BROWNSVILLE
PUBLIC UTILITIES BOARD

CONTRACT DOCUMENTS AND TECHNICAL SPECIFICATIONS

Downtown Water and Wastewater Improvements – ARPA Project 2
Bid No. B011-24

October 2023

Hazen

Texas Registered Engineering Firm # F-13618
Tel (214) 382-5750
1100 NW Loop 410, Suite 700-773
San Antonio, Texas

BROWNSVILLE PUBLIC UTILITIES BOARD DOWNTOWN WATER AND WASTEWATER – ARPA PROJECT 2

BID # 011-24

SEAL SHEET

10/19/2023

HAZEN AND SAWYER

TBPELS FIRM NO. F-13618

Responsible Specifications

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DESCRIPTION

LEGAL NOTICE
AND
INVITATION TO BID
BID # B011-24

Notice Date:

Sealed bids will be received by the PUBLIC UTILITIES BOARD of the City of Brownsville, Texas ("BPUB", "OWNER"), at the PUB Purchasing Department office; 1155 FM511, Olmito, TX 78575 **until 2:00 PM, local prevailing time, on November 16, 2023** for the Project described in the Contract Documents and Specifications entitled:

BPUB Downtown Water and Wastewater – ARPA Project 2

Bids received after this time will not be considered.

Bids will be publicly opened and read aloud on November 16, 2023 at 2:15 PM. Bidders can request a copy of the bid tabulation by emailing dsolitaire@brownsville-pub.com. Vendors can call in at 2:15 PM, November 16, 2023 to (956) 214-6020 to listen to the bid opening.

The Work in general includes, but is not limited to:

1) Installation of approximately 1,940 linear feet of 8-inch PVC water main
2) Installation of new water service connections
3) Installation of approximately 750 linear feet of 8-inch PVC sanitary sewer, lateral connections, and associated manholes
4) Installation of approximately 3,190 linear feet of 12-inch PVC sanitary sewer, lateral connections, and associated manholes
5) Installation of approximately 365 linear feet of 12-inch HDPE sanitary sewer through pipe bursting method, lateral connections, and associated manholes (supplementary bid item)
6) Surface restoration including asphalt and concrete pavement
7) All work to be done in downtown Brownsville

Copies of the Contract Documents and Specifications may be obtained at the following website https://www.brownsville-pub.com/rfp_status/open/. A non-mandatory pre-bid conference shall be held at the BPUB Purchasing Department via conference call (956-214-6020) at **2:00 PM**, local prevailing time, on **November 6, 2023**.

Each bid, with1 signed original, and 1 copy shall be enclosