governing authorities having jurisdiction. The Specifications and the Drawings are not intended to be prescriptive but rather to convey the intent to provide complete slope protection, erosion control, and stormwater pollution prevention for both the Owner's property and adjacent properties.

- B. Perform Work to comply with “Best Practices” as established by the Sabine River Authority - Texas or the local agency of jurisdiction.
- C. Contractor must develop and implement a SWPPP in accordance with the General Permit prior to the beginning of construction activity.
- D. Contractor assumes sole responsibility for implementing, updating, and modifying the General Permit per Laws and Regulations for the SWPPP and Best Management Practices.
- E. Stormwater pollution prevention measures must be established prior to the beginning of construction and maintained during the entire length of construction until final stabilization has been achieved for the area protected.
- F. All land-disturbing activities must be planned and conducted to minimize the area to be exposed at any one time as well as time of exposure, off-site erosion, sedimentation, and adverse water quality impacts.
- G. Surface water runoff originating upgrade of an exposed area must be managed to minimize erosion and sediment loss during the period of exposure.
- H. Install measures to control both the velocity and rate of release so as to minimize erosion and sedimentation of the receiving water body (i.e. , ditch, channel, stream) in accordance with regulatory requirements and as directed by the OPT.
- I. Periodically clean out and dispose of all sediment and other pollutants as necessary to maintain adequate treatment capacity of each pollution control feature. Clean out and properly dispose of all sediment and other stormwater pollutants at the time of completion of the Work.

1.04 JOB CONDITIONS, CODES AND ORDINANCES

- A. Comply with the local codes and ordinances. If local codes and ordinances require more stringent or additional stormwater pollution prevention measures during construction beyond those required by state and federal Laws and Regulations, the Contractor must provide such measures at no additional cost.

1.05 STANDARDS

- A. The applicable provisions of the following standards apply as if written here in their entirety:
 1. ASTM International (ASTM):

ASTM D4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles, 90 pounds
ASTM D4833	Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products, 60 pounds
ASTM D3786	Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, 280 psi
ASTM D4751	Standard Test Method for Determining Apparent Opening Size of a Geotextile, U.S. Sieve No. 70 (max) to No. 100 (min)
ASTM D4355	Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc-Type Apparatus

ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All materials used for stormwater pollution prevention must meet the minimum design and specification requirements identified below for commonly used sediment loss prevention (referenced from the North Central Texas Council Of Governments (NCTCOG) integrated Storm Water Management (iSWM) Design Manual for Construction). The Contractor must use appropriate control devices to protect against stormwater pollution from construction site activities.
- B. Erosion control blankets (ECBs) to hold seed and soil in place until vegetation is established on disturbed areas are subject to the following design criteria:
 - 1. The type and class of erosion control mat must be specified as appropriate for the slope of the area to be protected, the flow rate (sheet flow on cut/fill slopes) or velocity (concentrated flow in swales) of stormwater runoff in contact with the ECB, and the anticipated length of service.
 - 2. Erosion control blankets must meet the applicable Texas Department of Transportation (TxDOT) Minimum Performance Standards for TxDOT as provided in its Erosion Control Report and/or be listed on the most current annual Approved Products List for TxDOT applicable to TxDOT Item 169 Soil Retention Blanket and its Special Provisions.
- C. Silt fences for perimeter controls located downstream of disturbed areas are subject to the following design criteria:
 - 1. If 50 percent or less soil by weight passes the U.S. Standard sieve No. 200, select the apparent opening size (A.O.S.) to retain 85 percent of the soil.
 - 2. If 85 percent or more of soil by weight passes the U.S. Standard sieve No. 200, silt fences must not be used unless the soil mass is evaluated and deemed suitable by a soil scientist or geotechnical engineer concerning the erodibility of the soil mass, dispersive characteristics, and the potential grain-size characteristics of the material that is likely to be eroded.
 - 3. Silt fence fabric must meet the following minimum criteria:
 - a. Tensile Strength, ASTM D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles, 90 pounds.
 - b. Puncture Rating, ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products, 60 pounds.
 - c. Mullen Burst Rating, ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, 280 psi.

- d. Apparent Opening Size, ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile, U.S. Sieve No. 70 (max) to No. 100 (min).
 - e. Ultraviolet Resistance, ASTM D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc-Type Apparatus. Minimum 70 percent.
4. Filter stone for an overflow structure must be 1-1/2-inch washed stone containing no fine material. Angular shaped stone is preferable to rounded shaped stone.
 5. Fence posts must be galvanized steel or equivalent and may be T-section or L-section, 1.3 pounds per linear foot minimum, and 4 feet in length minimum. Wood posts may be used depending on anticipated length of service and provided they are 4 feet in length minimum and have a nominal cross-section of 2 inches by 4 inches for pine or 2 inches by 2 inches for hardwoods.
 6. Silt fence must be supported by galvanized steel wire fence fabric as follows:
 - a. 4-inch by 4-inch mesh size, W1.4/1.4, minimum 14-gauge wire fence fabric;
 - b. Hog wire, 12-gauge wire, small openings installed at bottom of silt fence;
 - c. Standard 2-inch by 2-inch chain link fence fabric; or
 - d. Other welded or woven steel fabrics consisting of equal or smaller spacing as that listed herein and appropriate gauge wire to provide support.
- D. Inlet protection used in new developments that include new inlets or roads with new curb inlets or during repairs to existing roadways are subject to the following design criteria:
1. Filter fabric protection must be designed and maintained in a manner similar to a silt fence.
 2. Where applicable, filter fabric, posts, and wire backing must meet the material requirements specified in Paragraph 2.01.C.
 3. Filter gravel must be 3/4-inch washed stone containing no fines. Angular shaped stone is preferable to rounded shapes.
 4. Concrete blocks must be standard 8-inch by 8-inch by 16-inch concrete masonry units.
 5. When organic filter tubes are used, the designer must specify the type of material to be used (or excluded) on a particular site:
 - a. Straw filter material must be Certified Weed Free Forage. The straw must be in good condition, air-dried, and not rotten or moldy.
 - b. Compost must conform to the requirements for Erosion Control Compost in TxDOT Special Specification 1001 Compost (2004). Compost may provide some oil and grease removal; however, the large percentage of fines in compost will result in less filtering and more ponding of stormwater.
 - c. Wood chips must be 100 percent untreated chips and free of inorganic debris, such as plastic, glass, metal, etc. Wood chip size must not be smaller than 1 inch and must not exceed 3 inches in diameter. Shavings must not be more than 5 percent of the total mass.

6. Bags used to secure inlet protection devices on pavement must be filled with aggregate, filter stone, or crushed rock that is less likely than sand to be washed into an inlet if the bag is broken. Filled bags must be 24 to 30 inches long, 16 to 18 inches wide, and 6 to 8 inches thick. Bags must be polypropylene, polyethylene, or polyamide woven fabric with a minimum unit weight of 4 ounces per square yard and meet the following criteria:
 - a. Greater than 300 psi Mullen Burst Strength using ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method.
 - b. Greater than 70 percent UV Stability using ASTM D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus.
- E. Stone outlet sediment traps (bermed or excavated) used in situations where flows are concentrated in a drainage swale or channel are subject to the following design criteria:
1. The embankment must be placed on geotextile fabric meeting the following minimum criteria:
 - a. Tensile Strength, ASTM D4632 Text Method for Grab Breaking Load and Elongation of Geotextiles, 250 pounds.
 - b. Puncture Rating, ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products, 135 pounds.
 - c. Mullen Burst Rating, ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, 420 psi.
 - d. Apparent Opening Size, ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile, U.S. Sieve No. 20 (max).
 2. Fill placed to constrict the swale for construction of the excavated stone outlet sediment trap and fill placed for the berm in the bermed stone outlet sediment trap must consist of clay material, minimum Plasticity Index of 30, using ASTM D4318 Standard Test for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 3. The embankment must be comprised of well graded stone riprap with a size range of 6 to 12 inches in diameter.
- F. Sediment basins used as treatment devices for sites with disturbed areas of 10 acres and larger that are part of a common drainage area are subject to the following design criteria:
1. The embankment must be constructed with clay soil, minimum Plasticity Index of 30 using ASTM D4318 Standard Test for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 2. Texas Administrative Code Title 30, Chapter 299 (30 TAC 299), Dams and Reservoirs, contains specific requirements for dams that:
 - a. Have a height greater than or equal to 25 feet and a maximum storage capacity greater than or equal to 15 acre-feet;
 - b. Have a height greater than 6 feet and a maximum storage capacity greater than or equal to 50 acre feet;

- c. Are a high- or significant-hazard dam as defined in Chapter 299, regardless of height or maximum storage capacity; or
 - d. Are used as a pumped storage or terminal storage facility.
- G. Check dams used for long drainage swales or ditches to reduce erosive velocities are subject to the following design criteria:
 - 1. Use geotextile filter fabric under check dams exceeding 12 inches in height. The fabric must meet the material specified for the Stone Outlet Sediment Trap discussed above.
 - 2. Loose, unconfined soil, wood chips, compost, and other material that can float or be transported by runoff must not be used to construct check dams.
 - 3. Sand bags must not be used for check dams, due to their propensity to break and release sand that is transported by the concentrated flow in the drainage swale or ditch.
 - 4. Rock Check Dams:
 - a. Stone must be well graded with stone size ranging from 3 to 6 inches in diameter for a check dam height of 24 inches or less.
 - b. The stone size range for check dams greater than 24 inches is 4 to 8 inches in diameter.
 - 5. Rock Bag Check Dams Bags:
 - a. Fill material should be pea gravel, filter stone or aggregate that is clean and free of deleterious material.
 - b. Bag material must comply with the requirements of Inlet Protection above.
 - 6. Sack Gabion Check Dams:
 - a. Sack gabions must be wrapped in galvanized steel, woven wire mesh. The wire must be 20 gauge with 1-inch diameter, hexagonal openings.
 - b. Stone must be well graded with a minimum size range from 3 to 6 inches in diameter.
 - 7. Organic Filter Tube Check Dams:
 - a. Filter material used within tubes to construct check dams must be limited to coir, straw, aspen fiber and other organic material with high cellulose content.
 - b. The material should be slow to decay or leach nutrients in standing water and comply with the requirements for Inlet Protection above.
- H. Stabilized construction exits used for sites in which significant truck traffic occurs on a daily basis are subject to the following design criteria:
 - 1. The construction exit material must be a minimum thickness of 6 inches. The stone or recycled concrete used must be 3 to 5 inches in size with little or no fines.
 - 2. The geotextile fabric must meet the following minimum criteria:
 - a. Tensile Strength, ASTM D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles, 300 pounds.

- b. Puncture Strength, ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products, 120 pounds.
 - c. Mullen Burst Rating, ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, 600 psi.
 - d. Apparent Opening Size, ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile, U.S. Sieve No. 40 (max).
- I. Alternative pollution prevention measures selected by the Contractor must be identified from one or more of the following reference sources, as appropriate for the region of the construction activity:
- 1. City of Austin Environmental Criteria Manual.
 - 2. North Central Texas Council of Governments (NCTCOG) integrated Stormwater Management (iSWM) Design Manual for Construction.
 - 3. Harris County/Harris County Flood Control District/City of Houston Stormwater Management Handbook for Construction Activities.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Prepare a SWPPP in accordance with applicable permit requirements for construction activity. Develop the SWPPP in conformance with the General Permit and any applicable local requirements.
- B. Prepare and implement the SWPPP prior to the beginning of construction activity in accordance with local, state, and federal Laws and Regulations.
- C. OPT may require Contractor to install stormwater pollution prevention devices and/or practices during construction in addition to those required under the approved SWPPP. Contractor must remain solely responsible for complying with all local, state, and federal Laws and Regulations.

3.02 INSTALLATION

- A. Erosion control blankets to hold seed and soil in place until vegetation is established on disturbed areas are subject to the following installation criteria:
 - 1. Prior to the installation of any erosion control matting, all rocks, dirt clods, stumps, roots, trash, and any other obstructions that would prevent the mat from lying in direct contact with the soil must be removed.
 - 2. Anchor trenching must be located along the entire perimeter of the installation area, except for small areas with less than 2 percent slope.
 - 3. Installation and anchoring must conform to the recommendations shown within the manufacturer's published literature for the erosion control blanket.
 - 4. Anchors (staples) must be a minimum of 6 inches in length and 1 inch wide. They must be made of 11-gauge wire, or equivalent, unless the ECB is intended to remain in place with final stabilization and biodegrade.

5. Particular attention must be paid to joints and overlapping material. Overlap along the sides and at the ends of ECBs should be per the manufacturer's recommendations for site conditions and the type of ECB being installed. At a minimum, the end of each roll of ECB must overlap the next roll by 3 feet and the sides of rolls must overlap 4 inches.
 6. After installation, check blankets for uniform contact with the soil, security of the lap joints, and flushness of the staples with the ground.
- B. Silt fences for perimeter controls located downstream of disturbed areas are subject to the following installation criteria:
1. Construct fences along a line of constant elevation (along a contour line if possible).
 2. Maximum drainage area must be 0.25 acres per 100 linear feet of silt fence.
 3. Maximum flow to any 20-foot section of silt fence must be 1 cfs.
 4. Maximum distance of flow to silt fence must be 200 feet or less. If the slope exceeds 10 percent, the flow distance must be less than 50 feet.
 5. Maximum slope adjacent to the fence must be 2:1.
 6. Stone overflow structures or other outlet control devices must be installed at all low points along the fence or spaced at approximately 300 feet if there is no apparent low point.
 7. A 6-inch wide trench is to be cut 6 inches deep at the toe of the fence to allow the fabric to be laid below the surface and backfilled with compacted earth or gravel to prevent bypass of runoff under the fence. Fabric must overlap at abutting ends a minimum of 3 feet and must be joined such that no leakage or bypass occurs. If soil conditions prevent a minimum toe-in depth of 6 inches or installation of support post to depth of 12 inches, silt fences must not be used.
 8. Sufficient room for the operation of sediment removal equipment must be provided between the silt fence and other obstructions in order to properly maintain the fence.
 9. The last 10 feet (or more) at the ends of a line of silt fence must be turned upslope to prevent bypass of stormwater. Additional upslope runs of silt fence may be needed every 200 to 400 linear feet, depending on the traverse slope along the line of silt fence.
- C. Inlet protection for new developments that include new inlets or roads with new curb inlets or during repairs to existing roadways are subject to the following installation criteria:
1. Maintain barricades, signs, and safety features around the Work in accordance with all provisions of the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD), when installing inlet protection on publicly traveled streets or in developed areas. Ensure that inlet protection is properly designed, installed, and maintained to avoid flooding of the roadway or adjacent properties and structures.
 2. Maximum depth of flow must be 8 inches or less.
 3. A 2-inch overflow gap or weir is required on all curb inlet protection devices.
 4. Positive drainage is critical in the design of inlet protection. If overflow is not provided for at the inlet, excess flows must be routed through established swales, streets, or other watercourses to minimize damage due to flooding.

5. Filter Fabric Protection:
 - a. Filter fabric protection is appropriate where the drainage area is less than 1 acre and the basin slope is less than 5 percent.
 - b. Filter fabric, posts, and wire mesh must meet the material requirements specified in Paragraph 2.01.C.
 - c. A 6-inch wide trench is to be cut 6 inches deep at the toe of the fence to allow the fabric to be laid below the surface and backfilled with compacted earth or gravel. This entrenchment prevents any bypass of runoff under the fence.
 - d. Stone overflow structures must be installed where flow to the inlet is concentrated and more than 1 cfs according to the criteria in Paragraph **[2.01]**.
6. Block and Gravel Protection (Curb and Drop Inlets):
 - a. Concrete blocks are to be placed on their sides in a single row around the perimeter of the inlet, with ends abutting.
 - b. Openings in the blocks should face outward, not upward. 1/2-inch by 1/2-inch wire mesh must then be placed over the outside face of the blocks covering the holes.
 - c. Filter stone must then be piled against the wire mesh to the top of the blocks with the base of the stone being a minimum of 18 inches from the blocks.
 - d. Alternatively, where loose stone is a concern (streets, etc.), the filter stone may be placed in appropriately sized geotextile fabric bags.
7. Excavated Impoundment Protection:
 - a. Excavated impoundment protection is only applicable to drop inlets.
 - b. It should not be applied to Y inlets because it will undermine the concrete pad surrounding the inlet opening. Nor can it be used for inlets on pavement.
 - c. With this protection method, it is necessary to install weep holes to allow the impoundment to drain completely.
 - d. The impoundment must be sized such that the volume of excavation is equal to or exceeds the runoff volume from the temporary control design storm (2-year, 24-hour) for the inlet's drainage area.
 - e. The trap must have a minimum depth of 1 foot and a maximum depth of 2 feet as measured from the top of the inlet and must have side slopes of 2:1 or flatter.
8. Organic Filter Tube Protection (Curb and Drop Inlets):
 - a. Organic filter tubes may be used on paved or unpaved surfaces. On paved surfaces, tubes must be secured in place by rock bags. On unpaved surfaces, the tubes must be embedded in the ground a minimum of 3 inches and staked at 4-foot spacing.
 - b. Designer must provide calculations and specify the diameter of tube to be used based on the inlet's drainage area and the flow rate of runoff to the inlet.
 - c. The minimum allowable diameter is 12 inches.

- d. For curb protection, the diameter of the tube must be at least 2 inches less than the height of the inlet opening. The tube should not be allowed to block the entire opening, since it will clog.
 - e. The tube must be placed on 4-inch by 4-inch or 2-inch by 4-inch wire mesh to prevent the tube from sagging into the inlet. The tube should be long enough to extend a minimum of 12 inches past the curb opening on each side of the inlet.
- D. Stone outlet sediment traps (excavated or bermed) for situations where flows are concentrated in a drainage swale or channel are subject to the following installation criteria:
1. The maximum drainage area contributing to the trap must be less than 10 acres for the excavated trap, and 5 acres or less for the bermed trap. For larger drainage areas a sediment basin must be used.
 2. The minimum storage volume must be the volume of runoff from the temporary control design storm (2-year, 24-hour) for the sediment trap's drainage area.
 3. The surface area of the design storage must be 1 percent of the area draining to the device.
 4. The maximum embankment height must be 6 feet as measured from the toe of the slope on the downstream side.
 5. Minimum width of the embankment at the top must be 2 feet.
 6. Embankment slope must be 1:5:1 or flatter.
 7. The embankment must have a depressed area to serve as the outlet with a minimum width of 4 feet.
 8. A 6-inch minimum thickness layer of 1-1/2-inch filter stone must be placed on the upstream face of the embankment when stormwater runoff contains fine silt and clay particles.
 9. The embankment must consist of stone riprap or a combination of compacted fill with stone riprap. The stone may be enclosed in wire mesh or a gabion basket and anchored to the channel bottom to prevent washing away.
 10. Fill must be placed in 8-inch loose lifts (maximum) and compacted to 95 percent Standard Proctor Density at optimum moisture content using ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 11. Geotextile fabric, covered with a layer of stone, must extend past the base of the embankment on the downstream side a minimum of 2 feet.
 12. The outlet must be designed to have a minimum freeboard of 6 inches at design flow.
- E. Sediment basins for treatment devices for sites with disturbed areas of 10 acres and larger that are part of a common drainage area are subject to the following installation criteria:
1. Design of the sediment basin should be coordinated with design of the permanent drainage infrastructure for the development. Sediment basin sizing and discharge volumes should be calculated using the NCTCOG iSWM Technical Manual or similar technical manual in accordance with the design criteria of the locality where the basin is constructed.

2. Minimum capacity of the basin must be the calculated volume of runoff from a 2-year, 24-hour duration storm event plus sediment storage capacity of at least 1000 cubic feet.
3. The basin must be laid out such that the effective flow length to width ratio of the basin is a minimum of 4:1. The effectiveness of sediment basins may be increased by using baffles to prevent short-circuiting of flow through the basin.
4. Top width of the embankment must be determined by the Design Professional based on the total height of the embankment as measured from the toe of the slope on the downstream side.
5. Embankment side slopes must be 3:1 or flatter.
6. Clay soil for the embankment must be placed in 8-inch lifts and compacted to 95 percent Standard Proctor Density at optimum moisture content using ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
7. The primary outlet must have a minimum design dewatering time of 36 hours for the temporary control design storm (2-year, 24-hour).
8. Whenever possible, the outlet must be designed to drain the basin in less than 72 hours to minimize the potential for breeding mosquitoes.
9. The basin's primary outlet and spillway must be sized to pass the difference between the conveyance storm (25-year, 24-hour) and the temporary control design storm without causing damage to the embankment and structures.
10. Unless infeasible, the primary outlet structure should withdraw water from the surface of the impounded water. Outlet structures that do this include surface skimmers, solid risers (non-perforated), flashboard risers, and weirs.
11. The outlet of the outfall pipe (barrel) must be stabilized with riprap or other materials designed using the conveyance storm flow rate and velocity. Velocity dissipation measures must be used to reduce outfall velocities in excess of 5 feet per second.
12. The outfall pipe through the embankment must be provided with anti-seep collars connected to the exterior of the pipe section or at a normal joint of the pipe material. The anti-seep collar material must be compatible with the pipe material used and must have a watertight bond to the exterior of the pipe section. The size and number of collars must be selected by the designer in accordance with the NCTCOG iSWM Technical Manual or similar technical manual in accordance with the design criteria of the locality where the basin is constructed.
13. Risers used to discharge high flows must be equipped with an anti-vortex device and trash rack.
14. Spillways must be constructed in undisturbed soil material (not fill) and must not be placed on the embankment that forms the basin.

- F. Check dams for long drainage swales or ditches to reduce erosive velocities are subject to the following installation criteria:
1. Typically, the dam height should be between 9 inches and 36 inches, depending on the material of which they are made. The height of the check dam must always be less than one-third the depth of the channel.
 2. Dams should be spaced such that the top of the downstream dam is at the same elevation as the toe of the upstream dam. On channel grades flatter than 0.4 percent, check dams should be placed at a distance that allows small pools to form between each check dam.
 3. The top of the side of the check dam must be a minimum of 12 inches higher than the middle of the dam. In addition, the side of the dams must be embedded a minimum of 18 inches into the side of the drainage ditch, swale or channel to minimize the potential for flows to erode around the side of the dam.
 4. Larger flows (greater than 2-year, 24-hour design storm) must pass the check dam without causing excessive upstream flooding.
 5. Check dams should be used in conjunction with other sediment reduction techniques prior to releasing flow off-site.
 6. Rock Check Dams: Rock check dams must have a minimum top width of 2 feet with side slopes of 2:1 or flatter.
 7. Rock Bag Check Dams:
 - a. Rock bag check dams should have a minimum top width of 16 inches.
 - b. Bag length must be 24 to 30 inches, width must be 16 to 18 inches, and thickness must be 6 to 8 inches and having a minimum weight of 40 pounds.
 - c. Minimum rock bag dam height of 12 inches would consist of one row of bags stacked on top of two rows of bag. The dam must always be one more row wide than it is high, stacked pyramid fashion.
 - d. PVC pipes may be installed through the dam to allow for controlled flow through the dam. Pipe should be schedule 40 or heavier polyvinyl chloride (PVC) having a nominal internal diameter of 2 inches.
 8. Sack Gabion Check Dams:
 - a. Sack gabion check dams may be used in channels with a contributing drainage area of 5 acres or less.
 - b. Wire mesh must be one piece, wrapped around the rock, and secured to itself on the downstream side using wire ties or hog rings.
 - c. Sack gabions must be staked with 3/4-inch rebar at a maximum spacing of 3 feet. Each wire sack must have a minimum of two stakes.
 9. Organic Filter Tube Check Dams:
 - a. Organic filter tubes may be used as check dams in channels with a contributing drainage area of 5 acres or less.
 - b. Organic filter tubes must be a minimum of 12 inches in diameter.

- c. Staking of filter tubes must be at a maximum of 4-foot spacing and must alternate through the tube and on the downstream face of the tube.
- G. Stabilized construction exits for sites in which significant truck traffic occurs on a daily basis are subject to the following installation criteria:
1. Limit site access to one route during construction, if possible; two routes for linear and larger projects.
 2. Prevent traffic from avoiding or shortcutting the full length of the construction exit by installing barriers. Barriers may consist of silt fence, construction safety fencing, or similar barriers.
 3. Design the access point(s) to be at the upslope side of the construction site. Do not place construction access at the lowest point on the construction site.
 4. Stabilized Construction Exits are to be constructed such that drainage across the entrance is directed to a controlled, stabilized outlet on-site with provisions for storage, proper filtration, and removal of wash water.
 5. The exit must be sloped away from the paved surface so that stormwater is not allowed to leave the Site onto roadways.
 6. Minimum width of exit must be 15 feet.
 7. Vehicles must not be permitted to track or drop sediment onto paved roads, streets, or parking lots. When necessary, vehicles must be cleaned to remove sediment prior to exit onto paved areas. When washing is required, it must be done on a constructed wheel wash facility that drains into an approved sediment trap or sediment basin or other sedimentation/filtration device.
 8. Minimum dimensions for the exit must be as follows:
- | Tract Area | Min. Width of Exit | Min. Length of Exit |
|-----------------------|--------------------|---------------------|
| <1 Acre | 15 feet | 20 feet |
| ≥ 1 acre but <5 Acres | 25 feet | 50 feet |
| ≥5 Acres | 30 feet | 50 feet |
- H. Install pollution control devices in a manner consistent with their designed intent.

3.03 MAINTENANCE

- A. Maintain pollution prevention control structures and procedures in full working order at all times during construction. This must include any necessary repair or replacement of items which have become damaged or ineffective. Remove sediment and other pollutants which accumulate in pollution control devices as necessary to maintain the intended design efficiency for the pollution prevention measure.
- B. Dispose properly of trash, debris, and other pollutants.
- C. Place sediment material in approved earth spoil areas or return the sediment material to the area from which it eroded.
- D. Maintain pollution prevention structures and procedures until construction is complete for the area protected and until the Site achieves final stabilization. Unless more stringently defined by local, state, or federal requirements, final stabilization is defined as achieving 70

percent of background vegetative cover or placement of permanent cover, such as concrete or asphalt.

- E. Upon completion of construction and achievement of final stabilization, properly remove the temporary pollutant control structures and complete the area as indicated. Pollution control devices made of organic materials designed to degrade naturally in place will not require removal, unless specifically required by the OPT.
- F. Erosion control blankets must be inspected regularly (at least as often as required by the General Permit) for bare spots caused by weather related events. Missing or loosened blankets must be replaced or re-anchored. Also check for excess sediment deposited from runoff. Remove sediment and/or replace blanket as necessary. In addition, determine the source of excess sediment and implement appropriate Best Management Practices to control the erosion.
- G. Silt fences must be inspected regularly (at least as often as required by the General Permit) for buildup of excess sediment, undercutting, sags, and other failures. Sediment should be removed when it reaches approximately one-half the height of the fence. In addition, determine the source of excess sediment and implement appropriate Best Management Practices to control the erosion. If the fabric becomes damaged or clogged, it must be repaired or replaced as necessary.
- H. Inlet protection must be inspected regularly (at least as often as required by the General Permit). Floatable debris and other trash caught by the inlet protection should be removed after each storm event. Sediment should also be removed from curb inlet protection after each storm event because of the limited storage area associated with curb inlets. Sediment collected at inlet protection should be removed before it reaches half the height of the protection device. Sediment should be removed from inlets with excavated impoundment protection before the volume of the excavation is reduced by 50 percent. In addition, the weep holes should be checked and kept clear of blockage. Concrete blocks, 2-inch by 4-inch boards, stakes, and other materials used to construct inlet protection should be checked for damaged and repaired or replaced if damaged. When filter fabric or organic filter tubes are used, they should be cleaned or replaced when the material becomes clogged. For systems using filter stone, when the filter stone becomes clogged with sediment, the stones must be pulled away from the inlet and cleaned or replaced. Because of the potential for inlet protection to divert runoff or cause localized flooding, remove inlet protection as soon as the drainage area contributing runoff to the inlet is stabilized. Ensure that all inlet protection devices are removed at the end of the construction.
- I. The stone outlet sediment trap should be inspected regularly (at least as often as required by the General Permit) to check for clogging of the void spaces between stones. If the filter stone appears to be clogged, such that the basin will not completely drain, then the filter stone will require maintenance. If the filter stone is not completely clogged it may be raked with a garden rake to allow the water to release from the basin. If filter stone is completely clogged with mud and sediment, then the filter stone will have to be removed and replaced. Failure to keep the filter stone material properly maintained will lead to clogging of the stone riprap embankment. When this occurs, the entire stone rip-rap structure will need to be replaced. If the aggregate appears to be silted in such that efficiency is diminished, the stone should be replaced. Trash and debris should be removed from the trap after each storm event to prevent it from plugging the rock. Deposited sediment must be removed before the storage capacity is decreased by one-third, or sediment has reached

a depth of 1 foot, whichever is less. The removed sediment must be stockpiled or redistributed in areas that are protected with erosion and sediment controls.

- J. Sediment basins should be inspected regularly (at least as often as required by the General Permit) to check for damage and to ensure that obstructions are not diminishing the effectiveness of the structure. Sediment must be removed and the basin must be re-graded to its original dimensions when the sediment storage capacity of the impoundment has been reduced by 20 percent. The removed sediment may be stockpiled or redistributed on-site in areas that are protected by erosion and sediment controls. Inspect temporary stabilization of the embankment and graded basin and the velocity dissipaters at the outlet and spillway for signs of erosion. Repair any eroded areas that are found. Install additional erosion controls if erosion is frequently evident.
- K. Check dams should be inspected regularly (at least as often as required by the General Permit). Silt must be removed when it reaches approximately one-third the height of the dam or 12 inches, whichever is less. Inspectors should monitor the edges of the dam where it meets the sides of the drainage ditch, swale, or channel for evidence of erosion due to bypass or high flows. Eroded areas must be repaired. If erosion continues to be a problem, modifications to the check dam or additional controls are needed. Care must be used when taking out rock check dams in order to remove as much rock as possible. Loose rock can create an extreme hazard during mowing operations once the area has been stabilized.
- L. Stabilized construction exits should be inspected regularly (at least as often as required by the General Permit). The stabilized construction exit must be maintained in a condition that prevents tracking or flow of sediment onto paved surfaces. Periodic re-grading and top dressing with additional stone must be done to keep the efficiency of the exit from diminishing. The rock must be re-graded when ruts appear. Additional rock must be added when soil is showing through the rock surface. Additional controls are needed if inspections reveal a properly installed and maintained exit, but tracking of soil outside the construction area is still evident. Additional controls may be daily sweeping of all soil spilled, dropped, or tracked onto public rights-of-way or the installation of a wheel cleaning system.

3.04 FIELD QUALITY CONTROL

- A. In the event of conflict between the specified requirements and stormwater pollution control laws, rules, or regulations or other local, state, or federal agencies, the more restrictive laws, rules, or regulations will apply.

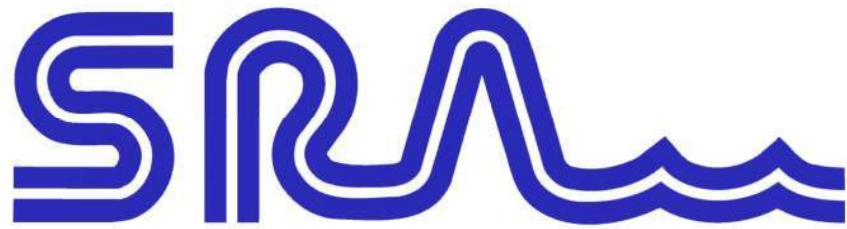
3.05 SCHEDULES

- A. Prior to start of construction, submit schedules to the OPT for accomplishment of temporary and permanent erosion control work in connection with required clearing and grubbing, grading, construction, and paving. Include a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials in the submittal.

END OF SECTION



TECHNICAL SPECIFICATIONS



Division 02 – Existing Conditions

02 41 00 DEMOLITION

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary for every type of required demolition.
- B. Furnish equipment of every type required to demolish and transport construction debris away from the Site.

1.02 STANDARDS

- A. Work shall be performed in accordance with the codes and ordinances of the agency having authority over the Place of Record.
- B. Occupational Safety and Health Association (OSHA), 29 CFR Parts 1010 and 1926, "Occupational Exposure to Asbestos, Tremolite, Anthophyllite, and Actinolite", 40 CFR Part 61 - "National Emission Standard for Hazardous Air Pollutants"

1.03 DELIVERY AND STORAGE

- A. Stockpile construction debris at the Site only as long as necessary to haul to a disposal site. Stack materials neatly and handle in an orderly manner until removed from the Site.

1.04 JOB CONDITIONS

- A. Contractor shall visit the Site and determine the extent of demolition required and the Site conditions that might affect its proposal. Include costs of covering all aspects of the demolition as part of the proposal.
- B. The Drawings shall be carefully reviewed to determine the extent of necessary demolition and to identify elements of the existing construction which are to remain in place. Report any discrepancies to Owner and Engineer before disturbing existing conditions. Property lines and limits of demolition shall be accurately located prior to beginning site demolition. Start of demolition activities shall represent confirmation by Contractor that existing conditions are as presented in the Contract Documents. Demolition outside the limits indicated on the Drawings, or outside the property lines shall not be performed.
 - 1. For siphon piping demolition confirm with the Owner that current operations will not be impacted and provide temporary equipment with Owner to keep systems functional during demolition process if required.
- C. Material removed during demolition, and any equipment not otherwise designated to remain the property of the Owner, shall become the property of the Contractor, and shall be promptly removed from the Site.

1.05 HAZARDOUS MATERIALS

- A. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.

2.00 PRODUCTS

2.01 MATERIALS

- A. New materials and equipment for patching and extending work shall meet the requirements of the individual Sections in these Contract Documents. For materials not addressed in these documents, materials used shall meet or exceed the dimensions and quality of the existing work.

3.00 EXECUTION

3.01 SITE CLEARING

- A. Perform site clearing to the limits indicated on the Drawings. Scrape the Site, removing brush, trees, weeds and trash. Haul debris away from the Site to an approved site as it accumulates.
- B. Grub out tree and brush roots within the limits of grading and structures. Remove rock out-croppings and boulders from any area within the limits of grading or structures. Remove roots and backfill any excavation resulting from tree removal with suitable soil for final grading plan.
- C. Trees not located within the construction limits, or otherwise indicated for removal, shall remain in place. Visit the Site with the Engineer or Owner and identify those trees that are to remain. Mark all other trees with yellow paint to indicate removal. Protect remaining trees during construction. Wrap the tree trunks with 2 x 4 timbers if construction equipment must operate in close proximity to them.
- D. Only designated trees shall be removed. In the event that trees other than those designated are erroneously removed or damaged to the point of distress, install replacement trees of equal size and number to compensate for those destroyed, at no additional cost to the Owner.
- E. Provide dust control as needed or requested by the Owner.

3.02 REMOVAL OF ASPHALT PAVING

- A. Remove parts of the existing asphalt paving as indicated on the Drawings. Asphalt paving removal shall conform to methods outlined in TXDOT Item 105 "Removing Treated and Untreated Base and Asphalt Pavement".

3.03 REMOVAL OF EXISTING SITE STRUCTURES

- A. Remove concrete or masonry structures located below the ground line where indicated or where such structures will interfere with new construction. Where structures are a part of an active underground utility system, repair piping to prevent blockage in the flow.
- B. Remove abandoned manholes, basins, or similar structures. With the Engineer's approval, and if structures will not interfere with any other proposed construction, they may be abandoned in place. Remove the top part of the structure so that it is a minimum of 2 feet below the new finish grade. Remove part of the floor system of basins, manholes and other

such structures to prevent entrapment of water. Fill remaining cavities with approved backfill material.

- C. Provide dust control as needed or as requested by the Owner.

3.04 REMOVAL OF STRUCTURES

- A. Removal of Steel Headwalls: Remove steel headwall members by unbolting, cutting welds, or cutting rivet heads and punching shanks through holes. Do not use flame-cutting unless approved by the Engineer.

3.05 REMOVAL OF PIPE

- A. Remove pipe using protective measures which prevent damage. Piping shall be disconnected at joints, allowing removal in one piece. Salvaged pipe determined unsatisfactory for re-use by the Engineer may be removed in any manner. Suspended or supported pipe shall be disassembled at joints. Remove in sections without cutting. Welded pipe sections may be cut with a torch, but cuts shall be along a welded joint.

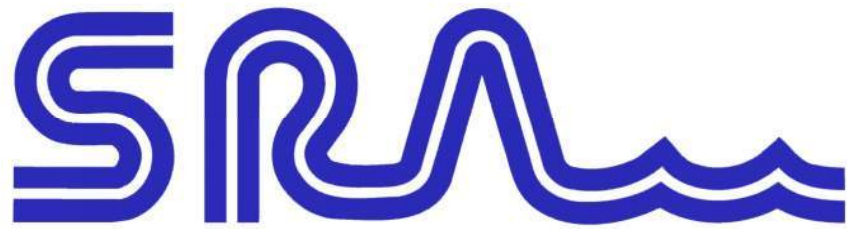
3.06 UNDERGROUND PIPING

- A. Contractor shall be responsible for obtaining location of underground utilities at the Site. Arrange for all applicable utility companies to accurately locate underground piping and set color-coded flags along the pipe route. Investigate utility company's records to ascertain depths and sizes of piping and other ancillary features.
- B. In the event that exact location of piping cannot be obtained, dig test holes as necessary to establish location of piping. Contractor shall not use mechanical digging machines within 6 feet of any active buried piping. For a distance of 4 feet on either side of buried piping, all digging shall be by hand excavation. If the piping is not active, or is to be abandoned or removed, any form of excavation may be used. Any existing active piping that is damaged during demolition will be repaired to new condition by the Contractor at no additional cost to the Owner.

3.07 BACKFILLING

- A. Backfill cavities resulting from demolition. Fill cavities occurring within the limits of buildings, structures, or pavements in accordance with the requirements of other Sections of the Specifications. Backfill and compact cavities outside the construction limits to the same density as the surrounding earth. No testing is required for backfill outside the limits of new construction.

END OF SECTION



Division 03 - Concrete

03 11 00 CONCRETE FORMING

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish material and labor to form, tie, brace and support wet concrete, reinforcing steel and embedded items until the concrete has developed sufficient strength to remove forms.

1.02 QUALITY ASSURANCE

- A. Design Criteria: Forms shall be designed for the pressure exerted by a liquid weighing 150 pounds per cubic foot. The rate of placing the concrete, the temperature of the concrete, and all other pertinent factors shall be taken into consideration when determining the depth of the equivalent liquid. An additional design live load of 50 pounds per square foot shall be used on horizontal surfaces.
- B. Alignment Control:
 - 1. True alignment of walls and other vertical surfaces having straight lines or rectangular shapes shall be controlled and checked by the following procedures:
 - a. Forming shall be arranged with provisions for adjusting the horizontal alignment of a form, after the form has been filled with concrete to grade, using wedges, turn buckles, or other adjustment methods. Establish a transit line or other reference so that adjustments can be made to an established line while the concrete in the top of the form is still plastic.
 - b. Adjusting facilities shall be at intervals which permit adjustments to a straight line. Concrete shall not be placed until adequate adjusting facilities are in place.
- C. Tolerances: Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
 - 1. Shop Drawings:
 - a. Drawings and Calculations: At least 30 days before use, submit drawings and supporting structural calculations, sealed by a registered Professional Engineer in the state of Texas, for all shoring and walls greater than 10 feet in height.
 - b. The submittal shall include the type, size, quantity and strength of all materials of which the forms are made and the assumed design values and loading conditions.
 - 2. Record Data.
 - a. Manufacturers' literature for specified products including shoring, form materials, form accessories, prefabricated forms, and form release agents.

1.04 STANDARDS

A. The applicable provisions of the following standards shall apply as if written here in their entirety:

1. American Concrete Institute (ACI) Specifications:

ACI 117	Specifications for Tolerances for Concrete Construction and Materials
ACI 301	Specifications for Structural Concrete
ACI 318	Building Code Requirements for Structural Concrete

2. American Institute of Steel Construction (AISC) Publication:

a. AISC Manual of Steel Construction.

3. American Iron and Steel Institute (AISI) Publication:

a. AISI Cold Formed Steel Design Manual.

4. American Plywood Association (APA) Standards:

a. APA Design/Construction Guide: Concrete Forming.

1.05 DELIVERY AND STORAGE

A. Lumber for forms shall be stacked neatly on platforms raised above ground.

1.06 JOB CONDITIONS

A. The Contractor shall notify the Engineer upon completion of various portions of the work required for placing concrete so that compliance with the plans and specifications may be monitored. The Engineer will authorize the Contractor to proceed with the placement after this has been completed and corrections, if required, have been made.

B. In hot weather, both sides of the face forms may be required to be treated with oil to prevent warping and to secure tight joints.

2.00 PRODUCTS

2.01 MATERIALS

A. Lumber: Properly seasoned and of good quality; free from loose or unsound knots, knot holes, twists, shakes, decay, splits, and other imperfections which would affect its strength or impair the finished surface of the concrete.

1. Refer to Section 03 30 00 "Cast-In-Place Concrete" for finish requirements.

B. Fiber Board Form Lining: Hardboard finished smooth on one side; minimum thickness of 3/16 inch thoroughly wet with water at least 12 hours before using.

C. Plywood Form Lining: Conforming to APA HDO; exterior exposure waterproof adhesive, 3/8 inch thick.

D. Form Oil: Light, clear oil; shall not discolor or injuriously affect the concrete surface, subsequent coatings, or delay or impair curing operations.

2.02 FABRICATIONS

- A. Lumber: Lumber for facing or sheathing shall be surfaced on at least one side and two edges, and sized to uniform thickness. Lumber of nominal 1-inch thickness or plywood of 3/4-inch thickness shall be permitted for general use on structures, if backed by a sufficient number of studs and wales.
- B. Forms:
 - 1. Forms shall be built mortar tight and of material sufficient in strength to prevent bulging between supports.
 - 2. Reused forms or form lumber shall be maintained clean and in good condition as to accuracy, shape, strength, rigidity, tightness, and smoothness of surface.
 - 3. All forms shall be so constructed as to permit removal without damage to the concrete. Exercise special care in framing forms for copings, offsets, railing and ornamental work, so that there will be no damage to the concrete when the forms are removed.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Metal Forms:
 - 1. The specifications for "Forms" regarding design, mortar tightness, filleted corners, beveled projections, bracing, alignment, removal, re use, oiling, and wetting shall apply equally to metal forms.
 - 2. The metal used for forms shall be of such thickness that the forms will remain true to shape. Bolt and rivet heads on the facing sides shall be countersunk. Clamps, pins, or other connecting devices shall be designed to hold the forms rigidly together and to allow removal without injury to the concrete.
 - 3. Metal forms which do not present a smooth surface or line up properly shall not be used. Exercise special care to keep metal free from rust, grease, or other foreign material that discolors the concrete.
- E. Form Linings:
 - 1. Timber forms for exposed concrete surfaces which are to be given a rubbed finish shall be face-lined with an approved type of form lining material.
 - 2. If plywood is used for form lining, it shall be made with waterproof adhesive and have a minimum thickness of 3/4 inch. It shall preferably be oiled at the mill and then re-oiled or lacquered on the job before using.
 - 3. If fiber board is used, apply water to the screen side on the board. Stack the boards screen side to screen side. Use the smooth hard face as the contact surface of the form. Such surfaces may be formed with 3/4-inch thick plywood made with waterproof adhesive if backed with adequate studs and wales. The greatest strength of the outer plies should be at right angles to the studding. In this case, form lining will not be required.

4. Carefully align edges and faces of adjacent panels and fill the joints between panels with patching plaster or cold water putty to prevent leakage. Lightly sand with No. 0 sandpaper to make the joints smooth.
 5. Forms which are reused shall have all unused form tie holes filled and smoothed as specified above.
- F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties:
1. Metal form ties shall be used to hold forms in place and to provide easy metal removal. The use of wire for ties shall not be permitted.
 2. Leave no metal or other material within 1-1/2 inches of the surface, when removing form tie assemblies which are used inside the forms to hold the forms in correct alignment. The assembly shall provide cone-shaped depressions in the concrete surface at least 1 inch in diameter and 1-1/2 inches deep to allow filling and patching. Such devices, when removed, shall leave a smooth depression in the concrete surface without undue injury to the surface from chipping or spalling.
 3. Burning off rods, bolts, or ties shall not be permitted.
 4. Metal ties shall be held in place by devices attached to wales. Each device shall be capable of developing the strength of the tie.
 5. Metal and wooden spreaders which are separate from the forms shall be wired to top of form and shall be entirely removed as the concrete is placed.
 6. In the construction of basement or water bearing walls, the portion of a single rod tie that is to remain in the concrete shall be provided with a tightly fitted washer at midpoint to control seepage. Multi-rod ties do not require washers. The use of form ties which are tapered or encased in paper or other material to allow the removal of complete tie, and which leave a hole through the concrete structure, shall not be permitted.
- H. Falsework:
1. Falsework shall be designed and constructed so that no excessive settlement or deformation occurs. Falsework shall provide necessary rigidity.
 2. Timber used in falsework centering shall be sound, in good condition and free from defects which impair its strength.
 3. Steel members shall be of adequate strength and shape for the intended purpose.
 4. Timber piling used in falsework may be of any wood species which satisfactorily withstands driving and which adequately supports the superimposed load.
 5. When sills or timber grillages are used to support falsework columns, unless founded on solid rock, shale or other hard materials, place them in excavated pits. Backfill to prevent the softening of the supporting material from form drip or from rains that may

occur during the construction process. Sills or grillages shall be of ample size to support the superimposed load without settlement.

6. Falsework not founded on a satisfactory spread footing shall be supported on piling, which shall be driven to a bearing capacity to support the superimposed load without settlement.

3.00 EXECUTION

3.01 PREPARATION

- A. Before placing concrete, ensure that embedded items are correctly, firmly and securely fastened into place. Embedded items shall be thoroughly clean and free of oil and other foreign material. Anchor bolts shall be set to the correct location, alignment and elevation by the use of suitable anchor bolt templates.

3.02 INSTALLATION

A. Pre-Placement:

1. During the elapsed time between building the forms and placing the concrete, maintain the forms to eliminate warping and shrinking.
2. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - a. For concrete surfaces exposed to view: Class A, 1/8 inch.
 - b. For concrete surfaces to receive a rubbed finish: Class A, 1/8 inch.
 - c. For concrete surfaces to receive plaster, stucco or wainscoting: Class B, 1/4 inch.
 - d. For concrete surfaces not exposed to view: Class D, 1 inch.
3. Construct forms tight enough to prevent loss of concrete mortar.
4. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, recesses, and the like, for easy removal.
5. Do not use rust-stained steel form-facing material.
6. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
7. Treat the facing of forms with suitable form oil before concrete is placed. Apply oil before the reinforcement is placed. Wet form surfaces which will come in contact with the concrete immediately before the concrete is placed.
8. At the time of placing concrete, the forms shall be clean and entirely free from all chips, dirt, sawdust, and other extraneous matter at the time. Forms for slab, beam and girder construction shall not have tie wire cuttings, nails or any other matter which would mar the appearance of the finished construction. Clean forms and keep them free of foreign matter during concrete placement.

- B. Where aluminum anchors, aluminum shapes, or aluminum electrical conduits are embedded in concrete, paint aluminum contact surfaces with zinc rich primer. Allow the paint to thoroughly dry before placing the aluminum in contact with the concrete.
- C. Placement:
1. Set and maintain forms to the lines designated, until the concrete is sufficiently hardened to permit form removal. If, at any stage of the work, the forms show signs of bulging or sagging, immediately remove that portion of the concrete causing this condition. If necessary, reset the forms and securely brace against further movement.
 2. Provide adequate cleanout openings where access to the bottom of the forms is not otherwise readily attainable.
 3. Chamfer exterior corners and edges of permanently exposed concrete.
 4. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
 5. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement. Carefully and accurately place and support reinforcement in concrete structures.
- D. Removal: Remove forms so that the underlying concrete surface is not marred or damaged in any way. Forms shall not be removed until the concrete has attained sufficient strength to safely carry the dead load, but in no case less than the number of curing days set forth in the following table:

Forms	Curing Days
Forms for concrete of minor structural load carrying importance	1 day
Forms for walls, columns, sides of drilled shafts, massive structural components and other members not resisting a bending moment during curing	1 day
Forms and falsework under slabs, beams and girders where deflections due to dead load moment may exist (for spans < or = 10 feet)	7 days
Forms and falsework under slabs, beams and girders where deflections due to dead load moment may exist (for spans > 10 feet and < or = 20 feet)	14 days
Forms and falsework under slabs, beams and girders where deflections due to dead load moment may exist (for spans > 20 feet)	21 days

- E. Reuse:
1. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
 2. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Owner's Representative.

F. Shores and Reshores:

1. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and re-shoring.
 - a. Plan sequence of removal of shores and re-shore to avoid damage to concrete. Locate and provide adequate re-shoring to support construction without excessive stress or deflection.

END OF SECTION

03 21 00 REINFORCING STEEL

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor and reinforcing materials required to cut, bend, tie, splice, place and support the reinforcement in the material grades, sizes, quantities and locations specified.

1.02 QUALITY ASSURANCE

- A. Tolerances:
 - 1. Reinforcing shall be placed where specified, with the following maximum tolerances, plus or minus:
 - a. Concrete Cover: 1/4 inch.
 - b. Reinforcing Bar Spacing: 1/4 inch in 12 inches.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
 - 1. Shop Drawings:
 - a. Reinforcing bar layout drawing with bar lists clearly marked and referenced to the Drawings. Include:
 - 1). Material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcing.
 - 2). Additional reinforcing required for openings through concrete structures.
 - 2. Record Data: Manufacturers' literature for specified products.
 - 3. Certified Test Reports:
 - a. Certification of steel quality, size, grade and manufacturer's origin.

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. ASTM International (ASTM) Standards:

ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

- 2. American Concrete Institute (ACI) Publications:

ACI 301	Specification for Structural Concrete
ACI SP-66	ACI Detailing Manual

ACI 318	Building Code Requirements for Structural Concrete
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3. Concrete Reinforcing Steel Institute (CRSI) Publications:

CRSI	Manual of Standard Practice
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1.05 DELIVERY AND STORAGE

- A. Store reinforcement above the surface of the ground upon platform skids or other supports. Protect from mechanical and chemical injury and surface deterioration caused by exposure to conditions producing rust. When placed in the Work, reinforcement shall be free from dirt, scale, dust, paint, oil and other foreign material. Tag and store reinforcement for ease of correlation with Shop Drawings.

1.06 JOB CONDITIONS

- A. Proposed deviations from reinforcing indicated on the Drawings or Specifications shall be approved in writing by the Engineer prior to fabrication.
- B. Lap lengths shall be of the length shown on the Drawings or noted in lap and embedment table, and shall be in compliance with ACI 318.
- C. Specified cover for reinforcing shall be maintained throughout construction. Bars shall be cut to lengths necessary to allow for proper clearances. Cover of concrete shall be measured from face of forms to outside face of reinforcement.
- D. Stirrups shall be hooked.

2.00 PRODUCTS

2.01 MATERIALS

- A. Steel Reinforcing Bars: Billet-Steel bars for concrete reinforcement conforming to ASTM A615; Grade 60, deformed, with minimum yield strength of 60,000 psi. Steel reinforcing bars shall be produced in the United States of America.
- B. Welded Wire Reinforcement: Cold-drawn steel wire conforming to ASTM A1064; flat sheets fabricated in accordance with ASTM A1064.
- C. Joint Dowel Bars: Plain-steel bars, ASTM A615/A615M, Grade 60. Cut bars true to length with ends square and free of burrs.
- D. Supports (Chairs): Bar supports shall be of the proper type for the intended use.
 - 1. CRSI Class 1 – Maximum Protection – uniform high density polyethylene (plastic) or fiberglass reinforced plastic (FRP). Plastic protected wire bar supports are not allowed.
 - 2. Unexposed Surface: CRSI Class 3 – No Protection.
- E. Spacers: Precast mortar blocks with a 28-day compressive strength that is greater than the specified concrete strength in which the blocks are being placed. Additionally:
 - 1. Cure a minimum of 4 days.

2. Blocks shall be in the form of a frustum positioned such that its size increases away from the formed surface. The surface placed adjacent to the forms shall not exceed 2-1/2 x 2-1/2 inches or 3 inches in diameter.
 3. Blocks shall be accurately cast to the thickness required and the surface to be placed adjacent to the forms shall be a true plane free of surface imperfections.
 4. Wires ties for securing reinforcement shall be embedded in the block.
- F. Mechanical Splices:
1. Mechanical splices shall develop at least 125 percent of the reinforcement yield strength.
 2. Cadweld splices as manufactured by Erico Products, Inc.
 3. Bolted coupler with bolts that shear off when fully tightened.
 4. Threaded coupler shall utilize a metal coupling sleeve with internal threads.
 5. Cold-swaged coupler that deforms onto the reinforcement bar profile.

3.00 EXECUTION

3.01 FABRICATION

- A. Reinforcing bars shall be bent cold by machine to shapes indicated on the Drawings; true to shapes indicated; irregularities in bending shall be cause for rejection. Unless otherwise noted, all hook and bend details and tolerances shall conform to the requirements of ACI SP-66 and ACI 318.
1. Fabricate reinforcement to provide lapped connections, bends and transitions in reinforcement as required for continuity of the typical reinforcement specified on the Drawings.
 2. Unless otherwise detailed, intersecting wall and/or beam reinforcement shall extend to the far face and terminate in a standard hook. Reinforcement at the outside face of corners shall be continuous or provide lap splices at each side of the corner.

3.02 PREPARATION

- A. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- B. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcement.

3.03 INSTALLATION

- A. General: Place the reinforcement carefully and accurately in the concrete structures. Rigidly tie and support the reinforcement. Welding of any type of reinforcement shall not be permitted.

B. Splices:

1. Splice reinforcement only as indicated on the Drawings or as approved by the Engineer prior to fabrication. Splices shall preferably occur at points of minimum stress.
2. Lap Splice: Lengths shall be as indicated on the Drawings. Rigidly wire the bars at all splices. Overlap sheets of wire fabric sufficiently to maintain a uniform strength and securely fasten.
3. Mechanical Splice: Cadweld splices, Bolted coupler, Threaded coupler, Cold-swaged coupler or approved equal, installed in accordance with the manufacturer's instructions and recommendations. The splice device shall develop at least 125 percent of the specified yield strength of the reinforcement.

C. Placement:

1. Place reinforcement, as indicated on the Drawings with the specified tolerances. Hold securely in place during the placing of the concrete. The minimum clear distance between bars shall be per ACI 318 unless noted otherwise. Always pass vertical stirrups around the main tension members and securely attach thereto. Wire reinforcing together at a sufficient number of intersections to produce a sound, sturdy mat or cage of reinforcement that will maintain the reinforcement in correct positions when the concrete is placed.
2. Hold the reinforcing steel in concrete slabs firmly in place with wire supports or "chairs." Sizing and spacing of the chairs shall be sufficient to properly support the steel, and shall be in accordance with CRSI Publications "Manual of Standard Practice in."
3. Space the reinforcing steel in concrete walls the proper distance from the face of the forms, as indicated on the Drawings:
 - a. For wall surfaces exposed to view, use chairs.
 - b. For wall surfaces not exposed to view, use chairs.
4. Where reinforcing conflicts with location of anchor bolts, inserts, etc., submit prompt notifications so that revisions can be made before concrete is placed. No cutting of reinforcing shall be permitted without the prior approval of the Engineer.
5. Welded wire shall be fabricated flat sheets, in longest practical lengths. Lap joints one mesh. Do not locate end laps over beams of continuous structures or midway between supporting beams. Offset end laps of adjacent widths to prevent continuous lap. Fasten ends and sides of welded wire fabric at 48 inches O.C. with tie wire.
6. Reinforcing shall extend through construction joints.
7. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.04 FIELD QUALITY CONTROL

- A. Concrete shall not be placed until the Engineer has observed the final placing of the reinforcing steel, and has given permission to place concrete.

END OF SECTION

03 30 00 CAST-IN-PLACE CONCRETE

1.00 GENERAL

1.01 SUMMARY

- A. Furnish labor, materials, mixing and transporting equipment and incidentals necessary to proportion, mix, transport, place, consolidate, finish, and cure concrete in the structure.

1.02 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and silica fume; subject to compliance with requirements.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:

- 1. Shop Drawings:

- a. Mix Design: For each mix design, provide documentation using field test data or trial mixture data in accordance with ACI 301, which includes average strength documentation using either field strength test data or trial mixtures.
- b. Submit a schedule to the Owner's representative which shows the sequence of concrete placements.
- c. Procedures for placement through water if required.
- d. If joints are not detailed on the Drawings, construction joint details and locations shall be submitted to the Engineer for approval.

- 2. Certified Test Reports:

- a. Materials used in the mix design and which will be used during production of concrete for the Project.
- b. Water: Verification that all potable mix water and curing water sources do not exceed the non-potable water limits listed in ASTM C1602 Table 2.
 - 1). Test mix water chloride content as indicated in ASTM C1602 Table 2.
- c. Aggregate, conforming to ASTM C33, including the test reports for soundness and abrasion resistance.
- d. Aggregate:
 - 1). Verification that aggregate is not "potentially reactive" per ASTM C1260.
 - 2). Or a cement chemical analysis indicating that the total alkali content is acceptable per Paragraph 2.02.A.
 - 3). Test all aggregate sources for chlorides in accordance with ASTM C1524.
- e. 7-day and 28-day compressive strength tests results.

- f. If the sum total of chlorides in mix water and aggregates exceeds 80 percent of the specified limit for hardened concrete, then prior to use of concrete, test mix design to verify acceptable chloride ion concentrations in accordance with ASTM C1218.
- 3. Record Data:
 - a. Manufacturer's literature on specified materials.
 - b. Documentation indicating conformance with ASTM C94 requirements.
 - 1). Concrete delivery tickets in accordance ASTM C94.
 - c. Documentation of supplier's National Ready Mixed Concrete Association certification.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications:
 - 1. A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment.
 - 2. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- C. Testing Agency Qualifications:
 - 1. An independent testing agency, acceptable to authorities having jurisdiction and the Engineer, qualified according to ASTM C1077 and ASTM E329 to conduct the testing indicated.
 - 2. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- E. Pre-Submittal Conference:
 - 1. Conduct conference at the Site to comply with requirements in Section C700 "General Conditions."

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cement in bulk or bags which are plainly marked with the brand and manufacturer's name. Immediately upon receipt, store cement in a dry, weather-tight, and properly ventilated structure which excludes moisture. Storage facilities shall permit easy access for inspection and identification. Cement not stored in accordance with the requirements shall not be used.
- B. Sufficient cement shall be in storage to complete placement of concrete started. In order that cement may not become unduly aged after delivery, maintain records of delivery dates.

Use cement which has been stored at the Site for 60 days or more before using cement of lesser age. No cement shall be used which is lumped, caked, stored more than 90 days, or whose temperature exceeds 170 F.

1.06 STANDARDS

A. Mixing, sampling, placing, curing and testing of concrete, and the materials used shall be in compliance with the latest revisions of the following standards, unless otherwise noted in the Contract Documents.

1. ASTM International (ASTM) Standards:

ASTM Standards	
ASTM C31	Standard Practice for of Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C94	Standard Specification of Ready Mixed Concrete
ASTM C109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
ASTM C125	Standard Terminology Relating to Concrete and Concrete Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C143	Standard Test Method for Slump of Hydraulic Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C191	Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
ASTM C192	Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C290	Standard Specification for Elastomeric Joint Sealants
ASTM C309	Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete

ASTM Standards	
ASTM C579	Standard Test Methods for Compressive Strength of Chemical Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
ASTM C580	Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C827	Standard Test Method for Change in Height at Early Stages of Cylindrical Specimens of Cementitious Mixtures
ASTM C845	Standard Specification for Expansive Hydraulic Cement
ASTM C881	Standard Specification for Epoxy Resin Base Bonding Systems for Concrete
ASTM C1116	Standard Specification for Fiber-Reinforced Concrete
ASTM C1157	Standard Performance Specification for Hydraulic Cement
ASTM C1218	Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
ASTM C1240	Standard Specification for Silica Fume used in Cementitious Mixtures
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D2240	Standard Test Method for Rubber Property Durometer Hardness
ASTM E96	Standard Test Methods for Water Vapor Transmission of Materials

2. American Concrete Institute (ACI) Standards:

ACI Standards	
ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavy-weight, and Mass Concrete
ACI 301	Specification for Structural Concrete
ACI 305.1	Specification for Hot Weather Concreting
ACI 306.1	Standard Specification for Cold Weather Concreting
ACI 308.1	Specification for Curing Concrete

ACI Standards	
ACI 318	Building Code Requirements for Structural Concrete

3. Federal Specification:
 - a. TT S 00227E - Type II, Class A or B, Expansion Joint Sealant.
4. Concrete Plant Manufacturers Bureau (CPMB) Standards:
 - a. Concrete Plant Standards.

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Products: Subject to compliance with requirements, provide one of the products specified.
 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 CONCRETE MATERIALS

- A. Cementitious Material; General: If the fine and/or coarse aggregates test “Potentially Reactive”, in accordance with ASTM C1260, then a low alkali cementitious material shall be used. A low alkali cementitious material shall be such that, the Sodium Oxide Equivalent ($N_{a_2O_{eq}}$) shall not exceed 0.6 percent of the total cementitious material content.
- B. Cement; Type I or I/II Portland cement, conforming to ASTM C150 used for all concrete, unless noted otherwise.
- C. Supplementary Cementitious Materials (SCM):
- D. Fly Ash/Pozzolans: Conforming to ASTM C618, Class F fly ash; used in all classes of concrete. A supplier’s certificate of the analysis and composition of the fly ash shall be supplied. If fly ash is not available then provide a straight cement mix.
- E. Coarse Aggregate:
 1. Crushed stone or gravel conforming to ASTM C33, in the gradation size specified.
 - a. Class: Negligible weathering region, but not less than 1N.

2. For gradation size number 467, a maximum aggregate size of 1-1/2 inches is:

Sieve Size	Percent Retained	Percent Passing
2"	0	100
1-1/2"	0-5	95-100
3/4"	30-65	35-70
3/8"	70-90	10-30
No. 4	95-100	0-5

3. For gradation size number 57, the maximum aggregate size of 1 inch is:

Sieve Size	Percent Retained	Percent Passing
1-1/2"	0	100
1"	0-5	95-100
1/2"	40-75	25-60
No. 4	90-100	0-10
No. 8	95-100	0-5

4. For gradation size number 67, the maximum aggregate size of 3/4 inch is:

Sieve Size	Percent Retained	Percent Passing
1"	0	100
3/4"	0-10	90-100
3/8"	45-80	20-55
No. 4	90-100	0-10
No. 8	90-100	0-5

5. For gradation size number 8, the maximum aggregate size of 3/8 inch is:

Sieve Size	Percent Retained	Percent Passing
1"	0	100
3/8"	0-15	85-100
No. 4	70-90	10-30
No. 8	90-100	0-10
No. 16	95-100	0-5

F. Fine Aggregate:

1. Washed and screened natural sands or sands manufactured by crushing stones; conforming to ASTM C33. The gradation in ASTM C33 for air entrained concrete is:

Sieve Size	Percent Retained	Percent Passing
3/8"	0	100

Sieve Size	Percent Retained	Percent Passing
#4	0-5	95-100
#8	0-20	80-100
#16	15-50	50-85
#30	40-75	25-60
#50	70-90	10-30

2. Fine aggregate shall have not more than 45 percent retained between any two consecutive sieves. Its fineness modulus, as defined in ASTM C125, shall be not less than 2.3 nor more than 3.1.

G. Water: Potable and complying with ASTM C1602 and ASTM C1602 Table 2.

2.03 ADMIXTURES

- A. Measure and dose admixtures in accordance with manufacturer's recommendations.
- B. Air Entraining Admixture: Conforming to ASTM C260.
- C. Water Reducing Admixtures: Conforming to ASTM C494; Types A or D.
- D. Set Retarding Admixtures: Conforming to ASTM C494; Types B and D.
- E. Water Reducing Admixtures, High Range (HRWR): High Range Water Reducer shall comply with ASTM C494, Type F or G. HRWR shall be added to the concrete mix at the concrete batch plant. HRWR may not be added at placement site except to redose a batch and only after approval of the HRWR manufacturer. The high range water reducing admixture shall be able to maintain the plasticity range without significant loss of slump or rise in concrete temperature for 2 hours. Other admixtures may only be used with the HRWR if approved by the HRWR manufacturer. A representative of the HRWR manufacturer shall be present during any large placement, placement of slabs, or during times of unusual circumstance which may require changes to the product formulation.
 1. Manufacturers:
 - a. GCP Applied Technologies.
 - b. Master Builders Solutions US LLC.
 - c. Sika Corporation.

2.04 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes. Unless indicated otherwise, provide the following configurations.
 1. Construction Joints:
 - a. Profile: Ribbed without center bulb.
 - b. Width: 6 inches.
 - c. Minimum thickness: 3/8 inch.

2. Expansion Joint:
 - a. Profile: Ribbed with center bulb.
 - b. Width: 9 inches.
 - c. Minimum thickness: 3/8 inch.
 3. Manufacturers:
 - a. Sika Greenstreak and Sika Westec Barrier Technologies.
 - b. W.R. Meadows, Inc.
 - c. Paul Murphy Plastics Co.
 - d. Progress Unlimited Inc.
 - e. DCA Construction Products, LLC: Durajoint Waterstop.
 - f. Vinylex Corporation.
- B. Self-Expanding Strip Waterstops (Hydrophilic): Self-expanding strip waterstops shall be used only where specifically indicated. Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophilic material for adhesive bonding to concrete.
1. Products:
 - a. De Neff Swellseal Joint; GCP Applied Technologies.
 - b. Adeka Ultra Seal; Mitsubishi International Corporation.
 - c. Sika Hydrotite; Sika Corporation – U.S.

2.05 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape for sealing lap joints, penetrations, and as required for securing terminations.
1. Available Products:
 - a. Fortifiber Corporation; Moistop Ultra A.
 - b. Raven Industries Inc.; Vapor Block 15.
 - c. Reef Industries, Inc.; Griffolyn Type-105.
 - d. Stego Wrap (15-mil) Vapor Barrier; STEGO INDUSTRIES LLC.
 - e. Huskey Yellow Guard, 15-mil Vapor Barrier; Poly-America, L.P.

2.06 CURING MATERIALS

- A. Sheet Curing Material: Conforming to ASTM C171.
1. Waterproof paper.
 2. Polyethylene film.
 3. White burlap - polyethylene film.

- B. Membrane Curing Compounds: Membrane curing compound conforming to ASTM C309; applied according to the manufacturer's recommendations. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, 18 to 22 percent solids.
 - 1. Products:
 - a. Diamond Clear VOX; Euclid Chemical Co.
 - b. Lambco Glazecote 30; Lambert Corporation.
 - c. Dress & Seal; Laticrete International, Inc.
 - d. Vocomp-20; W.R. Meadows, Inc.
 - e. Cure & Seal 250E; Nox-Crete Products Group, Kinsman Corporation.
 - f. Starseal 0800; Vexcon Chemicals, Inc.
 - g. Approved equal.
- C. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A.
 - 1. Products:
 - a. Polyseal WB-15; ChemMasters.
 - b. UV Safe Seal; Lambert Corporation.
 - c. Lumiseal Plus; Laticrete International, Inc.
 - d. MasterKure CC 1315 WB; Master Builders Solutions US LLC.
 - e. Vocomp-30; W.R. Meadows, Inc.
 - f. Vexcon Starseal 1315; Vexcon Chemicals, Inc.
 - g. Approved equal.
- D. Finishing Aid: Spraying material designed to form a monomolecular film on fresh concrete that reduces the rate of evaporation of surface moisture prior to finishing. This material is not a curing compound. Concrete must be cured as specified.
 - 1. MasterKure ER 50; Master Builders Solutions US LLC.
 - 2. Approved equal.

2.07 RELATED MATERIALS

- A. Expansion and Isolation Joint Filler:
 - 1. Water retaining structures: ASTM D1752, Type II.
 - 2. Non-water retaining structures: ASTM D1751; or ASTM D1752, Type I or II.
 - 3. Thickness as indicated on the Drawings.
- B. Expansion and Isolation Joint Sealant:
 - 1. Water retaining structures: ASTM C920, Type M, Grade P or NS as applicable, Class 35, Use I (ASTM C127, Class 2), UV resistance.

2. Non-water retaining structures: ASTM C920, Type S or M, Grade P or NS as applicable, Class 35, Use T, UV resistance.
 3. Backing material for sealant shall be a rod of diameter and composition recommended by the sealant manufacturer.
- C. Bonding Agent: Water-based epoxy modified, with integral corrosion inhibitor. Install according to the manufacturer's recommendations.
1. Sika Armatec 110 EpoCem; Sika Corporation.
 2. MasterEmaco P 124; Master Builders Solutions US LLC.
 3. Approved equal.
- D. Non-Shrink Grout:
1. General: Non-shrink grout for grouting of pump, motor, and equipment baseplates or bedplates, column baseplates, other miscellaneous baseplates, piping block outs and other uses of grout. Grout shall meet the following requirements, as verified by independent laboratory tests:
 - a. No shrinkage from the time of placement, or expansion after set, under ASTM C827 and CRD C621 83 (Corps of Engineers). When non-shrink grouts are tested under CRD C621 83, the grout shall be tested in a fluid state. A fluid state shall be defined as flowing through a flow cone at a rate of 20 seconds, plus or minus 5 seconds.
 - b. An initial set time of not less than 45 minutes under ASTM C191.
 2. Non-Shrink Non-Metallic Grout: Pre-mixed, non-staining, non-shrink grout; minimum 28-day compressive strength of 5000 psi.
 - a. Do not use for vibrating equipment.
 - b. Products:
 - 1). MasterFlow 100; Master Builders Solutions US LLC.
 - 2). Five Star Grout; Five Star Products, Inc.
 - 3). SikaGrout 212; Sika Corporation.
 3. Non-Shrink Epoxy Structural Grouts: Furnished in two components from the factory and mixed on the Site; conforming to ASTM C579, ASTM C580, and ASTM C827; chemical resistant, water resistant and a minimum 7-day compressive strength of 12,000 psi.
 - a. Use for vibrating equipment.
 - b. Products:
 - 1). Sikadur 42, Grout-Pak; Sika Corporation.
 - 2). Five Star HP Epoxy Grout; Five Star Products, Inc.
 - 3). MasterFlow 648; Master Builders Solutions US LLC.
- E. Normal Shrinkage Grout: 1 part Portland cement, Type I or II, to 3 parts of clean, first quality sand; proportioning on a volumetric basis; used for non-structural applications for grouting areas as shown on the Drawings which do not require non-shrink grout.

- F. Foundation Waterproofing: Foundation coating shall be used only on the exterior of concrete walls not exposed to view where indicated on the Drawings.
 - 1. MasterSeal 581 (Thoroseal); Master Builders Solutions US LLC.
 - 2. TREMproof 250GC; Tremco Commercial Sealants and Waterproofing.
 - 3. Approved equal.
- G. Zinc Rich Primer: Aluminum surfaces which contact or are embedded in concrete shall be coated with zinc rich primer. Primer shall be:
 - 1. Tneme-Zinc; Tnemec Company, Inc.
 - 2. MasterProtect P 8100AP; Master Builders Solutions US LLC.
 - 3. Approved equal.

2.08 REPAIR MATERIALS

- A. Structural Concrete Repair Material: Low-shrink, non-slump, non-metallic, quick setting patching mortar; as approved by the manufacturer for each application and applied accordance with the manufacturer's recommendations.
 - 1. Products:
 - a. Five Star Structural Concrete; Five Star Products, Inc.
 - b. SikaTop 123; Sika Corporation.
 - c. SikaTop 122; Sika Corporation.
 - d. MasterEmaco N 425; Master Builders Solutions US LLC.
 - e. Approved equal.

2.09 CONCRETE MIXTURES

- A. Design Criteria:
 - 1. Provide a mix design for each concrete application indicated. This may necessitate multiple mix designs for each class of concrete depending on HRWR, entrained air, and other requirements.
 - 2. All Concrete shall be normal weight concrete composed of Portland cement, fine aggregate, coarse aggregate, admixtures, and water, as specified.
 - 3. ACI 211.1 shall be the basis for selecting the proportions for concrete made with aggregates of normal and high density and of workability suitable for usual cast in place structures.
 - 4. The workability of any mix shall be as required for the specific placing conditions and the method of placement. The concrete shall have the ability to be worked readily into corners and around reinforcing steel without the segregation of materials or the collection of free water on the surface. Compliance with specified slump limitations shall not necessarily designate a satisfactory mix.
 - 5. In no case shall the amount of coarse material produce harshness in placing or honeycombing in the structure, when forms are removed. The maximum amount of

coarse aggregate (dry loose volume) per cubic foot of finished concrete shall not exceed 0.82 cubic feet.

6. In calculating water-cement ratio: The water content shall include the amount of water batched or to be added later, plus the free water in the aggregate, and minus the water content at SSD conditions.
7. No allowance shall be made for the evaporation of water after batching. If additional water is required to obtain the desired slump, a compensating amount of cement shall also be added. In no case shall the maximum water cement ratio exceed the specified maximum or that of the approved mix design.
8. Air Entrainment: Provide the percent air entrainment in each concrete mix design as recommended by ACI 318:
 - a. Exposure Class: F1, unless otherwise specified/restricted:
 - 1). Do not provide air-entrainment in drilled shafts unless placed underwater.
 - 2). Do not provide air-entrainment and entrapped air shall not exceed 3 percent for the following applications:
 - a). Interior slabs.
 - b). Slabs on composite metal decks.
9. Maximum water-soluble chloride ion content in concrete, by percent weight of concrete, shall not exceed ACI 318 Exposure Class C1.
10. When job conditions dictate, water-reducing and set-controlling admixtures may be used. Only specified admixtures shall be used. Admixtures shall be batched at the batch plant.
11. High Range Water Reducer (HRWR): Provide HRWR in mix designs for the following specified applications:
 - a. Drilled shafts, footings, walls, columns, and beams.
 - b. Interior of building curbs which are not cast monolithically with slabs.
 - c. Precast concrete.
 - d. Exception: Do not provide HRWR in slabs and pavement (a water reducer is permitted provided performance requirements are met).
12. If fly ash is to be used in place of cement, no more than 25 percent of the cement may be replaced.
13. Concrete shall be capable of developing two-thirds of the required 28-day compressive strength in 7 days.
14. Shrinkage Limits: All concrete used in the following structures shall have a shrinkage limit of 0.04 percent at 28 days in accordance with ASTM C157.

B. Concrete Classifications:

Class	Min. 28-Day Compressive Strength (psi)	Max. Size Aggregate (inches)	Max. Water: Cementitious Materials Ratio	Slump +/-1 (inches)
A	4000	1.5, Size No. 467	0.45	3 (8*)
B	3000	1.5, Size No. 467	0.47	3
C	4000	1.0, Size No. 57	0.45	4 (8*)
D	5000	0.75, Size No. 67	0.47	4
E	1500	1.5, Size No. 467	0.70	4
F	4000	0.375, Size No. 8	0.47	3

* Slump shown is with HRWR.

C. Concrete Usage:

Class	Usage
Class A Use	Footings and slabs, and other unless noted otherwise
Class B Use	Pavement, gutters, sidewalks
Class C Use	Walls, columns, beams, drilled shafts
Class D Use	Precast concrete and precast panels
Class E Use	Cradling, blocking, mud slab, lean concrete backfill
Class F Use	Stair pans and landings, interior building curbs

D. Required Average Compressive Strength:

1. All concrete is required to have an average compressive strength greater than the specified strength. The required average compressive strength shall be established according to the requirements of ACI 301.
2. Standard Deviation: Calculate a standard deviation and establish the required average compressive strength (f_{cr}') in accordance with ACI 301. If field test records are not available, select the required average strength from ACI 301.

E. Documentation of Required Average Compressive Strength:

1. Documentation indicating the proposed concrete proportions will produce an average compressive strength equal to or greater than f_{cr}' . Documentation shall consist of field strength records or trial mixture.
2. Field Strength Test Records: Document field strength test records according to ACI 301, which is partially restated here:
 - a. If field test data are available and represent a single group of at least 10 consecutive strength tests for one mixture, using the same materials, under the same conditions, and encompassing a period of not less than 45 days, verify that the average of the field test results equals or exceeds f_{cr}' .

- b. If the field test data represent two groups of strength tests for two mixtures, plot the average strength of each group versus the water-cementitious materials ratio of the corresponding mixture proportions and interpolate between them to establish the required mixture proportions for f_{cr}' .
3. Trial Mixtures:
- a. Establish trial mixture proportions according to ACI 301, which is partially restated here:
 - 1). Make at least three trial mixtures complying with performance and design requirements. Each trial mixture shall have a different cementitious material content. Select water-cementitious materials ratios that will produce a range of compressive strengths encompassing f_{cr}' .
 - 2). Submit a plot of a curve showing the relationship between water-cementitious materials ratio and compressive strength.
 - 3). Establish mixture proportions so that the maximum water-cementitious materials ratio is not exceeded when the slump is at the maximum specified.
 - b. Trial mixtures shall be designed, sampled, and tested by an independent testing laboratory, retained and paid by the Contractor and approved by the Owner.
 - c. Provide 7-day and 28-day strengths test results.
4. Revisions to concrete mixtures:
- a. When less than 15 compressive strength tests results for a given class of concrete are available from the current Project:
 - 1). If any of the following criteria are met, take immediate steps to increase average compressive strength of the concrete.
 - a). A 7-day compressive strength test result multiplied by 1.5 falls below the required 28-day compressive strength.
 - b). A 28-day compressive strength test result is deemed not satisfactory.
 - b. When at least 15 compressive strength test results for a given class of concrete become available from the current Project:
 - 1). Calculate the actual average compressive strength, standard deviation and required average compressive strength using the previous 15 consecutive strength tests. Submit results in graphical form with each 28-day test result for that class of concrete.
 - 2). If any of the following criteria are met, take immediate steps to increase average compressive strength of the concrete.
 - a). A 28-day compressive strength test result is deemed not satisfactory.
 - b). The average compressive strength falls below the required average compressive strength.
 - c. When revisions to the mix design are required, notify the Engineer in writing of the corrective actions taken.

2.10 OFF-SITE BATCH PLANT

- A. Batch plants shall be an established concrete batching facility meeting the requirements of the Concrete Plant Standards of the Concrete Plant Manufacturers Bureau.

2.11 CONCRETE MIXING

- A. Mixers may be stationary, truck, or paving mixers of approved design. They shall be capable of combining the materials into a uniform mixture and of discharging without mixture segregation. Stationary and paving mixers shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. The mixers or mixing plant shall include a device for automatically counting the total number of batches of concrete mixed. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer on the name plate.
- B. The mixing time for stationary mixers shall be based upon the mixer's ability to produce uniform concrete throughout the batch and from batch to batch. For guidance purposes, the manufacturer's recommendations, or 1 minute for 1 cubic yard plus 1/4 minute for each additional cubic yard may be used. Final mixing time shall be based on mixer performance. Mixers shall not be charged in excess of the capacity specified by the manufacturer.
- C. When a stationary mixer is used for partial mixing of the concrete (shrink mixed), the stationary mixing time may be reduced to the minimum necessary to intermingle the ingredients (about 30 seconds).
- D. When a truck mixer is used, either for complete mixing (transit-mixed) or to finish the partial mixing in a stationary mixer and in the absence of uniformity test data, each batch of concrete shall be mixed not less than 70 nor more than 100 revolutions of the drum, at the rate of rotation designated by the manufacturer of the equipment as mixing speed. If the batch is at least 1/2 cubic yard less than the rated capacity, in the absence of uniformity test data, the number of revolutions at mixing speed may be reduced to no less than 50. Additional mixing shall be performed at the speed designated by the manufacturer of the equipment as agitating speed. When necessary for proper control of the concrete, mixing of transit-mixed concrete shall not be permitted until the truck mixer is at the Site of the concrete placement. Truck mixers shall be equipped with accurate revolution counters.
- E. Paving mixers may be either single compartment drum or multiple compartment drum type. A sled or box of suitable size shall be attached to the mixer under the bucket to catch any concrete spillage that may occur when the mixer is discharging concrete into the bucket. Multiple compartment drum paving mixers shall be properly synchronized. The mixing time shall be determined by time required to transfer the concrete between compartments of the drum.
- F. Vehicles used in transporting materials from the batching plant to the paving mixers shall have bodies or compartments of adequate capacity to carry the materials and to deliver each batch, separated and intact, to the mixer. Cement shall be transported from the batching plant to the mixers in separate compartments which are equipped with windproof and rain proof covers.

3.00 EXECUTION

3.01 PREPARATION

- A. Notify the Owner's representative upon completion of various portions of the work required for placing concrete, so that inspection may be made as early as possible. Keep the Owner's representative informed of the anticipated concrete placing schedules.
- B. All items, including lines and grades, forms, waterstops, reinforcing, inserts, piping, electrical, plumbing and the Contractor's concreting materials and equipment shall be in compliance with the Contract Documents before proceeding.
- C. Do not place any concrete until formwork and the placing reinforcement in that unit is complete. Place no concrete before the completion of all adjacent operations which might prove detrimental to the concrete.
- D. Brilliantly light the Site so that all operations are plainly visible when concrete mixing, placing, and finishing, continues after daylight. Whenever possible, concrete finishing shall be completed in daylight hours.
- E. When placing concrete, the forms shall be clean and entirely free from all chips, dirt, sawdust and other extraneous matter. Forms for slab, beam and girder construction shall not have tie wire cuttings, nails, or any other matter which would mar the appearance of the finished construction. Clean forms and keep them free of any foreign matter during concrete placing.
- F. The concrete shall be mixed in quantities required for immediate use. Any concrete which is not in place within the time limits specified shall not be used. Concrete shall not be re-tempered.
- G. Concrete shall not be placed if impending weather conditions would impair the quality of the finished Work.
- H. Unless otherwise provided, the following requirements shall govern the time sequence on which construction operations shall be carried.
 - 1. Forms for walls or columns shall not be erected on concrete footings until the concrete in the footing has cured for at least 2 curing days. Concrete may be placed in a wall or column as soon as the forms and reinforcing steel placements are approved.
 - 2. Steel beams or forms and falsework for superstructures shall not be erected on ground-supported concrete substructures until the substructure concrete has cured for at least 4 curing days.
 - 3. Falsework required for superstructures shall not be erected until the substructure has cured for 4 curing days, and shall not be removed until allowed for by Section 03 11 00 "Concrete Forming."

3.02 EMBEDDED ITEMS

- A. Where aluminum anchors, aluminum shapes, or aluminum electrical conduits are embedded in concrete, paint aluminum contact surfaces with zinc rich primer. Allow the paint to thoroughly dry before placing the aluminum in contact with the concrete.

- B. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor bolts, accurately located, to elevations required.

3.03 VAPOR RETARDERS

- A. Place, protect, and repair vapor-retarder sheets according to ASTM E1643 and manufacturer's written instructions. At a minimum, provide the following:
 - 1. Lap sheets not less than 6 inches at all joints. Use pressure-sensitive tape at all laps. Lap reinforcement directly over film before placing concrete, taking precautions to prevent punctures.
 - 2. Carefully cut film around pipes and wiring outlets. Install reinforcing sheets and apply pressure sensitive tape around penetrations as recommended by the manufacturer.
 - 3. Terminate vapor barrier as indicated on the Drawings.
- B. Granular fill below vapor retarder sheet shall be smoothed and free of protrusions that might damage or rupture the sheet.
- C. Completely cover subgrade with the vapor retarder sheet as indicated on the Drawings.

3.04 JOINTS

- A. Expansion Joints and Devices:
 - 1. Workmanship: Exercise careful workmanship in joint construction to separate the concrete sections by an open joint or by the joint materials, and make the joints true to the outline indicated.
 - 2. Expansion Joints: Construct expansion joints and devices to provide expansion and contraction. Construct joints which are to be left open or filled with poured joint material with forms which are adaptable for loosening or early removal. In order to avoid jamming by the expansion action of the concrete and the consequent likelihood of injuring adjacent concrete, remove or loosen these forms as soon as possible after the concrete has initially set. Make provisions for loosening the forms to permit free concrete expansion without requiring full removal.
 - 3. Armored Joints: Carefully construct armored joints to avoid defective anchorage of the steel and porous or honeycombed concrete adjacent to same. Anchor pre-molded materials to the concrete on one side of the joint with approved adhesive. Anchor so that the material does not fall out of the joint.
- B. Construction Joints:
 - 1. Construction joints are formed by placing plastic concrete in direct contact with concrete which has attained its initial set. When concrete is specified as monolithic, the term shall be interpreted as the manner and sequence of concrete placement so that construction joints do not occur.

2. Additional horizontal and vertical construction joints, when submitted and approved by the Engineer, may have an impact on reinforcing details. Revise reinforcing details to reflect additional joints.
 3. Unless otherwise provided, construction joints shall be square and normal to the forms. Provide bulkheads in the forms for all joints except horizontal joints.
 4. Clean horizontal construction joints for receiving the succeeding lift using air water cutting. The surface shall be exposed sound, clean aggregate with a 1/4 inch amplitude. After cutting, wash the surface until there is no trace of cloudiness in the wash water.
 5. In areas where air water cutting cannot be satisfactorily accomplished, or in areas where it is undesirable to disturb the surface of the concrete before it has hardened, prepare the surface for receiving the next lift by wet sand blasting to immediately remove all laitance and unsound concrete prior to placing of the next lift. Thoroughly wash the surface of the concrete after sand blasting to remove all loose material.
 6. Provide construction joints with concrete keyways, reinforcing steel dowels, and waterstops where indicated on the Drawings. The method of forming keys in keyed joints shall permit the easy removal of forms without chipping, breaking, or damaging the concrete.
 7. Construction joint layout unless otherwise indicated on the Drawings:
 - a. Maximum horizontal spacing of construction joints shall be 45 feet.
 - b. Maximum vertical spacing of construction joints shall be 15 feet.
- C. Control Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness, spaced as indicated on the Drawings, and as follows:
1. Tooled Joints: Form control joints after initial floating by tooling/grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form control joints with early entry dry-cut power saws within 2 hours of finishing operations. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Hardened Concrete: Where new concrete or grout is to be placed in contact with existing or recently hardened concrete, texture the existing or recently hardened surface by chipping or other means so that an irregular surface having a height variance of not less than 1/4 inch is created. The existing or recently hardened concrete shall then be coated with a bonding agent and new concrete or grout placed.

3.05 WATERSTOPS

- A. PVC/TPER/PE Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work.
1. At formed surfaces, a split form shall be used. The split form shall have a tight fit which prevents misalignment and concrete leakage.

2. The embedded flange of the waterstop must be secured prior to concrete placement. The flange shall be secured at 12 inches on-center by factory installed hog rings or grommets at the outermost rib. Never place nails or screws through the body of the waterstop.
 3. All fittings and changes in direction shall be factory fabricated. Only straight butt splices shall be made in the field. Field splices shall be according to the manufacturer's written instructions and as follows:
 - a. Cut adjoining ends square to form matching edges.
 - b. Uniformly melt the ends at 380 F using a thermostatically controlled, Teflon coated splicing iron.
 - c. When a 1/8-inch diameter melt bead develops on each waterstop end, remove the splicing iron and firmly press the two ends together in proper alignment. Hold until the material has fused and cooled. Allow the splice to cool naturally; do not quench.
- B. Self-Expanding Strip Waterstops:
1. Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place.
 - a. Waterstop shall be bonded to the substrate using a continuous bead of swelling sealant or adhesive as recommended by the manufacturer.
 - 1). ADEKA Ultra Seal P-201.
 - 2). Sika Leakmaster.
 2. Install in longest lengths practicable.
 3. Protect from moisture, oil, dirt, and sunlight prior to the placement of concrete. Coordinate with manufacturer for additional requirements.

3.06 CONCRETE PLACEMENT

A. Cold Weather:

1. If air temperature has fallen to, or is expected to fall below 40 F during the protection period (a minimum of 48 hours but not less than that required by ACI 306.1), then cold weather concreting shall be performed in accordance with ACI 306.1.
2. In cases where the temperature drops below 40 F after the concreting operations have been started, sufficient canvas and framework or other type of housing shall be furnished to enclose and protect the structure, in accordance with the requirements of ACI 306.1. Sufficient heating apparatus to provide heat shall be supplied, and heating source and protection from combustion gas shall be in accordance with ACI 306.1. The concrete shall be protected when placed under all weather conditions. Should concrete placed under such conditions prove unsatisfactory, remove and replace the concrete at no cost to the Owner.

3. When the air temperature is above 30 F:
 - a. The minimum concrete temperature at the time of mixing shall be 60 F unless other requirements of ACI 306.1 are met, which may allow for a lower mix temperature.
 - b. The minimum concrete temperature at the time of placement and during the protection period shall be 55 F unless other requirements of ACI 306.1 are met, which may allow for a lower temperature.
4. The means used to heat a concrete mix shall be in accordance with ACI 306.1.
5. Salts, chemicals, or other foreign materials shall not be mixed with the concrete to preventing freezing. Calcium chloride is not permitted.

B. Hot Weather:

1. Hot weather is defined as any combination of high air temperature, low relative humidity, and wind velocity that impairs the quality of the concrete. Hot weather concreting shall be in accordance with ACI 305.1. Concrete shall be placed in the forms without the addition of any more water than that required by the design (slump). No excess water shall be added on the concrete surface for finishing. Control of initial set of the concrete and extending the time for finishing operations may be accomplished with the use of approved water reducing and set retarding admixture, as specified.
2. Maximum time intervals between the addition of mixing water and/or cement to the batch, and the placing of concrete in the forms shall not exceed the following (excluding HRWR admixture use):

Concrete Temperature	Maximum Time from Water Batch to Placement
Non-Agitated Concrete	
Up to 80 F	30 Minutes
Over 80 F	15 Minutes
Agitated Concrete	
Up to 75 F	90 Minutes
75 F to 89 F	60 Minutes

- a. The use of an approved set-retarding admixture will permit the extension of the above time maximums by 30 minutes, for agitated concrete only.
- b. The use of an approved high range water reducing (HRWR) or hydration-controlling admixture will allow placement time extensions as determined by the manufacturer.
3. The maximum temperature of fresh concrete at time of discharge shall not exceed 95 F. The temperatures of the mixing water shall be reduced by the use of chilled water or ice.
4. The maximum temperature of fresh concrete with high range water reducing admixture shall not exceed 100 F at time of discharge.
5. Under extreme heat, wind, or humidity conditions, concreting operations may be suspended if the quality of the concrete being placed is not acceptable.

C. Handling and Transporting:

1. Delivery tickets shall be required for each batch and shall be in accordance with ASTM C94. Each delivery ticket must show plainly the amount of water, in gallons that can be added to the mixer truck at the Site without exceeding the maximum water cement ratio approved for that mix design. Amount of water added must be in proportion to contents of truck.
2. Arrange and use chutes, troughs, or pipes as aids in placing concrete so that the ingredients of the concrete are not segregated. They shall be steel or steel lined. When steep slopes are necessary, equip the chutes with baffles or make in short lengths that reverse the direction of movement. Extend open troughs and chutes, if necessary, inside the forms or through holes left in the forms. Terminate the ends of these chutes in vertical downspouts.
3. Keep chutes, troughs, and pipes clean and free from coatings of hardened concrete by thoroughly flushing with water before and after placement. Discharge water used for flushing away from the concrete in place.
4. Use pumping equipment that has sufficient capacity so that:
 - a. Discharge of pump concrete does not result in segregation.
 - b. Modification of accepted concrete mixture is not required.
5. Carting or wheeling concrete batches on completed concrete floor slab shall not be permitted until the slab has aged at least 4 curing days. Unless pneumatic tired carts are used, wheel the carts on timber planking so that the loads and impact are distributed over the slab. Curing operations shall not be interrupted for the purpose of wheeling concrete over finished slabs.

D. Depositing:

1. The method and manner of placing shall prevent segregation or separation of the aggregate or the displacement of the reinforcement. Use drop chutes or tremies as necessary.
2. Free Fall: Concrete shall not be allowed to free fall more than 10 feet when HRWR admixture is used or 5 feet without the use of HRWR. Free falling concrete shall avoid striking reinforcing during placement. Placement of concrete for heights exceeding the free fall limit shall be placed using a tremie.
 - a. Concrete shall not be allowed to free fall through water. Place as indicated below.
3. Prevent the splattering of forms and reinforcing bars if the splattered concrete will dry or harden before incorporation into the mass.
4. Fill each part of the forms by directly depositing concrete as near its final position as possible. Work the concrete under and around the reinforcement bars. Depositing large quantities at one point in the forms, then running or working it along the forms shall not be permitted.
 - a. Place required sections in one continuous operation to avoid additional cold joints. Each layer shall be fluid and concrete shall not have taken initial set when a new layer is placed upon it. Not more than 1 hour shall elapse between the placing of

successive concrete layers in any portion of the structures included in continuous placement.

5. Place in continuous horizontal layers with a depth of from 1 to 3 feet. If excessive bleeding causes water to form on the surface of the concrete in tall forms, revise mix design to reduce the bleeding.
6. In tall walls, place the concrete to a point about 1 foot below the top of the wall and allow to settle for 1 hour. Resume and complete concreting before set occurs.
7. For slopes greater than 2 percent, start concrete placement at low end and proceed upslope.
8. After the concrete has taken initial set, the forms shall not be jarred. No force or load shall be placed upon projecting reinforcement.

E. Consolidating:

1. Compact each layer of concrete and flush the mortar to the surface of the forms by continuous-working mechanical vibrators. Apply the vibrator to the concrete immediately after deposit. Move vibrator throughout the layer of the newly placed concrete, several inches into the plastic layer below. Thoroughly work the concrete around the reinforcement, embedded fixtures and into the corners and angles of the forms until it is well-compacted.
2. Mechanical vibrators shall not be operated so that they penetrate or disturb previously placed layers which are partially set or hardened. They shall not be used to aid the flow of concrete laterally. The vibration shall be of sufficient duration to completely compact and embed reinforcement and fixtures, but not to an extent causing segregation.
3. Keep vibrators constantly moving in the concrete and apply vertically at points uniformly spaced, not farther apart than the radius over which the vibrator is visibly effective. The vibrator shall not be held in one location longer than required to produce a liquified appearance on the surface.
4. When submerged in concrete, internal vibrators shall maintain a frequency of not less than 6000 impulses per minute for heads with diameters greater than 5 inches and 10,000 impulses for smaller vibrator heads. The vibration intensity (amplitude) shall be sufficient to produce satisfactory consolidation.
 - a. Vibrator head shall be sufficiently small to allow placement between reinforcing steel.
 - b. Provide at least one standby vibrator.
 - c. Check vibrators intended for regular service or standby service prior to concreting operations.

F. Placement in Water:

1. Deposit concrete in water only when dry conditions cannot be obtained. The forms, cofferdams, or caissons shall be sufficiently tight to prevent any water flowing through the space where concrete is to be deposited. Pumping of water shall not be permitted while the concrete is being placed, nor until it has set for at least 36 hours.

2. Carefully place the concrete using a tremie, closed bottom dumping bucket, or another approved method which does not permit the concrete to fall through the water without protection. The concrete shall not be disturbed after being deposited. Regulate depositing to maintain horizontal surfaces.
 3. When a tremie is used, it shall consist of a tube constructed in sections having water-tight connections. The means of supporting the tremie shall permit the movement of the discharge end over the entire top surface of the work, and shall allow the tremie to be rapidly lowered to retard the flow. The number of times it is necessary to shift the location of the tremie shall be held to a minimum for any continuous placement of concrete. During the placing of concrete, keep the tremie tube full to the bottom of the hopper. When a batch is dumped into the hopper, slightly raise the tremie, but not out of the concrete at the bottom, until the batch discharges to the level of the bottom of the hopper. Stop the flow by lowering the tremie. Continue placing operations until the work is completed.
 4. When concrete is placed by means of the bottom dump bucket, the bucket shall have a capacity of not less than 1/2 cubic yard. Lower the bucket gradually and carefully until it rests upon the concrete already placed. Raise it very slowly during the discharge travel to maintain still water at the point of discharge and to avoid agitating the mixture.
 5. Use a sump or other approved method to channel displaced fluid and concrete away from the shaft excavation. Recover slurry and dispose of it as approved. Do not discharge displaced fluids into or in close proximity to streams or other bodies of water.
- G. Placement in Slabs:
1. Allow concrete in columns, walls and deep beams or girders to stand for at least 1 hour to permit full settlement from consolidation, before concrete is placed for slabs they are to support. Haunches are considered as part of the slab and shall be placed integrally with them.
 2. When monolithic slabs are placed in strips, the widths of the strips, unless otherwise specified or indicated, shall insure that concrete in any one strip is not allowed to lie in place for more than 1 hour before the adjacent strips are placed.
 3. Immediately before placing concrete, thoroughly dampen the subgrade to receive concrete to prevent moisture absorption from the concrete.
 4. As soon as concrete placing is complete for a slab section of sufficient width to permit finishing operations, level the concrete, strike off, tamp and screed. The screed shall be of a design adaptable to the use intended, shall have provision for vertical adjustment and shall be sufficiently rigid to hold true to shape during use.
 5. The initial strike off shall leave the concrete surface at an elevation slightly above grade so that, when consolidation and finishing operations are completed, the surface of the slab is at grade elevation.
 6. Continue tamping and screeding operations until the concrete is properly consolidated and free of surface voids. Bring the surface to a smooth, true alignment using longitudinal screeding, floating, belting, and/or other methods.
 7. When used, templates shall be of a design which permits early removal so satisfactory finishing at and adjacent to the template is achieved.

8. While the concrete is still plastic, straighten the surface as required to achieve specified flatness requirements. Remove high spots and fill depressions with fresh concrete and re-float. Continue to check during the final finishing operation, until the surface is true to grade and free of depressions, high spots, voids, or rough spots.
 9. Where floor drains are shown in slabs and sloping the slab is not indicated, slope slab to drain on a grade of 1/16 inch per foot. The thickness of slab at floor drain shall be the thickness of slab as indicated on the Drawings.
- H. Placement in Foundations: Place concrete in deep foundations so that segregation of the aggregates or displacement of the reinforcement is avoided. Provide suitable chutes or vertical pipes. When footings can be placed in dry foundation pits without the use of cofferdams or caissons, forms may be omitted and the entire excavation filled with concrete to the elevation of the top of footing. The placing of concrete bases above mud slab is permitted after the forms are free from water and the seal course cleaned. Execute necessary pumping or bailing during concreting from a suitable sump located outside the forms.
- I. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on the Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.07 FINISHING FORMED SURFACES

- A. Forms for walls, columns, and sides of beams and girders shall be removed as specified in Section 03 11 00 "Concrete Forming." Patch, repair, finish, and clean concrete after form removal. Finish concrete not more than 7 days after form removal. Cure concrete as finishing progresses.
- B. Air voids, for all types of finishes, are defects and shall be removed by rubbing or patching.
- C. Finish Schedule:

Type of Finish	Location
No Finish	Surfaces which are not visible from the inside or outside of the completed structure, are more than 12" below finish grade, and where a coating/membrane/drainage board will not be installed
Smooth Finish	Surfaces exposed to view, areas below to a point 12" below grade, and where a coating/membrane/drainage board will be installed.

- D. No Finish: Patch tie holes. Repair defects larger than 1-1/2 inches in diameter or 1/2 inch in deep. Remove projections larger than 1 inch.
- E. Smooth Finish: The form facing material shall produce a smooth, uniform texture on the concrete. Patch tie holes. Repair defects larger than 3/4 inch wide or 1/2 inch deep. Remove projections flush with the adjacent surface.

3.08 FINISHING FLOORS AND SLABS

- A. General: Screed, restraigten, and finish concrete surfaces. Do not wet concrete surfaces.
- B. Finish slabs, platforms, and steps monolithically and apply as indicated on the Drawings and the following schedule of finishes:

Type of Finish	Location
Rough Finish	Tank floors that receive grout topping and slabs which receive additional concrete toppings.
Float Finish	Top of walls, vault top slabs not subject to pedestrian foot traffic.
Trowel Finish	Interior slab surfaces exposed to view or to be covered with resilient flooring, carpet, and ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
Broom Finish	Exterior concrete platforms, steps, and ramps.

1. Rough Finish: Provide a rough surface by screeding only without further finish.
2. Float Finish: Finish surfaces using a float to a true, even plane with no coarse aggregate visible. In the initial floating, while the concrete is plastic, use sufficient pressure on the float to bring excess moisture to the surface for removal. Apply a final "light float" finish to the surface as the concrete hardens. The surface shall have a uniform granular texture and shall meet the straightness requirements.
3. Trowel Finish:
 - a. After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - b. Finish and measure surface so gap at any point between concrete surface and an unlevelled freestanding 10-foot long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following:
 - 1). 1/8 inch.
4. Broom Finish: Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with the Engineer before application.
- C. Finishing in Hot, Dry Weather: During periods of high temperature and/or low humidity, take extreme care in finishing the slabs to eliminate initial shrinkage cracks. Following the initial set of concrete, but while the concrete is still "green" continue to finish as required to remove shrinkage cracks which may occur. In hot, dry weather, keep a cement finisher on the job following normal finishing operations for a sufficient length of time to insure the removal of initial shrinkage cracks.

3.09 MISCELLANEOUS CONCRETE ITEMS

A. Normal Shrinkage Grouting:

1. Prior to grout application, thoroughly clean the surface of all foreign matter. Roughen concrete surface to CSP 4 and wet as required for a saturate surface dry condition (SSD). Set forms in place; tight and securely anchored to prevent the loss of grout.
2. The necessary materials and tools shall be on hand before starting grouting operations.
3. After preparing surface and immediately prior to grouting, provide scrub coat of grout material. Do not allow scrub coat to dry prior to placing grout.
4. After mixing, quickly and continuously place the grout to avoid overworking, segregation and breaking down of the initial set. Mix and place the grout where indicated on the Drawings. Cure grout using wet curing method for concrete. Grout shall receive a trowel finish, unless otherwise noted.

B. Non-Shrink Grout:

1. Obtain field technical assistance from the grout manufacturer, as required, to ensure that grout mixing and installation comply with the manufacturer's recommendations and procedures.
2. Roughen concrete surface as required by the manufacturer, but not less than CSP 4. Saturate the surface to achieve an SSD condition. Baseplates shall be free of oil, grease, laitance and other foreign substances.
 - a. Epoxy Grout: Surface shall be dry as recommended by the manufacturer.
3. Place grout according to the manufacturer's directions so that spaces and cavities below the bottom of the baseplates are completely filled. Provide forms where structural components of the baseplates do not confine the grout. Trowel finish the non-shrink grout where the edge of the grout is exposed to view and after the grout has reached its initial set. Cut off the exposed edges of the grout at a 45-degree angle to the baseplate, bedplate, member, or piece of equipment.
4. Wet cure a minimum of 3 days, but not less than that recommended by the manufacturer.
 - a. Epoxy Grout: Dry curing is acceptable if recommended by the manufacturer.
5. Use epoxy non-shrink grout under all machinery, pumps, equipment, and where chemicals are present that would abate cementitious non-shrink grouts.

3.10 CONCRETE CURING AND PROTECTION

- #### A. General:
- Begin curing of concrete immediately after completion of finishing activities for unformed concrete and immediately after removal of forms from formed concrete. Apply curing method without staining, marring, or damaging concrete surfaces. Where pedestrian traffic is unavoidable, provide suitable walkways to protect the curing material and the concrete surface from damage. Unless a particular curing method is specified, select the appropriate curing method from the curing options indicated.

- B. Length of Curing Period:
 - 1. Curing Day: A day on which the ambient temperature is above 50 deg. F for at least 18 hours.
 - 2. Curing Period: 7 consecutive curing days.
 - 3. Extended Curing Period: When curing day requirements are not met, then extend the curing period by one day for each day not in compliance. Extend curing up a maximum total of 14 consecutive days.
- C. Wet Curing with Absorbent Material:
 - 1. Cover concrete surfaces with absorbent material and hold it in contact with concrete surface. Provide a minimum 8-inch lap of adjacent material section edges.
 - 2. Apply water to absorbent material and saturate. Maintain saturated condition for curing period – do not allow absorbent material to dry.
 - 3. Do not use wet curing if curing water will be subject to freezing during the curing period.
- D. Sheet Curing: Cover concrete surfaces with sheets and hold in contact with concrete surface. Apply in accordance with manufacturer recommendations, which includes placement, patching holes, and tape joints per manufacturer recommendations.
- E. Membrane Curing:
 - 1. Cover the surface of the concrete with a continuous, uniform film. Application shall be in accordance with manufacturer recommendations. Prevent overspray as necessary to meet project requirements.
 - 2. Do not allow foot traffic on surface in accordance with manufacturer recommendations.
 - 3. Repair film if damaged within the curing period.
 - 4. Unless preapproved, do not use membrane curing on surfaces that:
 - a. Receive concrete topping, terrazzo, paint, floor hardener, or other finish.
 - b. Are specified to have a rubbed finish.
- F. Protection: During and after curing period, protect concrete surfaces from damage, marring, or staining by construction activities.

3.11 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. After the tie rods are broken back or removed, thoroughly clean the holes to remove grease and loose particles. Patch holes with structural concrete repair material or non-shrink grout. After the holes are completely filled, strike off flush excess mortar and finish the surface to render the filled hole inconspicuous.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. If the surface of the concrete is bulged, uneven, or shows honeycombing or form marks, which in the Engineer's opinion cannot be repaired satisfactorily, remove and replace the entire section.
 2. Patch honeycomb and minor defects in all concrete surfaces with structural concrete repair material. Cut back each defective area with a pneumatic chipping tool as deep as the defect extends, but in no case less than 1/2 inch. Prepare the existing concrete and apply repair material according to the manufacturer's recommendations. Finish the surface of the patches to match finish on surrounding concrete.
 3. Immediately after form removal, cut out honeycombs, rock pockets, and voids to expose solid concrete but not less than 1-inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with repair material before bonding agent has dried.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, pop outs, honeycombs, rock pockets, crazing and cracks in excess of 0.01-inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 5. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.12 FIELD QUALITY CONTROL

A. Testing:

1. General:
 - a. Tests shall be required throughout the Work to monitor the quality of concrete. Samples shall be taken in accordance with ASTM C172.
 - b. Engineer may waive these requirements on concrete placements of 10 cubic yards or less. However, evidence shall be furnished showing a design mix which meets the Specifications.
 - c. Unless noted otherwise, testing of the materials, ready mix, transit mix, or central plant concrete will be by an independent testing agency. The independent testing agency will be approved by the Owner and paid by the Contractor. A summary of all tests performed will be available. No concrete shall be placed without a representative present at either the plant or at the Site.
 - d. Unless the Owner's laboratory is on the Site, provide housing for the curing and storage of test specimens and equipment.
2. Slump Test: Slump tests, in accordance with ASTM C143, shall be used to indicate the workability and consistency of the concrete mix from batch to batch. Generally, a slump test shall be made at the start of operations each day, at regular intervals throughout a working day, and at any time when the appearance of the concrete suggests a change in uniformity.
3. Air Content Test: Tests for the concrete's air content shall be made in accordance with ASTM C231 or ASTM C173, at the point of delivery of concrete, prior to placing in forms. The test shall be made frequently to monitor a proper air content uniform from batch to batch.
4. Temperature Test: Test for the concrete's temperature in accordance with ASTM C1064 and as follows: the temperature of the concrete to be placed shall be taken with a thermometer immediately before placement, with the point of measurement being in the chute or bucket. Temperature test shall be performed for each truck. Record temperatures on batch ticket.
5. Compression Test:
 - a. Compression test specimens shall be 6-by-12-inch concrete cylinders made and cured in accordance with ASTM C31. If the maximum aggregate size is no larger than 1 inch, 4-by-8-inch concrete cylinders are acceptable. No fewer than four 6-by-12-inch or four 4-by-8-inch specimens shall be made for each test Sample. Samples shall be taken at a minimum of every 50 cubic yards of concrete for each class placed. At least one set of test specimens per day shall be made for each class of concrete used that day. Specimens shall be cured under laboratory conditions specified in ASTM C31. Additional concrete cylinders may be required for curing on the job under actual job curing conditions. These Samples could be required when:
 - 1). There is a possibility of the air temperature surrounding the concrete falling below 40 F, or rising above 90 F.
 - 2). The curing procedure may need to be improved and/or lengthened.

- 3). It is necessary to determine when the structure may be put into service.
 - b. Compression strength tests shall be made on the laboratory-cured and job-cured concrete cylinders at 7 and 28 days, in accordance with ASTM C39. The value of each test result shall be the average compressive strength of all of the cylinders in the test Sample. All cylinders within a test Sample shall be taken at the same time from the same batch of concrete. For the 28-day cylinders, the strength level shall be satisfactory if the averages of all sets of three consecutive strength test results exceed the required design compressive strength, and no individual strength test result falls below the required compressive strength by more than 500 psi.
6. Failure to Meet Requirements:
- a. Should the 28-day strengths shown by the test specimens fall below the required values, additional curing shall be performed on those portions of the structures represented by the test specimens at the Contractor's expense. Test cores shall be obtained and tested in accordance with ASTM C42. If additional curing does not give the strength required, the Owner reserves the right to require strengthening, replacement of those substandard portions of the structure, or additional testing, at the Contractor's expense.
 - b. Upon receipt of the Contractor's written request, substandard concrete work may be reexamined in place by nondestructive testing methods or core Samples, in accordance with ACI 301. The services of an independent testing laboratory shall be retained and all expenses paid without compensation from the Owner. Laboratory results shall be evaluated by the Engineer, who shall make the final decision on acceptability of the concrete in question. Core Sample holes shall be repaired.
 - c. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
 - d. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by Engineer.
- B. The Owner may withhold payment for any section of concrete which does not meet the requirements of the Specifications. Withheld payment shall be based upon the unit prices established for concrete and reinforcing steel. Payment shall be withheld until the unacceptable concrete has been refinished, removed and replaced or otherwise brought into conformance with the Specifications.
- C. PVC/TPER/PE Waterstops: Waterstops shall be observed by the Owner's representative prior to concrete placement. Unacceptable splicing defects include:
1. Misalignment of center bulb, ribs, and end bulbs greater than 1/16 inch.
 2. Bond failure at joint deeper than 1/16 inch.
 3. Misalignment which reduces waterstop cross-section more than 15 percent.

4. Bubble or visible porosity in the weld.
5. Visible signs of splice separation when a cooled splice is bent by hand at a sharp angle.
6. Charred or burnt material.

END OF SECTION

Concrete Mix Design

Project Name: _____

FNI Project Number: _____

Project Location: _____

Owner: _____

General Contractor: _____

Mix Number / Class: _____

A. Mix Design:

Cement = _____ lb/yd³

Fly Ash = _____ lb/yd³

Other Cementitious Material:
 _____ = _____ lb/yd³

Fine Aggregate = _____ lb/yd³

Coarse Aggregate = _____ lb/yd³

Water = _____ lb/yd³

Water Reducing Admixture = _____ oz/yd³

High Range Water Reducer = _____ oz/yd³

Air Entraining Admixture = _____ oz/yd³

Other Admixture:
 _____ = _____ oz/yd³

Slump = _____ inches

Gross Weight = _____ lb/yd³

Air Content = _____ percent

Water/Cement Ratio = _____

B. Materials:

	Source	ASTM	Type	Remarks
Cement				
Fly Ash				
Other Cementitious Material: _____				
Fine Aggregate				
Coarse Aggregate				
Water				
Water Reducer				
High Range Water Reducer				
Air Entraining				

	Source	ASTM	Type	Remarks
Other Admixture: _____				

C. Determination of Average Strength Required (f_{cr}'):

1. Test Records Available:

A. Summary of Test Records (Provide Supporting Documentation):

Test Group No.	No. of Consecutive Tests	Specified Strength (psi)	Standard Deviation (psi)
Average Standard Deviation:			

B. Standard Deviation Modification Factor (ACI 30 1, Table 4.2.3.3.a): ____.

C. Standard Deviation Used: ____.

D. Average Compressive Strength Required: ____.

2. Test Records Not Available:

A. Average Compressive Strength Required (ACI 30 1, Table 4.2.3.3.b, if required): ____.

D. Documentation of Required Average Compressive Strength (Check One):

1. Field Strength:

a. Field Strength Test Records (ACI 30 1, Table 4.2.3.3.a): ____ . *Complete Attachment A.

2. Trial Mixtures:

a. Trial Mixtures (ACI 301, Table 4.2.3.3.b, if required): ____ . *Complete Attachment B.

I, _____ certify that the above information is correct and all gradations, cement certifications, and test results are located at our place of business for review by the Engineer.

Name: _____

Date: _____

Title: _____

Company: _____

Address: _____

Attachment A

Documentation of Required Average Strength – Field Strength Records

(ACI 301, 4.2.3.4.a)

A. Summary of Test Records (Provide Supporting Documentation):

Test Record No.	No. of Tests in Record	Duration of Record (days)	Water-Cementitious Materials Ratio	Average Strength (psi)

B. Interpolation used? _____.

1. Provide an interpolation calculation or plot of strength versus proportions.

C. Submit the following data for each mix:

1. Brand, type, and amount of cement.
2. Brand, type, and amount of each admixture.
3. Source of each material used.
4. Amount of water.
5. Proportions of each aggregate material per cubic yard.
6. Gross weight per cubic yard.
7. Measured slump.
8. Measured air content.
9. Results of consecutive strength tests.

END OF ATTACHEMENT A

Attachment B

Documentation of Required Average Strength – Trial Mixtures

(ACI 301, 4.2.3.4.b)

A. Summary of Test Record(s):

Trial Mix No.	7-Day Tests		28-Day Tests		Water-Cementitious Materials Ratio	Slump (in)	Air Content (percent)	Temperature (F)
	No. of Test Cylinders	Strength (psi)	No. of Test Cylinders	Strength (psi)				

B. Maximum water-cementitious materials ratio _____.

1. Provide an interpolation calculation or plot of strength versus water-cementitious materials ratio.

C. Submit the following data for each mix:

1. Brand, type, and amount of cement.
2. Brand, type, and amount of each admixture.
3. Amount of water used in trial mixes.
4. Proportions of each aggregate material per cubic yard.
5. Gross weight per cubic yard.
6. Measured slump.
7. Measured air content.
8. Compressive strength developed at 7 days and 28 days, from not less than three test cylinders cast for each 7-day and 28-day test.

END OF ATTACHMENT B



Division 05 - Metals

05 50 00 MISCELLANEOUS METALS

1.00 GENERAL

1.01 SCOPE

- A. Provide miscellaneous metal work as detailed and as specified herein.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section C700 "General Conditions." Drawings shall indicate each item being furnished including materials, quantities, sizes, shapes, size and types of anchors, locations finish types and installation details.

2.00 PRODUCTS

2.01 MATERIALS

- A. Miscellaneous Structural Steel: ASTM A36.
- B. Cast and Miscellaneous Loose Steel: ASTM A36 (A27).
- C. Bolts: ASTM A307, Grade A.
- D. Steel Pipe: ASTM A53 black seamless pipe, Grade B, Schedule 40, free of pits and abrasions.
- E. Aluminum Extruded: ASTM B221, Alloy 6063-T5.
- F. Primer: Tnemec Series 60 Hi-Build Epoxy Line 5.0 mils thick dry minimum coat.
- G. Surface Paint: Tnemec Series 73 Endurashield III, two coats at a min. of 4.0 mils thick per coat dry.
- H. Setting Grout: Pro-Loc, non-shrink, setting grout.
- I. Stainless Steel Bolts: Conform to ASTM F593-91.

2.02 ITEMS OF WORK - FABRICATED

- A. Miscellaneous Steel and Aluminum Shapes: Channels, wide flange shapes, angles, plates, pipe, tubing, connections and bolts where shown and detailed on the Drawings.
- B. Shop fabricate sections in maximum lengths possible for final installation in the field.

2.03 FINISHES

- A. Shop Paint: Miscellaneous ferrous metal items, except those indicated to be galvanized or those with a factory finish, shall be solvent cleaned (SSPC SP1) and hand tool cleaned (SP2-63) and then given one coat of Specified Primer in shop before delivery to the Site.
- B. Galvanized Finish: Zinc-coating conforming to ASTM A123 and ASTM A385.
- C. Decorative Shop Finishes: Decorative metal shall be solvent cleaned (SSPC SP1) and then commercial blast cleaned (SP6-63) to completely remove mill scale, rust and other foreign deposits and to provide a uniform satin finish to exposed surfaces. Coat surfaces with the specified primer to minimum dry film thickness of 1.5 mils.

D. Anodizing:

1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.
2. Aluminum: NAAMM AMP 501, (Clear anodized natural finish).
3. Mill Finish: AAMIO, as fabricated.

3.00 EXECUTION

3.01 INSTALLATION

- A. Work shall be made and erected square, plumb, straight and true, accurate fitted, and with tight joints and intersections. Work shall be adequately reinforced and anchored in place. Welding shall conform to best modern practice to be of adequate strength and durability, with jointing made tight, flush and in true plane with base metals, clean and smooth. Form exterior joints to exclude water. Welded connections in exposed members shall be ground smooth and polished. Install stock manufactured items in accordance with manufacturer's directions. Leave items plumb, level and securely fastened.

3.02 DISSIMILAR MATERIALS

- A. Where aluminum surfaces will contact steel, other incompatible metals, masonry, stone or concrete, keep the aluminum surfaces from direct contact with such dissimilar material by painting the incompatible metal with prime coat of zinc chrome primer followed by one or two coats of aluminum metal paint or other suitable protective coating excluding those containing lead pigmentation.

END OF SECTION



Division 10 – Specialties

10 14 53 TRAFFIC SIGNAGE

1.00 GENERAL

1.1 WORK INCLUDED

- A. Furnish labor, materials, equipment, and incidentals necessary to furnish and install roadside traffic signs, complete with posts, supports, fittings and concrete bases, where required, in accordance with these specifications and to the dimensions and details, and at the locations shown on the plans, or as directed.

1.2 QUALITY ASSURANCE

- A. Contractor shall submit mill test reports, obtained from the manufacturer, for aluminum sheeting that reflect the chemical and physical properties of the aluminum to the Engineer for approval.

1.3 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include shop drawings showing arrangements and spacing of letters, symbols, and borders for each type of sign, details of supports for each type of sign, and the proposed method of attaching signs to supports.

1.4 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in its entirety:
 - 1. Federal Highway Administration (FHWA):
 - a. Manual on Uniform Traffic Control Devices (MUTCD)
 - b. Standard Highway Signs
 - c. Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects
 - 2. In Texas:
 - a. Texas Manual on Uniform Traffic Control Devices (TMUTCD)
 - b. Standard Highway Sign Designs for Texas
 - c. Texas Department of Transportation (TxDOT) - Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, November 1, 2014 or latest edition.

1.5 DELIVERY AND STORAGE

- A. Signs shall have heavy cardboard separator sheets between finished faces during transit. Signs shall remain inside protective cartons until installed and shall be stored on wood runners above grade and covered with protective coverings.

2.00 PRODUCTS

2.1 SIGNS

- A. Signs: Aluminum; reflectorized; meeting the requirements of the MUTCD; conforming to the details in the Standard Highway Signs manual published by the Federal Highway Administration, U.S. Department of Transportation.
- B. Sign Panels:
 - 1. Standard signs shall be fabricated without stiffeners on the back and shall be fabricated aluminum alloy (ASTM B209, Alloy 6061-T6 or 5052-H38) and shall consist of a single sheet of aluminum. The sign blank shall be 0.080-inch thick. Sign blanks shall be flat and straight and within commercial tolerances established by the aluminum industry.
 - 2. Sign panels to which retroreflective sheeting is to be applied shall be degreased, etched, and anodized.
 - 3. All fabrication, including cutting and punching of holes, shall be completed prior to metal degreasing, etching, anodizing and the application of reflective sheeting.
 - 4. Sign panels shall be free of buckles, warp, dents, burrs, and defects resulting from fabrication. The surface of all sign panels shall be flat.
- C. Reflective Sheeting:
 - 1. Use retroreflective sheeting as specified and according to ASTM D4956. For roadside signs, use Type III, IV, VIII, IX, or XI prismatic retroreflective sheeting. Use fluorescent yellow sheeting for warning signs. Use fluorescent yellow-green sheeting for pedestrian, bicycle, and school crossing signs. The retroreflective sheeting material shall comply with all applicable requirements as set forth in Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, 2014 (FP-14), Section 633 and Section 718. Type II sheeting may be used for parking lot and non-roadway signs.
 - 2. Reflective sheeting shall be applied to properly treated sign panels with mechanical equipment in a manner specified by the sheeting manufacturer. Sign faces comprising two or more pieces or panels of reflective sheeting shall be carefully matched for color at the time of sign fabrication to provide uniform appearance and brilliance both day and night. At splices, sheeting shall be overlapped no less than 3/16 inch. Alternate successive width sections of either sheeting or panels must be reversed and consecutive to ensure that corresponding edges of reflective sheeting lie adjacent on the sign. Non-conformance may result in non-uniform shading and an undesirable contrast between adjacent widths of applied sheeting which shall not be acceptable.
- D. Color: Colors for signs shall match the colors specified in the MUTCD. The color and size of letters, symbols, borders, and background on sign shall be as shown in FHWA "Standard Highway Signs", unless otherwise specified on the plans.
- E. Legend:
 - 1. The legend shall include letters, numerals, symbols, and arrows. The border shall have a regular outline and be clean cut and sharp. The border shall have a continuous stroke and without ragged or torn edges.

2. The legend on guide signs shall be of the size shown on the plans. The legend on standard signs shall meet the requirements of the latest revision of FHWA "Standard Highway Signs."
 3. Silk Screen Process: The letters, numerals, arrows, symbols, border, and other features shall be produced on reflective sheeting of the sign field by a silk screen process approved by the Engineer. Sign messages and borders of a color darker than the sign field shall be applied to the reflective sheeting by direct process. Sign messages and borders of a color lighter than the sign field shall be produced by the reverse process in which the message and border are outlined by applying darker transparent color to the reflective sheeting of the sign field.
 4. Transparent Colors: Inks and paints used in the silk screen process shall be of the type and quality recommended by the manufacturer of the reflective sheeting, and shall conform to red, blue, yellow, and green colors approved by the FHWA shown in the MUTCD and FHWA "Standard Highway Signs."
 5. Direct Applied Legend: The legend and other features of the sign message shall be cut from Type II reflective sheeting with a pre-coated pressure sensitive adhesive backing (Class 1).
- F. Delineators and Object Markers:
1. Delineators: Consisting of one or two reflector units of the color specified for the various types as shown on the plans.
 2. Object Markers: Consisting of reflector units or reflectorized panels of the color specified for the various types as shown on the plans.
 3. Supply: Reflector units supplied to the project shall be of the same type and manufacturer.
 4. Reflector Units: Center-mount acrylic plastic, prismatic retroreflector units.

2.2 SIGN POSTS

- A. Wood. Furnish posts conforming to AASHTO M 168. Treat the posts according to Category 4A of the AWP Standard U1-UC4A, Ground Contact, General Use for waterborne preservative treatments ACA, ACZA, or CCA.
- B. Galvanized metal. Conform to the following:
 1. U-channel steel. Furnish flanged, channel, galvanized steel posts conforming to ASTM A499, Grade 60 (420) and the following:
 - a. Punching. Starting 1-inch (25 millimeters) from the top and extending the full length of the post, drill or punch $\frac{3}{8}$ -inch (10-millimeter) holes on 1-inch (25 millimeter) centers along the centerline of the bottom of the U. Remove burrs and sharp edges.
 - b. Galvanizing after punching AASHTO M 111
 2. Square tubular steel. Furnish square tubular galvanized steel posts conforming to ASTM A1011, Grade 55 (380) and the following:
 - a. Punching. Starting 1 inch (25 millimeters) from the top and extending the full length of the post, drill or punch $\frac{7}{16}$ -inch (11-millimeter) holes on 1-inch (25-millimeter)

centers along the centerline of all four sides, in true alignment and opposite each other directly and diagonally. Remove burrs and sharp edges.

b. Galvanizing after punching ASTM A123 or ASTM B695

- C. Aluminum. Furnish standard shapes and thicknesses conforming to ASTM B221, alloy 6061-T6, 6351-T5, 6063-T6, or 6005-T5.
- D. Corrosion resistant steel. Furnish posts conforming to ASTM A588 or ASTM A242. Zinc-coat the embedded portion of the corrosion resistant steel post according to ASTM A123.

2.3 OBJECT MARKER & DELINEATOR POSTS

- A. Wood. Furnish 4- by 4-inch (100- by 100-millimeter) wooden posts conforming to Subsection 718.04(a).
- B. Steel. Furnish flanged U-channel steel posts weighing not less than 2 pounds per foot (3 kilograms per meter) and conforming to ASTM A36. Galvanize according to AASHTO M 111.
- C. Aluminum. Furnish standard shaped ½-inch (3-millimeter) thick aluminum posts conforming to ASTM B221, alloy 6063-T6.
- D. Plastic. Furnish flexible delineator posts made with high-impact resistant polymer material

2.4 FOUNDATIONS

- A. Use Class A concrete for non-reinforced foundations
- B. Stake and install foundations as shown on the plans. The Engineer may shift the foundation locations within design guidelines where necessary to secure a more desirable location or avoid conflict with utilities. Use established industry and utility safety practices when working near underground or overhead utilities. Consult the appropriate utility before beginning work.
- C. Hold anchor bolts in place with templates during concrete placement. Hold embedded items such as conduit or other hardware in place during concrete placement with templates or other approved means.
- D. Carefully align foundation, posts, and anchor bolts. Do not spring or rake posts or anchor bolts. Remove the top template after concrete has achieved initial set. Keep forms and other bracing intact until the concrete has cured at least one curing day.

3.00 EXECUTION

3.1 INSTALLATION

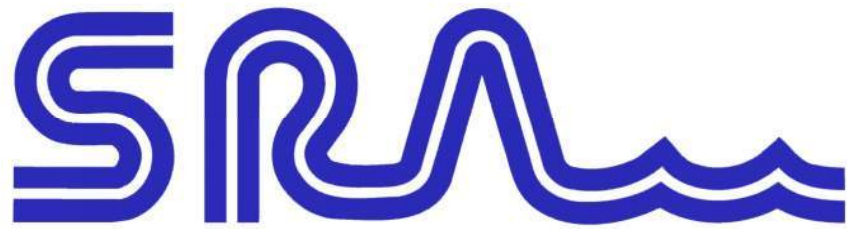
- A. Erect signs at the specified location, plumb and to the specified vertical and horizontal clearances as shown on the plans, or as directed by the Engineer. Install signs with the specified fasteners and brackets.
- B. Erect signs normally so that the sign face is vertical. Where lanes divide or on curves, orient the sign face to be most effective both day and night and to avoid the possibility of specular reflection.

- C. Perform field drilling of holes in any part of the sign support structure only when specified in the plans, or as directed by the Engineer.

3.2 FIELD QUALITY CONTROL

- A. After sign installation is complete, the signs will be inspected by the Engineer. If specular reflecting is apparent on any sign, adjust its position to eliminate this condition.

END OF SECTION



Division 31 - Earthwork

31 05 13 SOILS FOR EARTHWORK

1.00 GENERAL

1.01 WORK INCLUDED

- A. This Section of the specifications describes the various classes of Earth Fill. All of the classes of Earth Fill contained in this specification may not be used on this project. The classes of Earth Fill used on this project are shown on the drawings or specified in other sections of the specifications. This Section does not include specifications for placement and compaction of Earth Fill. Specifications for placement and compaction of Earth Fill are included in other sections of the specifications and/or shown on the drawings.

1.02 STANDARDS

- A. Soil materials shall be classified into the appropriate class of Earth Fill shown below according to ASTM D2487 "Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)" or other appropriate methods as designated by the Engineer.

2.00 PRODUCTS

2.01 MATERIALS; CLASSIFICATIONS

- A. Class 1 Earth Fill: Limited to clays and sandy clays classified as CH material with a liquid limit greater than or equal to 50, a plasticity index greater than or equal to 25, and a minimum of 60 percent passing the No. 200 sieve, which are free of organic materials.
- B. Class 2 Earth Fill: Limited to clays and sandy clays classified as CH and CL materials with a coefficient of permeability less than or equal to 1.0×10^{-7} cm/sec, a liquid limit greater than or equal to 30, a plasticity index greater than or equal to 15, and more than 50 percent passing the No. 200 sieve, which are free of organic materials.
- C. Class 3 Earth Fill: Consist of any materials classified as CH, CL, SM, SP, SP-SM, SC, and GC, which have a minimum plasticity index of 4, which are free of organic materials.
- D. Class 4 Earth Fill: Consist of materials which are classified as SP, SM, SC, CL, or dual classifications thereof, which have a liquid limit less than or equal to 35 and a plasticity index of a minimum of 4 and a maximum of 15, which are free of organic materials.
- E. Class 5 Earth Fill: Consist of materials classified as SP or SP-SM which have a plasticity index less than or equal to 4 and a maximum of 12 percent passing the No. 200 sieve, which are free of organic materials.
- F. Class 12 Earth Fill: Consist of soils suitable for topsoil which are relatively free of stones or other objectionable debris, which have sufficient humus content to readily support vegetative growth. The suitability of soils for topsoil shall be subject to the approval of the Engineer.

3.00 EXECUTION (NOT APPLICABLE)

END OF SECTION

31 05 13.13 OFFSITE SOIL BORROW GENERAL

1.01 WORK INCLUDED

- A. The work covered by this Section consists of obtaining and furnishing to the job site, soil borrow material from offsite borrow pits or other sources as required for the various embankments, fills and backfills.

1.02 QUALITY ASSURANCE

A. Classification Testing:

1. Laboratory Testing:

- a. Contractor shall arrange and pay for the services of an independent soil testing firm to sample and test proposed borrow soils from the offsite borrow source(s). A minimum of one set of tests will be required from each representative soil from the various sources. Composite samples may be taken for each representative soil, but samples shall not be mixed from different representative soils or from different borrow sources.
- b. Contractor shall submit the classification test results on the borrow sources to the Engineer for approval prior to proceeding with furnishing of offsite soil borrow.

2. Field Testing:

- a. Contractor shall arrange and pay for the services of an independent soil testing firm to provide the required in-place compaction tests and additional classification tests on the offsite soil borrow during construction as required by the Contract Documents or as deemed necessary by the Engineer.

3. Test Methods:

- a. Classification testing on all offsite soil borrow materials, except Class 12 earth fill, shall be performed to allow for classification of the material in accordance with ASTM D2487, "Classification of Soils for Engineering Purposes" or other standard test methods as designated by the Engineer.
- b. Class 12 earth fill will not require specific classification testing but its suitability shall be subject to the approval of the Engineer and suitability testing shall be performed by the Contractor if deemed necessary by the Engineer. A minimum of a 2 cubic foot representative sample of proposed Class 12 earth fill shall be delivered to the job site for observation by the Engineer. The Contractor shall also arrange for observation of the proposed Class 12 earth fill at the source, if desired by the Engineer. The Contractor shall not proceed with furnishing Class 12 earth fill to the site until its suitability has been approved by the Engineer.

- 4. Certification: All independent soils testing firms shall be registered with the Texas Board of Professional Engineers. Documentation shall be provided of the firm's registration number with the test reports.

B. Contamination Testing and Certification:

1. Contamination Testing:

- a. The Contractor shall arrange and pay for the services of an EPA approved laboratory to perform a toxic contaminant scan of composite soil samples representative of each separate borrow source in accordance with the U.S. Environmental Protection Agency protocol for the list of contaminants described in 40 CFR, Part 261, Appendix VIII and by EPA Methods SW-846.
- b. The results of the laboratory scan shall be submitted to the Engineer by the Contractor prior to proceeding with delivery of soil materials to the site. Any potential offsite soil borrow on which scan test results indicate the presence of contaminants above background levels will be rejected as an offsite soil borrow source.

2. Certification:

- a. The laboratory performing the scan test for contaminants for the Contractor shall provide a written certification along with the test results which states that the laboratory is EPA approved and that the tests were performed according to EPA guidelines.
- b. The Contractor shall obtain a written, notarized certification from the landowner of each proposed offsite soil borrow source stating that to the best of the landowner's knowledge and belief there has never been contamination of the borrow source site with hazardous or toxic materials. These certifications shall be submitted to the Engineer by the Contractor prior to proceeding to furnish soil materials to the site. The lack of such certification on a potential offsite soil borrow source will be cause for rejection of that source.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
1. Classification Test Reports.
 2. Certified Contamination Test Reports.
 3. Contamination Testing Laboratory Certification.
 4. Landowner Certification of Borrow Source.

1.04 STANDARDS

- A. ASTM D2487 "Classification of Soils for Engineering Purposes" or other appropriate methods as designated by the Engineer.
- B. U.S. Environmental Protection Agency - 40 CFR, Part 261, Appendix VIII.
- C. EPA Method SW-846.

1.05 DELIVERY AND STORAGE

- A. Contractor shall be responsible for properly handling offsite soil borrow material once it reaches the job site until unloading at the point of use or at approved stockpile areas.
- B. Handling of the soil borrow material once unloaded from the transport vehicle, either at the point of use or stockpile area, is not a part of this Section, but is included in other Specification Sections.
- C. Stockpile offsite soil borrow material only in stockpile areas approved by the Engineer. Minimize stockpiling of the material. The majority of the material will generally require transportation to the point of use as needed from the offsite source unless otherwise approved or requested by the Engineer. Material shall not be stockpiled along the crest of slopes, excavations or other sensitive areas unless approved by the Engineer.
- D. The Contractor shall maintain stockpiles including dressing of surfaces to be free draining.
- E. It shall be the sole responsibility of the Contractor to see that soil borrow is transported from the source to the job site in appropriate vehicles which comply with all applicable codes, laws, and ordinances and which are acceptable to the Owner and Engineer for compatibility with conditions and existing facilities at the job site. An adequate number of vehicles will be used for transporting the soil borrow so as to prevent undue delays in the construction sequence.
- F. The Contractor shall have sole responsibility for control and cleanup of dust, mud, dirt, or other debris on streets or other areas as a result of his transporting operations.
- G. Methods of handling of soil borrow materials at the source including excavation, segregation, blending, wetting or drying, stockpiling, loading and other necessary handling shall be the sole responsibility of the Contractor. The Contractor shall comply with all applicable codes, laws, and ordinances.
- H. If the soil in place must meet appropriate moisture criteria, then the borrow site shall be irrigated prior to removal as needed to allow proper placement, compaction, and/or porosity in place.

2.00 PRODUCTS

2.01 MATERIALS

- A. Offsite soil borrow materials shall be classified into one of the classifications listed herein.
 - 1. Class 1 Through Class 12 Earth Fill: Shall meet the requirements of Section 31 05 13 "Soils for Earthwork."
 - 2. Structural Backfill: Shall consist of the Class 4 earth fill as shown on the Drawings for structural backfill.

3.00 EXECUTION (NOT APPLICABLE)

END OF SECTION

APPENDIX A

A1.00 MEASUREMENT AND PAYMENT

A1.01 Offsite borrow material shall not be measured or directly paid. It is the intention of these specifications that compensation for all borrow and related activities shall include the payments for the item into which the material is included. All appropriate measurements shall be made for in place items only.

END OF APPENDIX A

31 11 00 CLEARING AND GRUBBING

1.00 GENERAL

1.01 WORK INCLUDED

- A. Provide labor, materials, equipment and incidentals necessary to perform operations in connection with clearing, grubbing, and disposal of cleared and grubbed materials.

1.02 QUALITY ASSURANCE; DEFINITIONS

- A. Clearing: Clearing is defined as the removal of trees, shrubs, bushes, and other organic matter at or above original ground level.
- B. Grubbing: Grubbing is defined as the removal of stumps, roots, boards, logs, and other organic matter found at or below ground level.

2.00 PRODUCTS (NOT APPLICABLE)

3.00 EXECUTION

3.01 PREPARATION

- A. Mark areas to be cleared and grubbed prior to commencing clearing operations. The Owner's Representative shall approve clearing and grubbing limits prior to commencement of clearing operations.
- B. Trees and shrubs outside of the clearing limits, which are within 10 feet of the clearing limits, shall be clearly marked to avoid damage during clearing and grubbing operations.
- C. Remove trees and brush outside the clearing limits, but within the immediate vicinity of the work, upon receipt of approval by the Owner's Representative, when the trees or brush interfere with the progress of construction operations.
- D. Clearly mark trees and shrubs within the clearing limits, which are to remain, and protect the trees and shrubs from damage during the clearing and grubbing operations.
- E. The clearing limits shall not extend beyond the project limits.
- F. Establish the clearing limits as follows:
 - 1. Embankments plus 10 feet beyond the toe of the embankment.
 - 2. Excavations plus 5 feet beyond the top of the excavation.
 - 3. Concrete structures plus 10 feet beyond the edge of the footing.
 - 4. Roadways plus 5 feet beyond the edge of pavement or R.O.W. limits.
 - 5. Underground utility trench top width plus 8 feet.
- G. Establish the grubbing limits as follows:
 - 1. Embankments plus 2 feet beyond the toe of the embankment.
 - 2. Concrete structures plus 2 feet beyond the edge of the footing.
 - 3. Roadways plus 1 foot beyond the edge of pavement.

3.02 INSTALLATION

- A. Clearing: Clearing shall consist of the felling, cutting up, and the satisfactory disposal of trees and other vegetation, together with the down timber, snags, brush, rubbish, fences, and debris occurring within the area to be cleared.
- B. Grubbing:
 - 1. Grubbing shall consist of the removal and disposal of stumps and roots larger than 1 inch in diameter.
 - 2. Extend grubbing to the depth indicated below: In the case of multiple construction items, the greater depth shall apply.
 - a. Footings: 18 inches below the bottom of the footing.
 - b. Roads: 18 inches below the bottom of the subgrade.
 - c. Embankments: 24 inches below existing ground.
 - d. Concrete Structures: 18 inches below the bottom of the concrete.

3.03 FIELD QUALITY CONTROL

- A. Completely remove timber, logs, roots, brush, rotten wood, and other refuse from the Owner's property. Disposal of materials in streams shall not be permitted and no materials shall be piled in stream channels or in areas where it might be washed away by floods. Timber within the area to be cleared shall become the property of the Contractor, and the Contractor may cut, trim, hew, saw, or otherwise dress felled timber within the limits of the Owner's property, provided timber and waste material is disposed of in a satisfactory manner. Materials shall be removed from the site daily, unless permission is granted by the Engineer to store the materials for longer periods.

END OF SECTION

31 23 10 STRUCTURAL EXCAVATION AND BACKFILL

1.00 GENERAL

1.01 SUMMARY

- A. This Section specifies excavation, backfill materials, backfill placement and compaction procedures, and other construction activities incidental to project structures.
- B. The Specification does not include excavation and backfilling for utility lines, manholes, valve boxes, and other minor structures related to utility lines. Refer to Section 31 23 33.16 “Trenching and Backfill” for utility line related excavation and backfill.

1.02 DEFINITIONS

- A. Cofferdams: Any temporary or removable structure constructed to hold the surrounding earth and/or water out of the excavation, whether the structure is formed of soil, timber, steel, concrete, or a combination thereof, including the use of pumping wells or well points as required by design.

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design of cofferdams, including comprehensive engineering analysis by a qualified professional engineer for project specific site conditions. Design shall comply with AASHTO LRFD Bridge Design Specifications, latest addition.

1.04 QUALIFICATION ASSURANCE

- A. Cofferdam Designer: A professional engineer licensed in the state of Texas.
- B. Testing Agency: An independent testing agency that is AASHTO accredited.

1.05 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 “Document Management” and shall include:
 - 1. Qualification Data: For professional engineer responsible for cofferdam design and testing agency.
 - 2. Shop Drawings: Cofferdam placement and details for record purposes.
 - 3. Calculations: For cofferdam indicated to comply with project specific site conditions, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Submittal shall be for record purposes.
 - 4. Provide list of compaction equipment to be used.
 - 5. Backfill material classifications: For each soil or aggregate backfill material provide a certification by the testing agency.
 - 6. Compaction Test Results: Submit test results within 24 hours of successful testing.

1.06 STANDARDS

A. Material classification, placing, and testing shall be in compliance with the latest revisions of the following standards, unless otherwise noted in the Contract Documents.

1. ASTM International (ASTM) Standards:

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

B. Any other testing required by these specifications and not specifically referenced to a standard shall be performed under ASTM or other appropriate standards as designated by the Engineer.

1.07 DELIVERY AND STORAGE

A. Deposit material to be used for backfill in storage piles at points convenient for handling of the material during the backfilling operations and as required to prevent contamination with other materials.

1.08 JOB CONDITIONS

- A. Review subsurface investigations. A limited subsurface investigation has been performed by Tolunay-Wong Engineers, Inc. Boring logs and a geotechnical report from that investigation area part of the Construction Documents for information purposes only. The precise profile of soil and rock strata beneath this Site is not known.
- B. Review the Site and determine the conditions which may affect the structural excavation, prior to the commencement of the excavation.

2.00 PRODUCTS

2.01 BACKFILL MATERIALS

- A. Structural Earth Backfill: Structural backfill shall be Class 4 Earth Fill as specified in Section 31 05 13 "Soils for Earthwork."
- B. Flowable Fill: As specified in Section 31 23 23.34 "Flowable Fill."
- C. Mud Slab: Lean concrete in accordance with Section 03 30 00 "Cast-In-Place Concrete."
- D. Topsoil: Topsoil shall be Class 12 Earth Fill as specified in Section 31 05 13 "Soils for Earthwork."

2.02 COMPACTION EQUIPMENT

A. Compaction equipment shall conform to the following requirements.

1. Heavy Compaction Equipment:

a. Tamping Compactor: Steel wheels with rectangular face, tapered pads that prevent fluffing the soil. Compactor shall be equipped with cleaning fingers to remove soil accumulation from between pads.

1). Operating Weight, Minimum: 30,000 pounds.

2). Wheels or Drum Size, Minimum: 4 feet diameter.

3). Travel Speed, Maximum: 10 mph.

b. Pneumatic Rollers: Minimum eight-tire, pneumatic roller with a modular ballast system and flexible operating weight, and which will equally distribute load between tires to provide compaction uniformity.

1). Operating Weight Range: As required for specified compaction, 36,000 to 50,000 pounds.

2). Tire Pressure Range: 80 psi to 100 psi.

3). Travel Speed, Maximum: 10 mph.

4). Distance Between Edges of Adjacent Tires: Less than 50 percent of tire width.

c. Vibratory Rollers: Smooth drum roller with 90 percent of the static weight transmitted through a single drum.

1). Static Weight, Minimum: 20,000 pounds

2). Centrifugal Force Per Drum, Minimum: 40,000 pounds

3). Frequency: 1400 v/min

4). Drum Size: Diameter 5 feet, +/- 1 foot; width between 6 and 9 feet.

5). Travel Speed: 5 mph for self-propelled; 2 mph for towed.

6). No backing up of the vibratory roller will be allowed on an embankment unless the vibrating mechanism is capable of being reversed.

2. Hand-Directed Compaction Equipment: Use power tampers and vibratory plate compactors in areas where it is impracticable or unacceptable to use heavy compaction equipment.

2.03 COFFERDAMS

A. Interior Dimensions: Of sufficient size to allow for all construction and inspection activities.

B. Walls: Watertight. Extend below proposed subgrade as required to prevent water infiltration through subgrade. Extend above normal water surface elevations, but not less than that required by design.

C. Provide pumping or bailing system as required by cofferdam design and/or Construction Document requirements.

- D. Provide mud slab as required by cofferdam design and/or as indicated on the Drawings. Mud slab shall be installed as indicated below.

3.00 EXECUTION

3.01 PREPARATION

- A. Clear and grub the area to be excavated prior to the start of excavation in accordance with Section 31 11 00 "Clearing and Grubbing." Remove the surficial vegetation, waste and soils to a minimum depth of 12 inches. Depth of removal shall not be less than that required to remove trees, shrubs, stumps, roots, and other organic material above and below ground from within the area to be excavated. Ensure below grade organic material is removed to a minimum depth of 18 inches below bottom of footing/structure.

3.02 EXCAVATION FOR FOUNDATIONS

- A. General: Excavate subgrade to the depth indicated on Drawings, +/- 0.1 feet tolerance. Extend limits of the excavation beyond the perimeter of the foundations.
 - 1. Exposed subgrade surfaces shall be level and of sound, stable material; free of mud, frost, snow, or ice. Testing agency or Owner's representative shall confirm exposed subgrade is a suitable bearing material based on the Construction Documents.
 - 2. Proof roll the exposed subgrade in accordance with TxDOT Item 216. Do not proof roll wet or saturated subgrades.
 - 3. Where unsound or unstable material is uncovered, notify Owner's representative. Remove objectionable material and replace after approval is received from Owner's representative. Replacement material shall be as indicated here unless otherwise indicated on Drawings:
 - a. Soil subgrade replacement material: Compacted structural backfill.
- B. Mud Slab: Where indicated, install mud slab on exposed foundation subgrade surface within 8 hours of subgrade exposure. Confirm subgrade is free of loose, unsound, and/or deleterious material before placement of mud slab.
- C. Excavation Safety: All excavations shall be in accordance with OSHA requirements.

3.03 COFFERDAMS

- A. Install and remove cofferdams without disturbing the subgrade or marring the structure.
- B. Pump or bail water as required for construction and inspection work, and to prevent hydrostatic uplift pressures when not accounted for in the cofferdam design.

3.04 WATER IN FOUNDATION EXCAVATIONS

- A. General:
 - 1. Prevent water infiltration into foundation excavations. Remove standing water from excavation prior to placing concrete. If removal of standing water is not possible due to continuous water infiltration, then contact Owner's representative for additional direction regarding placing concrete underwater.

2. Do not dewater a foundation excavation while placing concrete or for a period of at least 24 hours after concrete placement.
- B. Soil Foundation Subgrade: If foundation subgrade becomes saturated do not disturb the subgrade. Wait for water to evacuate the subgrade and subgrade surface to adequately stiffen prior to placing concrete. If subgrade is disturbed, then wait until subgrade has dried out, excavate disturbed subgrade and provide replacement material as indicated above.

3.05 COMPACTED BACKFILL

- A. General: Backfill excavated spaces and areas not occupied by the permanent structure.
1. Backfill behind a retaining wall or basement-type wall shall not be placed until the concrete has reached its 28-day compressive strength or 7 days, whichever is longer.
 2. Unless otherwise indicated on Drawings, structures with a top slab shall not backfilled until the top slab has been in place at least 4 days.
 3. Structures with soil on opposing (opposite) sides shall be backfilled to prevent uneven loading of the structure – evenly raise backfill on opposing sides of the structure. The maximum differential backfill height between opposing sides is 1 foot.
 4. Do not permit rollers to operate within 3 feet of structures.
 5. Maximum Loose Lift Height:
 - a. Heavy Compaction Equipment: 8 inches.
 - b. Hand-Directed Compaction Equipment: 4 inches.
 6. Previous Compacted Layer: If backfill placement occurs over a period of time greater than 24 hours, then scarify and recompact the previous day's final compacted layer.
 - a. Scarify and Recompact: 6-inch depth; adjust the moisture content; recompact.
 - b. Saturated subgrades shall not be worked on until sufficiently dry and harden so as not to be rutted with compaction equipment. Scarify and recompact layers damaged by weather or construction equipment.
- B. Moisture: Prior to compacting backfill, mix and aerate or water the loose lift backfill material as necessary to adjust the moisture content and evenly distribute throughout. The material shall contain moisture within the limits specified below.
1. In accordance with ASTM D6938, determine the optimum moisture content for the maximum dry density.
 2. Backfill moisture content shall be as indicated in Table 1, "Compacted Fill."
- C. Compaction: As required to achieve the specified density, increase the number of passes above the minimum specified and/or modify the weight of the equipment.
1. Determine the maximum dry density in accordance with ASTM D698 for cohesive soils and ASTM D4253 for cohesionless soils.
 2. Minimum number of passes for all compacted fill types: 8.
 3. Cohesive Soils: A tamping compactor or tamping compactor followed by a pneumatic roller shall be used.

4. Cohesionless or low cohesive soils: A vibratory roller or vibratory plate compactors shall be required if the material is cohesionless or with less than 15 percent passing the No. 200 sieve. Confirm applicability of vibratory compaction equipment in the field.
5. Overlap passes a minimum of 1 feet for heavy compaction equipment and 50 percent of the baseplate width for hand-directed equipment.
6. Backfill density shall be as indicated in Table 1, "Compacted Fill."

Table 1: Compacted Fill			
Backfill Type	Density^{1,2}	Moisture Content^{3,4}	Comments
Classes 1 & 2	95%	-0% to +5%	N/A
Classes 3, 4, & 5	95%	-2% to +5%	N/A

¹ The percentage indicated is the minimum required percentage of the maximum dry density as determined by the applicable ASTM.

² Below Vehicular Pavement: Scarify to a depth of 8, moisture condition, and recompact to not less than 100 percent of the maximum dry density.

³ Range indicated is the acceptable tolerance with respect to the optimum moisture content.

⁴ Completely cohesionless materials, shall be at a moisture content which will allow use of the specified compaction equipment and result in consistent achievement of the specified density.

3.06 FIELD QUALITY CONTROL

- A. Owner is responsible for the costs involved in providing an approved testing agency to perform quality control testing of backfill operations and verification of subgrade bearing material. The testing laboratory shall make tests of in-place density and moisture in accordance with ASTM Standards previously mentioned in this Section. The testing agency shall monitor backfill operations continuously or at intervals acceptable to the Owner's representative. It shall be the responsibility of the Contractor to notify the testing agency a minimum of 2 business days before backfill operations begin.
 1. Unless noted otherwise, in-place density tests shall be conducted at a rate of one test per 1500 square feet for every lift.

END OF SECTION

31 23 16 EXCAVATION

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to perform the operations in connection with removing, hauling, and disposing of materials from the locations specified in accordance with these specifications. Conduct excavations to be placed in the compacted fills to segregate different materials in accordance with their suitability in the various zones of the work.

1.02 QUALITY ASSURANCE

- A. Classifications: Classifications of excavation shall include material of whatever nature encountered, including but not limited to clays, sands, gravels, conglomeritic boulders, weathered clay shales, shales, rock, debris, and miscellaneous abandoned subsurface structures. The Engineer will, in accordance with the specifications, determine the classification of required excavations. All required excavation shall be considered to fall within one of the following classifications.
1. General Required Excavation: Shall consist of the material required to be excavated which is not classified or subsidiary to another class of excavation or other work. General required excavation includes but is not limited to diversion ditches and drainage channels.
 2. Canal Excavation: Shall consist of the material required to be excavated for the channelization of the canal and for preparation of the banks to receive riprap or other erosion protection.
 3. Structural Excavation: Shall consist of the excavation required for structures including but not limited to footings, foundations, walls and slabs below grade, drop structures, and any other structures specified, excluding roadways and embankments.
 4. Additional Structural Excavation: Shall consist of additional excavation below structures listed in the Structural Excavation paragraph above as may be required to remove unsuitable material. Rock which occurs under only a portion of a structure may be defined as unsuitable and will require removal a minimum of 1 foot below footings, foundations and below grade slabs.
 5. Undercutting: Shall consist of the excavation and removal of soft or otherwise unsuitable soil from prepared subgrade areas underneath embankments, roadways, parking areas, slabs at grade and similar structures.
 6. Onsite Borrow Excavation: Borrow Excavation shall consist of suitable material required to be excavated from the General Required Excavation areas or Canal Excavation areas as may be required for the various classes of Earth Fill. It shall be the responsibility of the Contractor to see that soils from required excavations which are suitable for the various fills are properly segregated and not disposed of unless there is a surplus. See specification Section 31 05 13.13 "Offsite Soil Borrow."
- B. Exclusions: Excavation required for trenches shall not be measured or paid under this Section.

2.00 PRODUCTS

2.01 EQUIPMENT

- A. Excavation of materials may be performed by the use of any excavating and hauling equipment adaptable to the work and by any method generally accepted for this type of work, which is compatible with project requirements and conditions.

3.00 EXECUTION

3.01 REMOVAL

A. General:

1. Excavations shall be to the lines and grades shown on the drawings within a tolerance of plus or minus 0.1 foot unless specified otherwise herein. Any and all excess excavation for the convenience of the Contractor or over-excavation performed by the Contractor for any purpose or reason, except when requested by the Engineer, and whether or not due to the fault of the Contractor, shall be at the expense of the Contractor. Where required to complete the work, refill the excess excavation and over-excavation with materials furnished, placed and compacted at the Contractor's expense, using procedures approved by the Engineer.
2. Perform excavation for structural foundations in the dry. Perform no excavation in frozen material without the approval of the Engineer. No additional allowance above the unit prices bid per cubic yard for the respective classification of excavation shall be made on account of any material being wet or frozen or on account of any surface or ground water condition.
3. Excavations shall be to the full dimensions shown on the drawings. Finish excavations to the prescribed lines and grades.
4. Following completion of the excavation and prior to placement of embankment material upon the prepared subgrade surface, the Engineer will approve the subgrade surface. If the subgrade material, in the opinion of the Engineer, is unsuitable for use as the subgrade, perform additional excavation and backfill as requested by the Engineer. Such additional excavation and backfill shall be paid for in accordance with the appropriate bid items. Following approval of the subgrade surface, assume all responsibility for maintaining the subgrade surface and remove or recompact the weathered or unsatisfactory subgrade material and replace with compacted fill at Contractor's expense. Following approval of the subgrade, diligently prosecute the work of placing the appropriate embankment material on the prepared subgrade. Maintenance of all slopes is the Contractor's responsibility.
5. Requirements for care of water, including dewatering of excavations, are included in Section 31 23 19.02 "Care of Water During Construction."

- B. General Required Excavation: Perform general required excavation to the full lines and grades shown on the drawings and within the tolerance of plus or minus 0.1 foot. Sequence and schedule the excavation operations so that the various types of excavated materials will be available when needed for fill or backfill and so the overall site drainage patterns will not be unduly interrupted.

- C. Canal Excavation: Perform canal excavation to the full dimensions shown on the drawings and finish to the prescribed lines and grades. Individual sharp points of undisturbed material will be permitted to extend within the prescribed lines not more than 0.5 foot, except at riprap areas a subgrade tolerance of minus 0.3 foot and plus 0.0 foot shall be achieved. Maintenance of the slopes is the Contractor's responsibility.
- D. Structural Excavation: Perform structural excavation to the full lines and grades shown on the drawings or necessary for placement of the structures. Perform structural excavation to the tolerance of plus or minus 0.1 foot, except excavation areas underneath footings, foundations, slabs, or other structures will have a tolerance of minus 0.1 foot and plus 0.0 foot. Perform final depth of excavation underneath structures immediately prior to placement of structure to the fullest extent practicable. Protect foundation subgrades from saturation by rain or other surface water. Remove and replace any material in the foundation subgrade that becomes soft from saturation with suitable material as requested by the Engineer, at no additional cost to the Owner.
- E. Additional Structural Excavation:
 - 1. Additional Structural Excavation shall consist of removal of unsuitable material underneath structures and below the excavation limits of minus 0.1 foot and plus 0.0 foot. Perform additional structural excavation only when specifically requested by the Engineer and to the limits determined by the Engineer.
 - 2. The Engineer shall be notified by the Contractor in advance of the time that structural excavation is to be performed for the various structures. The Engineer shall observe the excavations and determine if additional structural excavation is required.
 - 3. Backfill additional structural excavation areas as specified in Section 31 23 23.16 "Compacted Earth Fill."
- F. Proof-Rolling and Undercutting:
 - 1. Proof-roll the prepared subgrade areas underneath embankments, roadways, parking areas, slabs at grade or other such structures with a loaded dump truck or other rubber-tired, heavy ground pressure equipment acceptable to the Engineer. The equipment shall pass over the entire subgrade at low speed with tire tracks staggered approximately 3 feet on each pass. Mark any soft or otherwise unsuitable subgrade areas during proof-rolling for undercutting.
 - 2. Undercut and remove the marked areas of soft or otherwise unsuitable subgrade to the limits determined by the Engineer. Backfill of undercut subgrade areas shall be as specified in Section 31 23 23.16 "Compacted Earth Fill [Landfills and Heavy Earthwork Projects, Excluding Dams]."
- G. Borrow Excavation:
 - 1. Borrow excavation shall consist of suitable material from required excavations on site or from on site borrow areas approved by the Engineer. Do not use the materials that are unsuitable for placement in the work. Upon completion of the borrow excavation, leave the borrow areas neat and slightly and graded to drain freely. Side slopes shall not be steeper than one vertical to two horizontal (1:2) if borrow is in the area by the reservoir or one vertical to four horizontal (1:4) for all areas that will be left exposed after

completion of the project. All exposed areas of the borrow pits are to be grassed at the Contractor's expense before completion of the project.

2. Use the soil borrow materials from required excavations and onsite borrow areas in the most restrictive earth fill classification zone which the borrow material will meet until all requirements for the most restrictive earth fill classification are fulfilled. Segregate and stockpile borrow materials. It is the intent that the segregation take place generally in the normal course of excavation. Highly selective excavation or segregation of small pockets less than 50 cubic yards of soil material shall not be required.

3.02 BLASTING

- A. No blasting shall be allowed.

3.03 DISPOSAL

- A. Suitable material from excavations which meets the requirements for the various fills as specified in Section 31 23 23.16 "Compacted Earth Fill" may be placed in the fill zones of the embankments. When necessary, adjust the moisture of the excavation suitable for use in the embankments to the proper moisture content prior to placing on the fill. When necessary, stockpile excavated materials suitable for use at convenient locations in an approved manner. Place materials that are not useable in the spoil disposal areas at no additional cost to the Owner.

3.04 SPOIL DISPOSAL AREAS

- A. Place materials designated as spoil in spoil disposal areas as approved by the Engineer or in off-site disposal areas. Leave spoil disposal areas neat and sightly conditioned and sloped to provide positive drainage away from the embankments and present and proposed future construction work. Compaction of materials in the spoil disposal areas will not be required.

END OF SECTION

31 23 19.02 CARE OF WATER DURING CONSTRUCTION

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals, including pumps, piping and other facilities necessary to remove surface and groundwater as needed to perform the required project construction.
- B. Build and maintain the necessary temporary impounding works, channels, and diversions. Remove the temporary works, equipment, and materials after they have served their purpose in strict accordance with this section of the specifications and the applicable drawings.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
 - 1. Plans and procedures for handling flood flows and dewatering excavations. Submit plans and procedures to Engineer for approval.
 - 2. Any construction modifications to the system shall also be submitted.

1.03 JOB CONDITIONS

- A. Approval of plans and procedures for handling flood flows and dewatering does not relieve the Contractor of full responsibility and liability for care of water during construction.

2.00 PRODUCTS (NOT APPLICABLE)

3.00 EXECUTION

3.01 FLOOD FLOWS AND OTHER WATER

- A. The Contractor shall be responsible for handling and diverting any flood flows, stream flows, or any other water, including groundwater encountered during the progress of the work. Build, maintain, and operate cofferdams, channels, flumes, sumps, and other temporary works needed to pass floodwater, divert stream flow, or pass other surface water through or around the construction site and away from construction in progress. Unless otherwise approved by the Engineer, a diversion must discharge into the same natural watercourse in which its headworks are located. Construct permanent work in areas free from water. The removal of protective works, after having served their purpose, shall be in a manner and timing satisfactory to the Engineer.

3.02 DEWATERING EXCAVATED AND OTHER FOUNDATION AREAS

- A. The Contractor shall be responsible for dewatering foundations for all areas during construction of the works of improvement, including areas of required backfills. Lower the water table as needed to keep those areas free of standing water or excessive muddy conditions.

- B. Furnish the drains, sumps, casings, well points, and other equipment necessary to dewater areas for required construction work. Any dewatering method that causes a loss of fines from foundation areas will not be permitted. Keep available standby equipment to provide proper and continuous operation of the dewatering system. Provide continuous monitoring (24 hours per day) of the dewatering system to provide continuous operation.

3.03 DEWATERING BORROW AREAS

- A. Unless otherwise specified on the drawings, maintain the borrow areas in drainable condition or otherwise provide for timely removal of surface waters that accumulate, for any reason, within the borrow areas.

3.04 CLOSURE OF CANAL

- A. The Contractor shall submit for approval to the Engineer and Owner plans and sequencing to maintain the required flow shown in the drawings at all times during construction.

END OF SECTION

31 23 23.16 COMPACTED EARTH FILL GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals, and perform the necessary operations in connection with preparing the subgrades for the embankments and placing and compacting the permanent earth fill and backfill not otherwise specified. See specification Section 31 05 13.13 "Offsite Soil Borrow."

1.02 QUALITY ASSURANCE

- A. Definitions: The term "embankment" as used in these specifications is defined as the earth fill portions of the levee structures, canal fill, roadway fill, topsoil and any other earth fill as specified or shown on the drawings. Earth spoil and structural backfill shall not be considered as embankments and are not a part of this Section.
- B. Classification: Classifications shall be in accordance with Section 31 05 13 "Soils for Earthwork."
- C. General Provisions:
 - 1. Lines and Grades: The embankments shall be constructed to the lines, grades, and cross sections indicated on the drawings. The embankments and fills shall be final graded to a tolerance of plus or minus 0.1 foot, except earth fill underneath roadways shall be graded to a tolerance of plus or minus 0.04 foot. There will be no payment for shrinkage or consolidation that occurs during construction. The end slopes and side slopes of fill sections shall not be steeper than those shown on the plans.
 - 2. Conduct of the Work:
 - a. Maintain and protect the embankments in a satisfactory condition at all times until final completion and acceptance of the work. If the hauling equipment causes horizontal shears or slickensides, rutting, quaking, heaving, cracking, or excessive deformation of the embankments, limit the type, load, travel speed, and/or haul pattern of the hauling equipment on the embankments. Excavate and remove from the embankments any material which the Engineer considers objectionable and dispose of such material and refill the excavated area. Remove any embankment material placed outside of prescribed lines shown on the drawings. Replacement of any material rendered unsuitable as a result of the operation will be at the Contractor's own expense.
 - b. Do not place frozen earth fill or fill upon frozen subgrade. Previously frozen fill shall be recompacted prior to placement of additional fill.
 - 3. Haul Roads: Locate and construct haul roads at approved locations. Construct roads to maintain the intended traffic and be free draining. Maintain roads in good condition throughout the contract period. When no longer needed, remove haul roads and topsoil and seed the area as requested by the Owner.
 - 4. Stockpiling from Approved Borrow Sources: Stockpile the excavated material, adjacent to the work until used, at locations approved by the Owner when the excavation from approved borrow sources or from required excavation progresses at a faster rate than placement of the fill is being accomplished. Plan operations to minimize stockpiling.

Dress and maintain stockpiles so that the surfaces will be free draining. Suitable erosion control methods are to be incorporated adjacent to stockpile areas in accordance with Section 01 57 23 "Temporary Stormwater Pollution Control."

5. Quality Control Testing:
 - a. The Owner will provide for quality control tests on the materials incorporated in the work, including classification testing of borrow materials from on-site sources. Copies of the results of the tests performed will be furnished to the Contractor upon request. The testing performed by the Owner in no way relieves the Contractor of the responsibility of completing the work in accordance with the specifications. The Contractor shall assist the testing personnel in taking tests to the extent of furnishing labor and equipment to prepare the areas for testing and curtailing operations in the vicinity of the test area during testing.
 - b. The Contractor has the right to conduct such tests as deemed necessary to assure compliance with the contract specifications. Conflicting results between the Owner's tests and those made by the Contractor will be resolved by the Engineer, whose decision shall be final.
 - c. The Contractor shall have the sole responsibility for seeing that the appropriate class of earth fill is placed in each zone. To this end, the Contractor will be responsible for determining any changes in materials from borrow sources, excavations, and stockpiles, and see that appropriate classification tests are requested in a timely manner. Any earth fill which does not meet the classification requirements for the zone in which it is placed, shall be removed and properly replaced with conforming material by the Contractor at no additional cost to the Owner.
6. Slides: In the event of slides in any part of the embankments prior to final acceptance of the work, remove all loose material from the slide area and rebuild the portion of the embankment as requested by the Engineer, at no additional cost to the Owner.

1.03 STANDARDS

- A. The following publications, referred to hereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:
 1. American Society for Testing and Materials (ASTM) Standards:

ASTM D698	Moisture-Density Relationship of Soils and Soil Aggregate Mixtures, Using 5.5-lb. Rammer and 12-Inch Drop
ASTM D1556	Density of Soil in Place by the Sand Cone Method
ASTM D2922	Density of Soil and Soil-Aggregate In-Place by Nuclear Methods
ASTM D3017	Moisture Content of Soil and Soil-Aggregate In-Place by Nuclear Methods
ASTM D4253	Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4254	Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

- B. Any other testing required by these specifications and not specifically referenced to a standard shall be performed under ASTM or other appropriate standards as designated by the Engineer.
- C. References herein or on the drawings to soil classifications shall be understood to be according to ASTM D2487, "Classification of Soils for Engineering Purposes" unless indicated otherwise.

2.00 PRODUCTS

2.01 MATERIALS; EARTH FILL ZONES

- A. General: Materials for embankment fills shall be secured from required excavations or from offsite borrow areas approved by the Engineer. The intention is to use the most suitable materials obtainable from these sources. Materials containing brush, roots, sod, or other perishable materials will not be considered suitable. The suitability of the materials shall be subject to approval of the Engineer. Mixing of materials during the excavating process at the borrow area may be required for Class 3 earth fill.
- B. Embankments and Backfill: Consist of Class 1 earth fill as specified in Section 31 05 13 "Soils for Earthwork."
- C. Structural Backfill: Consist of earth fill of the classes shown on the drawings or specified in Section 31 23 10 "Structural Excavation and Backfill."
- D. Undercutting Backfill: Consists of the same class of earth fill as the fill zone or structure to be placed on the subgrade. Appropriate foundation treatment is needed prior to placement of undercutting backfill.

2.02 COMPACTION EQUIPMENT

- A. Compaction equipment shall conform to the following requirements and shall be utilized as hereinafter specified.
 - 1. Tamping Rollers (Sheepsfoot):
 - a. Tamping rollers shall consist of a heavy duty double drum unit with a drum diameter not less than 60 inches and an individual drum length of not less than 60 inches. The drums shall be water or sand and water ballasted. Each drum shall have staggered feet uniformly spaced over the cylindrical surface such as to provide approximately 3 tamping feet for each 2 square feet of drum surface. The tamping feet shall be 7 to 9 inches in clear projection from the cylindrical surface of the roller and shall have a face area of not less than 7 nor more than 10 square inches. Self-propelled rollers with tamping feet surface areas greater than 10 but less than 30 square inches can be utilized provided the feet have tapered heads that add to the compactive effort. The roller shall be equipped with cleaning fingers, designed and attached to prevent the accumulation of material between the tamping feet, and these cleaning fingers shall be maintained at their full length throughout the periods of use of the roller. The weight of the roller shall not be less than 3500 pounds per foot of linear drum length weighted and shall not be less than 1500 pounds per foot of drum length empty. The two drums comprising one roller unit shall be designed

such that they will both function when traversing uneven ground. The roller shall be self-propelled or tractor drawn at a speed that will give optimum compactive effort.

- b. The design, operation, and use of the tamping roller shall be approved by the Engineer based on the results of the construction of a test section. The test section shall be constructed using the proposed roller and the materials from designated and/or planned borrow areas. The roller shall provide uniform compaction throughout the lift and shall insure bonding by its kneading action. The roller shall not cause scaring of the fill or laminations in the fill. The roller shall not walk across a lift until uniform compaction is obtained. Additional testing will be required if the materials change during construction. When necessary, repairs shall be made to the tamping feet, minor alterations shall be made to the roller, and variations in the weight of roller shall be made.
2. **Pneumatic Rollers:** Pneumatic rollers shall have a minimum of four wheels equipped with pneumatic tires. The tires shall be of such size and ply as can be maintained at tire pressures between 80 and 100 pounds per square inch for a 25,000-pound wheel load during rolling operations. The roller wheels shall be located abreast and be designed so that each wheel will carry approximately equal load in traversing uneven ground. The spacing of the wheels shall be such that the distance between the nearest edges of adjacent tires will not be greater than 50 percent of the tire width of a single tire at the operating pressure of a 25,000-pound wheel load. The roller shall be provided with a body suitable for ballast loading such that the load per wheel may be varied, from 18,000 to 25,000 pounds. The roller shall be towed at speeds not to exceed ten miles per hour. The character and efficiency of this equipment shall be subject to the approval of the Engineer.
 3. **Vibratory Rollers:** Vibratory rollers shall have a total static weight of not less than 20,000 pounds, with at least 90 percent of the weight transmitted to the ground through a single smooth drum when the roller is standing in a level position. The diameter of the drum shall be between 5 and 5-1/2 feet and the width between 6 and 9 feet. The unsprung weight of drum, shaft, and internal mechanism shall be not less than 12,000 pounds. The frequency of vibration during operation shall be between 1100 and 1500 cpm, and the dynamic force shall be not less than 40,000 pounds at 1,400 cpm. No backing of the vibratory roller will be allowed on the embankment unless the vibrating mechanism is capable of being reversed. The Equipment Manufacturer shall furnish sufficient data, drawings and computations for verification of the above specifications, and the character and efficiency of this equipment shall be subject to the approval of the Engineer. Self-propelled and towed vibratory rollers shall be operated at speeds not exceeding 3 miles per hour and 1.5 miles per hour, respectively.
 4. **Power Hand Tampers and Vibratory Plate Hand Compactors:** Compaction of material in areas where it is impracticable to use a roller or tractor shall be performed with approved power hand tampers, vibratory plate hand compactors, or other approved equipment. Approval shall be based upon performance in a test section.

3.00 EXECUTION

3.01 PREPARATION OF SUBGRADE

A. Stable Subgrades: After excavation or stripping of the subgrades and excavation of the undesirable material to the extent indicated on the drawings or otherwise required, break down the sides of stump holes, test pits, and other similar cavities or depressions to flatten out the slopes to no steeper than five horizontal to one vertical (5:1). Scarify the sides of the cut or hole to provide bond between the subgrade material and the fill. Scarify the slopes and bottom of all excavations. Fill each depression with the appropriate class of earth fill material, depending upon the type of material which is to be placed immediately above the subgrade. Place the fill in layers, moistened, and compacted in accordance with the applicable provisions. Spread materials which cannot be compacted by roller equipment because of inadequate clearances in 4-inch layers and compact with power tampers to a density and moisture content specified herein for the particular material being placed. After filling of depressions and trenches and immediately prior to placement of compacted fill in any section of the embankment, loosen the subgrade of such section thoroughly by scarifying, plowing, discing, or hallowing to a minimum depth of 6 inches. The moisture content shall be within the limits specified in Paragraph 3.03 of this specification for the appropriate type of material. After removal of roots or other debris turned up in the process of loosening, compact the entire surface of the embankment subgrade area as specified in Paragraph 3.04 of this specification.

B. Unstable Subgrades:

1. In areas of the subgrade which, in the opinion of the Engineer, are too soft, wet, or otherwise unstable to allow embankment construction to begin, the Engineer may request soft ground stabilization techniques. Soft ground stabilization techniques shall consist of plating and/or plating in combination with a geogrid.
2. Plating shall consist of covering the unstable areas with an approximate 12-inch lift of dry cohesive soil meeting the earth fill classification requirements for the particular zone. Spread and initially compact the lift with low ground pressure equipment such as D-3 Caterpillar bulldozer or equivalent. The lift shall receive a minimum of three coverages of the bulldozer tracks prior to beginning compaction with the equipment specified in Paragraph 2.02 of this specification. The lift shall receive the specified number of passes of the specified compaction equipment for the particular class of earth fill. In areas which will not support the specified number of passes of the compaction equipment without severe rutting or pumping, place an additional 8-inch lift of dry cohesive soil over the previous lift and apply the specified number of passes of the specified compaction equipment. This process shall continue until all areas will support the compaction equipment for the specified number of passes without significant rutting or pumping.
3. Each lift of plating will be tested for moisture and density by the Owner's independent testing personnel. These tests on the plating will be for informational purposes. No specific moisture or compaction criteria will be required in areas of plating which will not support the specified number of passes of the compaction equipment without significant rutting or pumping; however, when requested by the Engineer, the Contractor shall adjust the moisture content of the earth fill material being used for plating prior to spreading on the plating areas. This adjustment shall be within a range as designated by the Engineer. The minimum and maximum percentages of moisture content of the range designated by the Engineer shall be separated by no less than 5 percentage points. Once the lifts of plating are built up in an area to the point that the

plating will support the specified number of passes of the specified compaction equipment, these areas will then be considered as stable subgrade areas. Embankment construction shall then proceed and all additional lifts of earth fill shall meet the requirements for placing, moisture, and density as specified in this specification for the particular class of earth fill.

4. Soft ground stabilization techniques in relation to embankment construction will not be undertaken by the Contractor without prior approval of the Engineer. When soft ground stabilization techniques are approved or requested by the Engineer, each lift of plating and each layer of geogrid will require specific approval by the Engineer prior to the Contractor proceeding to the next lift or layer. Any soft ground stabilization techniques performed by the Contractor without prior specific approval of the Engineer shall be subject to removal and proper replacement by the Contractor at no cost to the Owner.
5. Soft ground stabilization techniques shall not be used within any portion of a constructed soil liner used for containment purposes.

3.02 PLACING OF MATERIAL

A. Class 1 through Class 5 Earth Fill:

1. Place embankment materials on properly prepared subgrade as specified above. The combined excavation, placing, and spreading operation shall be done in such manner to obtain blending of material and to insure that the materials, when compacted in the embankment, will have the best practicable degree of compaction, impermeability, and stability. The placing of materials from the borrow sources shall be in the zones as shown on the drawings or specified. Spread the earth materials that can be compacted with the specified tamping and pneumatic rollers with approved equipment in approximate horizontal layers not more than 8 inches thick for Class 1 and 2 earth fill and not more than 12 inches thick for Class 3 through 5 earth fill, before compacting over the length and breadth of the section of embankment under construction. Lift thickness will be reduced if required to consistently achieve the specified density. In areas where the specified tamping and pneumatic rollers cannot be utilized, spread the earth materials in approximately horizontal layers not more than 4 inches thick before compacting. If the surface of the embankment is too smooth and hard to bond properly with succeeding layer, roughen and loosen the surface by scarifying before the succeeding layer is placed. Where fill is to be placed next to existing fill, remove fill to unweathered, dense material, sloped to no steeper than 1H:1V if existing fill face is parallel to the centerline of the embankment and 5H: 1V if the face is perpendicular to the centerline of the embankment. Bench and scarify each layer as adjoining lifts are placed. Route material hauling equipment over the surface of the embankment to distribute the added compaction afforded by the rolling equipment and to prevent the formation of ruts on the embankment surface.
2. As soon as practicable after commencement of construction of any section of the embankment, raise or crown the appropriate portions with grades not to exceed 2 percent so that the surface of the fill will drain freely and can be maintained throughout construction. During the dumping and spreading process, maintain at all times a force of men adequate to remove all roots and debris and all stones greater than 3 inches in

maximum dimension from all embankment materials. Remove roots, stones and debris from the embankment and dispose of material in an approved manner.

- B. Undercutting Backfill: Place undercutting backfill as specified in Paragraph A above and use undercutting backfill to backfill the excavations formed by "Undercutting" as specified in Section 31 23 16 "Excavation" as requested by the Engineer.
- C. Class 12 Earth Fill:
 - 1. Prior to and immediately preceding spreading of Class 12 earth fill, lightly scarify the surface of the area to receive Class 12 earth fill and lightly wet the surface if unusually dry, as determined by the Engineer.
 - 2. Uniformly spread Class 12 earth fill over the areas and to the thickness shown on the drawings or specified. Class 12 earth fill thickness shall be 4 inches if not shown or specified otherwise.
 - 3. Remove stones 1-1/2 inches or larger in maximum dimension, stumps, large roots, or other objectionable debris from the Class 12 earth fill at the time of spreading, and dispose of material in an approved manner.

3.03 MOISTURE CONTROL - CLASS 1 THROUGH CLASS 5 EARTH FILL

- A. General: The materials in each layer of the fill shall uniformly contain the amount of moisture within the limits specified below necessary to obtain the maximum dry density for the soil. Compact Class 1 and Class 2 earth fill with a moisture content at or within 5 percentage points wet of optimum moisture content. Compact Class 3, Class 4, and Class 5 earth fill with a moisture content within 2 percentage points dry to 5 percentage points wet of optimum moisture content. The moisture content ranges specified above for the various classes of earth fill represent maximum upper and lower limits of the particular range. Determination of the maximum dry density-optimum moisture is specified in Paragraph 3.04 of this specification. Completely cohesionless materials which are to be compacted to a specified percentage of maximum density and shall be at a moisture content which will allow use of the specified compaction equipment and consistent achievement of the specified density.
- B. Irrigation of Borrow: Irrigation of borrow shall be done with distributing or sprinkling equipment that will uniformly produce the required results. Wet the material at the source of borrow to within 3 percentage points of optimum moisture content. Wet the material in the borrow pits by irrigation sprinkler system, by flooding, or by another approved method. Allow an adequate amount of time to wet the borrow source in advance of excavation operations to permit thorough and uniform distribution and penetration of moisture throughout the material. Divide the borrow area into sufficient sections to be worked in rotational order, for example, while one section is being worked, the previously worked section will be in the process of wetting, and the other sections will be in the process of curing to obtain uniform distribution and penetration of moisture.
- C. Drying of Borrow: Drying of borrow prior to placing may be required if the placed material is wet enough to adversely affect the moisture and/or density of the underlying lifts.
- D. Moisture Control During Placement: After spreading the soil on the embankment, adjust the moisture content of the soil if necessary by either aeration or the addition of water to bring the moisture content within the range specified. Uniformly distribute the moisture

content throughout the layer of soil to be compacted. In order to accomplish this distribution, thoroughly mix the layer of soil by discing, harrowing, or by the use of a power-driven pulverizer. Should the surface of a previously compacted layer become dry due to exposure to the elements, appropriately wet the surface of the compacted layer prior to placing the succeeding layer of soil, and properly disk or harrow the surface. Should a layer of soil be over wet, allow the layer to dry to a proper moisture content prior to compacting. Should the surface of a layer become smooth and hard, roughen the surface by scarifying, and wet the surface if necessary prior to placing the next layer of soil. Reprocess any layer which becomes damaged by weather conditions to meet the specification requirements. There shall be no additional payment made for such reprocessing. The prescribed moisture and density characteristics of the compacted fill shall be met immediately prior to placement of any fill on top of it.

3.04 PROCESSING AND COMPACTION

A. Class 1 through Class 5 Earth Fill:

1. After a layer of fill material has been dumped and spread, thoroughly process the material to break up and blend the fill materials. Perform harrowing with a heavy disc plow or other approved harrow to the full depth of the layer. If the power-driven pulverizer is used, a minimum of three passes shall be required. If a heavy disc plow or other similar harrow is used, a minimum of five passes shall be required. Where space permits, each pass shall be in a direction perpendicular to the previous pass. Regardless of the type of equipment used, a greater number of passes than specified above shall be used if necessary to accomplish the breaking up and blending of the materials. When the moisture content and the condition of the layer is satisfactory, compact the lift of material by at least the specified number of passes to the percent of maximum density specified below.
2. Compact the Class 1 and Class 2 earth fill zones by a minimum of eight passes with a tamping roller. Compact the Class 3, Class 4, and Class 5 earth fill zones by a minimum of eight passes with a tamping roller or by a minimum of four passes with a tamping roller, followed by a minimum of four passes with a pneumatic roller. A vibratory roller shall be required if the material is sandy and if requested by the Engineer. A pass shall consist of one trip over the area being compacted. The front and rear axle rollers on self-propelled models will only be considered as one pass per trip. The initial and final area to be rolled shall each have eight passes. Stagger passes between the initial and final area in order to establish overlapping with at least eight passes at all locations. Dumping, spreading, sprinkling and compacting may be performed at the same time at different points along a section where there is sufficient area to permit these operations including approximate testing to proceed simultaneously.
3. Areas of the fill being compacted with power hand tampers or vibratory plate hand compactors shall receive a minimum of eight passes of the equipment with an overlap of 50 percent of the equipment base plate width.
4. The in-place density of Class 1 through Class 5 earth fill shall not be less than 95 percent of maximum dry density as determined by ASTM D698, Standard Proctor, except compact the top 12 inches of fill underneath roadways and parking areas to not less than 100 percent of maximum dry density as determined by ASTM D698, Standard

Proctor. In areas of cut underneath roadways and parking areas scarify and recompact the top 8 inches of the subgrade within the specified moisture content, to not less than 100 percent of maximum dry density as determined by ASTM D698, Standard Proctor.

5. Cohesionless materials on which are not practical to control the density by proctor methods shall be compacted to a minimum of 95 percent of the maximum density as determined by ASTM D4253.
 6. Determine the moisture and density of in-place materials by one or more of the following ASTM procedures: D1556, D3017, or D2922.
 7. If necessary to achieve the specified density, the number of passes of the compaction equipment shall be increased and/or the weight of the compaction equipment shall be modified.
 8. Regardless of the density achieved, the number of passes of the compaction equipment shall not be less than eight.
- B. Class 12 Earth Fill: Class 12 earth fill does not require specific compaction but roll with suitable construction equipment as required for initial stability. Finish grade Class 12 earth fill to a tolerance of plus or minus 0.1 foot. Repair any erosion of Class 12 earth fill at the Contractor's expense until final acceptance by the Owner.

END OF SECTION

31 23 23.34 FLOWABLE FILL

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment, and incidentals necessary to mix and place flowable fill, consisting of Portland cement, fine aggregate, fly ash, and water in the proper proportions as specified hereinafter. Flowable fill (Controlled Low-Strength Material, CLSM) shall be used to bed and backfill around piping, utilities, and structures where indicated. Flowable fill shall also be used to grout the existing eastern pipes that are to be abandoned under the UPRR ROW.

1.02 QUALITY ASSURANCE

- A. Design Criteria – Flowable Fill Proportions and Consistency: Flowable fill shall be proportioned to give the necessary workability, strength, and consistency, and shall conform to the following governing requirements:
1. Permeability: Maximum permeability limit of 1×10^{-6} cm/sec. This limit shall apply at all locations where flowable fill is used as a utility trench plug (dam) within trench backfill materials.
 2. Subsidence: Evaporation of bleed water shall not result in shrinkage of more than 10.4 mm per m (1/8 inch per ft.) of flowable fill depth. Measurement of a Final Bleeding shall be as measured in Section 10 of ASTM C940.
 3. Strength for Non-Excavatable Flowable Fill: Unconfined compressive strength at 28-days when tested in accordance with ASTM D4832: 150 psi minimum.
 - a. Where indicated provide Non-Excavatable Flowable Fill below structures and/or around structures, unless noted otherwise.
 4. Fluidity: Flowable fill shall be self-consolidating and non-segregating in accordance with ASTM C1611:
 - a. Slump Flow Test: Minimum 20-inch mean spread.
 - b. Visual Stability Index (VSI) Test: Less than or equal to 1.
 5. Density, minimum: 100 pcf
- B. Factory Testing: The Contractor shall be responsible for the design of the material. A trial mix shall be designed by an independent testing laboratory, retained by the Contractor. The testing laboratory shall submit verification that the materials and proportions of the trial mix design meets the requirement of the Specifications. In lieu of trial mix design, Contractor may submit historical data for a mix design used successfully in previous similar work. The Contractor shall not make changes in materials, either in gradation, source, or brand, or proportions of the mixture after having been approved, except by specific approval of the Engineer.
- C. Owner Testing: It is the responsibility of the Contractor to achieve and maintain the quality of material required by this Section. However, the Owner may secure the services of an independent testing laboratory to verify the quality of the flowable fill. The Owner shall

have the right to require additional testing, strengthening, or replacement of flowable fill which has failed to meet the minimum requirements of this Section.

1.03 SUBMITTALS

- A. Submit mix design on each material required. Provide backup data as required below.
- B. Submit historical or trial mix data and test results as a basis for mix design approval. Required data shall include:
 - 1. Permeability test results if plugs are required on Project.
 - 2. Subsidence test results.
 - 3. Strength test results for Excavatable and Non-Excavatable Flowable Fill if used on Project.
 - 4. Fluidity test results.

1.04 STANDARDS AND REFERENCES

- A. Materials shall meet recommendation for mix design and placement, as published by National Ready Mixed Concrete Association.
- B. The applicable provisions of the following references and standards shall apply to this Section as if written herein in their entirety.
 - 1. ASTM International (ASTM) Standards:

ASTM C33	Specification for Concrete Aggregates
ASTM C40	Test Method for Organic Impurities in Fine Aggregates for Concrete
ASTM C150	Specification for Portland Cement
ASTM C618	Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as Mineral Admixture in Portland Cement Concrete
ASTM C 940	Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory
ASTM C 1611	Standard Test Method for Slump flow of Self Consolidating Concrete
ASTM D 4832	Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders

2.00 PRODUCTS

2.01 MATERIALS

- A. Cement: ASTM C150, Type I or II.
- B. Fly Ash/Pozzolans: ASTM C618, Class C.
- C. Fine Aggregate: ASTM C33, fine aggregate.
 - 1. ASTM C40: Aggregate shall not contain strong alkali, or organic material which gives a color darker than the standard color.
- D. Water: Potable and in conformance with ASTM C1602 and ASTM C1602, Table 2.

- E. Performance Additive: As required to meet specification requirements:
 - 1. DaraFill by GCP Applied Technologies.
 - 2. MasterCell 25 by Master Builders Solutions US LLC.
 - 3. Sika Lightcrete Powder by Sika Corporation.
 - 4. Approved equal.
- F. Chemical Admixtures for Concrete per ASTM C 494, as required by performance requirements.

2.02 MIXES

- A. In the determination of the amount of water required for mix, consideration shall be given to the moisture content of the aggregate. The net amount of water in the mix will be the amount added at the mixer; plus the free water in the aggregate; and minus the absorption of the aggregate, based on a 30 minute absorption period. No water allowance shall be made for evaporation after batching.
- B. The methods of measurement of materials shall be such that the proportions of water to cement are closely controlled during the progress of the Work and easily checked at any time by the Owner's representative. To avoid unnecessary or haphazard changes in consistency, the aggregate shall be obtained from sources which will insure a uniform quality and grading during any single day's operation and they shall be delivered to the Work and handled in such a manner that the variation in moisture content will not interfere with the steady production of flowable fill of reasonable degree of uniformity. Sources of supply shall be approved by the Owner's representative.
- C. All material shall be separately and accurately measured. All equipment for measurement of materials shall be subject to approval by the Owner's representative.

3.00 EXECUTION

3.01 INSTALLATION

- A. Contractor shall give the Owner's representative sufficient advance notice before starting to place material in any area, to permit inspection of the area, and preparation for pouring.
- B. Conduct the operation of depositing the material so as to form a well consolidated mass and so as not to develop air pockets in confined spaces.
- C. Unless specified otherwise, flowable fill shall be uniformly placed to the depth shown on the Drawings. The fill shall be brought up uniformly to the top of excavation elevation or as otherwise indicated on the Drawings. Placement of flowable fill shall then cease and the fill protected from traffic for a period of not less than 72 hours.
 - 1. To prevent pipe flotation place material in lifts or provide alternate means.
 - 2. Around structures, material shall be placed in lifts. Lift depth shall not exceed one-tenth of total structure embedment into subgrade nor 4 feet, whichever is less.

3. When multiple lifts are required, material shall be allowed to harden before placing next lift. Hardening time varies with each mix. Verify flowable fill has reached a penetration number of 1500, in accordance with ASTM C 403, but not less than 3 hours.
- D. The material shall be placed against undisturbed trench walls, and shall not be placed on or against frozen ground.
- E. At time of placement the ambient temperature shall be 35 F and rising.

3.02 ABANDONMENT OF EXISTING PIPES

- A. Clean existing pipes to be filled and video to assess the condition of the pipes. Remove free water prior to starting fill placement. Abandon pipes by completely filling with flowable fill. Continuously place flowable fill from end to end with no intermediate pour points. Have filling operation performed by experienced crews with equipment to monitor density of flowable fill and to control pressure.

3.03 FIELD QUALITY CONTROL

- A. An approved testing laboratory shall perform the quality control testing of backfill operations. The testing laboratory shall sample material in accordance with ASTM D5971. The testing laboratory shall monitor backfill operation continuously or at intervals acceptable to the Owner and Engineer at structures. It shall be the responsibility of the Contractor to provide sufficient advance notification to the testing laboratory before backfill operations begin.
 1. Strength: A strength test is the average of two cylinders per ASTM D4832.
 2. Fluidity: A fluidity test is a Slump Flow Test and a VSI Test per ASTM C1611.
 3. For all tests required, at a minimum perform one test per day, but not less than one per 150 cubic yards.

END OF SECTION

31 23 33.14 TRENCH SAFETY

1.00 GENERAL

1.01 WORK INCLUDED

- A. This specification is for the purpose of providing minimum performance specifications and consists of the basic requirements which the Contractor must comply with in order to provide for the safety and health of workers in a trench.
- B. Contractor shall develop, design, and implement the trench safety system and will be solely responsible for the adequacy of the trench safety system and providing “a safe place to work” for the workman.
- C. Should the trench safety protection system require wider trenches than specified elsewhere, the Contractor shall be responsible for the costs associated with determining adequacy of pipe bedding and class, including the purchase and installation of alternate materials.
- D. Contractor shall comply with all applicable federal, state, and local rules, regulations, and ordinances related to trench excavation and safety.

1.02 STANDARDS

- A. The following standard shall be the minimum governing requirement of this specification and is hereby made a part of this specification as if written in its entirety.
 - 1. Occupational Safety and Health Administration (OSHA): 29 CFR Part 1926 - Safety and Health Regulations for Construction, Subpart P – Excavations.

2.00 PRODUCTS (NOT APPLICABLE)

3.00 EXECUTION (NOT APPLICABLE)

END OF SECTION

31 23 33.16 TRENCHING AND BACKFILL

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment, and incidentals necessary to excavate and backfill as required for the construction of the facilities to the line, grade, and extent indicated.

1.02 SUBMITTALS

- A. Certified Test Reports for embedment and flexible base materials, including those for compaction tests, shall be submitted by the Contractor. Copies of submittals will be provided to the Installation Contractor. Any other submittals required shall be submitted by the Installation Contractor to the Contractor for review by the Engineer.
- B. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
 - 1. Certified Test Reports for embedment material, coarse gravel, and flexible base material. Certified Test Reports shall be from an independent laboratory. Test reports shall include sieve analysis, Atterburg limits, and results of an abrasion test.
 - 2. Certified Test Reports for compaction tests.
 - 3. A 5-gallon bucket of proposed granular embedment material.
 - 4. Pipe layout detail.

1.03 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. ASTM International (ASTM):

ASTM C33	Specification for Concrete Aggregates
ASTM C131	Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C535	Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM D698	Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D1556	Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
ASTM D1557	Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
ASTM D2487	Practice of Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4253	Test Methods for Maximum Index Density of Soils and Unit Weight of Soils Using a Vibratory Table

ASTM D6938	Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM G57	Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method

2. American Water Works Association (AWWA):

AWWA C151	Ductile Iron Pipe, Centrifugally Cast
AWWA C200	Steel Water Pipe, 6-Inch and Larger
AWWA C301	Prestressed Concrete Pressure Pipe, Steel Cylinder Type
AWWA C303	Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type

3. Texas Department of Transportation (TxDOT): Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges.

1.04 JOB CONDITIONS

- A. Classification of Excavation: Excavation shall be “unclassified” and involves the removing of the necessary materials to provide the trench to the required width and depth. The Installation Contractor, prior to submitting a proposal, must satisfy himself as to the actual subsurface conditions. No extra or separate payments shall be made for rock, dewatering, or any other condition.
- B. City, County, and Private Road Crossings: Where the Work is in city or county right-of-way or privately owned roads, the Installation Contractor will secure the necessary construction permits and easements for the Work. Work performed within the limits of the public right-of-way shall be in full accordance with the requirements of the easements and permits, and as requested by the city, county, and/or private owner. Provide temporary access and detours for roads and driveways cut-off during pipe laying operations.
- C. Protection of Existing Structures and Utilities:
 - 1. Prior to the delivery of pipe and start of construction, the Installation Contractor shall communicate with the local representatives of all utility companies including, but not limited to: oil, gas, electric, and telephone companies; water and sanitary sewer utilities; and any other public or private utility companies in the location of the proposed construction. Obtain the assistance of the utility owner in locating utility lines and in the avoidance of conflicts with utility lines. The Installation Contractor shall uncover and determine the elevation and location of conflicts well ahead of the manufacture of the pipe. The Engineer has shown the approximate location of existing utilities as determined from field surveys and record data from utility companies. The fact that some utilities are not shown or are shown incorrectly in no way relieves the Installation Contractor of its responsibility to locate all existing utilities.
 - 2. The Installation Contractor shall advise the Engineer, Contractor, and Owner of any existing utilities that are not shown on the Drawings, or are shown incorrectly, and may affect the pipe layout. Installation Contractor shall also propose a resolution to the utility conflict for the Engineer to review. The Engineer will determine whether the utility will be relocated or the proposed pipeline location revised. If the pipeline location is revised, an adjustment to the Contract Price will be made by adjusting the

quantities for the various unit price pay items. If the proposed pipe grade is adjusted by 2 vertical feet or less, no adjustment to the Contract Price will be made. If the proposed pipe grade is adjusted by more than 2 vertical feet, an adjustment to the Contract Price will be agreed to as described in the General Conditions.

3. Utilities that affect the pipe layout will be interpreted by the Engineer as follows:
 - a. Utilities that conflict with the grade of the proposed pipe will be interpreted as affecting the pipe layout.
 - b. Utilities that conflict with the operations and maintenance of the proposed pipe will be interpreted as affecting the pipe layout.
4. Where excavation endangers adjacent structures and utilities, the Installation Contractor shall carefully support and protect such structures and/or utilities so that there shall be no damage. Costs of temporarily or permanently relocating the conflicting utilities shall be included in the Contract Price.

1.05 MAINTENANCE AGREEMENT

- A. Maintain paved surfaces, unpaved trench surfaces, fences, curbs, sidewalks, and gutters for the entirety of the warranty period following the certification of completion. Material and labor required for the maintenance shall be supplied by the Installation Contractor. The Work shall be done in a manner satisfactory to the Engineer.

2.00 PRODUCTS

2.01 MATERIALS

- A. Concrete Embedment, Cap, Blocking, and Encasement: Where concrete embedment, cap, blocking, or encasement is indicated or requested by the Engineer, it shall be 2,000 psi compressive strength as specified in Section 03 30 00 "Cast-in-Place Concrete."
- B. Controlled Low Strength Material (CLSM): As specified in Section 31 23 23.34 "Flowable Fill."
- C. Granular Embedment:
 1. Granular embedment material shall be sandy gravel or blended sand and crushed rock, free from large stones, clay, and organic material. Embedment material shall be a soil classification of GW, GP, SW, or SP as determined by ASTM D2487. The embedment material shall be such that when wet, the fine material shall not form mud or muck. The embedment material shall be composed of angular, tough durable particles; free of thin, flat, and elongated pieces; of suitable quality to ensure permanence in the trench; and having not more than 40 percent wear when tested in accordance with ASTM C131 or ASTM C535. The P.I. of the fines shall not exceed 3. Light weight aggregate is not acceptable for granular embedment. Material used for granular embedment shall have a resistivity of not less than 5000 ohms/cm as measured by ASTM G57.

2. Granular embedment shall be cohesionless material meeting the following gradation requirements:

Sieve Size Sq. Openings	Amount Passing Percent by Weight
1/2"	100
3/8"	85-100
No. 4	10-30
No. 8	0-10
No. 16	0-5

D. Coarse Gravel:

1. Where coarse gravel is required for water drainage, restoration of trench foundation, or other uses, it shall be crushed stone or gravel in compliance with ASTM C33 for Coarse Concrete Aggregate. Gradation shall be ASTM C33 No. 57, No. 67, or as follows:

Sieve Size Sq. Openings	Amount Passing Percent by Weight
1"	95-100
3/4"	55-85
1/2"	25-50
No. 4	0-5

- E. Select Material: Selected or processed excavated trench material free of rock fragments and clods larger than 2 inches greatest dimension, organic materials, and sharp or angular materials that could damage the pipe coating.
- F. Ordinary Material: Trench excavated material free of rock fragments and clods larger than 6 inches greatest dimension, and organic materials.
- G. Flexible Base Backfill: Complying with TxDOT Item 247, Type A, Grade 1.
- H. Crushed Concrete Backfill: Complying with TxDOT Item 247, Type D, Grade 1.
- I. Cement Stabilized Sand:
 1. Sand and cement mixture of 25 parts sand and 2 parts cement.
 2. Sand shall be free of any cohesive material and gradation shall be as follows:

Sieve Size Sq. Openings	Amount Passing Percent by Weight
1"	100
1/2"	95-100
No. 40	80-100

3. Plasticity Index: 10 Maximum.
4. Liquid Limit: 25 or less.

- J. Topsoil: Soil material relatively free of stones or other objectionable debris, which have sufficient humus content to readily support vegetative growth. The suitability of soil for topsoil shall be subject to approval by the Owner's representative.
- K. Flexible Base Pavement: Complying with TxDOT Item 247, Type A, Grade 1 or 2.
- L. Hot-Mix Asphalt Concrete (HMAC): Complying with TxDOT Item 340.

3.00 EXECUTION

3.01 TRENCH EXCAVATION

A. General:

1. Excavate trenches to the alignment, width, and depth as indicated or as required for the proper installation of the pipe. Brace the trench, and dewater if necessary, so that the workmen may work safely and efficiently.
2. Comply with all applicable laws, ordinances, rules, regulations, and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss. Comply with the requirements of Section 31 23 33.14 "Trench Safety."
3. Dewater excavations so that the Work is performed in the "dry." Bailing, pumping, and dewatering shall be at the Installation Contractor's expense. Where necessary, use coarse gravel instead of embedment material under the pipe, at no extra cost to the Owner, to provide for the free drainage and flow of water in the trench and to keep the water level below the pipe barrel and bell holes for joints. The water removed from trenches shall be conducted to natural drainage ways, drains, or storm sewers in such a manner as to prevent damage to adjacent property and to the public, in accordance with Section 01 57 00 "Temporary Controls." Pumps of ample capacity must be provided in duplicate to ensure that once an excavation is made dry and the water is kept down until that part of the Work is completed.
4. The minimum depth of cover shall be maintained at all locations unless shown otherwise. The approximate ground profile and the top of pipe profile show the relationship intended by the Engineer. The precise and detailed pipe layout is to be prepared by the Installation Contractor and submitted to the Engineer for review. The responsibility for the workability of the detailed layout remains the responsibility of the pipe manufacturer. High points shall be located at air valves. Air valves shall be located in pipe sections having a horizontal grade.
5. Where unforeseen utilities or conditions warrant a revision of the pipe grade or alignment, the Installation Contractor shall submit a revised pipe layout to the CMAR for review by the Engineer. No intermediate high or low points will be allowed in the pipe grade without the approval of the Engineer.

B. Pipe Trench:

1. The pipe zone is defined as the zone from the bottom of the pipe trench to 6 inches above the top of the pipe.
2. The trench walls in the pipe zone shall be vertical. Trench widths shall be as shown on the Drawings.

3. Trench walls above the pipe zone may be laid back or benched where room permits, as necessary to meet the requirements of OSHA.
4. For semi-rigid pipe, where the character of the trench walls is loose, unstable, saturated soft clays, quicksand, or otherwise unable to provide adequate side support to maintain the required pipe deflection, the Installation Contractor shall modify the backfill to keep the pipe within the limits of the specified pipe deflection.
 - a. Installation Contractor shall widen the trench excavation as necessary.
 - b. Pipe shall be laid and the trench backfilled with embedment material to the top of the pipe zone. Embedment material shall be compacted to 95 percent maximum density as measured by ASTM D4253.
 - c. Installation Contractor shall protect exterior pipe coating and shall repair any damage caused by backfilling.
 - d. Concrete encasement, soil cement, or some other method approved by the Engineer may be used in lieu of this procedure.
 - e. No additional compensation will be made for additional trench excavation and backfill required for stabilizing the trench walls.

C. Pipe Foundation:

1. Excavate the trench to an even grade so that the full length of the pipe barrel is supported and joints make-up properly. Excavate the trench to the line and grade indicated and as directed by the Engineer. Grades shall be uniform between high points and low points to eliminate intermediate highs and lows.
2. The trench shall be rough cut a minimum of 6 inches below the bottom of the pipe. The rough cut dimension shall be increased as necessary to provide a minimum clearance of 2 inches from the bottom of the trench to the bottom of all parts of the pipe, valves, or fittings.
3. The entire foundation area in the bottom of all excavations shall be firm, stable material. Loose material shall be removed, leaving a clean, flat trench bottom, and material shall not be disturbed below required subgrade except as hereinafter described. If the subgrade is soft, spongy, disintegrated, or the character of the foundation materials is such that a proper foundation cannot be obtained at the elevation specified, then, when directed by the Engineer, the Installation Contractor shall deepen the excavation to where a satisfactory foundation can be obtained. The subgrade shall then be brought back to the required grade with coarse gravel placed at the direction of the Engineer, and thoroughly compacted to 95 percent maximum density as measured by ASTM D4253. Payment for additional coarse gravel shall be made at the unit price bid in the Proposal.

D. Correcting Faulty Grade:

1. If the trench is excavated to a faulty grade (i.e., a lower elevation than indicated), correct the faulty grade as follows:
 - a. In uniform, stable, dry soils, correct the faulty grade with granular embedment material thoroughly compacted to 95 percent of the maximum density measured in accordance with ASTM D4253.

- b. In soft, spongy, disintegrated soils, or where necessary to allow proper drainage, correct the faulty grade with coarse gravel compacted to 95 percent of the maximum density measured in accordance with ASTM D4253.
 - c. The cost of materials, labor, equipment, or incidentals required to correct faulty grade is the responsibility of the Installation Contractor.
- E. Pipe Clearance in Rock: Remove ledge rock, rock fragments, or unyielding shale or marl to provide a clearance of at least 6 inches below all parts of the pipe, valves, or fittings. Provide adequate clearance at bell holes for properly jointing pipe laid in rock trenches. Refill the excavation to grade with granular embedment material.
- F. Blasting Procedure: Blasting is not allowed.
- G. Bell Holes Required:
 - 1. Bell holes of ample dimension shall be provided at each pipe joint to permit proper jointing, visual inspection, and to allow the pipe to rest on the full length of the barrel.
 - 2. Pipe with field-applied exterior coatings shall have the bell holes excavated to sufficient depth to allow proper cleaning, application, testing, and inspection of the field-applied coating system.
- H. Care of Surface Material for Reuse: Surface materials suitable for reuse in restoring the excavated surface, such as topsoil in its natural state, shall be kept separate from the general excavation material. The top 12 inches of the trench backfill shall be considered topsoil. Save the topsoil to be used as backfill for the top 12 inches of the trench after pipe laying.
- I. Piling Excavated Material: Place excavated material so that Work is not endangered or interfering with public traffic. Do not place excavated material over buried pipelines or existing utilities unless adequate provisions are made to protect those pipelines and/or utilities. Roads and driveways must be kept open in every case. Keep drainage channels clear of obstructions or make other satisfactory provisions for drainage.
- J. Trenching by Machine or by Hand: The use of trench digging machinery is approved except in places where operations will cause damage to existing structures above or below ground, in which case employ hand methods.
- K. Open Trench:
 - 1. The Owner's representative shall have the right to limit the amount of trench that may be opened or partially opened at any time in advance of the completed line.
 - 2. Not more than 500 feet of trench shall be opened through open country or pasture land at any one time; and not more than 150 feet of trench shall be left open through populated areas, unless permitted in writing by the Owner.
 - 3. Backfill and/or protect trenches as necessary to prevent injury to livestock, adjacent property, and the public.
 - 4. Trenches left open at night shall be fenced with adequate construction fencing. No trenches in streets or populated areas shall be left open at night.
- L. Structural Excavation: Excavation shall extend a sufficient distance from walls and footings to allow for form installation and inspection, except where concrete for walls and footings is

authorized or required to be deposited directly against excavated surfaces. Where excavation is made below the elevation specified or directed by the Engineer, restore the excavation to the proper elevation with lean concrete or other approved material, at no additional cost to the Owner.

3.02 BACKFILLING OF TRENCHES OUTSIDE ROADWAYS

- A. Trenches outside roadways indicate anywhere the trench is located in open fields, unimproved alleys, and other similar open areas, except public and private roadways.
- B. Time of Backfilling: Backfill operations shall immediately follow pipe jointing, joint coating application, and curing.
- C. Braced and Sheeted Trenches: Remove sheeting and shoring as backfilling operations progress. Incorporate methods so a good bond is obtained between the backfill material and the undisturbed trench walls.
- D. Protection of Pipe during Backfilling Operations: Take the necessary precautions to protect the pipe during backfilling operations. Take care to prevent damage to the pipe or to the pipe coating, and repair any damaged pipe before backfilling. Backfill the trench to prevent excessive pipe deformation or deflection. Use methods such as stulling or ellipsing as necessary.
- E. Site Preparation: In addition to clearing and grubbing of brush and trees along the right of way for this Project, alteration to the topography shall be done, if indicated on the Drawings, at the locations and to the extent shown.
- F. Backfill Procedure Above Pipe Zone: Mechanical compaction shall be utilized. Place the ordinary material above the pipe zone in lifts not exceeding 12 inches loose-depth and compact to 95 percent standard proctor density, tested per ASTM D698. The Installation Contractor shall be responsible for any damage that may occur to the pipe using this method of compaction.
- G. Surface Material Replacement:
 - 1. The top 12 inches, or equal amount to adjacent land top soil, of the trench backfill shall be composed of the original surface material or topsoil excavated from the trench. Place the topsoil over the consolidated trench backfill material and neatly round over the trench to a sufficient height to allow settlement to grade after consolidation. Grade the surface to allow drainage in the same manner as existed prior to construction.
 - 2. Top soil shall not contain rocks or clods larger than those adjacent to the trench in the undisturbed condition.
- H. Backfill Around Utilities:
 - 1. When crossing an existing utility with the pipeline, take care to protect existing utility during pipe installation and backfilling procedures.
 - 2. For utilities smaller than 24 inches in diameter, the pipe zone shall be extended to 6 inches above the existing utility. Backfill in accordance with the applicable procedures above.

3. For utilities 24 inches in diameter and larger, the pipe zone shall be extended to 6 inches above the existing utility. Backfill pipe zone with CLSM in accordance with the procedure for depth of cover over 15-feet, regardless of actual depth.
 4. If in the opinion of the Engineer, concrete backfill is necessary for the support of utility lines crossing trenches, then 2000 psi concrete backfill shall be used. Payment shall then be made to the Installation Contractor at the unit price bid for the installation of such quantity of the concrete backfill.
- I. Backfill Around Structures:
1. After completion of foundations, walls, etc., remove forms and clean excavation of debris or other objectionable matter prior to placing backfill.
 2. In areas where structures, such as slabs or pipes, are to be constructed on backfill, backfill shall be lean concrete or granular backfill as indicated on the Drawings. Thoroughly compact the backfill. Granular backfill shall be compacted to a minimum of 95 percent maximum density as measured by ASTM D4253.
 3. Place select backfill in layers not to exceed 8 inches loose depth. Higher lifts may be allowed with the approval of the Engineer and must be placed in accordance with the manufacturer's recommendations for large mechanical tampers. Mechanically tamp select backfill around and over structures.
 4. Bring material to within 2 percent of optimum moisture content and compact each layer to a uniform density of not less than 95 percent standard proctor density per ASTM D698. Laboratory control shall be used to secure compliance with this requirement.
- J. Trench Test Section for Verification of Compacting
1. Inspection and Test Pits: The Installation Contractor will provide a testing laboratory capable of performing a full range of testing procedures complying with the testing procedures specified. The testing laboratory shall provide certified technicians that are trained and knowledgeable in in-trench nuclear density testing, sand cone method, concrete sampling and testing, and ASTM D698 and ASTM D1557 proctors at a minimum.
 2. Testing Frequency:
 - a. Soils Testing: Installation Contractor shall pothole every 1000 feet and provide grab samples from pipe level to Owner-provided testing laboratory for materials testing and proctors.
 - b. Installation Contractor-provided testing laboratory will take a minimum of three in-trench, pipe zone, nuclear density tests every 150 feet of installed pipe in populated areas and every 250 feet in unpopulated areas or pastureland. If less than 150 feet of pipe is installed in 1 day, the Installation Contractor shall perform the minimum number of three tests per day.
 - c. Installation Contractor-provided testing laboratory will take a minimum of three nuclear density tests above the pipe zone for every 150 feet of installed pipe in populated areas and every 250 feet in unpopulated areas, pastureland, or cultivated fields.

- d. Installation Contractor-provided testing laboratory will take a minimum of three in-trench, pipe zone, nuclear density tests, and a minimum of three above pipe zone nuclear density test, at all open-cut road crossings.
 - e. Field record drawings shall be updated with test locations in the profile.
 - f. Laboratory test results shall be submitted with monthly pay requests. Pipe installation without passing tests and/or record drawing updates will not be considered for payment.
 - g. Installation Contractor is required to make its site available to the testing laboratory and to assist with and coordinate testing activities with its work.
3. Excavate test pits after the backfill has been placed and compacted in the pipe zone for taking field density tests and inspecting the haunch areas under the pipe for voids.
 4. Excavate the test pits to a depth and area of sufficient size to allow the inspector to visually inspect the haunch area of the pipe for voids or loose material next to the pipe, and to perform a field density test. Provide a trench safety shield to protect the inspector while in the pit.
 5. After inspection, backfill and compact the test pit area in accordance with the Specification.
 6. Dig one test pit for inspection and testing of each day's work if deemed necessary as determined by the Owner's representative. Repair and replace areas that are found not to be in compliance with the Specification requirements, until satisfactory results are consistently and uniformly attained.
 7. Special care should be taken by the Installation Contractor to ensure the backfill material flows under the pipe haunches. The Installation Contractor's method and procedures used to accomplish this will be observed to confirm that adequate results are being achieved. This may require the removal of pipe joints to observe the results and perform density tests. Pipe laying shall not begin until satisfactory results are achieved by the Installation Contractor's proposed method.

3.03 BACKFILL PROCEDURE FOR PUBLIC AND PRIVATE ROADS

- A. Place CLSM backfill within the pipe zone beneath flexible base, chip seal, and asphalt roads and all driveways. Place granular embedment compacted to 95 percent of maximum density per ASTM D698 beneath concrete roadways.
- B. Place and compact granular backfill material above the pipe zone to a minimum of 95 percent of maximum density per ASTM D698 for City and County roads, paved or improved private roads, driveways, sidewalks, parking lots, and any proposed roads as indicated.
- C. Test compacted material per ASTM D1556 and ASTM D6938.

3.04 MAINTENANCE OF SURFACES

- A. Rock and Organic Material Exclusion: Rock and organic material removed from the trench excavated material shall be removed from the right of way at the Installation Contractor's expense.

- B. Deficiency of Backfill: Any deficiency in the quantity of material for backfilling the trenches, or for filling depressions caused by settlement, shall be supplied by the Installation Contractor. Make-up material shall be approved by the Owner's representative.
- C. Restoration of Surfaces: Replace surface material and restore paving, curbing, sidewalks, gutters, shrubbery, fences, grass or turf, and other surfaces disturbed, to a condition equal to that before the Work began. Provide seeding as requested by the Owner or its representative.
- D. Seeding: Provide seeding in TxDOT rights-of-way and all areas where disturbed by construction. Seeding shall be in accordance with Section 32 92 13 "Hydro-Mulching."

3.05 CLEAN AND ADJUST

- A. Remove surplus pipeline materials, tools, rubbish, and temporary structures, and leave the construction site clean, to the satisfaction of the Engineer. Grade the surface and re-establish drainage. Remove rock and other excess excavated material, and grade and level the right of way surface to a presentable appearance, no further than 2500 feet behind the backfilling operations. The Installation Contractor shall be responsible for location of disposal sites for excess material. No additional payment will be made for expenses incurred in such disposal.

END OF SECTION

31 32 19.15 GEOTEXTILE

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install geotextile. Use geotextile to provide for the following applications:
 - 1. Drainage/Filtration: For lining trenches, pavement edge drains, interceptor drains or blanket drains in subsurface drainage applications.
 - 2. Protection/Erosion Protection:
 - a. Under bedding stone or riprap along channels, shores and waterways.

1.02 QUALITY ASSURANCE

- A. Design Criteria:
 - 1. The geotextile fabric shall be inert to commonly encountered chemicals, hydrocarbons, mildew and rot resistant, resistant to ultraviolet light exposure, insect and rodent resistant, and conform to the properties in the following table.
 - 2. The minimum average roll value (MARV) in the weakest principle direction for strength properties of any individual roll tested from the manufacturing lot or lots of a particular shipment shall be in excess of the minimum average roll value (MARV) in the weakest principle direction stipulated herein.

Geotextile			
Property	Test Method	Units	MARV
Grab Tensile Strength	ASTM D4632-91	lb.	180
Grab Tensile Elongation	ASTM D4632-91	%	40
Trapezoid Tear Strength	ASTM D4533-91	lb.	110
CBR Puncture Strength	ASTM D6241	lb.	125
AOS	ASTM D4751-87	U.S. Standard Sieve Size	0.212
Permittivity	ASTM D4491-92	Sec-1	0.1

- B. Packing and Identification Requirements: Provide the geotextile in rolls wrapped with protective covering to protect the fabric from mud, dirt, dust, and debris. The fabric shall be free of defects or flaws which significantly affect its physical properties. Label each roll of fabric in the shipment with a number or symbol to identify that production run.
- C. Sampling and Compliance Requirements: A competent laboratory must be maintained by the producer of the fabric at the point of manufacture to ensure quality control in accordance with ASTM testing procedures. The laboratory shall maintain records of its quality control results and provide a manufacturer’s certificate upon request to the Engineer prior to shipment. The certificate shall include:
 - 1. Name of manufacturer.

2. Chemical composition.
3. Product description.
4. Statement of compliance to specification requirements.
5. Signature of legally authorized official attesting to the information required.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
1. Submit Manufacturer's certificate as stipulated in Paragraph 1.02.C.
 2. Samples.

2.00 PRODUCTS

2.01 MATERIALS

- A. Geotextile: Non-woven fabric composed of polypropylene fibers, formed into a stable network by needle punching.

3.00 EXECUTION

3.01 INSTALLATION

A. Drainage/Filtration:

1. Exposure of geotextiles to the elements between laydown and cover shall be a maximum of 14 days to minimize potential damage. Install the geotextile fabric in accordance with the Drawings and manufacturer's recommendations. Construction vehicles will not be allowed to traffic directly on the fabric. In trenches, after placing the backfill material, fold the geotextile over the top of the backfill material to produce a minimum overlap of 12 inches for trenches greater than 12 inches wide. In trenches less than 12 inches in width, the overlap shall be equal to the width of the trench. Cover geotextile with the subsequent course of backfill. Overlap successive sheets of geotextile a minimum of 12 inches in the direction of flow.
2. Where seams are required in the longitudinal trench direction, join them by either sewing or overlapping. Seams shall be subject to the approval of the Engineer. Overlap seams a minimum overlap equal to the width of the trench.
3. Repair damaged geotextile with a geotextile patch placed over the damaged area and extended 3 feet beyond the perimeter of the tear or damage.

B. Protection/Erosion Protection:

1. Exposure of geotextiles to the elements between laydown and cover shall be a maximum of 14 days to minimize damage potential. Install the geotextile fabric in accordance with the Drawings. Construction vehicles will not be allowed to traffic directly on the fabric. Place and anchor geotextile on a smooth graded surface approved by the Engineer. The geotextile shall be placed so that placement of the overlying materials will not excessively stretch or tear the fabric. Anchoring of the

terminal ends of the geotextile shall be accomplished through the use of key trenches or aprons at the crest and the toe of the slope. Successive geotextile sheets shall be overlapped so that the upstream sheet is placed over the downstream sheet and/or upslope over downslope. In underwater applications, the geotextile and required thickness of backfill material shall be placed the same day. The geotextile shall be placed so that placement of the overlying materials will not excessively stretch or tear the fabric. Overlaps when necessary shall be 12 inches minimum except when placed under water where the overlap shall be a minimum of 36 inches. Use securing pins when necessary to ensure proper anchoring of the fabric, with securing pins spaced at 5- to 10-foot centers. Securing pins shall be 3/16-inch steel bars, pointed at one end and fabricated with a head to retain a steel washer having an outside diameter of not less than 1-1/2 inches. The pin length shall not be less than 19 inches. U-shaped pins or special staples shall be an acceptable option, if approved by the Engineer. Damaged geotextile shall be repaired with geotextile patch placed over the damaged area and extended 3 feet beyond the perimeter of the tear or damage.

2. The backfill placement shall begin at the toe and proceed up the slope. Back-dump the aggregate onto the fabric and spread in a uniform lift maintaining design aggregate thickness. Avoid over-stressing the soil by utilizing equipment in spreading and dumping that exerts only moderate pressures on the soil. Severe rutting at the time of placement is an indication of over-stressing the soil. Such soil over-stressing must be avoided. Increasing aggregate depths and reducing loads are two methods of reducing pressures on the soil. Fill any ruts that develop during spreading or compacting with additional aggregate rather than blading from surrounding areas.

END OF SECTION

31 37 00 ROCK RIPRAP

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment, tools and incidentals necessary to produce and place the rock riprap and gravel bedding material.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management."
- B. Certified Test Reports: soundness (ASTM C88), gradation (ASTM C136/ASTM D5519), and unit weight (ASTM C127).

1.03 STANDARDS

- A. Sampling and testing of material shall comply with the latest revision of the following except where specifically modified:
 - 1. ASTM International (ASTM):

ASTM C88	Standard Specification for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium sulfate
ASTM C127	Standard Specification for Specific Gravity and Absorption of Coarse Aggregates
ASTM C136	Standard Specification for Sieve Analysis of Fine and Coarse Aggregates
ASTM D5519	Standard Test Methods for Particle Size Analysis of Natural and Man-Made Riprap Materials

1.04 DELIVERY AND STORAGE; ROCK RIPRAP STOCKPILE

- A. Rock Riprap temporarily stockpiled for construction purposes shall be located in an area approved by the Owner. Rock riprap materials shall not be located so as to block or restrict equipment and vehicle access to site or impact canal flow.

2.00 PRODUCTS

2.01 MATERIALS

- A. Rock Riprap:
 - 1. Stone for rock riprap shall be durable and of a suitable quality for permanence in the structure and in the climate which it is to be used. The stone shall be free from cracks, seams, and other defects which would tend to increase unduly its deterioration from natural causes and shall be reasonably well graded between the prescribed limits as specified herein.

2. Except as otherwise specified, the rock fragments shall be angular to subrounded. The least dimension of an individual stone fragment shall be not less than one-third the greatest dimension of the stone.
3. Rock riprap shall have a minimum unit weight of 145 pounds per solid cubic foot based upon the bulk specific gravity (saturated surface dry) when tested in accordance with ASTM C127. A minimum of one bulk specific gravity (saturated surface dry) shall be performed on rock riprap material delivered to the Site.
4. Rock riprap shall have a loss of less than 18 percent after five cycles when tested for soundness in magnesium sulfate in accordance with ASTM C88. A minimum of one soundness-in-magnesium sulfate test shall be performed on rock riprap material delivered to the Site.
5. Rock Riprap gradation shall be as shown on the Drawings. Acceptance of rock riprap material shall be based upon in-place gradations.

2.02 MANUFACTURED PRODUCTS

- A. Geotextile Fabric: Geotextile fabric shall be as specified in Section 31 32 19.15 "Geotextile."

3.00 EXECUTION

3.01 FOUNDATION PREPARATION

- A. Trim and dress areas on which rock riprap are to be placed to conform to cross-sections shown on the Drawings within an allowable tolerance of plus or minus 2 inches from the slope lines and grades shown on the Drawings. Where such areas are below the allowable minus tolerance limit, bring areas to grade with compacted fill similar to the adjacent material in accordance with Section 31 23 23.16 "Compacted Earth Fill" or with well compacted gravel bedding material.

3.02 GEOTEXTILE FABRIC

- A. Store and place fabric as specified by the manufacturer. Place the geotextile fabric after the foundation is prepared and cover immediately with gravel bedding material.
- B. Place fabric with the length running up and down the slope unless otherwise approved. The geotextile shall be placed so that placement of the overlying materials will not excessively stretch or tear the fabric. Anchoring of the terminal ends of the geotextile shall be accomplished through the use of key trenches or aprons at the crest and the toe of the slope.
- C. Make a minimum 24-inch lap on all joints. Secure fabric with nails or pins. Use nails at least 2 inches long with washers or U-shaped pins with legs at least 9 inches long. Space nails or pins at a maximum of 10 feet in each direction and 5 feet along the seams. Alternative anchor spacing may be used when approved.
- D. Construction vehicles will not be allowed to traffic directly on the fabric. Damaged geotextile shall be repaired with geotextile patch placed over the damaged area and extended 3 feet beyond the perimeter of the tear or damage.

3.03 ROCK RIPRAP PLACEMENT

- A. Place stone for rock riprap on the gravel bedding in such manner as to produce a reasonably well-graded mass of rock with the minimum practicable percentage of voids, and construct within the specified tolerance to the lines and grades shown on the Drawings or staked in the field. A tolerance of plus 6 or minus 0 inches from the slope lines and grades shown on the Drawings shall be allowed in the finished surface of the rock riprap. Place rock riprap to its full course thickness at one operation and in such a manner as to avoid displacing the gravel bedding material. Distribute the larger stones evenly and conform the entire mass of stones in their final position to the specified gradation.
- B. The finished rock riprap shall be free from objectionable pockets of small stones and clusters of larger stones. Place rock riprap loads along horizontal rows and progress up the slope. Place each load against previously placed rock riprap. Placing rock riprap in layers shall not be permitted. Placing rock riprap by dumping from top of slope, dumping into chutes, or by similar methods likely to cause segregation of the various sizes shall not be permitted. The desired distribution of the various sizes of stones throughout the mass shall be obtained by methods of placement which produces the specified results. Rearrange individual stones by mechanical equipment or by hand to the extent necessary to obtain a reasonably well graded distribution of stone sizes. Maintain the rock riprap protection until accepted and replace any material displaced by any cause to the lines and grades shown on the Drawings.
- C. Rock riprap shall be placed in a manner to prevent damage to structures. Hand placing is required as necessary to prevent damage to any new and existing structures.

3.04 FIELD QUALITY CONTROL TESTING

- A. Contractor shall be responsible for providing all testing, including gradation, unit weight, and soundness tests, for the Owner's review of the rock riprap and gravel bedding source prior to approval of the rock riprap for use. Owner will be responsible for the gradation testing of materials in place to determine compliance with the requirements of the Contract Documents. Gradation testing of the rock riprap and gravel bedding materials shall be timed such that each test represents no greater than 1/3 of the material placed. The in-place gradation will be taken using rock riprap and gravel bedding material within a 10-foot by 10-foot square area designated by the Engineer. Contractor shall provide labor and equipment (excluding weight scales and dimension gages) to remove and transport the rock riprap and gravel bedding materials to a suitable site for testing. Contractor shall bear all costs, including additional testing, of the correction of materials which fail to meet the requirements of the Contract Documents.

END OF SECTION



Division 32 – Exterior Improvements

32 01 29 ASPHALT PAVING REPAIR

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to repair and resurface pavement. This section shall govern for the repair or replacement of pavement or other improved surfaces damaged or destroyed in performing the construction of water and sewer lines. Construction of such projects below pavement subgrade is covered by Section 31 23 33.16 "Trenching and Backfill."

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
 - 1. Proposed material list and sources as Record Data.
 - 2. Experience record of proposed paving subcontractor as Record Data.

1.03 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. Texas Department of Transportation (TXDOT), Standard Specifications for Construction of Highways, Streets, and Bridges, latest edition.

1.04 JOB CONDITIONS

- A. Do not place materials when, in the opinion of the Owner's Representative, weather conditions are unsuitable. Do not place concrete when the temperature is 40 F and falling. Concrete may be placed when temperature is above 35 F and rising. Do not place asphalt or asphaltic concrete when the temperature is below 50 F and falling. Asphalt or asphaltic concrete may be placed when temperature is above 40 F and rising.

2.00 PRODUCTS

2.01 MATERIALS

- A. Asphalt Pavement:
 - 1. Hot Mix Asphaltic Concrete:
 - a. HMAC Surface Course: Conforming to TXDOT Standard Specifications, Item 340, Type D.
 - b. Asphaltic Materials Used in the Mix: Conforming to TXDOT Standard Specifications, Item 300. The grade of asphalt shall be AC-10. Other grades of asphalt will be considered if weather conditions or mix design appear to warrant a change.
 - c. Aggregate: Conforming to TXDOT Standard Specification, Item 340.2.

- d. Prime Coat: Conforming to TXDOT Standard Specifications, Item 300, Grade MC-30, or an appropriate asphalt emulsion.
 - e. Tack Coat: Cut-back asphalt RC-250 or MC-30 conforming to TXDOT Standard Specification, Item 300 unless otherwise approved by the Owner's Representative.
2. Two-Course Surface Treatment: Conforming to TXDOT Standard Specifications, Item 316. Asphaltic materials shall conform to TXDOT Standard Specifications, Item 300, AC-10 for hot weather and AC-5 for cooler weather. Aggregates shall conform to TXDOT Standard Specifications, Item 302. First course shall be Grade 1 and second course shall be Grade 2 (TXDOT Table 2 Aggregate Gradation Requirements).
 3. Flexible Base: Of the depth and to the extent shown on the plans. Unless otherwise shown on plans, flexible base shall be one or more of the following listed options:
 - a. Flexible Base Material: Conforming to TXDOT Standard Specifications, Item 247, Type A, B, C, or D, Grade 1 or Grade 2.
 - b. Full Depth Asphaltic Concrete: Conforming to TXDOT Standard Specifications, Item 340, Type A (Coarse Base), B (Fine Base), or C (Coarse Surface).

3.00 EXECUTION

3.01 PREPARATION

- A. Asphalt Pavement: Cut paved surface in parallel straight lines outside trench walls prior to trench excavation. Before pavement replacement has begun, make additional straight line cuts and remove pavement a minimum of 1 foot outside trench walls.
- B. Subgrade: The subgrade, including granular trench backfill, shall be approved by the Owner's Representative before any base or pavement surface is replaced. Moisten, reshape, and re-compact subgrade as necessary to receive the base material.

3.02 INSTALLATION

- A. Flexible Base:
 1. Where the base course exceeds 6 inches in thickness, construct the flexible base in two or more courses of equal thickness. Wet, manipulate, and compact material to 95 percent maximum density as determined by ASTM D698. Where deemed necessary by the Owner's Representative, apply a uniform application of prime coat asphaltic material to the surface of the prepared subgrade, applied at a rate of not less than 0.30 gallon per square yard of surface.
 2. Where plant mix asphalt material is used for base, construction shall be in accordance with TXDOT Standard Specifications, Item 351, as applicable to small areas.
- B. Asphalt Pavement Replacement:
 1. Hot Mix Asphaltic Concrete: Apply prime coat to base or tack coat base as indicated. Coat contact surfaces of pavement edges and structures with asphalt before any pavement is placed. Do not place pavement until the Owner's Representative has approved the base. Hauling or transporting of the material to the project site, placing, compaction, and shaping shall be in accordance with TXDOT Standard Specification Item

340.6 as applicable for small areas. After final compaction of the pavement, no vehicular traffic of any kind shall be permitted until the pavement has cooled and hardened for at least 6 hours. Smooth the finished surface course, upon completion of final rolling true to grade and cross-section. Immediately correct low or defective areas by cutting out the faulty areas and replacing with fresh, hot mixture. Compact the area to conform to the remainder of the pavement.

2. Two-Course Asphalt Surface Treatment: On the approved surface of the finished base, asphalt at the rate of 0.20 to 0.30 gallons per square yard shall be applied by an approved distributor so operated to result in a uniform, proper distribution at the correct temperature. Immediately cover the surface with No. 1 aggregate, distribute at a rate of one cubic yard per 80 square yards, broom as necessary for uniform distribution, and roll with a flat wheel roller of ample weight. Make a second application of asphalt in the manner specified for the first application, at a rate of 0.30 to 0.40 gallon per square yard. Make the second application with No. 2 aggregate at a rate of one cubic yard per 110 square yards and process as specified for the first application. After the work has been completed, there should be a slight excess of aggregate on the surface.
- C. Other Improved Surfaces: Where water, storm drains, or sewer lines to be constructed traverse or cross through gravel surfaced public roads or shoulders, or private dirt or gravel driveways or parking areas, replace the surface with a quality material, workmanship and at a thickness at least equal to the existing surfaces.

END OF SECTION

32 91 19.13 TOPSOIL PLACEMENT AND GRADING

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to place topsoil, free from rock and foreign material in areas designated to receive sodding or seeding.

2.00 PRODUCTS

2.01 TOPSOIL

- A. General: The topsoil shall be fertile loam, easily cultivated and free from objectionable material, and shall have a relatively high erosion resistance and be readily able to support the growth of the planting, seeding, or sodding specified on the plans.
- B. Sources:
 - 1. The topsoil may be obtained from the right-of-way at sites of proposed excavation, or it may be obtained from sources outside the right-of-way, secured by the Contractor, and meeting the approval of the Engineer.
 - 2. Topsoil required in addition to salvaged topsoil from the project shall be secured from approved off-site borrow sources. Excavated material from construction which is suitable for topsoil shall be salvaged and used before any topsoil is obtained from borrow source.

3.00 EXECUTION

3.01 INSTALLATION

- A. Stockpile topsoil material at locations approved by the Owner's Representative. Remove any trash, wood, brush, stumps or other objectionable materials prior to placement. The source and stockpile areas shall be kept drained and in a neat and presentable condition. Place and spread topsoil to a uniform depth to provide 6-inch compacted depth, while maintaining drainage in areas to be seeded or sodded.

END OF SECTION

32 92 13 HYDRO-MULCHING

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, material, equipment and incidentals necessary to prepare the ground, furnish and install fertilizer and hydro-mulching seed or a mixture of seed of the kind specified in areas disturbed by the construction operations.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 “Document Management” and shall include:
 - 1. Texas Testing Seed Label.
 - 2. Specification of fertilizer to be used.

1.03 STANDARDS

- A. The applicable provision of the following standard shall apply as if written here in its entirety:
 - 1. Texas Seed Law.

1.04 GUARANTEES

- A. Contractor shall fertilize and reseed any area which fails to survive for a period of 1 year from the date the project is accepted by the Owner.

2.00 PRODUCTS

2.01 MATERIALS

- A. General: Seed used must carry a Texas Testing Seed label showing purity and germination, name, type of seed, and that the seed meets all requirements of the Texas Seed Law. Seed furnished shall be of the previous season’s crop and the date of analysis shown on each tag shall be within 9 months of the time of delivery to the Project. Each variety of seed shall be furnished and delivered in separate bags or containers.
- B. Seed: The specified seed shall equal or exceed the following percentages of purity and germination:

Common Name	Purity	Germination
Common Bermuda Grass	95%	90%
Gulf Coast Annual Rye	95%	90%

- C. Mulch: The mulch shall be natural cellulose fiber mulch produced from grinding clean, whole wood chips, or fiber produced from ground newsprint with a labeled ash content not to exceed 7 percent. The mulch shall be designed for use in conventional mechanical

planting, hydraulic planting of seed or hydraulic mulching of grass seed, either alone or with fertilizers and other additives. The mulch shall be such that, when applied, the material shall form a strong, moisture-retaining mat without the need of an asphalt binder.

- D. Fertilizer: Pelleted or granulated type fertilizer of the composition for the season of the year at which applied shall be used:
 - 1. Early season (April 1-June 1) 21-0-0.
 - 2. Normal season (June 1-Sept 1) 10-10-5.
 - 3. Late season (Sept 1-Nov 1) 6-12-12.

3.00 EXECUTION

3.01 PREPARATION

- A. After the areas disturbed by construction operations have been backfilled and completed to the original pre-construction lines and grades shown on the Drawings and as provided for in other items of this Contract, perform hydro-mulch seeding in accordance with the requirements hereinafter described.

3.02 INSTALLATION

- A. Cultivation: Cultivate areas to be seeded to a depth of at least 4 inches. Cultivate the seedbed sufficiently to reduce the soil to a state of good tilth when the soil particles on the surface are small enough and lie closely enough together to prevent the seed from being covered too deep for optimum germination. Cultivation of seedbed will not be required in loose sand where depth of sand is 4 inches or more. Maintain the cross-section previously established throughout the process of cultivation and any necessary reshaping shall be done prior to any planting of seed.
- B. Planting Season and Application Rates: Perform planting between the dates specified for each type except when specifically authorized in writing. The seeds planted per acre shall be of the type specified with the mixture, rate, and planting dates as follows:
 - 1. Common Bermuda Grass - hulled, 20 pounds per acre - February through August; or
 - 2. Combination of Common Bermuda Grass - unhulled, 15 pounds per acre and Gulf Coast Annual Rye - unhulled, 15 pounds per acre - August through February.
 - 3. Apply fertilizer uniformly at the average rate of 400 pounds per acre.
- C. Hydro-Mulch (Cellulose Fiber) Seeding: Uniformly distribute the fertilizer, seed or seed mixture, in the quantity specified over the areas to be seeded. Mechanical equipment shall be such that all varieties of seed as well as fertilizer may be distributed at the same time, provided that each component is uniformly applied at the specified rate. When seed and fertilizer are to be distributed as a water-slurry, apply the mixture to that area to be seeded within 30 minutes after all components are placed in the equipment. Upon completion of planting the seed, spread cellulose fiber mulch uniformly over the area at the following rates:
 - 1. Sandy soils with 3:1 slope or less: Min. 2000 lb. per acre.
 - 2. Sandy soils with greater than 3:1 slope: Min. 2300 lb. per acre.

3. Clay soils with 3:1 slope or less: Min. 2500 lb. per acre.
 4. Clay soils with greater than 3:1 slope: Min. 3000 lb. per acre.
 5. The rates are given in dry weight of mulch per acre. A mulching machine, approved by the Owner's representative, shall be equipped to eject the thoroughly wet mulch material at a uniform rate to provide the mulch coverage specified.
- D. Maintenance:
1. Water the planted area at such times as necessary for a period of 1 year after final acceptance of the Project by the Owner or until seeding is accepted per Paragraph 3.02.D.3.
 2. Fertilize and reseed any area which fails to survive for a period of 1 year from the date the Project is accepted by the Owner or until seeding is accepted per Paragraph 3.02.D.3.
 3. Disturbed areas with slopes less than or equal to 4:1 slopes will be accepted when there is a minimum of 70 percent established coverage. Any slopes or grades exceeding a 4:1 must have a minimum of 90 percent established coverage to be accepted.

END OF SECTION



Division 33 - Utilities

33 05 23.33 PIPELINE CROSSING

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, equipment, materials, and incidentals necessary to directly install jacking pipe by tunnel or trenchless construction methods as specified herein. This Section sets forth the requirements for construction and installation of jacking pipe by pipe jacking methods utilizing a pipe jacking shield. For construction and installation of jacking pipe by microtunneling, please refer to the additional requirements in Section 33 30 00 "Microtunneling." Jacking pipe shall be fiberglass reinforced pipe in accordance with Section 33 31 13.13 "Fiberglass (Glass-Fiber Reinforced Thermosetting-Resin) Pipe."

1.02 QUALITY ASSURANCE

A. Qualifications:

1. Tunnel or Trenchless Contractor: Unless specified otherwise, tunnel or trenchless construction shall be performed by a competent, experienced contractor or subcontractor. The tunnel or trenchless contractor or subcontractor shall have a satisfactory experience record of at least 5 years engaged in similar work and shall demonstrate successful completion of at least three previous projects within the last 5 years using tunnel or trenchless methods similar to those proposed involving installation of similar jacking pipe materials with equal to or greater diameter as that proposed and in similar ground conditions anticipated for this Project.
- B. Performance Requirements: Horizontal or vertical variation in the final position of the jacking pipe from the proposed line and grade shall be permitted only to the extent of the tolerances provided herein, provided that such variation shall be regular and only in the direction that will not detrimentally affect the installation or intended function of the jacking pipe in the opinion of the Engineer.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
1. Copies of permit(s) as required herein for construction of the pipeline crossing, if required to be obtained by the Contractor.
 2. Qualifications for the Contractor or subcontractor who is performing the tunnel or trenchless construction as required by Paragraph 1.02.A.
 3. Pipeline Crossing Work Plan, which shall include, but not be limited to the following:
 - a. Site layout plan, including a plan view of the Contractor's proposed operations, including but not limited to dimensions of the pit excavations, dimensions of equipment to be utilized, location where excavated materials will be placed, location of where jacking pipe will be stored prior to installation, etc.
 - b. Product data, description of, and operation manual for the pipe jacking shield and other pipe jacking equipment proposed to be used. Include capacity, number, and

- arrangement of hydraulic jacks as applicable. Provide details of thrust ring, jacking controls, and pressure gages as applicable.
- c. Means and methods to control of line and grade of equipment.
 - d. Theoretical volume calculation for the proposed excavation, including an estimated bulking factor.
 - e. Description of the proposed procedures for performing tunnel or trenchless excavation, including handling and disposal of excavated materials.
 - f. Description of the proposed procedures for installation of jacking pipe, including jointing procedures for jacking pipe, as applicable.
 - g. Product Data and proposed procedures for use of pipe lubrication materials proposed for use for installation of the jacking pipe, if used.
 - h. Mix design for the proposed contact grout, including Product Data and applicable test reports for each constituent of the mix design. See also requirements of Section 33 23 24 "Contact Grouting."
 - i. Description of the proposed procedures for batching, mixing, pumping, and placement of contact grout. See also requirements of Section 33 23 24 "Contact Grouting."
4. Shop Drawings of the jacking pipe from the jacking pipe manufacturer, including jointing and welding requirements, lubrication/grout ports or fittings, joint details, and other items to be furnished with and fabricated for the jacking pipe. Include dimensions, tolerances, wall thicknesses, material properties and strength, and other pertinent information. Shop Drawings shall include calculations for the design of the jacking pipe, including calculations for the anticipated jacking forces along the full length of the jacking pipe installation and the maximum allowable jacking force that may be applied to the jacking pipe without damage. Calculations shall be performed by a professional engineer licensed in the State of Texas and retained by the Contractor. Calculations associated with the jacking pipe are to be submitted for record purposes only and will not be reviewed by the Engineer. See also requirements of Section 33 31 13.13 "Fiberglass (Glass-Fiber Reinforced Thermosetting-Resin) Pipe."
 5. Daily reports, to be submitted no more than 12 hours after the end of each shift, including, but not limited to the following:
 - a. Name of crew members and their classification, number of hours worked, quantity of materials installed or used, and a summary of the work activities, regardless of the amount of progress made.
 - b. Starting and ending station of excavation face and limits of installation of jacking pipe completed.
 - c. Torque, jacking pressures, and other parameters measured by the excavation equipment as applicable.
 - d. Type and quantity of material excavated and removed compared to the theoretical volume.

6. As-built documentation, to be submitted no more than 1 week after completion of jacking pipe installation, which shall include, but not be limited to the following:
 - a. Name of Contractor and subcontractor, if applicable, and contact information.
 - b. Date of completion of installation.
 - c. Summary of type, size, and dimensions of jacking pipe.
 - d. Summary of project survey information.
 - e. Plan and profile drawing, including theoretical alignment, actual installed alignment, survey benchmarks, and other pertinent information such as adjacent structures or facilities.
7. Contingency plan that includes corrective actions to be taken in the event of excessive ground movement (settlement or heave), excessive deviation from line and grade, slower than anticipated progress, stuck excavation equipment, damage to an existing utility, encountering greater than anticipated groundwater inflows, etc.

1.04 STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO):

AASHTO	Standard Specifications for Highway Bridges
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- B. American Railway Engineering and Maintenance-of-Way Association (AREMA):

AREMA	Manual for Railway Engineering
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- C. American Society of Civil Engineers (ASCE):

ASCE MOP 106	Manual of Practice [for] Horizontal Auger Boring Projects
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- D. National Utility Contractors Association (NUCA)

NUCA	Trenchless Construction and New Installation Methods Manual (Trenchless Manual)
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- E. North American Society of Trenchless Technology (NASTT)

NASTT	New Installation Methods Good Practices Guidelines
NASTT	Pipe Jacking Good Practices Guidelines

- F. Railroad Crossing Standards:

UPRR CMSR	Union Pacific Railroad Company Contractor Minimum Safety Requirements
UPRR PPM	Union Pacific Railroad Company Public Projects Manual

- G. Highway or Roadway Crossing Standards:

TxDOT	Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, Item 476, Jacking, Boring, or Tunneling Pipe or Box
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1.05 JOB CONDITIONS; PERMITS AND EASEMENT REQUIREMENTS

- A. Contractor shall obtain and comply with licenses, agreements, and/or permits from the Union Pacific Railroad Company as described or referenced herein.
- B. Contractor shall comply with instructions and requirements of the Union Pacific Railroad Company; laws, regulations, and rules of the Federal Railroad Administration (FRA) and Federal Energy Regulatory Commission (FERC); and standards and guidelines of the American Railway Engineering and Maintenance-of-Way Association (AREMA) as to the methods of performing the Work and shall take all necessary precautions for the safety of the public and protection of existing infrastructure and property. Direct coordination with the Union Pacific Railroad Company and any associated third parties shall be performed by the Contractor, as required, unless otherwise instructed by the Owner or Engineer.
- C. A hard copy of approved licenses, agreements and/or permits shall be available on-site for the duration of the construction activity pertaining to the permit and as required by the applicable licenses, agreements, and/or permits.
- D. The Contractor shall comply with all of the requirements of the licenses, agreements, and/or permits from the Union Pacific Railroad Company (e.g. Pipeline Crossing Agreement). The Contractor shall not commence any work within Union Pacific Railroad Company property or right-of-way without written approval from the Union Pacific Railroad Company and any associated third parties. Contractor shall provide the required notifications to the Union Pacific Railroad Company as required by the license, agreement, and/or permit and shall comply with all safety rules and regulations and training requirements established by the Union Pacific Railroad Company. The Contractor shall ensure that all Contractor personnel maintain current safety training certifications throughout the duration of the work as required by the Union Pacific Railroad Company, including eRailSafe certification (<https://www.erailsafe.com/usa/>).
- E. The Contractor shall pay for all costs and expenses associated with inspections, flagging, and/or construction observation services, or other safety measures, provided by Union Pacific Railroad Company or third parties (e.g. RailPros Field Services) as required by Union Pacific Railroad Company, or otherwise imposed by the Union Pacific Railroad Company to fulfill the requirements of the applicable license, agreement, and/or permit. The costs and expenses may include a license fee, an agreement fee, and/or a permit fee, processing fees, or insurance fees, which are required by or for the execution of the applicable license, agreement, and/or permit; the Contractor's own costs and expenses to comply with the license, agreement, and/or permit, such as the Contractor's insurance policy costs (e.g. Contractor obtaining an insurance policy for railroad protective liability insurance); and other costs for compliance with all of the Union Pacific Railroad Company's applicable safety rules and regulations, including cost of safety training certifications. The Contractor shall directly pay all invoices in accordance with the payment terms as described in the applicable license, agreement, and/or permit.
- F. In the event of an emergency, the Contractor shall immediately contact the Union Pacific Railroad Company's Response Management Communications Center at 1-888-877-7267 to stop railroad traffic on the affected railroad track(s) at approximately Mile Post 260 in the Union Pacific Railroad Company's Lafayette Subdivision. In the event the UPRR Railway Company cannot be reached, the Contractor shall dial 911 and provide the approximate GPS coordinates of the location of the crossing (30.0916 degrees latitude, -93.7959 degrees longitude). The Contractor shall also contact the personnel listed in the applicable license, agreement, and/or permit to schedule inspectors for immediate railroad inspections. If the

contacts cannot be reached, the Contractor shall leave a voicemail and email describing the emergency situation and provide the Contractor's contact information.

- G. Construction along railroad tracks shall be performed in such a manner that construction materials and excavated material be kept off the railroad tracks at all times, as well as all operating equipment. Construction shall not interfere with the operations of the railroad tracks, unless otherwise allowed by the authority having jurisdiction.
- H. Traffic control devices, such as barricades and warning signs, and flagmen, when necessary and required by the authority having jurisdiction, shall be furnished and installed by the Contractor. All traffic control devices for highways and roadways shall comply with the Texas Manual on Uniform Traffic Control Devices (TMUTCD).
- I. Existing pipelines and other existing infrastructure are to be protected. The Contractor shall verify location and elevation of any existing pipelines and other existing infrastructure before proceeding with the construction so as to avoid damage to the existing pipelines or other existing infrastructure during construction. Verification of location and depths of existing pipelines and other existing infrastructure shall be the complete responsibility of the Contractor.

1.06 OPTIONS

- A. Jacking Pipe Material: Contractor shall use fiberglass reinforced pipe where tunnel or trenchless construction is required for installation of jacking pipe. The material specifications for jacking pipe in Section 33 31 13.13 "Fiberglass (Glass-Fiber Reinforced Thermosetting-Resin) Pipe" and as required herein are the minimum acceptable requirements. The Contractor shall be fully responsible to ensure the materials used are of sufficient strength for the installation method chosen and suitable for the soil conditions that are actually encountered.
- B. Tunnel and Trenchless Methods: Unless specified otherwise, the Contractor shall use a pipe jacking shield and other pipe jacking equipment for the installation method of jacking pipe. The Contractor shall be fully responsible to ensure the means and methods used are adequate for the protection of workers and the public. The tunnel and trenchless equipment selected by the Contractor shall be compatible with the ground and groundwater conditions presented in the Geotechnical Engineering Report for the project.

1.07 DEFINITIONS

- A. Jacking Shaft: A jacking shaft is an excavation from which tunnel or trenchless equipment is launched for the installation of a pipeline or conduit.
- B. Pipe Jacking Shield: A pipe jacking shield is a fabricated steel cylinder within which excavation is carried out either by machine or by hand to facilitate installation of jacking pipe through the performance of pipe jacking. An articulated steering section and steering jacks are incorporated into the shield to allow it to be adjusted so as to control line and grade.
- C. Pipe Jacking: Pipe jacking is a system of using hydraulic jacks from a jacking shaft to directly install pipes behind a jacking shield so that they form a continuous string of pipe in the ground.

- D. Receiving Shaft: A receiving shaft is an excavation from which tunnel or trenchless equipment is driven towards and recovered.

2.00 PRODUCTS

2.01 MATERIALS

- A. Jacking Pipe: Jacking pipe shall be fiberglass reinforced pipe in accordance with Section 33 31 13.13 "Fiberglass (Glass-Fiber Reinforced Thermosetting-Resin) Pipe."
- B. Contact grout shall be in accordance with Section 33 23 24 "Contact Grouting."

3.00 EXECUTION

3.01 GENERAL CONSTRUCTION PROCEDURES

- A. Contractor shall comply with all applicable requirements of permits as described or referenced herein, whether or not such permits were to be obtained by the Contractor.
- B. Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing as required by the Owner. Contractor shall be able to produce evidence, when required, that each item of work has been constructed properly in accordance with the Drawings and Specifications.

3.02 JACKING AND RECEIVING PITS

- A. Excavation and backfill of jacking and receiving pits shall be performed in accordance with Section 33 73 15 "Shaft Excavation" and as required by standards referenced herein.
- B. Contractor shall not perform excavation activities beyond the limits shown on the Drawings.
- C. Contractor shall keep the jacking and receiving pits free from standing water to the extent practical and shall perform dewatering as necessary.
- D. Upon completion of the Work described herein, Contractor shall restore the Site as required by the Contract Documents.

3.03 TUNNEL OR TRENCHLESS EXCAVATION

- A. Contractor shall commence excavation operations from the low or downstream end of the tunnel or trenchless crossing, unless otherwise specified or shown on the Drawings.
- B. Contractor shall perform Work in a manner that minimizes ground settlement or heave.
- C. Contractor shall furnish all equipment and all necessary temporary electrical power and water service to perform the Work described herein.
- D. Pipe jacking equipment shall be manufactured by a company that specializes in the design and fabrication of this type of equipment and has at least 5 years of experience in the design and fabrication of such equipment. The equipment shall meet the following minimum requirements:
 - 1. Capable of installing jacking pipe at the diameters and lengths required by the Drawings.
 - 2. Provide a means for controlling line and grade within the tolerances listed herein.

3. Capable of maintaining settlement or heave of the ground to limits as required herein or as otherwise acceptable to the authority having jurisdiction.
 4. Hydraulically operated and capable of installing jacking pipe in a controlled manner.
 5. Capable of providing sufficient torque and jacking loads as appropriate.
- E. Excavated materials shall be removed from the tunnel or trenchless excavation to the jacking pit and shall be disposed of properly at an off-site facility.

3.04 INSTALLATION OF JACKING PIPE BY A PIPE JACKING SHIELD AND PIPE JACKING EQUIPMENT

- A. Jacking pipe to be installed by tunnel or trenchless methods as described herein shall meet the requirements for the type of casing pipe specified herein and shall be in accordance with the Contractor's accepted submittals.
- B. Pipe jacking and use of a pipe jacking shield shall be performed in accordance with applicable provisions of ASCE MOP 106, NUCA Trenchless Manual, and NASTT Pipe Jacking Good Practices Guidelines.
- C. Contractor shall monitor the volume of material excavated and adjust rate of excavation to prevent settlement or heave of the ground.
- D. Jacking pipe shall be set on properly braced and supported guide rails in the jacking shaft prior to installation.
- E. Contractor shall not exceed the maximum allowable jacking force when jacking the pipe.
- F. Jointing of the jacking pipe shall be performed in accordance with the jacking pipe manufacturer's recommendations.
- G. Provide a means of tracking the leading edge of the jacking pipe using an electronic transmitting and receiving device.
- H. In the event a section of jacking pipe is damaged during installation, additional jacking pipe shall be advanced through the receiving pit to allow for the removal of the damaged jacking pipe. This shall be performed at no additional cost to the Owner.

3.05 INSTALLATION OF CONTACT GROUT

- A. Install contact grout in accordance with Section 33 23 24 "Contact Grouting."

3.06 CONTROL OF LINE AND GRADE

- A. Benchmarks and other survey control points shall be established by the Contractor. Accuracy of the benchmarks shall be verified prior to commencement of construction by the Contractor.
- B. The jacking pipe shall be installed to meet the following tolerances along the entire length of the tunnel or trenchless crossing. If the installation exceeds the specified tolerances herein, Contractor shall perform corrective work that is acceptable to the Engineer and at no additional cost to the Owner.
 1. Horizontal Tolerance: Plus or minus 6 inches from theoretical horizontal alignment for every 100 feet of tunnel or trenchless crossing, unless otherwise specified.

2. Vertical Tolerance: Plus or minus 2 inches from theoretical vertical alignment for every 100 feet of tunnel or trenchless crossing, unless otherwise specified.

END OF SECTION

33 13 54 GEOTECHNICAL INSTRUMENTATION AND MONITORING

1.00 GENERAL

1.01 SCOPE OF WORK

- A. Furnish the required labor, equipment, and materials for installation, monitoring, maintenance, and removal of geotechnical instrumentation for monitoring of movement of the ground surface and movement of structures and utilities adjacent to shaft excavations and associated trenchless construction. Geotechnical instrumentation and monitoring shall be performed as required by and in accordance with the Guidelines for Track & Ground Monitoring published by the Union Pacific Railroad Company.
- B. Geotechnical instrumentation includes Surface Monitoring Points (SMPs) Utility Monitoring Points (UMPs), and Piezometers (PZs).
- C. The Contractor shall perform all monitoring and surveying as required for geotechnical instrumentation. Contractor shall install additional survey benchmarks and control points as necessary.

1.02 RELATED WORK

- A. Section 33 05 23.33 "Pipeline Crossing"
- B. Section 33 23 24 "Contact Grouting"
- C. Section 33 30 00 "Microtunneling"
- D. Section 33 73 15 "Shaft Excavation"
- E. Section 33 73 16 "Groundwater and Surface Water Control"

1.03 QUALIFICATIONS

- A. Qualifications for Instrumentation Specialist: Contractor shall employ a Professional Engineer licensed in the State of Texas to supervise and direct instrument installation as specified herein and as shown on the Drawings. The Instrumentation Specialist shall have sufficient experience in furnishing, installing, monitoring, maintaining, and removing instrumentation.
- B. Qualifications for Surveyor: Contractor shall employ a Professional Land Surveyor licensed in the State of Texas with previous similar experience surveying for the detection of movement of the ground surface, structures, utilities, and other facilities. The Surveyor shall supervise and direct Contractor personnel performing readings of instrumentation as specified herein and as shown on the Drawings.

1.04 QUALITY ASSURANCE AND CONTROL

- A. All instrumentation shall be installed, and baseline readings shall be obtained no later than 14 days prior to the applicable construction activity, including, but not limited to any shaft or tunnel excavation and/or associated dewatering activities.
- B. Contractor shall provide notice to the Engineer not less than 24 hours before installing instrumentation.

- C. Instrumentation Supplier: Each type of instrument specified herein shall be the product of an acceptable manufacturer currently engaged in manufacturing instrumentation.

1.05 SUBMITTALS

- A. Pre-construction Submittals: Submit to the Engineer the following a minimum of 30 days before the scheduled start of the applicable construction activity, including, shaft or tunnel excavation and/or associated dewatering activities.
 - 1. Qualifications: Submit qualifications of the Instrumentation Specialist(s) and Surveyor(s) in accordance with Article 1.03. herein.
 - 2. Description of methods and materials for installing, maintaining, protecting, and removal of the instruments. Include instrumentation manufacturer's shop drawings, product data sheets, operating manual, installation and calibration instructions, and calibration certifications, as applicable. Also include plan for instrument locations.
 - 3. Draft of all proposed instrumentation reporting forms for recording, reducing, and presenting instrumentation readings and results in both tabular and graphical form, including both manual and/or computerized data reduction methods.
 - 4. Building and Structures Assessment: Perform a detailed pre-construction and post-construction assessment of the existing structures within 200 feet of proposed construction activities. Include photographs and/or video recording of the existing conditions, especially any imperfections or damage to existing structures in vicinity of the proposed excavations.
 - 5. Contingency Plan: Submit a Contingency Plan that defines the remedial measures to be implemented to stabilize the shaft or tunnel excavation if any geotechnical instrumentation readings meet or exceed the response values listed herein. The Contingency Plan is not to restrict the Contractor from using the best construction methods available to meet the conditions but is required to demonstrate a reasonable level of preparedness in the event of movement of ground, structures, utilities, or other facilities. The Contractor shall have appropriate labor, equipment, materials, and other items that are identified in the Contingency Plan available at all times while the shaft and tunnel excavations are open, or any associated dewatering operations are being performed. At a minimum, the Contingency Plan shall include:
 - a. Name and qualifications of personnel responsible for implementing the Contingency Plan.
 - b. Description of the scenarios where remedial measures may be required in order to stop or prevent further movement and to protect adjacent structures, utilities, or other facilities as well as a description of the remedial measures.
 - c. Listing of labor, equipment, and materials to be utilized or implemented for remedial measures described above and their availability.
 - d. Description of methods used to verify that the remedial measures were successful for each scenario.
- B. Construction Submittals: Submit to the Engineer the following items within the time restrictions specified:

1. Installation Records: Within five days of installation of each instrument, the Instrumentation Specialist shall submit drawings showing the installed location, the instrument identification number, the instrument type, the installation date and time, established elevations, initial elevations, offset and stationing, initial coordinates, and the anchor to tip elevation and instrument length, when applicable. The Instrumentation Specialist shall also furnish details of installed instruments showing all dimensions and materials used, a separate statement describing installation procedures for each instrument, and as-built drawings of each instrument including depths, lengths, elevations and dimensions of key elements. For piezometers, boring logs and piezometer logs shall be submitted if the Contractor elects to install any.
2. Initial baseline readings for all instruments.
3. Data: Provide electronic reports in Microsoft Excel format of data to the Engineer within twenty-four hours after collection of the data unless movement is observed that meets or exceeds the response values herein. If the response value is observed or exceeded, the Contractor shall notify the Engineer immediately as described herein. The data shall include the instrument identification number, location, date and time of reading, initial baseline readings, reference elevations, weather conditions and temperature at time of reading, proximity of the excavation activities to instrument location, project name, project number, and all other pertinent information, or other information as requested by the Engineer. Each data submittal shall include all current and previous readings and time history of excavation activity in both tabular and graphical form acceptable to the Engineer.
4. Calibration Records: Within five working days of performing an instrument calibration or re-calibration, submit results of the calibration to the Engineer.

1.06 SAFETY

- A. The Contractor's methods of construction shall ensure the safety of the Work, project participants, the public, third parties, and adjacent property, whether public or private. All Work shall conform to the requirements of all Federal, State, and local laws and regulations. The Contractor is solely and completely responsible for maintaining safe working conditions at the site at all times.
- B. For instruments located on the ground surface, in, adjacent to, or near active traffic lanes, appropriate precautionary traffic control and/or diversion measures shall be taken during installation, monitoring, maintaining, and removing of instruments to ensure a safe working environment.

2.00 PRODUCTS AND MATERIALS

2.01 MATERIALS

- A. Bentonite: Granular bentonite shall be Enviroplug Medium, as manufactured by Wyo-Ben, Inc., Billings, MT, or Holeplug, as manufactured by Baroid Division, Petroleum Services, Inc., Houston, TX, or acceptable equivalent.
- B. Cement Grout: Shall be Type II Portland cement and water in accordance with ASTM C150.

2.02 PRODUCTS

- A. Piezometers (PZs) are instruments used to monitor groundwater.
- B. Surface Monitoring Points (SMPs) are instruments used to monitor movement of the ground surface.
- C. Utility Monitoring Points (UMPs) are instruments used to monitor movement of existing utilities.

3.00 EXECUTION

3.01 GENERAL

- A. Instrumentation Installation: Instrumentation shall be installed by the Contractor at the locations as required by the Union Pacific Railroad Company, as shown on the Drawings, or as otherwise acceptable to the Engineer. Instruments shall be installed in accordance with the Guidelines for Track & Ground Monitoring published by the Union Pacific Railroad Company, the instrumentation schedule and details shown on the Drawings, in accordance with the manufacturer's recommendations for the respective instrument, and as described herein. The Contractor may install and monitor additional instrumentation as required by the Contractor, but installation, monitoring, and removal of such additional instrumentation shall be performed at no additional cost to the Owner. Locations of additional instrumentation shall be acceptable to the Engineer.
- B. Access: Contractor shall coordinate with the Union Pacific Railroad Company to obtain access within their property or right-of-way. Contractor shall provide and facilitate safe access to the instruments at all times for the Engineer. The Contractor shall allow and facilitate instrument monitoring by the Engineer, for up to a maximum of 30 minutes of interruption per each 8-hour shift. The Engineer may collect or check the readings at any time during construction for quality assurance purposes, but this shall not limit or shift the responsibility of the Contractor for the Work described herein.
- C. Existing Conditions: Contractor shall locate conduits and underground utilities in all areas where subsurface geotechnical instrumentation is to be installed. Contractor shall contact "Texas811" prior to any excavation activities.
- D. Identification: All instruments shall be clearly marked, labeled, and protected to avoid being obstructed or otherwise damaged by construction operations or the general public.
- E. Instrument Designation: A unique instrument identification number shall be assigned to each instrument and each point. The instrument identification number shall be clearly marked on each instrument in a permanent, legible, and nondestructive manner.
- F. Surveying: Immediately following installation, the location of all instruments shall be surveyed to provide horizontal and vertical coordinates and such data shall be provided to the Engineer. Re-surveying from control points shall be required monthly or more frequently to address potential disturbance or resolve conflicting data. Monitoring of all instruments and monitoring points shall be per the schedules provided herein.
- G. Piezometers (Existing): Existing piezometers shown on the Drawings shall be protected and monitored during construction until construction is complete or until the piezometer is removed to facilitate construction. The Contractor shall obtain authorization from the Engineer prior to removal of any existing piezometers shown on the Drawings.

- H. **Piezometers (New):** The Contractor may install and monitor additional piezometers as required by the Contractor, but installation, monitoring, and removal of such additional piezometers shall be performed at no additional cost to the Owner. Locations of additional piezometers shall be acceptable to the Engineer. Installation of additional piezometers shall be performed by a well driller licensed in the State of Texas and installations shall comply with the Administrative Rules for Water Well Drillers and Pump Installers of the Texas Department of Licensing and Regulation and the applicable rules of Groundwater Management Area 8 and the Middle Trinity Groundwater Conservation District.

3.02 MONITORING

- A. **Initial Baseline Readings:** The Contractor shall take initial baseline readings of all instruments to establish a baseline and provide the Engineer with this data, in accordance with the requirements specified herein. The initial baseline readings shall consist of at least three complete sets of separate readings of each instrument. Each separate reading at each instrument shall be taken at least 24 hours apart. The initial baseline readings shall be performed and recorded to the nearest hundredth of a foot.

- B. **Frequency:**

- 1. The Contractor shall monitor instrumentation and provide the Engineer with the data within the timeframe required herein. As a minimum, the Contractor shall adhere to the following schedule. The “Active Zone” is defined as instrumentation that is within 100 feet of active shaft excavation activities and/or within 100 feet of the face of tunnel excavation. The readings shall be performed and recorded to the nearest hundredth of a foot. Survey benchmarks or survey control points used to obtain readings shall be at least 200 feet away from locations of shaft or tunnel excavation or associated dewatering activities.

Instrument Type	Active Zone	Outside Active Zone
Surface Monitoring Points (SMPs)	Daily	Weekly
Utility Monitoring Points (UMPs)	Daily	Weekly

- 2. The Contractor shall perform additional monitoring as necessary or as directed by the Engineer to monitor movement and to ensure the safety of the Work. Additional monitoring, if required, shall be performed at no additional cost to the Owner.

- C. **Interpretation:** The Contractor shall make their own interpretations of the data for their own purposes. Data or interpretations thereof shall not be published or disclosed to other parties without advance written permission of the Engineer. The Engineer may make their own interpretations of the data available to the Contractor at the Engineer’s option.

3.03 MAINTENANCE

- A. **Damaged Installations:** Contractor shall protect the instruments from damage. Damaged installations shall be replaced as required prior to continuing excavation, unless otherwise permitted by the Engineer.

- B. Maintenance: Maintain the instruments by draining water and flushing debris from under protective covers and keeping covers locked and sealed at all times.

3.04 REMOVAL

- A. Prior to final acceptance of the Work and except as otherwise acceptable to the Engineer, the Contractor shall remove and dispose of at least the top three (3) feet of instrument or casing for all instrumentation, including piezometers previously installed by others at locations indicated on the Drawings. Any existing instrumentation that is not specifically indicated on the Drawings shall remain.
- B. Existing and any Contractor installed piezometers or dewatering wells shall be plugged by a licensed well driller in the State of Texas and plugging shall be in accordance with the Administrative Rules for Water Well Drillers and Pump Installers of the Texas Department of Licensing and Regulation and the applicable rules of the Southeast Texas Groundwater Conservation District. Contractor shall complete and submit a Plugging Report with applicable fees to the Texas Department of Licensing and Regulation as required for the plugging of such piezometers. The Contractor shall provide a copy of the Plugging Reports to the Engineer and Owner.
- C. Any surface enclosures, protective bollards, or other appurtenances associated with such instrumentation, shall be removed, and the area at and surrounding the removed instruments shall be restored to previously existing conditions by the Contractor. Contractor shall also repair or patch any pavement that is disturbed or damaged by the Work required herein.

3.05 RESPONSE VALUES

- A. The Contractor shall abide by the following Response Values, unless otherwise as required by the Guidelines for Track & Ground Monitoring published by the Union Pacific Railroad Company. The Contractor shall utilize whatever means and methods necessary to limit ground, structure, or utility movement, including, but not limited to, underpinning, compaction grouting, and/or consolidation grouting. Such means and methods shall be performed in accordance with industry accepted standards and practices.

Instrument Type	Threshold Value	Shutdown Value
Surface Monitoring Point (SMP)	0.25 Inch	0.50 Inch
Utility Monitoring Point (UMP)	0.25 Inch	0.50 Inch

- B. When a given Response Value is reached, the Contractor shall respond in accordance with the following and as required by the Guidelines for Track & Ground Monitoring published by the Union Pacific Railroad Company:
 1. Threshold Value: The Contractor shall notify and meet immediately with the Engineer to discuss the Contractor’s means and methods to determine what changes, if any, shall be made to better control movement.
 2. Shutdown Value: The Contractor shall stop all work immediately, unless in the event of an emergency, and notify the Engineer. The Contractor shall meet with the Engineer to

develop a plan of action that is acceptable to the Engineer for better control of movement before the Contractor may resume work.

- C. If movement due to excavation unacceptably damages the ground surface, structures, utilities, or other facilities, the repair and/or replacement of such shall be as required and as directed by the Owner, Engineer, and owner of such property, structure, utility, or other facility. Such repairs or replacements shall be performed by the Contractor at no additional cost to the Owner. If owner of such property, structure, utility, or other facility elects to self-perform the repair or replacement, the Contractor shall reimburse the owner of such property for such repair or replacement at no additional cost to the Owner.

END OF SECTION

33 23 24 CONTACT GROUTING

1.00 GENERAL

1.01 SOPE OF WORK

- A. The Work specified in this section includes requirements for contact grout mix designs and furnishing and injecting contact grout within the annular space between the outside face of the jacking pipe and the surrounding ground. Contact grouting shall be performed to fill all voids between the outside face of the jacking pipe and the surrounding ground resulting from trenchless construction.
- B. Related Sections:
 - 1. Section 33 05 23.33 "Pipeline Crossing"
 - 2. Section 33 13 54 "Geotechnical Instrumentation and Monitoring"
 - 3. Section 33 30 00 "Microtunneling"
 - 4. Section 33 73 16 "Groundwater and Surface Water Control"

1.02 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - 2. ASTM C144 – Standard Specification for Aggregate for Masonry Mortar
 - 3. ASTM C150 – Standard Specification for Portland Cement
 - 4. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete
 - 5. ASTM C937 – Standard Specification for Grout Fluidifier for Preplaced Aggregate Concrete

1.03 DEFINITIONS

- A. Contact Grouting: The systematic injection of grout, at low pressures, to achieve continuous contact between the outside face of the jacking pipe and the surrounding ground, including areas of over-excavation and/or panning and water drain systems. Contact grouting shall be considered incidental to trenchless construction and will not be paid for separately.
- B. Refusal: When the grout take into the grout port is measured as 0 cubic feet per minute over a continuous 1-minute period at the applicable maximum specified injection pressure.

1.04 SYSTEM DESCRIPTION (NOT USED)

1.05 DESIGN REQUIREMENTS

- A. Contact Grout:
 - 1. Minimum 24-hour compressive strength of 500 pounds per square inch (psi), 7-day compressive strength of 1,200 psi, and 28-day compressive strength of 1,500 psi.

2. Maximum Injection Pressure: 20 psi above hydrostatic pressure at the grout injection port unless otherwise required to prevent ground heave or damage facilities or structures. The jacking pipe manufacturer shall confirm the ability of the jacking pipe to accommodate the Contractor's proposed injection pressure.
3. Grout mix (water/cement) ratios shall be expressed in cubic feet of water per cubic foot of cement (94-pound bag). The range of water-cement ratios shall be between 0.75:1 and 1.5:1 by volume.
4. Grout shall consist of ASTM C150 Portland Type II cement, contain no more than 2 percent bentonite by weight of cement, fluidifier as necessary, and water in the proportions specified herein or as otherwise acceptable to the Engineer, but in no case shall the grout mix contain less than 6 sacks of cement per cubic yard of grout.
5. Sand may be added to the grout mix only in instances of very high grout takes as approved by the Engineer. The addition of sand may require the addition of fluidifier to the grout mix.
6. Any grout not placed within 2 hours of mixing shall be wasted and disposed of.

1.06 PERFORMANCE REQUIREMENTS (NOT USED)

1.07 SUBMITTALS

A. Product Data:

1. Manufacturer's product data sheets showing:
 - a. Mixing, handling, storage and waste disposal requirements.
 - b. Safety Data Sheets (SDSs) for all materials submitted and brought on site.
2. Source of supply for each component of the mix design(s).
3. For each type and source of material:
 - a. Cement: Standard physical and chemical analysis.
 - b. Admixtures: Documentation showing that the proposed admixtures have a history of demonstrable satisfactory performance.
4. Source of potable water.
5. Shop drawing of one-way valve assembly, grout injection header including shut-off valve, pressure gauges and bypass/recirculation system.

B. Working Drawings and Methods Statements:

1. Means and methods for cleaning the internal surface of the jacking pipe and disposing of wasted or excess grout.
2. Layout and description of grouting equipment and facilities for performing work, including:
 - a. Provide a Grouting Plan describing all grouting operations, including sequence of work, operations including starting location, ending location, criteria for completion of contact grouting at any port, grout mixing and pumping equipment location, access port one-way grout valve configuration and operation, and grout header

configuration and operation. Outline provisions to protect the jacking pipe from over pressurization which could lead to structural damage.

- b. Supply equipment.
- c. Drilling equipment.
- d. Agitators or holding tanks.
- e. Mixers.
- f. Pumps.
- g. Grout delivery piping and manifolds.
- h. Hookup details including valves, packers, and gauges.
- i. Proportioning and mixing grout.
- j. Measuring grout pressure and injection rate.
- k. Maintaining grout pressure not to exceed limits of jacking pipe.
- l. Sequence of grouting operations and establishing basis and threshold values for modifying mixes.
- m. Direct communication method between grout mixer operator and injection worker.

C. Mix Designs:

- 1. Details of grout mix, proportions, and admixtures; and laboratory test data verifying the strength and set time of the proposed grout mix.

D. Quality Control:

1. Qualifications:

- a. Test laboratory used for calibrating and testing accuracy of gauges and meters to be used in grouting operations.
- b. Test laboratory performing quality assurance and testing for all grout materials, test mixes and field testing.

2. Certifications:

- a. Certificates of compliance for materials specified herein.
- b. Calibration certificates for gauges and meters to be used in grouting operations.

3. Quality Control Plans:

- a. Methods for assuring uninterrupted contact grouting at pressures that do not exceed the maximum specified herein.
- b. Methods for demonstrating that grout mixes meet design criteria.

4. Recordkeeping:

- a. Cumulative records of strength tests on grout samples within 2 working days of performing tests.

- b. Shift reports for each grout crew and for each shift, regardless of actual progress made, and submitted no later than the beginning of the following working day. Include:
 - (1) Crew size, employee name, classification, and work assignment.
 - (2) Number and type of equipment used.
 - (3) List of idle or inoperative equipment and reason for downtime.
 - (4) Daily grout injection records for each grout port:
 - i. Location and orientation.
 - ii. Mix design used and any alterations.
 - iii. Time of original mix and time when injected or wasted.
 - iv. Grouting time spent on each grout port broken down by quantity injected, injection pressure, total volume and pumping rate.
 - v. Grout communication to other grout ports.
 - vi. Quantity of grout injected and pressure applied.
5. Notifications:
- a. The Contractor shall give the Engineer 24 hours of notice of his intention to perform grouting operations.
 - b. Written notification within 1 workday of any proposed addition, deletion or change to the scheduling of shift work, or mix design.
 - c. Written notification within 1 workday of performing gauge and meter tests.

1.08 QUALITY ASSURANCE

A. Acceptance Criteria:

- 1. Connecting to each and every grout port and attaining refusal.
- 2. Grout samples shall be acceptable if all production 28-day samples meet minimum 28-day strength or if the average of all production 28-day samples meet minimum 28-day strength and the weakest sample is within 10 percent of the minimum 28-day strength.

B. Testing:

- 1. Grout Strength Tests:
 - a. Prepare and test grout samples according to ASTM C39 for cylinders.
 - b. Grout for the test samples shall be taken from the nozzle of the grout injection line. Provide at least one set of three samples for each 250 cubic feet of grout injected, but not less than one set for each shift where grouting is performed.
 - c. Make nine samples for each proposed grout mix design and determine 24-hour, 7-day and 28-day strength in accordance with ASTM C39.

1.09 SEQUENCING AND SCHEDULING

- A. Contractor shall maintain any dewatering systems in accordance with Section 33 73 16 “Groundwater and Surface Water Control” during the full duration of contact grouting operations and until the minimum 24-hour compressive strength has been achieved in accordance with ASTM C39.

2.00 PRODUCTS

2.01 MATERIALS

- A. General:
 - 1. Conform to the requirements of Section 03 30 00 “Cast-in-Place Concrete” for all materials, except as modified herein.
 - 2. Admixtures may be used in the cement grout. Admixtures shall conform to ASTM C494 and shall not contain chlorides. The Engineer shall be advised of type and amount of admixture.
- B. Cement: Conforming to ASTM C150, Type II Portland cement.
- C. Bentonite:
 - 1. Bentonite shall be a high yielding sodium montmorillonite.
 - 2. Mix in accordance with manufacturer’s written recommendations.
- D. Sand: Sand to conform to ASTM C144, except:
 - 1. Fineness modulus is between 1.50 and 2.00; and
 - 2. Gradation shall meet the following grading requirements:

Table 1. Sand Gradation

Sieve Sizes	Percentage Passing by Weight
No.8	100
No. 16	95–100
No. 30	60–85
No. 50	20–50
No. 100	10–30
No. 200	0–5

- E. Fluidifiers shall be as acceptable to the Engineer.
- F. Water shall be from a potable source.

2.02 EQUIPMENT

- A. Grouting Equipment:
 - 1. Mixer:
 - a. High-speed, colloidal-type capable of providing a homogenized mix with a tangential return flow from the mixer pump.

- b. Use an appropriate system capable of delivering proposed grout mix to the mixer and pump in the tunnel where grouting is to be performed.
 - c. Size to ensure an uninterrupted supply of grout to the pump.
 - d. Provide a means of accurately measuring and metering grout ingredients, including modifying the water/cement ratio.
2. Agitator:
- a. Provide a separate agitator serving as a holding tank between the mixer and the pump.
 - b. Equip with:
 - (1) Baffles to induce turbulence.
 - (2) Rotating paddles to assure thorough mixing of the grout prior to and during injection.
3. Pumps:
- c. Helical, progressive cavity screw rotor-type (Moyno style), producing uniform flow without pulsation for pumping immediately behind the tunnel lining.
 - d. Equip with a water connection to facilitate flushing the system.
 - e. Equip with a pressure gauge and volumetric meter as specified herein.
 - f. Equip with pressure limiting device as necessary to assure that maximum injection pressure specified is not exceeded.
 - g. Recirculation pump.
4. Appurtenances:
- a. Packers: Capable of sealing grout ports without leakage when grouting at the maximum specified pressure and being removed after the grout has set. Packers shall be provided with shut-off valves.
 - b. Piping between pump and grout ports:
 - (1) Provide a manifold comprising a system of valves and pressure gauge in the line at the collar of the grout port to permit accurate control and monitoring of grouting pressure, bleeding and regulation of flow.
 - (2) Where the agitator is located in the tunnel, provide a return line from the manifold to the agitator tank to allow a constant circulation of grout and accurate regulation of grout pressures.
 - (3) Preinstalled grout pipe: Schedule 40, threaded at one end.
 - c. Piping between batch plant and tunnel agitator:
 - (1) The grouting equipment shall be provided with a meter at the point of placement. The meter shall be calibrated in cubic feet to the nearest 0.1 of a cubic foot.
 - (2) The grouting equipment shall be provided with a pressure gauge at the point of placement. The pressure gauge shall be accurate to ± 1 psi over allowable

grouting pressure range.

- (3) Equip with a return/recirculation line from grout injection valve to the agitator or mixer tank.

2.03 MIXES

- A. Use neat cement grout mixes.
- B. Fluidifiers shall hold the solid constituents of the grout in colloidal suspension, be compatible with the cement and water used in the grouting work, contain an expansive shrinkage compensator and comply with the requirements of ASTM C937.

3.00 EXECUTION

3.01 PREPARATION

- A. Prior to cleaning or flushing grout delivery lines, disconnect injection valve from grout port to avoid pressure surges.

3.02 INSTALLATION

- A. Perform grouting in a progressive, methodical manner:
 1. Grouting shall progress sequentially in a constant up-gradient direction from one grout port to the next adjacent grout port in the sequence indicated in the accepted submittals.
 2. At any time during the grouting operations, sufficient contact grouting ports ahead of the grouting shall be cleaned and opened. Valves or other suitable devices shall be attached and placed in the fully open position on all un-grouted ports within the maximum grout communication distance, as determined by the Contractor and accepted by the Engineer.
 3. Grout progressively along the tunnel:
 - a. For tunnel contact grouting, start from the lowest point of the tunnel both longitudinally and circumferentially, and not in a lead- and-lag or leapfrog manner.
 4. Do not pump grout into more than one grout port at any time.
 5. Operator of grout mixer and grout injection valves shall be in direct, constant, and continuous communication during grout injection operation.
- B. Grout shall be continuously recirculated after mixing and during grouting operations.
- C. Perform contact grouting through a valve affixed to a grout port installed in the jacking pipe as shown on the Shop Drawings.
- D. Leave grout ports open that are adjacent to a grout port used for injection during grouting operations to facilitate the escape of pipe lubrication materials, air, and water from pockets in the void space surrounding the jacking pipe. When grout is found to flow from adjacent grout connections at a consistency equal to that being injected, cap such adjacent connections or install valves for bleed, until later use as a grout connection.

- E. Do not close any valved, open, un-grouted grout port until grout of the same consistency as that being injected issues forth.
- F. After the grouting is finished, the valve shall be closed before the grout header is removed. Grout port valve shall remain closed until grout has attained 24-hour set strength.

3.03 INSTRUMENTATION AND MONITORING

- A. Monitor pressure gauges during all grouting operations.

3.04 FIELD QUALITY CONTROL

- A. Master Gauges and Meters:
 - 1. Perform testing of all field gauges and meters no less often than weekly using master gauges and meters.
 - 2. Perform field tests in the presence of the Engineer.
 - 3. Verify accuracy of master gauges and meters through the use of a test laboratory no less frequently than every 2 months or more often if required by the gauge or meter manufacturer.

3.05 CLEAN-UP

- A. Perform the following concurrently and at the end of each shift with grouting operations:
 - 1. Cleaning the surface of the interior of the jacking pipe.
 - 2. Maintaining the invert of the jacking pipe free of debris.
- B. Thoroughly clean the grout port threads and install plug flush with the pipe. Plugs shall be supplied by the jacking pipe manufacturer and installed after grout has attained 7-day strength.
- C. Promptly remove and dispose of any leakage or wastage of drill cuttings, grout, or other objectionable materials. If such materials bond to the surface of the interior of the jacking pipe, remove by chipping, bush hammering, grinding or other acceptable means approved by the Engineer.

END OF SECTION

33 30 00 MICROTUNNELING

1.00 GENERAL

1.01 SCOPE OF WORK

- A. The Work includes design, procurement, installation, and construction requirements for microtunneling involving excavation with Microtunnel Boring Machine (MTBM) and installation of jacking pipe. For installation and construction requirements for other tunnel or trenchless construction methods, refer to Section 33 05 23.33 "Pipeline Crossing."
- B. All Work specified herein is the responsibility of the Contractor, subject to the acceptance of the Engineer. Contractor shall perform all Work in accordance with all current applicable Federal, State, and local regulations and codes. In the event of conflict between such regulations or codes, the Contractor shall comply with the more stringent requirements. No part of this specification shall be construed as a relaxation of any such regulations or codes.
- C. Contractor shall furnish all labor, equipment, and materials as required to construct microtunnels at the line and grade as shown on the Drawings and to the tolerances and other requirements listed herein.
- D. The Contractor's selected means and methods for construction shall satisfy the requirements of this section while utilizing and preserving the inherent strength of the ground surrounding the microtunnel.
- E. The Contractor shall obtain and pay for a suitable source of electric power for all work associated with microtunneling, this includes, but is not limited to obtaining and paying for any permits from the local electric power provider and performing associated electrical work or furnishing a generator. The Contractor shall be responsible for furnishing and installing all electrical equipment required to complete the microtunnel construction activities both on the surface and underground at the shaft sites as required. The Contractor shall also furnish the electrical power and/or equipment for all of the auxiliary systems which shall include but not be limited to transformers, panel boards, security systems, lighting, grounding, power for ventilation fans, sump pumps, disconnect switches, voice communication equipment, office trailers, etc. All generator and other stationary fueled equipment shall be operated in compliance with the Texas Clean Air Act.
- F. The Contractor shall obtain and pay for a suitable water source for all work associated with microtunneling.

1.02 RELATED WORK

- A. Section 33 13 54 – Geotechnical Instrumentation and Monitoring
- B. Section 33 23 24 – Contact Grouting
- C. Section 33 31 13.13 – Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
- D. Section 33 73 15 – Shaft Excavation
- E. Section 33 73 16 – Groundwater and Surface Water Control

1.03 DESIGN CRITERIA

- A. The Contractor shall utilize a pressurized, closed face, remotely operated MTBM for all microtunneling work described herein. The MTBM shall have the capability to provide positive, stabilizing pressure at the heading (face of the tunnel excavation).
- B. The MTBM shall be equipped with an automated slurry spoil transportation system capable of coordinating the material excavated with the rate of pipe installation. This slurry system shall have the ability to reverse flush the slurry lines to avoid clogging the system.
- C. The MTBM shall have seals capable of withstanding the hydrostatic head to be encountered with appropriate factors of safety.
- D. The microtunnel entry and exit seals and any pipe brake or clamping devices shall be designed by a Professional Engineer licensed in the State of Texas retained by the Contractor. The seals shall be capable of withstanding the hydrostatic head to be encountered with appropriate factors of safety.
- E. The MTBM and associated equipment selected by the Contractor shall be compatible with the ground and groundwater conditions as described in the Geotechnical Engineering Report.
- F. Face pressure exerted at the heading by the MTBM shall be maintained as required to balance the actual soil and groundwater pressures present, and prevent loss of ground, groundwater inflows and settlement or heave of the ground surface. The Contractor shall control ground surface settlement or heave above the microtunnel as required by Section 33 13 54 "Geotechnical Instrumentation and Monitoring." The Contractor shall repair any damage resulting from surface settlement or heave caused by microtunneling operations at no additional cost the Owner.
- G. The thrust block shall be designed by a Professional engineer licensed in the State of Texas retained by the Contractor. The thrust block shall be constructed on the opposite wall of the shaft as the microtunnel entry seal and shall be designed to withstand the maximum anticipated jacking pressure, with an appropriate safety factor.

1.04 QUALITY ASSURANCE AND CONTROL

- A. Microtunnel Contractor: The Contractor performing microtunneling shall have successfully completed at least three microtunneling projects in last five years installing similar jacking pipe materials 72-inches or larger in nominal diameter with drive lengths of 100 feet or greater using similar methods as specified herein and in similar ground conditions to that of this project. Similar methods would include tunneling methods that utilize a pressurized, closed face, which have the capability to provide positive, stabilizing pressure at the heading (or face of the tunnel excavation) (e.g. an earth pressure balance tunnel boring machine with pipe jacking).
- B. Microtunnel Project Manager: The Contractor's Microtunnel Project Manager shall have at least ten years of experience in tunnel or trenchless construction industry as a project manager and successfully completed at least three microtunneling projects in the last ten years utilizing similar methods as specified herein and in similar ground conditions to that of this project. Similar methods would include tunneling methods that utilize a pressurized, closed face, which have the capability to provide positive, stabilizing pressure at the heading

(or face of the tunnel excavation) (e.g. an earth pressure balance tunnel boring machine with pipe jacking).

- C. The Contractor's MTBM Operator(s) shall each have at least five years of experience as an operator of MTBMs and successfully completed at least three microtunneling projects in the last five years installing similar jacking pipe materials 72-inches or larger in nominal diameter with drive lengths of 100 feet or greater using similar methods as specified herein and in similar ground conditions to that of this project. Similar methods would include tunneling methods that utilize a pressurized, closed face, which have the capability to provide positive, stabilizing pressure at the heading (or face of the tunnel excavation) (e.g. an earth pressure balance tunnel boring machine with pipe jacking).
- D. The Contractor shall provide quality control, testing and inspection as required herein, and in accordance with accepted submittals. The Contractor's design engineer shall visit the site to observe the work in progress as necessary to ensure the Work is conducted in accordance with the design and that design assumptions are accurate based on field conditions.
- E. Tolerances to line and grade for the microtunnel construction shall be as follows:
 - 1. Horizontal Alignment: Maximum departure of 6 inches at any point along the theoretical microtunnel centerline.
 - 2. Vertical Alignment: Maximum departure of 1 inch at any point along the theoretical microtunnel grade line.

1.05 SUBMITTALS

- A. Shop Drawings and Documentation:
 - 1. Submit the following shop drawings describing the microtunneling equipment and methods, a minimum of 30 days prior to mobilization of the microtunneling equipment to the site:
 - a. Provide a detailed description of the proposed MTBM and ancillary equipment and procedures to be employed. Provide manufacturer's literature for the MTBM and ancillary equipment describing in detail the equipment to be used including machine type, spoil removal system, surveying procedures and provisions for injecting pipe lubricants.
 - b. Describe the capabilities of the MTBM and the procedures for to minimize the loss of ground during Microtunnel excavation. The Contractor shall provide descriptions of previous projects where this equipment has been successfully used including names, addresses and telephone numbers of Owner's representatives for these projects as well as length, diameter, pipe material used, project cost and geological conditions encountered.
 - c. Provide a layout of each microtunnel work area, including pipe storage, material handling, jacking arrangement, steering cabin, and slurry handling system.
 - d. Schedule for microtunneling work identifying all major construction activities as independent items. The schedule shall include mobilization; shaft excavation and excavation support, jacking equipment setup, installation of pipe, site restoration, cleanup and demobilization. Any action with an anticipated duration longer than 1 week shall be listed separately in the task list of the schedule. The schedule shall

be reviewed with the Engineer and be updated and resubmitted by the Contractor on a bi-weekly basis. Follow requirements specified under Section 01 33 05 "Construction Progress Schedule," unless modified or supplemented above.

- e. Provide a detailed description of the alignment control and steering systems. Provide manufacturer's literature and drawings showing setup and support provisions, and other details for the systems. Submit a description of surveying methods to set laser positions and a description of procedures to check laser and reset or realign laser during construction. Confirm that these systems can achieve the required pipeline line and grade within the specified tolerances.
- f. Submit name and resume of the Contractor's Professional Land Surveyor licensed in the State of Texas who shall be responsible for setting survey control and laser for pipe installation.
- g. Capacity, number and arrangement of main jacks. Provide details of thrust ring, jacking controls and pressure gages. Provide an estimate of maximum jacking force expected to be required to complete each drive.
- h. Provide thrust block and jacking frame design and details. Submit calculations demonstrating that the thrust block can transfer the maximum anticipated forces developed by the main jacks to the ground without excessive movements.
- i. Provide details of pipe lubrication injection system and pipe lubricants to be used during microtunneling, including manufacturer's literature.
- j. Provide spoil and/or slurry handling, separation, transport and disposal equipment and procedures indicating details of the slurry additives, slurry separation plant and the location of slurry and spoil disposal sites for microtunneling.
- k. Provide a plan to deal with microtunnel slurry accidentally released to the surface.
- l. Submit written documentation from the accepted disposal site(s) indicating that they will accept the spoil and are in compliance with all applicable Federal, state and local regulations.
- m. Provide a safety plan for the microtunneling operations including provisions for ventilation and electrical system safeguards. Submit name of Contractor's site safety representative responsible for implementing safety program.
- n. Provide a general plan, procedures, and details for constructing recovery shafts and other methods to remove obstructions that may be encountered during microtunneling.
- o. Provisions for protecting adjacent existing facilities and utilities.
- p. Size, thickness and dimensions of jacking pipe, or other initial support proposed by Contractor, including the following:
 - 1). Calculations, signed and sealed by a licensed Professional Engineer in the State of Texas with a minimum of five years of experience in structural design for tunnels and/or shafts as appropriate, illustrating that the selected dimensions of the jacking pipe, or other initial support elements, including the entry and exit seals, pipe brake or clamp, and thrust block, proposed by the Contractor, can accommodate ground and groundwater loads, transport loads and any jacking

forces or grouting pressures imposed on the jacking pipe or other initial support elements by the Contractor's chosen microtunneling equipment.

- 2). Demonstrate that the Contractor's chosen means and methods for excavating the tunnel and supporting the surrounding ground is compatible with the ground and groundwater conditions described in the Geotechnical Engineering Report, and that the jacking pipe or other initial support elements are compatible with the Contractor's microtunneling equipment selection.
 - 3). The Contractor shall provide calculations of the allowable jacking force on the pipe, based on the chosen factor of safety and the anticipated maximum angular joint deviation. This value of allowable jacking force should not be exceeded during tunneling.
- q. Provide a Microtunnel Contingency Plans, including, but not limited to the following situations:
- 1). Inability of steering or control system of MTBM to meet line and grade requirements for the jacking pipe.
 - 2). Inability of slurry separation plant to effectively separate spoils from slurry.
 - 3). Laser or survey system distorted by heat, humidity, and/or physical disturbance.
 - 4). Jacking forces reach or exceed design capacity of jacking pipe, jacking frame, and/or thrust block.
 - 5). Groundwater inflows into tunnel and/or shaft increase significantly and/or transport fines into tunnel and/or shaft.
 - 6). Thrust block deforms under jacking loads or provides insufficient capacity to advance jacking pipe.
 - 7). Jacking pipe has been damaged or has been found to be out of compliance with specifications, either before, during, or after installation.

B. Submit to the Engineer the following reports and records:

1. Qualification for MTBM Staff: Submit within 30 days after the Notice to Proceed, qualifications and experience of individuals to be involved in microtunnel construction including the proposed Microtunnel Project Manager and MTBM Operator(s) that meet the requirements as provided herein.
2. Submit within 24 hours of the end of each shift worked, regardless of progress made: Survey notes, records and shift reports, and a digital file in a format able to be imported to Microsoft Excel, indicating thrust force, cutterhead torque, rate of advance, line and grade deviation, roll, inclination, laser position, steering altitude, slurry face pressure and other pertinent information from the data logger, recorded continuously. The distance wheel shall be operated at all times and the records correlated to the jacked stations. The Contractor shall at all times provide and maintain instrumentation that will accurately provide to the Engineer all required reports and records.
3. During microtunneling, display instruments in the control cabin indicating thrust force, cutterhead torque, rate of advance, line and grade deviation, roll, inclination, steering adjustments, slurry face pressure and other pertinent information shall be accessible for observation and documentation by the Engineer.

4. The Contractor shall provide the Engineer, in a form acceptable to the Engineer, an as-built drawing of each tunnel showing in detail the installed vertical and horizontal alignment.

1.06 REQUIREMENTS

- A. The Contractor shall have the sole responsibility for maintenance and protection of existing utilities, structures, and facilities within the alignment.
- B. The Contractor shall carefully monitor machine penetration rate, face pressures and line-and-grade of the drive.
- C. The Contractor shall carefully control slurry pressures applied at the tunnel face to prevent fracturing of the ground and discharge of slurry to the ground surface.
- D. The Contractor shall allow the Engineer and Owner's representative access to the shafts, and to use the shafts to observe microtunnel operations.

1.07 SAFETY

- A. The Contractor's methods of construction shall be such as to ensure the safety of the Work, project participants, the public, third parties, and adjacent property, whether public or private. All work shall conform to the requirements of all applicable Federal, State, and local laws and regulations. The Contractor shall be solely and completely responsible for maintaining safe work conditions at the site at all times.
- B. The Contractor's safety officer shall administer an accident prevention program and shall prepare a code of safe practices and an emergency plan. Provide the Engineer with a copy of each prior to starting tunnel excavation. Contractor shall hold safety meetings and provide safety instruction for new employees.
- C. Contractor shall provide acceptable instrumentation for testing and monitoring of the quality of the air in manned work areas. Obtain samples under working conditions at prescribed intervals in accordance applicable requirements. Submit the results of the air quality tests to the engineer each week during the performance of the work.

1.08 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO).
- B. American Society of Civil Engineers (ASCE) - ASCE/CI Standard 36-15, Standard Design and Construction Guidelines for Microtunneling, 2015.
 1. All work described herein shall be performed in conformance with ASCE/CI Standard 36-15 unless otherwise stated herein.
- C. National Fire Protection Code (NFPA) - (NFPA 70, National Electrical Code).
- D. Occupational Safety and Health Administration (OSHA) Safety and Health Regulations for Construction, 29 CFR Part 1926.

1.09 DEFINITIONS

- A. Definitions are as stated in ASCE/CI Standard 36-15, Chapter 3 Definitions, unless modified or supplemented herein.

2.00 PRODUCTS

2.01 EQUIPMENT

- A. Microtunnel Boring Machine (MTBM): The MTBM shall be a closed and pressurized face machine designed and built or rebuilt for the ground and groundwater conditions on this project by a recognized MTBM manufacturer with at least 5 years of experience in the design and manufacture of MTBMs of this type. The manufacturer must still be in the business of designing and manufacturing MTBMs. All of the various components and systems, which make up the MTBM shall be new or reconditioned so that the machine is ready to operate upon installation at the site. It shall be able, with excess capacity, to handle the range of ground and groundwater conditions indicated in the Geotechnical Engineering Report, and shall satisfy the following requirements:
1. The machine shall be capable of fully supporting the face during both excavation and shutdown periods, and shall have the capability of exerting a controllable, measurable, continuous, stabilizing pressure at the face as required to prevent loss of ground. The system shall be capable of adjustments required to balance the soil pressures at the tunnel face to an accuracy of one foot of equivalent hydrostatic pressure. The machine shall utilize a synchronized slurry transportation system with machine advance rate to avoid over excavation or loss of ground. The microtunneling system shall be capable of reverse flushing to clear debris that may be encountered.
 2. Provide a machine with an enclosed chamber for containing the slurry under pressure. A pressure gauge should be provided so that operator can monitor the chamber pressure. The system shall be capable of making the adjustments required to counterbalance the earth pressures as needed to prevent loss of ground.
 3. The machine shall be remotely operated, laser guided and monitored continuously by the operator. A display showing the position of the machine in relation to design line-and-grade shall be provided at the operation console to allow the operator to monitor face pressure, roll, inclination, laser position, steering attitude, slurry face pressure, rate of advance, installed length, thrust force and cutterhead torque. The machine shall have a data logger that records all the above continuously to a portable digital storage device in a format that can be imported into Microsoft Excel. This portable digital storage device shall be submitted to the Owner on a daily basis and shall be the property of the Owner.
 4. The machine shall have a laser guidance system with a light sensitive or electronic target appropriate for the drive lengths required and capable of achieving the line-and-grade control requirements for the project.
 5. The machine shall have an articulated shield that is steerable in both vertical and horizontal directions to maintain line-and-grade within the specified tolerances. The cutterhead shall have a reversible drive system so that it can rotate in either direction to minimize rotation or roll of the pipe during installation.
 6. The machine shall be capable of advancing through the ground and groundwater conditions described in the Geotechnical Engineering Report.

7. Slurry used to support the microtunnel face and to remove excavated muck may need to be produced using bentonite or polymer additives. It is the Contractor's responsibility to tailor the slurry to the encountered geologic conditions.
8. Provide a slurry separation plant that is appropriate for the soils being excavated, and compatible with the anticipated excavation rate, effective in removing the spoil from the slurry and is acceptable in terms of the available construction staging areas.
9. The machine shall be equipped for continuous gas monitoring and shall have a shut-off switch.
10. A pipe lubrication injection system shall be provided to inject pipe lubricants as required to minimize jacking force.
11. The tail of machine shall have gaskets and seals to prevent material from running into the tunnel at the contact between the tail skin and the pipe.
12. The maximum allowable over-cut shall not be greater than $\frac{3}{4}$ inch larger in radius than the outside of the jacked pipe or as approved by the engineer.

2.02 JACKING SYSTEM

- A. The main jacks shall be mounted in a jacking frame and located in the jacking shaft. The MTBM shall be moved forward by the jacks advancing a successive string of connected pipes toward a receiving shaft.
- B. A pipe lubrication system shall be used to lower the friction developed on the surface of the pipe during jacking operation. A lubricant, typically bentonite or polymers, shall be injected at the rear of the MTBM or through lubrication ports. This lubricant is subject to acceptance by the Engineer.
- C. The pipe lubrication system pressure shall be continuously monitored, recorded and controlled to prevent pipe buckling and/or ground heave.
- D. Thrust block shall be perpendicular to the proposed pipe alignment. The thrust block shall be capable of supporting the maximum jacking pressure developed by the main jacking system.
- E. Operate the jacks so as not to exceed 80 percent of their rated capacity. At no time shall the jacks be operated to exceed the axial capacity of the jacked pipe, including all safety factors and accounting for any angular joint deviation. At no time shall the jacks be operated to exceed the maximum capacity of the Thrust wall designed by the Contractor's Texas registered Professional Engineer.
- F. The maximum jacking load shall not exceed 50 percent of the axial load capacity of the pipe.

2.03 AUTOMATED SPOILS TRANSPORTATION

- A. Slurry System: The system shall be capable of measuring earth and groundwater pressure and making the adjustments required to counter-balance the earth and groundwater pressure to prevent loss of slurry or uncontrolled soil and groundwater inflow and shall satisfy the following requirements:
 1. The slurry pressure at the excavation face shall be controlled by use of slurry pumps.

2. A slurry bypass method shall be included to allow for a change in direction of flow to be made and /or isolated.
3. Provide a slurry separation equipment, properly sized for the tunnel being constructed, the soil type being excavated and the workspace available at each area. Separate the spoil from the slurry so that slurry can be returned to the cutting face for reuse.
4. Monitor the composition of the slurry to maintain the slurry density and viscosity limits as accepted in the submittals.

2.04 MATERIALS

- A. Jacking pipe material shall be fiberglass jacking pipe as specified in Section – 33 31 13.13 Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Gravity Sewer Pipe.

3.00 EXECUTION

3.01 GENERAL

- A. The construction of the shafts for the microtunnel drive are to be completed prior to commencement of MTBM excavation. Contractor shall provide Engineer with written acceptance by the contractor or subcontractor performing microtunneling operations that the shafts are ready for microtunneling operations, if the excavation and support of the shafts was performed by a separate contractor or subcontractor.
- B. Perform microtunnel excavation as shown on the Contract Drawings and as specified in this section.
- C. A thrust block is required to transfer jacking loads to the soil behind the jacking shaft. The thrust block shall be properly designed and constructed and shall be perpendicular to the proposed pipe alignment. The thrust block shall be designed to support the maximum obtainable jacking pressure developed by the main jacks or the microtunneling equipment.
- D. Provide entry and exit seals to prevent loss of or inflow of ground, inflow of groundwater and loss of slurry or lubricants at shafts as the pipe is advanced forward. The seals shall be designed to resist the hydrostatic and other forces at the location of the seal. A backup or emergency seal system, such as an inflatable seal, shall be used in conjunction with the primary seal. Grout injection ports at a maximum of 30 degree radial spacing shall be incorporated into each seal location.
- E. Entry and exit seals must be able to withstand the external hydrostatic pressure.
- F. Contractor shall provide a positive restraint or other necessary measures, including implementing a pipe brake or clamping device to prevent the pipe string from being pushed backwards into the shaft during the addition of pipe segments or when the jacking frame is not in operation, if deemed necessary by the Contractor. Contractor shall constantly apply forces as required to maintain stability of the face of the excavation.
- G. No gasoline powered equipment shall be permitted in jacking and receiving pits. Diesel, electrical, hydraulic and air powered equipment is acceptable, subject to applicable Federal, State, and local regulations.

- H. Conduct all operations such that trucks and other construction vehicles do not create a dust nuisance along roads and adjacent properties. Promptly clean up, remove, and properly dispose of any spoil or slurry spillage.
- I. All work shall be performed so as not to disturb roadways, railways, adjacent structures, landscaped areas, existing utilities or facilities. Any damage shall be immediately repaired to the satisfaction of the property Owner, residents, agency or utility having jurisdiction, and the Engineer at no additional cost to the Owner.
- J. The Contractor shall construct recovery shafts, in accordance with accepted submittals, if obstructions are encountered which stop or prevent the microtunneling machine from advancing. The recovery shafts shall be properly supported with suitable shoring provisions to minimize loss of ground and ground movements, which could damage adjacent utilities, streets or structures. Requirements for recovery shafts shall follow requirements specified in Section 33 73 15 "Shaft Excavation." Contractor shall obtain necessary approvals from affected agencies and proceed with the construction of recovery shafts as required to remove obstructions and minimize delays in the work.
- K. During microtunneling operations, no high-pressure water jetting at cutter head shall be allowed in non-cohesive soils (ie sand, silty sands, etc.).
- L. Pipe joints shall be leak free when installed.
- M. As soon as each microtunnel drive has been completed and the pipe is in its final position, the "eye" around the pipe at the jacking shaft junction shall be grouted as necessary to seal off water and soil entry into the shaft.

3.02 PIPE INSTALLATION

- A. Pipe installation shall be completed in accordance with applicable provisions of Section 33 31 13.13 "Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe."
- B. Pipe installation shall be performed in accordance with the pipe manufacturer's recommendations as well as the accepted submittals.
- C. Provide a suitable jacking frame and thrust block to carry out the work.
- D. Special care shall be taken when setting the pipe guide rails prior to starting the work in the jacking pit to ensure accuracy of the line and grade of the jacking pipe and stability of the pipe guide rails. Survey the location and orientation of the guide rails to ensure they are on the proper line and grade and verify that they are properly supported.
- E. Jacking pipe sections shall be handled and transported from the storage area to the jacking pit properly in accordance with the jacking pipe manufacturer's recommendations to avoid damage. Set the jacking pipe sections properly, which shall be braced and supported by guide rails. Join the two sections together following the below joint connection procedures or as indicated in accepted submittals.
- F. Clean both ends of each pipe section and the joint components.
- G. Apply joint lubricant to the bell interior surface and gaskets. Use only lubricants approved by the pipe manufacturer.
- H. Use suitable equipment and end protection to push the pipes together.

- I. Do not exceed forces recommended by the jacking pipe manufacturer for jointing or pushing pipe or during grouting operations.
- J. The axial forces from the thrust jacks shall be distributed to the pipe uniformly through a properly designed thrust ring and cushion materials, as recommended by the jacking pipe manufacturer, to prevent damage to the ends of the pipe. Jacking forces shall be applied uniformly to the pipe wall. The jacking system shall be capable of continuously monitoring the jacking pressure and advance rate of the jacking pipe.
- K. Pipes shall be jacked into position following the design line and grade of the pipeline without damaging the pipe. In the event a section of the pipe is damaged during the jacking operation, the pipe shall be jacked through to the receiving shaft and removed. Other methods of repairing the damaged pipe may be used, subject to the acceptance by the Engineer.
- L. Provide a lubrication system and inject lubricants through injection ports in the jacking pipe as necessary, to minimize friction. Lubricants shall be injected continuously as the pipe is advanced. The volume injected shall not be less than that required to fill the annular void space outside the pipe.
- M. Pressure applied at the tunnel face during microtunneling shall be maintained at all times and shall be between the measured active earth pressure and 50 percent of the estimated earth pressure. Pressure applied at the tunnel face to balance the groundwater shall be maintained at a level slightly more than measured hydrostatic pressure at piezometer locations and shall be monitored continuously.
- N. The MTBM shall be operated to minimize both surface heave and loss of ground during microtunneling. Restrict the excavation of the materials to only those materials that are physically displaced by the shield itself to prevent loss of ground and settlement or possible damage to overlying structures. Control the advance rate and monitor the volume of material excavated and adjusted advance rate, as required to avoid loss of ground, over excavation and surface heave.
- O. The MTBM shall be steered to maintain line and grade within the tolerance specified herein. This shall be achieved by continuously monitoring line and grade, machine inclination, and roll and steering attitude during the operation. At a minimum, the thrust force, slurry chamber pressure, torque, rate of advance, distance along the drive, deviation from line and grade, and roll and steering altitudes shall be monitored and recorded for each pipe section installed.

3.03 CONTACT GROUTING

- A. Contact grouting shall be performed in accordance with Section 33 23 24 "Contact Grouting."

3.04 SPOIL TRANSPORT AND DISPOSAL

- A. Use slurry spoil transportation system for all excavation performed by microtunneling. Monitor slurry pressure and adjust as required to adequately balance earth pressures as required herein.
- B. A separation plant shall be provided to remove the excavated soil from the slurry for disposal. Use settlement tanks, shakers, vibrating screens, hydro-cyclones and centrifuges as

required for effective spoil removal. The separation system shall be designed to separate materials as described in the Geotechnical Engineering Report.

- C. Properly handle, transport, and dispose of all excavated materials away from the construction sites in accordance with all applicable Federal, State, and local regulations. Slurry generated from microtunneling operations shall be pumped into tanker trucks and properly disposed of at acceptable facilities in accordance with applicable Federal, State, and local regulations for disposal of such materials.

3.05 CONTROL OF LINE AND GRADE

- A. The benchmarks and other primary survey control have been established and are shown on the Drawings. The Contractor shall verify the accuracy of these benchmarks prior to commencement of construction and report any errors or discrepancies to the Engineer immediately.
- B. When satisfied that all benchmarks are correct, use such benchmarks to furnish and maintain all reference lines and grades for the performance of microtunneling. Surveying shall be performed by a Professional Land Surveyor licensed in the State of Texas. Submit to the Engineer copies of the field notes used to establish all the lines and grades and allow the Engineer to review laser setup prior to beginning microtunneling operations. The Contractor shall be fully responsible for the accuracy of the Work and the correction of any defective work, as required.
- C. Laser shall be mounted independently from the thrust block and jacking frame in order to maintain the alignment of the laser. Contractor shall stop microtunneling operations and reset laser if laser alignment shifts or is moved off of design alignment and grade for any reason. Laser shall only be reset by qualified surveying personnel in accordance with accepted procedures.
- D. Contractor shall monitor line and grade continuously during microtunneling operations. Record deviation with respect to design line and grade at least once per foot and submit records to the Engineer as requested. Control line and grade of the pipe to within the specified tolerances herein.
- E. If the pipe installation exceeds the specified tolerances herein, Contractor shall notify the Engineer immediately. Contractor shall return to the theoretical microtunnel line and/or grade at a rate of not more than 1 inch per 25 feet. If the tunnel deviates sufficiently off plan line and/or grade to require a redesign of the microtunnel, manholes or other structures, in the opinion of the Engineer, the Contractor shall have the system redesigned at no additional cost to the Owner. All corrective work shall be performed as accepted by the Engineer, at no additional cost to the Owner.
- F. Water shall be free draining between any two points along the pipe invert. No reverse grades will be allowed.

3.06 CONSTRUCTION AREA APPEARANCE

- A. The Contractor shall throughout the duration of the project, keep all pavement and access roads, within and leading to the project limits, free from all debris produced from the project. The Contractor shall keep the project and surrounding areas neat and free from dust and debris. The Owner or Engineer may require supplementary measures as necessary.

- B. Upon completion of the Work, the Contractor shall remove all equipment, signs and unused or excess materials provided for the Work and shall restore the project area to a neat and clean condition as required by the Contract Documents.

3.07 FIELD TESTS AND INSPECTIONS

- A. Contractor shall perform field testing of the jacking pipe as required in Section 01 40 00 "Quality Management" and Section 33 31 13.13 "Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe." The Engineer shall witness all field testing performed by the Contractor.
- B. Perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed properly in accordance with the Drawings and Specifications.

3.08 EMERGENCY MEASURES

- A. Whenever there is a condition that is likely to endanger the stability of the excavation or adjacent structures, the Contractor shall operate with a full crew for 24 hours a day, including weekends and holidays, without intermission until those conditions no longer jeopardize the stability of the Work. Emergency operations that cannot be attributed to a differing site condition shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION

33 31 13.13 FIBERGLASS (GLASS-FIBER-REINFORCED THERMOSETTING-RESIN) PIPE

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment, and incidentals necessary to furnish and install centrifugally cast or filament wound fiberglass reinforced polymer mortar pipe, fittings, joints, and connections to new or existing pipe or headwalls, manholes, etc., to the lines and grades at the diameters indicated on the drawings. For pipe to be installed by trenchless construction methods (other than microtunneling), such pipe shall be installed in accordance with Section 33 05 23.33 "Pipeline Crossing." For pipe to be installed by microtunneling, such pipe shall be installed in accordance with the requirements of Section 33 30 00 "Microtunneling." For pipe to be installed by open cut methods, such pipe shall be installed in accordance with the requirements of Section 31 23 33.19 "Trenching and Backfill."
- B. The Work to be performed in this Section includes design calculations, detailing, and fabrication of pipe. Pipe design and associated calculations shall be performed by a Professional Engineer licensed in the State of Texas who is employed or retained by the Contractor. The design of the pipe shall include the selection of external loads, installation loads, and other loads as determined by the Contractor.

1.02 QUALITY ASSURANCE

- A. Experience:
 - 1. Pipe must be the product of one manufacturer with not less than five (5) years of successful experience manufacturing pipe of the type and size indicated. Pipe manufacturing operations (pipe, fittings, lining, and coating) must be performed at one location unless otherwise acceptable to the Engineer.
 - 2. Furnish an affidavit that the pipe, specials, fittings, and appurtenances furnished comply with all provisions of this Section and applicable ASTM and AWWA Standards referenced herein.
- B. Owner Testing and Inspection: Pipe may be subject to inspection during manufacture by an independent testing laboratory selected and retained by the Owner or the Engineer. Representatives of the independent testing laboratory and the Engineer must have access to the Work whenever it is in preparation or progress, and the pipe manufacturer shall provide proper facilities for access and for inspection. The pipe manufacturer must notify the Owner in writing a minimum of two (2) weeks prior to pipe fabrication so that the Owner may advise the manufacturer as to the Owner's decision regarding tests to be performed by the independent testing laboratory. Material, fabricated parts, and pipe found to be defective or not conforming to the requirements of this Section will be subject to rejection at any time prior to Owner's final acceptance of the Project.
- C. Factory Testing: At a minimum, the following tests must be conducted at the factory, with test results furnished to the Owner and Engineer:
 - 1. Load bearing tests: Provide test results for the first joint manufactured of each size and class, and at least one joint per hundred joints thereafter.

2. Material tests: Provide material test results per the applicable ASTM and AWWA standards.
 3. Pipes shall be manufactured and tested in accordance with ASTM D3262.
 4. Coupling joints shall meet the requirements of ASTM D4161.
 5. Minimum pipe stiffness when tested in accordance with ASTM D2412 shall be 72 psi (SN 72) for jacking pipe and 46 psi (SN 46) for open cut.
 6. The extrapolated 50-year strain corrosion value shall not be less than as determined in accordance with ASTM D3681 and ASTM D3262.
- D. Manufacturer's Technician for Pipe Installation: Pipe manufacturer must furnish the services of a factory trained, qualified, field experienced technician during installation. The technician must assist and advise the Contractor in his pipe installation operations and must instruct construction personnel in proper joint assembly and joint inspection procedures. The technician is not required to be on-site full time. However, the technician must be on-site during the first two (2) 8-hour days of pipe installation and thereafter three (3) additional 8-hour days as requested by the Engineer, Owner, or Contractor.
- E. Acceptable Manufacturers: Hobas Pipe USA or Thompson Pipe Group FRP.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 – "Document Management" and Section C700 "General Conditions", and must include:
1. Submittals for "Jacking Pipe" as required by Section 33 05 23.33 "Pipeline Crossing" or Section 33 30 00 "Microtunneling."
 2. Manufacturer's product data sheets, drawings, specifications, and other data, showing complete details of the fabrication and construction of each size and type of pipe and fittings, together with complete data covering all materials proposed for use, including the following:
 - a. Pipe stiffness.
 - b. Name of manufacturer.
 - c. Nominal pipe diameter.
 - d. Cell classification.
 - e. Laying lengths.
 - f. Joint and gasket details.
 - g. Jointing methods and tolerances.
 - h. Minimum radii for horizontal deflection.
 - i. Details of reinforcement.
 - j. Details of lubrication and grouting ports.
 - k. Details of fittings and specials.

3. Pre-Construction submittal data and specifications shall include, but shall not be limited to, the following for each size and type of pipe:
 - a. Manufacturer and manufacturer's qualifications.
 - b. Manufacturing Details. Description and specification of the manufacturer and methods of manufacture including reinforcing, casting, covering, and storage.
 - c. Material Properties. Submit data in support of the materials used meet or exceed the specified properties for all materials used including, reinforcing, gaskets, and protective lining, if applicable.
 - d. Shop drawings showing pipe details including:
 - 1). Pipe size, wall thickness, length, and dimensions.
 - 2). Reinforcing method, stiffness, and cover.
 - 3). Joint details with type and configuration sizes, dimensions, and gasket grooves.
 - 4). Grout port arrangement and details.
 - 5). Fabrication tolerances for all pipe dimensions.
 - 6). Shop drawings shall be prepared, signed, and sealed by a Professional Engineer licensed in the State of Texas employed or retained by the Contractor.
 - e. Detailed structural calculations for the pipe confirming the pipe can adequately resist anticipated installation loads, including handling and jacking loads, in-situ and service loads, and all other associated design loads, provides the required factor of safety against buckling, and meets the required maximum allowable long-term deflection.
 - 1). Calculations shall show loading and other design criteria, design standards, formulas, assumptions, loads, methods of analysis intermediate steps, and results of stresses and displacements.
 - 2). If computer calculations are performed, example calculations shall be furnished to show the procedures used by the software.
 - 3). Calculations shall be submitted showing that pipe and joints can adequately resist anticipated installation loads, including handling and jacking loads, in-situ and service loads, and all other associated design loads with required factors of safety.
 - 4). Calculations shall be prepared, signed, and sealed by a Professional Engineer licensed in the State of Texas employed or retained by the Contractor.
 - f. Pipeline layout and profile drawings showing the location, stationing, and invert elevations of pipe sections, fittings, and closure pieces, if applicable.
 - g. Handling, storage details, and shop drawings of methods of transportation from the manufacturing location to the site and methods and equipment used to handle and store.

4. Prior to shipment of the pipe, the pipe manufacturer shall submit the following:
 - a. A Certificate of Adequacy of Design stating that the pipe to be furnished complies with AWWA M45, ASTM D3262, ASTM D4161, ASTM D2412, ASTM D3567, ASTM D3754, and these specifications.
 - b. Certified Test Reports from the manufacturer’s testing facility or an acceptable testing laboratory for the factory testing required herein. Test reports shall include certification of compliance with specified standards.

1.04 REFERENCE SPECIFICATIONS

- A. Section C700 “General Conditions”
- B. Section 01 33 00 “Document Management”
- C. Section 01 40 00 “Quality Management”
- D. Section 31 23 33 “Trenching and Backfill”
- E. Section 33 05 23.33 “Pipeline Crossing”
- F. Section 33 23 24 “Contact Grouting”
- G. Section 33 30 00 “Microtunneling”
- H.

1.05 STANDARDS

- A. The applicable provisions of the following standards must apply as if written here in their entirety. Piping and fittings must be in full compliance with the applicable standards and specifications. Pipe may be rejected for failure to comply with any requirement of this Section. Whenever a conflict exists between the standards and the requirements herein or between separate standards, the most stringent requirement shall govern.

1. American Society of Civil Engineers (ASCE) Standards:

ASCE/CI 36-15	Standard Design and Construction Guidelines for Microtunneling
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2. American Railway Engineering and Maintenance-of-Way Association Standards:

AREMA MRE	Manual for Railway Engineering
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3. American Society for Testing and Materials (ASTM) Standards:

ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D2412	Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D3262	Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe
ASTM D3567	Standard Practice for Determining Dimensions of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings
ASTM D3681	Standard Test Method for Chemical Resistance of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting –Resin) Pipe in a Deflected Condition

ASTM D3754	Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe
ASTM D3839	Standard Guide for Underground Installation of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe
ASTM D4161	Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

4. American Water Works Association (AWWA) Standards:

AWWA M45	Fiberglass Pipe Design
AWWA C950	Fiberglass Pressure Pipe

1.06 DESIGN CRITERIA

- A. Pipe, joints, and gaskets shall be designed and furnished by the Contractor in accordance with the requirements of the standards listed herein except as modified or supplemented herein.
- B. Pipe Inside Diameter: Refer to the Drawings.
- C. Installation Tolerances: Refer to Section 33 05 23.33 "Pipeline Crossing" or Section 33 30 00 "Microtunneling" as applicable for the associated installation method.
- D. Design Earth Cover Height Above the Top of the Pipe: Refer to the Drawings.
- E. In Situ Soil Characteristics and Water Table Elevation: Refer to the Geotechnical Engineering Report.
- F. Live Load: Equal to HS-20.
- G. Surcharge Load: As determined by the Contractor during construction.
- H. Groundwater Load: Refer to the Geotechnical Engineering Report.
- I. Intermittent Hydrostatic Pressure or Other Loads: Assume Maximum Water Surface Elevation of 21.00 feet with the pipe empty or pipe full of water.
- J. Minimum pipe stiffness when tested in accordance with ASTM D2412 shall be 72 psi (SN 72) for trenchless installation or 46 psi (SN 46) for open-cut installation.
- K. Refer to additional design criteria provided in Section 33 05 23.33 "Pipeline Crossing" or Section 33 30 00 "Microtunneling" as applicable for the associated installation method.

1.07 DELIVERY, HANDLING, STORAGE, AND MARKING

- A. An inspection of the pipe will be made by the Engineer after delivery. Contractor shall make periodic inspections of stored pipe materials to assure that materials are maintained under specified conditions and free from damage or deterioration. Pipe with visible defects will be rejected and replaced at no additional cost to the Owner. Visible defects include cracks of any type, honeycombs, delamination, or any other defects indicative of poor workmanship. Any pipe rejected shall not be returned under any circumstances to the Project.

- B. Pipe damaged in shipment shall not be unloaded at the Site.
- C. Deliver, handle, and store pipe in accordance with the manufacturer's recommendations.
- D. Pipe Marking: The following information shall be clearly marked on each joint of pipe and each fitting must have plainly marked on the inside of the pipe at two locations by the pipe manufacturer:
 - 1. The class and stiffness for which it is designated,
 - 2. AWWA and/or ASTM standard designation,
 - 3. The date of manufacture and identification of plant,
 - 4. The name or trademark of the manufacturer,
 - 5. Diameter of the pipe,
 - 6. Identification number corresponding to the laying schedule, and
 - 7. The top centerlines must be marked on all specials.

2.00 PRODUCTS

2.01 MATERIALS

- A. Resin Systems: The manufacturer must use only polyester resin systems with a proven history of performance in this application. The historical data must have been acquired from a composite material of similar construction and composition as the proposed product.
- B. Glass Reinforcements: The reinforcing glass fibers used to manufacture the components must be of highest quality commercial grade E-glass filaments with binder and sizing compatible with impregnating resins.
- C. Silica Sand: Sand must be minimum 98 percent silica with a maximum moisture content of 0.2 percent.
- D. Additives: When used, resin additives such as curing agents, pigments, dyes, fillers, thixotropic agents, etc. may not detrimentally affect the performance of the product.
- E. Elastomeric Gaskets: Gaskets must be supplied by qualified gasket manufacturers and be suitable for the service intended and comply with ASTM F477.

2.02 MANUFACTURED PRODUCTS

- A. Manufacture pipes to result in a dense, non-porous, corrosion resistant, consistent composite structure. The interior surface of the pipes exposed to flow must be manufactured using a resin with a 50 percent elongation (minimum) when tested in accordance with ASTM D638, or a glass reinforced liner system. The interior surface must provide crack resistance and abrasion resistance. The exterior surface of the pipes must be comprised of a sand and/or resin layer which provides UV protection to the exterior. Pipes must be Type 1, Liner 2, Grade 3 per ASTM D3262 and AREMA MRE.
- B. Unless otherwise specified, the pipe shall be field connected with flush fiberglass sleeve couplings or flush bell-spigot joints, that utilize elastomeric sealing gaskets made of EPDM

rubber compound as the sole means to maintain water tightness. The joints must meet the performance requirements of ASTM D4161. Joints at tie-ins may utilize a fiberglass, gasket – sealed coupling.

- C. Flanges, elbows, reducers, tees, wyes, laterals, and other fittings must be contact molded or manufactured from mitered sections of pipe joined by glass-fiber-reinforced overlays, designed to perform without failure in all possible operating conditions.
- D. Pipe must be manufactured and tested in accordance with the applicable standards. Coupling joints must meet the requirements of ASTM D4161. Minimum pipe stiffness when tested in accordance with ASTM D2412 shall be 72 psi (SN 72) for trenchless installation and 46 psi (SN 46) for open-cut installation or as otherwise required by AREMA MRE.
- E. Grout ports shall be supplied as indicated in the drawings. Maximum grout port spacing shall be every 10 feet along the length of the pipe, maximum.

2.03 DIMENSIONS

- A. Dimensions called for on the Drawings are inside diameters and are minimums. The actual outside diameter shall be in accordance with applicable standards and shall be in accordance with manufacturer's literature.
- B. Pipe shall be supplied in nominal lengths of 10 to 20 feet. Other lengths may be supplied upon approval of the Engineer. Actual laying length must be a nominal plus one (+1) inch to minus four (-4) inches or as acceptable to the Engineer. At least 90 percent of the total footage of each size and class of pipe, excluding special order lengths, shall be furnished in nominal length sections.
- C. Pipe ends must be square to the pipe axis with a minimum tolerance of one-eighth (1/8) inch.

2.04 DETECTABLE WARNING TAPE:

- 1. Provide detectable warning tape at open cut installation locations as follows:
 - a. Thickness: 5.0-mil overall thickness.
 - b. Width: 3 inches minimum.
 - c. Weight: 27.5 pounds per inch per 1000 square feet.
 - d. Triple layer with:
 - 1). Minimum thickness 0.35 mils solid aluminum foil encased in a protective inert plastic jacket.
 - 2). 100 percent virgin low density polyethylene.
 - 3). Impervious to all known alkalis, acids, chemical reagents and solvents within soil.
 - 4). Aluminum foil visible to both sides.
 - e. Locatable by conductive and inductive methods.
 - f. Printing encased to avoid ink rub-off.
 - g. Color and Legends:

- 1). Sewer Line:
 - a). Color: Green (in accordance with APWA Uniform Color Code).
 - b). Legend: "Caution Sewer Line Below" (repeated every 24 inches).

3.00 EXECUTION

3.01 PIPE INSTALLATION, HANDLING AND JOINTING

- A. Install pipe, fittings, specials, and appurtenances as specified and required for the proper functioning of the completed pipeline. Install pipe, fittings, and specials in accordance with the manufacturer's recommendations, ASTM D3839, and AWWA M45.
- B. For pipe to be installed by trenchless methods, pipe installation shall also be in accordance with Section 33 05 23.33 "Pipeline Crossing" or Section 33 30 00 "Microtunneling" as applicable for the associated installation method.
- C. For pipe to be installed by open cut methods, trenching, backfilling, and embedment for pipe shall also be in accordance with the requirements of Section 31 23 33.19 "Trenching and Backfill."
- D. Pipe shall be installed to the lines and grades indicated.
- E. Each joint of pipe must be inspected immediately prior to being lowered into the excavation. If repair of damaged areas and holidays is permitted by Engineer, repair those areas per the pipe manufacturer's recommendations before the pipe is lowered into the excavation.
- F. Install pipe as specified. Pipe installation methods will be subject to the acceptance of the Engineer. Pipe must be lowered into the excavation using textile slings. Chains or cables shall not be used for handling the pipe.
- G. Do not damage the gaskets or the ends of the pipe joints. Prior to connecting the joints, inspect and verify that the pipe ends, and gaskets are thoroughly clean with no foreign materials adhering to them. Coat the pipe ends or groove slopes of the pipe with a lubricating material in accordance with the manufacturer's recommendations. Petroleum lubricants shall not be permitted. Assemble the pipe with sufficient force necessary to make a tight seal on the gasket. Extreme caution shall be taken by the Contractor so as not to damage the pipe. Do not exceed the forces recommended by the manufacturer for joining the pipe. For pipe to be installed by microtunneling/pipe jacking methods, do not exceed the jacking forces recommended by the manufacturer and as required by Section 33 05 23.33 "Pipeline Crossing" or Section 33 30 00 "Microtunneling" as applicable for the associated installation method.
- H. Check joints with a feeler gauge. If any irregularity in the position of the gasket is detected at any point on the entire circumference of the pipe, remove the pipe and examine the gasket for cuts. If the gasket is undamaged, it may be used again, but the gasket and the joint must be re-lubricated. After the pipe section is joined, check the line and grade.
- I. The maximum deflection of any joint may not exceed 75 percent of the manufacturer's maximum recommended joint deflection.

- J. Protection: Protect pipe from damage before, during, and after installation until backfill or grouting is complete. Protect the Work and materials of other trades. In event of damage, make all necessary repairs and replacements as recommended by the pipe manufacturer at no additional cost to the Owner.

3.02 GROUTING

- A. For pipe installed by microtunneling/pipe jacking methods, contact grouting shall be performed after each drive is completed in accordance with Section 33 23 24 "Contact Grouting."
- B. Grout plugs shall be supplied by the manufacturer and installed flush with the pipe.

3.03 FIELD QUALITY CONTROL

- A. Conduct pipe testing as outlined below.
- B. Hydrostatic Leak Test-Gravity Flow Sewer Lines:
 - 1. Perform hydrostatic leak tests after installation.
 - 2. The length of the pipe to be tested shall be such that the head over the crown of the upstream end is not less than 2 feet or 2 feet above the ground water level whichever is higher.
 - 3. Plug the pipe with pneumatic bags or mechanical plugs so that the air can be released from the pipe while it is being filled with water.
 - 4. Continue the test for 1 hour and make provisions for measuring the amount of water required to maintain the water at a constant level during this period.
 - 5. Determine the maximum allowable leakage or infiltration by the following formula.

$$L = \frac{C \times D \times S}{126,720}$$

Where L is the allowable leakage in gallons per hour; S is the length of pipe tested in feet; D is the nominal diameter of the pipe in inches; C is infiltration/exfiltration rate. Use 50 for C outside of 25-year floodplain, and 10 for C within 25-year floodplain.

- 6. Determine the rates of infiltration by means of V-Notch weirs, pipe spigot, or plugs in the end of the pipe. Methods, times, and locations are subject to the Engineer's acceptance.
 - 7. Pipe with visible leaks or infiltration or exceeds the maximum allowable leakage or infiltration is considered defective and must be corrected.
- C. Alternative Air Test for Individual Joints:
 - 1. An air test at each individual joint will be acceptable in lieu of the hydrostatic test referenced above.
 - 2. Lines 36 inches and larger may be tested at individual joints.
 - 3. Unless otherwise recommended by the manufacturer, the shortest allowable time for the test pressure to drop from 3.5 pounds per square inch (gauge pressure) to 2.5 pounds per square inch (gauge pressure) is 10 seconds for all pipe sizes.

4. Pipe joints that exceed the maximum allowable pressure drop over a specific period of time as recommended by the manufacturer or herein are considered defective and must be corrected by performing repairs as recommended by the pipe manufacturer.
- D. Deflection Testing for Pipe:
1. Perform deflection tests on flexible and semi-rigid pipe in accordance TCEQ requirements.
 - a. The maximum allowable deflection of pipe measured as the reduction in vertical inside diameter is 75% of the manufacturer's recommendation.
 - a. Conduct test after the final backfill has been in place a minimum of 30 days.
 - b. Thoroughly clear the lines before testing.
 2. Perform test by pulling a properly sized mandrel through the line up to 36-inch diameter. Larger than 36-inch which may be measured from the inside-vertical dimensions.
 3. Repair pipe with deflections in excess of the maximum allowable deflection as recommended by the pipe manufacturer.
- E. Engineer may require additional performance tests of the joints.
- F. Contractor shall not enclose or cover any Work until inspected and required testing has been completed and accepted by the Engineer.

END OF SECTION

33 73 15 SHAFT EXCAVATION

1.00 GENERAL

1.01 SCOPE OF WORK

- A. The Work includes shaft excavation and designing, furnishing, installing, maintaining, and removing initial support systems associated with shaft excavation. The initial support systems shall consist of watertight methods of support, including gasketed steel liner plates, secant piles, slurry walls, or interlocking steel sheet piling.
- B. All Work specified herein is the responsibility of the Contractor and is subject to the acceptance of the Engineer and the Owner. Contractor shall perform all Work described herein in accordance with all current applicable regulations and codes of Federal, State, and local agencies having jurisdiction. In the event of conflict between separate regulations or the requirements herein, the Contractor shall comply with the more stringent requirement. No part of this specification shall be construed as a relaxation of any applicable current Federal, State, or local regulations or codes.
- C. Contractor shall furnish all labor, equipment, and materials required to excavate and support the shafts that are required to perform trenchless construction and as required herein. The Contractor's methods of excavation shall be compatible with the requirements as shown on the Drawings and as required herein. If the Contractor's selected type of initial support system fails to provide satisfactory performance, the Contractor shall provide another type of initial support system at no additional cost to the Owner.
- D. The Contractor shall be solely responsible for the design of the initial support system. The design of the initial support system, including calculations, plans, specifications, and overall submittal for the initial support system shall be signed and sealed by a Professional Engineer licensed in the State of Texas with prior experience of design of initial support systems for similar applications in similar ground conditions.
- E. The requirements presented herein shall be considered the minimum requirements and such requirements do not alleviate or diminish the sole responsibility of the Contractor for the design, installation, and maintenance of the initial support system and for the safety of workers.

1.02 RELATED WORK

- A. Section 31 23 10 "Structural Excavation and Backfill"
- B. Section 33 05 23.33 "Pipeline Crossing"
- C. Section 33 13 54 "Geotechnical Instrumentation and Monitoring"
- D. Section 33 30 00 "Microtunneling"
- E. Section 33 73 16 "Groundwater and Surface Water Control"

1.03 QUALITY ASSURANCE AND CONTROL

- A. Shaft excavation operations shall be performed under the direct supervision of a qualified superintendent who is assisted by experienced foremen. Both the superintendent and

foremen shall have at least five years of experience with similar projects utilizing similar methods to those required herein, and in similar ground conditions.

1.04 DESIGN CRITERIA

- A. The watertight initial support systems for shaft excavations shall be designed by the Contractor in accordance with general engineering design practice and all applicable requirements of the Occupational Safety and Health Agency (OSHA). The Contractor's design shall also be performed in accordance with applicable codes, requirements, specifications, and standards, including those of the following organizations:
 - 1. American Concrete Institute (ACI)
 - 2. American Institute of Steel Construction (AISC)
 - 3. International Building Code (IBC)
- B. The Contractor shall design watertight initial support systems, including temporary watertight working slabs at the bottom of such initial support systems, to withstand all ground and groundwater pressures, bottom heave, equipment loads, traffic and construction loads, temporary stockpiles, stored materials, and other surcharge loads to allow for the safe performance of the Work to be performed inside and adjacent to shafts without excessive ground movement or settlement of the ground, and to prevent damage to adjacent existing structures, utilities, and other facilities. The embedment depth of the initial support system below the bottom of the excavation shall be sufficient to minimize lateral and vertical movement of the surrounding ground as well as to minimize the possibility the soils at the bottom of the shaft from "boiling."
- C. The design of the initial support system shall consider sequence of construction, including installation the initial support system, performing shaft excavation, performing trenchless construction, installation of jacking pipe and connecting structures within the initial support system, placement of concrete lining within the initial support system, and backfilling and removal of the initial support system, as applicable.
- D. The initial support systems shall be compatible with the Contractor's chosen means and methods to perform trenchless construction between shaft locations in accordance with Section 33 05 23.33 "Pipeline Crossing" or Section 33 30 00 "Microtunneling." The design of the initial support system shall include provisions for watertight entry and exit seals for tunneling equipment into and out of the shaft and thrust blocks at the opposite wall of the shaft, as required.
- E. The Contractor's design of the initial support systems shall be compatible with the ground and groundwater conditions presented in the Geotechnical Engineering Report.
- F. Contractor shall design each member or support element of the initial support system to support the maximum loads that are possible to occur during construction with appropriate safety factors.
- G. Contractor shall utilize walers, struts, and beams for bracing and lateral support as required for initial support systems. Provide struts with intermediate vertical and horizontal supports as required to prevent buckling.
- H. Watertight working slabs shall be provided at the bottom of each shaft excavation and shall be designed to provide stable support for construction operations.

- I. The initial support system shall limit movement or settlement of ground adjacent to the shaft excavation within the allowable limits in accordance with Section 33 13 54 "Geotechnical Instrumentation and Monitoring."
- J. The initial support system shall be watertight to prevent lowering of the groundwater level outside of the shaft excavation and allow for the control of groundwater in accordance with Section 33 73 16 "Groundwater and Surface Water Control."
- K. Shafts shall be protected from flooding. The design of the initial support system for each shaft located in the 100-year floodplain shall include a water retaining liner that extends at least two feet above the 100-year flood elevation. The water retaining liner can be preassembled and stored at the site for immediate installation in lieu of being installed prior to shaft excavation.
- L. Review of the Contractor's submittals for the initial support systems by the Engineer does not relieve the Contractor and the engineer retained by the Contractor, of their responsibility to provide and maintain adequate initial support systems for shaft excavations meeting the requirements herein.

1.05 SUBMITTALS

- A. At least 30 days prior to the start of shaft construction, the Contractor shall submit the following to the Engineer for review:
 - 1. Contractor performing shaft excavation shall have experience with shaft excavation and shall provide evidence of at least five years of experience of performing shaft excavations utilizing methods similar to those required herein, and in similar ground conditions. Contractor performing shaft excavation shall submit the resume of the Contractor's superintendent and foremen demonstrating relevant experience as required by Article 1.03.A. herein.
 - 2. Shaft Excavation Work Plan shall include, but not be limited to, descriptions of the proposed site facilities, proposed equipment to be utilized for installation, maintenance, and removal of initial support systems, and shaft excavation and backfilling, proposed methods for installation, maintenance, and removal of the associated initial support systems, proposed methods for shaft excavation, spoil handling, stockpiling, disposing, and backfilling, and proposed equipment for ventilation and lighting. The Shaft Excavation Work Plan shall be coordinated with the Groundwater Control Plan as required by Section 33 73 16 "Groundwater and Surface Water Control."
 - 3. The design of each initial support system shall include plans and specifications for the installation, maintenance, and removal of the initial support system, design criteria including thrust block requirements, calculations, assumptions, and loadings. The design shall include a table of minimum setback distances from the edge of the initial support system for vehicles, equipment, and materials to be used during construction. The design of each initial support system shall be signed and sealed by a Professional Engineer licensed in the State of Texas.
 - 4. The Professional Engineer retained by the Contractor responsible for designing initial support systems shall submit a resume demonstrating at least five years of experience in the design of initial support systems for shaft excavations utilizing methods similar to those required herein and in similar ground conditions.

5. Proposed grout mix design and procedures for filling the void space between the excavated ground and the initial support system, if applicable.
 6. Safety plan, including a code of safe practices and an emergency plan, for shaft, tunnel, and other underground construction, showing compliance with applicable regulations and laws. Safety plan shall include provisions for protecting the shaft excavation from unauthorized access as required herein.
 7. Address and description of disposal site for excess excavated materials that are generated from shaft excavation operations and to be removed from the site.
- B. Daily Reports
1. Installation of Initial Support System: On a daily basis during the Work, Contractor shall submit a log of the progress of the installation of the initial support system, including quantity and types of elements installed for each working day, regardless of the amount of progress made. Include number of hours worked, name and classification of crew members, and equipment and materials used. Indicate any downtime and include reason for downtime, duration, and impact of downtime.
 2. Shaft Excavation: On a daily basis during the Work, Contractor shall submit a log of materials generated from shaft excavation activities, including a description of soils encountered, pictures, approximate volume (and associated depth of shaft) for each working day, regardless of the amount of progress made. Include the numbers of hours worked, name and classification of crew members and equipment utilized. Indicate quantity and location of groundwater inflows, if encountered. Indicate any downtime and include reason for downtime, duration, and impact of downtime.
- C. Provide as-built information associated with the portions of the initial support systems to be left in place, as applicable, and as required herein.

1.06 SAFETY

- A. The Contractor's methods of construction shall ensure the safety of the Work, project participants, the public, third parties, and adjacent property, whether public or private. All work shall conform to the applicable requirements of all Federal, State, and local laws and regulations. The Contractor is solely and completely responsible for maintaining safe work conditions at the site at all times.
- B. The Contractor's safety officer shall administer an accident prevention program and shall prepare a code of safe practices and an emergency plan. Provide the Engineer with a copy of each prior to starting any shaft or tunnel excavation activities. The Contractor shall hold safety meetings and provide safety instruction for new employees.

1.07 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO) – Standard Specifications for Highway Bridges, 17th Edition, 2002.
- B. American Society of Civil Engineers (ASCE) – ASCE/CI Standard 36-15, Standard Design and Construction Guidelines for Microtunneling, 2015.
- C. ASCE, Geotechnical Baseline Reports for Construction, Suggested Guidelines, 2007.

- D. National Fire Protection Code (NFPA) – (NFPA 70, National Electrical Code), latest version.
- E. National Utility Contractor Association (NUCA) Trenchless Construction and New Installation Methods Manual.
- F. North American Society of Trenchless Technology (NASTT) Pipe Jacking Good Practices Guidelines.
- G. Occupational Safety and Health Administration (OSHA) Safety and Health Regulations for Construction, 29 CFR Part 1926, latest version.

1.08 DEFINITIONS

- A. Definitions shall be as stated in ASCE/CI Standard 36-15, Chapter 3 Definitions, unless otherwise modified or supplemented below.

2.00 PRODUCTS

2.01 MATERIALS

- A. Structural Steel: Structural steel members, such as fabricated connections and accessories, steel W shapes and other structural steel members, shall be in accordance with ASTM A36, ASTM A572, or ASTM A992.
- B. Interlocking Steel Sheet Piling: Steel sheet piling shall be in accordance with ASTM A328.
- C. Gasketed Steel Liner Plates: Steel liner plates shall be in accordance with ASTM A569.
- D. Steel Bolts and Nuts: Steel bolts and nuts shall be in accordance with ASTM A153.
- E. Concrete: Concrete and other cementitious materials shall be in accordance with ASTM C150. Aggregates used in concrete shall be in accordance with ASTM C33.

3.00 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Each shaft excavation shall be supported in accordance with the corresponding initial support system design as required herein. The Contractor shall perform all Work described herein in accordance with the Shaft Excavation Work Plan as required herein. No shaft construction work, including excavation or installation of initial support system components shall be performed until Engineer has reviewed and accepted all submittals required herein.
- B. If settlement of ground or deflections of supports indicates that the initial support system requires modification to prevent such movements, the Contractor shall redesign and modify the initial support system at no additional cost to the Owner.
- C. Dimensions of shaft excavations shall be determined by the Contractor to accomplish the Work, including installation of the jacking pipe and structures as shown on the Drawings, as required by the Contractor's chosen means and methods, as to minimize conflicts with existing utilities, structures, or other facilities, or as otherwise described herein. No additional payment will be made for additional excavation beyond the required lines of excavation shown on the Drawings, whether the additional excavation occurs as a result of intentional or unintentional excavation.

- D. Any shaft excavations performed more than six inches deeper than the elevations shown on the Drawings shall be backfilled with flowable fill at no cost to the Owner.
- E. Contractor's means and methods used in the performance of shaft excavations shall not disturb the ground beyond the limits of work.
- F. Contractor is fully responsible for maintaining and repairing all shaft excavations and associated initial support systems as required.
- G. The site shall be graded and/or berms shall be constructed to promote drainage away from the active shaft excavations.
- H. Unsupported Height: No unsupported sidewall spans will be allowed. Excavation shall not proceed more than two feet below an unsupported or unbraced member.
- I. Welding: All welding shall conform to the applicable provisions of ANSI/AWS D1.1.

3.02 EXISTING UTILITIES, STRUCTURES, AND OTHER FACILITIES

- A. The location of existing utilities, structures, and other facilities shown on the Drawings is approximate. The Contractor shall field locate and protect each existing utility, structure, and facility potentially impacted by the Work and to verify the exact location of such prior to beginning any shaft excavation activities.
- B. Existing utilities in the vicinity of the proposed shaft excavations shall rerouted, with a maximum 24 hours of service disruption or as otherwise acceptable to the owner of such utility. Methods for rerouting shall be acceptable in writing by the owner of the utility. The Contractor shall coordinate with the Owner prior to the planned disruption of service and with each utility owner as necessary prior to relocation, hanging, or upgrade of utilities in the vicinity of shaft excavation. The cost of this work shall be borne by the Contractor, whether performed by the Contractor or the utility owner, at no additional cost to the Owner unless specified elsewhere.

3.03 GEOTECHNICAL INSTRUMENTATION

- A. Install and monitor geotechnical instrumentation during performance of shaft excavations in accordance with Section 35 13 54 "Geotechnical Instrumentation and Monitoring."

3.04 GROUNDWATER CONTROL

- A. Watertight initial support systems shall prevent the migration of sediment and fines into the shaft excavation and shall limit groundwater inflows into each shaft excavation to 0.5 gallons per minute or less. Contractor shall perform repairs of the initial support system or perform dewatering and/or grouting, as necessary, to meet the groundwater inflow requirements for each shaft excavation herein at no additional cost to the Owner.
- B. Control groundwater in accordance with Section 33 73 16 "Groundwater and Surface Water Control."

3.05 INTERNAL BRACING OF INITIAL SUPPORT SYSTEM

- A. Internal Bracing: The internal bracing of the initial support system shall include wales, struts and/or shores as determined by the Contractor's initial support system design.

- B. Struts: Provide struts with intermediate bracing as needed to prevent rotation, crippling or buckling of connections and points of bearing between structural steel members. Allow for eccentricities caused by field fabrication and assembly.
- C. Web Stiffeners, Plates and Angles: Include web stiffeners, plates or angles as needed to prevent rotation, crippling, or buckling of connections and points of bearing between structural steel members. Allow for eccentricities caused by field fabrication and assembly.
- D. Bracing Supports: Install and maintain all bracing support members in tight contact with each other and with the surface being supported.
- E. Preloading: Preload bracing members by jacking struts to 50 percent of the design load if necessary to control shoring movement. Preload bracing members in accordance with methods, procedures and sequences as described in the accepted submittals. Coordinate excavation work with installation of bracing and preloading. Use steel shims and steel wedges welded or bolted in place to maintain the preloading force in the bracing after release of the jacking equipment pressure. Install support and preload immediately after installation and prior to continuing excavation.
- F. Procedures: Use procedures that produce uniform loading of bracing members without eccentricities or overstressing and distortion of members of system.

3.06 SAFETY

- A. A suitable guardrail barrier shall be constructed and maintained and shall extend a minimum of 42 inches above the ground surface adjacent to each shaft excavation for means of fall protection in accordance with OSHA requirements.
- B. Sufficient means of access and egress shall be constructed and maintained for the shaft excavations in accordance with OSHA requirements.
- C. A structural steel cover or netting shall be placed at the top of each shaft excavation when there is no construction activity being performed inside the shaft.
- D. Each shaft excavation shall be surrounded by a perimeter security fence which shall be secured at any time the site is not occupied by the Contractor's personnel.
- E. Provide portable concrete traffic barriers for shaft excavations adjacent to roadways, driveways, or parking lots. Barriers shall be angled in the direction of typical direction of travel and shall not be placed perpendicular to the typical direction of travel.
- F. Provide and maintain other traffic control devices in accordance with Federal, State, and local regulations and per other project requirements.

3.07 TOLERANCES

- A. The shaft shall be constructed within 0.5 foot of the plan location and elevations shown on the Drawings, if provided.
- B. The shaft shall be constructed in its final position not more than one inch out of plumb for every 10 feet of depth of shaft.
- C. The centerline of penetrations into the shaft shall not deviate by more than three inches when measured at the inside wall of the shaft.

- D. The ovality of the cross section of the shaft excavation at any given plane shall not exceed six inches when measured between any two diameters on a given horizontal plane.

3.08 DISPOSAL OF EXCAVATED MATERIAL

- A. All excess excavated materials generated from installation of initial support systems or shaft excavation shall be transported and disposed of in accordance with the applicable Federal, State, and local regulations and per other project requirements.

3.09 REMOVAL OF INITIAL SUPPORT SYSTEM AND BACKFILL

- A. All elements of the initial support system within five feet of the proposed finished grade shall be removed, unless otherwise acceptable to the Engineer. Elements of the initial support system greater than five feet below the ground surface shall be removed if practical, or if degradation or decay over time would result in settlement, ground movement, or other damage to adjacent utilities, structures, or other facilities.
- B. Removal of the initial support system shall be performed in a manner that will not disturb or harm adjacent construction, utilities, structures, or other facilities and only after backfill has been fully compacted. All voids created by the removal of the initial support system shall be backfilled in accordance with Section 31 23 10 "Structural Excavation and Backfill" or as otherwise acceptable to the Engineer. The portions of the initial support system removed from the excavation shall remain the property of the Contractor and shall be removed from the site and disposed.
- C. Furnish, place, and compact backfill in the shafts between the remaining elements of the initial support system. Backfill shall consist of flowable fill or Class 4 Earth Fill, unless otherwise accepted by the Engineer. Flowable fill backfill shall be placed in 3-foot lifts and the subsequent lifts shall not be placed until the previous lift can support the weight of workers without indenting the surface. Backfill shall be placed evenly where the elevation of backfill does not vary by more than 1 foot. Backfill adjacent to pipe or permanent structures located inside shaft excavations shall be performed in accordance with Section 31 23 10 "Structural Excavation and Backfill."
- D. Contractor shall record dimensions, locations, and elevations of all elements of the initial support system that were not removed from the shaft excavations and shall submit records to the Engineer.

END OF SECTION

33 73 16 GROUNDWATER AND SURFACE WATER CONTROL

1.00 GENERAL

1.01 SCOPE OF WORK

- A. Contractor shall design and construct groundwater and surface water control facilities as necessary to maintain the tunnel, shaft, and other excavations free from surface, seepage, and standing water at all times during the performance of excavation and construction activities. Contractor shall remove all components of the groundwater and surface water control systems when no longer required, as acceptable to the Engineer.
- B. Contractor shall furnish all labor, equipment, and materials to install and maintain pumps, piping, drains, and other facilities for the control, collection, and disposal of groundwater from tunnel, shaft, and other excavations. Water collected in the tunnel shall be directed to the shafts for collection.
- C. Contractor shall furnish all labor, equipment, and materials to perform grading to construct ditches, berms, and other surface water drainage systems necessary to divert and drain surface water away from tunnel, shaft, and other excavations and other work areas. Surface water drainage systems shall be located to not interfere with existing utilities, structures, or other facilities, adjacent properties, adjacent water wells, or construction operations.
- D. All Work specified herein is the responsibility of the Contractor, subject to the acceptance of the Engineer. All applicable Federal, State, and local rules, laws, and regulations shall be followed, including those of the Texas Commission on Environmental Quality (TCEQ) involving groundwater and discharges from construction activities, and the Texas Department of Licensing & Regulation (TDLR) involving well drilling and dewatering wells. No part of this specification shall be construed as a relaxation of any of these rules, laws, and regulations.

1.02 RELATED WORK

- A. Section 33 05 23.33 "Pipeline Crossing"
- B. Section 33 13 54 "Geotechnical Instrumentation and Monitoring"
- C. Section 33 23 24 "Contact Grouting"
- D. Section 33 30 00 "Microtunneling"
- E. Section 33 73 15 "Shaft Excavation"

1.03 QUALITY ASSURANCE AND CONTROL

- A. Contractor shall be competent and experienced in performing excavations below the water table and shall submit evidence of at least five years of experience with similar projects. All groundwater and surface water control operations shall be performed under the direct supervision of a qualified superintendent who is assisted by experienced foremen. Both the superintendent and foremen shall have at least five years of experience with similar projects involving tunnel and shaft construction.
- B. A detailed, site specific Groundwater Control Plan shall be prepared, signed and sealed by a Professional Engineer licensed in the State of Texas with a minimum of five years of

experience in the design, installation, and operation of groundwater control systems in similar ground conditions for similar projects involving tunnel and shaft construction.

1.04 PERFORMANCE REQUIREMENTS

- A. The Contractor's design and construction of the groundwater and surface water control systems shall be compatible with the ground and groundwater conditions presented in the Geotechnical Engineering Report.
- B. Contractor shall assume sole responsibility for groundwater and surface water control systems and shall be responsible for any loss or damage resulting from partial or complete failure of protective measures, and any settlement or resultant damage caused by the groundwater and surface water control systems.
- C. Contractor shall obtain all necessary permits from agencies that regulate the collection and use of groundwater and surface water and the discharge of collected groundwater and surface water into surface water bodies or storm sewers.
- D. Contractor shall protect all shaft excavations from flooding as required by Section 33 73 15 "Shaft Excavation." The Contractor shall monitor river and creek levels and river and creek level forecasts and shall be responsible for notifying personnel and evacuating the site if necessary. The Contractor is responsible for all damages, clean-up, restoration, disposal of fluids and solids, demobilization, re-mobilization, associated with flooding of the site. No adjustment to the contract price will be made for flooding, however a contract time extension may be considered if the flooding causes a delay.
- E. Review of the Contractor's submittals for control of groundwater and surface water by the Engineer does not relieve the Contractor, and the engineer retained by the Contractor, of their responsibility to provide and maintain adequate systems for the control of groundwater and surface water meeting the requirements herein.

1.05 SUBMITTALS

- A. The Contractor shall obtain and submit copies of permits obtained from Federal, State, or local jurisdictional authorities as required for the Work described herein.
- B. Contractor performing dewatering shall submit the resume of the Contractor's superintendent and foremen demonstrating relevant experience as required by Article 1.03.A. herein.
- C. The Contractor shall submit a Groundwater Control Plan to the Engineer for review and acceptance at least 30 calendar days prior to the start of any excavation and/or dewatering activities. The Groundwater Control Plan shall include a narrative, working drawings, and supporting documentation showing the type of groundwater control system proposed for each location for removing, monitoring, treating, and disposing of the collected water. The Groundwater Control Plan shall be signed and sealed by a Professional Engineer licensed in the State of Texas retained by the Contractor. The Groundwater Control Plan shall be coordinated with the Shaft Excavation Work Plan and initial support system designs as required by Section 33 73 15 "Shaft Excavation."
- D. The Professional Engineer retained by the Contractor responsible for the Groundwater Control Plan shall submit a resume demonstrating relevant experience as required by Article 1.03.B. herein.

- E. Contractor shall submit on a daily basis records of volume of water discharged and other parameters required to be recorded or reported by discharge permits or by agencies having jurisdiction.

1.06 SAFETY

- A. The Contractor's chosen means and methods of construction shall ensure the safety of the Work, project participants, the public, third parties, and adjacent property, whether public or private. All work shall conform to the applicable requirements of all Federal, State and local laws and regulations. The Contractor is solely and completely responsible for maintaining safe work conditions at the site at all times.

2.00 PRODUCTS

2.01 GENERAL

- A. The Contractor shall have on hand at all times during construction adequate labor, equipment, pipe, power, and supporting materials to maintain the groundwater and surface water control systems as specified herein. Adequate drains, sumps, pumps, and treatment systems shall be provided to facilitate handling, treatment, and disposal of water, and to conform to the requirements for discharge of collected water from construction activities.

3.00 EXECUTION

3.01 GENERAL

- A. The Contractor shall install, operate, and maintain the groundwater control systems in accordance with the Groundwater Control Plan. The Contractor shall monitor the effectiveness of the groundwater and surface water control systems and the associated effects of such systems on existing utilities, structures, other facilities, and adjacent property.
- B. The Contractor shall furnish, install, operate, and maintain pumps and grading, ditches, berms, and temporary pipes as required to maintain excavations and other work areas free of flowing or standing water and prevent surface water from flowing into excavations. Surface water control systems shall not cause erosion on or off site or cause unwanted flow of water onto adjacent property, roads, or other facilities.
- C. When the groundwater or surface water control system does not meet the specified requirements of this section and related specifications, the Contractor shall modify groundwater and surface water control systems or operations of such systems if they cause or threaten to cause damage to existing utilities, structures, other facilities, or adjacent property at no additional cost to the Owner. The Contractor shall notify the Engineer in writing of any modifications made and provide an updated Groundwater Control Plan to the Engineer as required. The Contractor shall repair any damage caused by the groundwater or surface water control systems to the satisfaction of the Engineer, at no additional cost to the Owner.

3.02 INSTALLATION

- A. The location of every element of the groundwater or surface water control systems shall be such that interference with tunnel, shaft, or other excavations and associated construction activity is minimized. Contractor shall locate wells and all other components of groundwater and surface water control systems in locations which do not adversely affect the Owner or third parties. Locations shall be proposed by the Contractor and acceptable to the Engineer prior to installation.

3.03 OPERATION

- A. Unless otherwise accepted by the Engineer in writing, the groundwater and surface water control systems shall be operated by the Contractor continuously 24 hours per day, 7 days per week until tunnel and shafts have been satisfactorily constructed. Contractor shall have sufficient equipment and materials on standby to ensure continuous operation, including a backup power source.
- B. Provide filtration to prevent piping, removal of fines, and loss of ground at all points where water is exiting the ground. Filtration shall be performed with a properly designed geotextile, engineered sand pack, or similar system designed to provide filtration.
- C. For dewatering of material within the interior of watertight initial support systems for shaft excavations, dewatering of shaft excavations shall not be performed until the watertight initial support system has been completely installed.
- D. Prior to dewatering of material outside of initial support systems for shaft excavations Contractor shall install at least three piezometers and other instrumentation as necessary adjacent to each shaft excavation prior to performing any dewatering, or as otherwise required by the Contractor's engineer responsible for the design of the groundwater control system. These piezometers and other instrumentation shall be used to monitor dewatering operations and assure that the required results are achieved. Piezometers or other instrumentation shall be installed, monitored, and maintained in accordance with the applicable requirements of Section 33 13 54 "Geotechnical Instrumentation and Monitoring."
- E. Any groundwater or surface water contaminated by the Contractor's operations or collected during excavation operations, shall be collected in tanks or settling basins to filter solids prior to discharge. Contractor shall settle out solids and perform other methods of treatment prior to discharging collected groundwater or surface water into surface water bodies or storm sewers as required by permits obtained by the Contractor and agencies having jurisdiction. Contractor shall dewater the solids that are collected and dispose of them as required by the Contract Documents.
- F. Piezometers shall be located in monitoring boreholes and not incorporated in dewatering wells.

3.04 REMOVAL

- A. All elements of the groundwater and surface water control system shall be removed from the site at the completion of the tunnel and shaft construction work as acceptable to the Engineer. For any piezometers and other instrumentation installed, such shall be removed in accordance with the applicable requirements of Section 33 13 54 "Geotechnical Instrumentation and Monitoring."

END OF SECTION



Division 40 – Process Integration

40 05 50 FABRICATED GATES

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to fabricate, test and install stop logs as shown on the Drawings and indicated in gate schedule with operators, gate stems, frames, gate guides, wall thimbles and other related appurtenances.

1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturers:
 - 1. Whipps.
 - 2. Fontaine.
 - 3. Golden Harvest.
 - 4. Approved Equal.
- B. The fully assembled stop logs shall be shop inspected, tested for operation and leakage, and adjusted before shipping. Manufacturer shall provide test certificates to show that they meet the leakage rate required in this Section. Factory hydrostatic testing shall be conducted to the maximum design head of each specific gate, per Paragraph 3.04.A. There shall be no assembling or adjusting on the Site other than for the lifting mechanism

1.03 MANUFACTURER'S QUALITY CONTROL SYSTEM

- A. The gate manufacturer shall be ISO 9001 certified and compliant or have an approved Quality Assurance Policy.

1.04 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include at least the following:
 - 1. Shop Drawings:
 - a. Certified shop and installation drawings showing all materials, details of construction, dimensions and anchor bolt locations. General arrangement drawings and catalog cut sheets are not acceptable for use as shop and installation drawings.
 - b. Maximum deflection and bending stress of the stop logs loaded under the maximum design head.
 - 2. Record Data:
 - a. Descriptive literature, bulletins and/or catalogs of the equipment.
 - b. Prior to shipment of stop logs, submit certified affidavit of compliance stating that the products for this Contract were manufactured, inspected, and tested in accordance with all applicable AWWA and ASTM Standards.

- c. Shop test reports, including test results from operation and shop leakage tests on all products. Leakage tests shall be performed with water in the unseating head condition. Feeler gauge testing is not acceptable in lieu of testing with water.
- d. ISO 9001:2015 certification or paperwork confirmation a similar QA/QA program.

3. Operation and Maintenance Manuals

1.05 STANDARDS

- A. The applicable provisions of the following standard shall apply as if written here in its entirety unless expressly contradicted in the text of this specification:
 - 1. American Water Works Association (AWWA): AWWA C561-14, Fabricated Stainless Steel Slide Gates (latest revision).
 - 2. ASTM International (ASTM).
 - 3. American Welding Society (AWS).

1.06 EXPERIENCE REQUIREMENTS

- A. The equipment Supplier shall have at least 10 years of experience in the design, application and supply of aluminum fabricated gates in water service. The equipment supplier shall submit a list of not less than 10 operating installations in the United States with similar size gate as scheduled, as evidence of meeting the experience requirement. Installation list shall be submitted with the Shop Drawings.

1.07 GUARANTEE AND WARRANTY

- A. Gate Manufacturer shall warrant the equipment furnished under this specification for a minimum period of 1 year against defects in materials and workmanship, and operational failure.

2.00 PRODUCTS

2.01 MATERIALS

- A. Materials in fabricated gates and appurtenances shall conform to the requirements of the applicable specifications listed below for the alloy, grade, type, or class of material and the condition and finish appropriate to the structural and operational requirements:
 - 1. Carbon Steel Bars: ASTM A108 or ASTM A575.
 - 2. Structural Steel Shapes, Plates, and Bars: ASTM A36.
 - 3. Stainless Steel: ASTM A167, ASTM A276 or ASTM A582, Type 302, 303, 304 or 304L, 316 or 316L.
 - 4. Bronze Bar, Rods, Shapes: ASTM B21 or ASTM B98.
 - 5. Cast Bronze: ASTM B584.
 - 6. Rubber for Gaskets and Seals: ASTM D2000, Grade R-62.
 - 7. UHMW Polyethylene: ASTM D4020.

8. Aluminum: ASTM B209.

2.02 GATE DEFINITIONS

- A. Sluice gates are defined as fabricated gates with top, bottom and side seals. Sluice gates are typically used at pipe ends in basins or influent and effluent boxes and fully submerged wall openings and/or orifices.
- B. Slide gates are defined as fabricated gates with bottom and side seals. Slide gates are typically used for open channel isolation and diversion. The top of slide gates are typically above the maximum water surface elevation. Slide gates are not suitable for submerged orifice applications.
- C. Weir gates are defined as fabricated gates with bottom and side seals. Weir gates are typically used as overflow downward opening adjustable weirs. The top of weir gates are typically submerged and set at the desired overflow elevation. Weir gates are mounted flush to the wall surface at the weir opening in the structural wall.
- D. Stop gates and stop logs are defined as hydraulic control gates where their use is more permanent and requires infrequent opening and closing. Stop gates and stop logs are used to provide a permanent flow control across an opening and operate similar to an adjustable weir gate. Stop gates typically consist of a single continuous slide while stop logs consist of several smaller equal size "logs" that can be installed or removed as needed to change the height of gate.

2.03 STOP GATE AND STOP LOGS

- A. Each stop log shall be manufactured from 1/4-inch minimum thickness aluminum plate or and extrusion, and shall be furnished with aluminum stop log grooves. The bottom and ends of the log shall be furnished with a water-activated resilient lip seal. Stop logs shall be provided with lifting slots in the top. Stop logs that utilize pins on the sides are not acceptable. A lifting device with guide rollers (where necessary) shall be furnished with the log.
- B. The wall mounted or embedded guide frame shall be of 304L or 316 stainless steel and shall have factory welded corners. The guide frame shall have a minimum thickness of 0.25 inches and weight of not less than 2.5 pounds per foot for aluminum stop gates. All stop gates seats and seals shall be UHMWPE and shall be incorporated into the guide frame. All stop logs seals shall be mounted on the stop logs and no seals shall be mounted on the frame. A stop log lifter shall be provided for each different stop log width with each complete set of stop logs and shall be capable of installing and removing all of the logs with an external lifting device such as a hoist or crane.
- C. Stop logs shall be provided with welded ID tags on each log that, at a minimum, lists the opening width, maximum head, and manufacturer.

3.00 EXECUTION

3.01 INSTALLATION

- A. Install the gates in a manner that will prevent leakage around the frame and will prevent binding of the slide during operation. Keep surfaces where metal and the concrete placed

come in contact free from oil, grease, loose mill scale, loose paint, surface rust, and other debris or objectionable coatings. Secure anchor bolts, thimbles and spigot frames in true position in the forms and hold in alignment during the placement of the concrete. Finish surfaces to provide a smooth and uniform contact surface where concrete and rubber seals come in contact and where frames or plates are installed. When a gate or stop log frame is installed against concrete, the Contractor shall either install using double-nuts and a nominal 1-inch grout pad or a minimum 3/8-inch thick 1/2-inch EPDM mounting gasket or 1/2-inch non-shrink grout shall be placed between the gate and the concrete. When the gate is attached to a thimble, apply non shrink grout between the face of the thimble and the gasket and the gasket and the gate frame. Apply the mastic between the wall thimble stud holes and the gate opening. If a gasket is utilized, the installer must ensure that the surface around the opening is sufficiently flat per the manufacturer's instructions.

3.02 FIELD QUALITY CONTROL

- A. Prior to final acceptance by the Owner, the stop logs shall be tested in the presence of the Engineer. A seating head and/or unseating head, at the Engineer's request, corresponding to the maximum water level shall be placed on the stop log and the stop log examined for leakage. The maximum allowable leakage for stop logs shall be 0.05 gpm/lf of wetted perimeter. Manufacturer shall provide test certificates to show that they meet the leakage rate required in this Section.

3.03 SCHEDULES

- A. Stop logs shall be supplied in accordance with the following schedule: The required products and certain pertinent data are given below. This list is given to facilitate description of the various gates and as an aid to plan take-off, and is not guaranteed to be complete.

No. Req.	Location /Service	Opening Size	Gate Type	Gate Material	Mount	Seating/ Unseating Head (feet)
2	Headwall Structure	7'-6" x 19'-6"	STL	Aluminum	FE	19.5/19.5

LEGEND	
Gate Type	Stop Log (STL)
Mount	New Structure Frame Embedded Mount (FE)

END OF SECTION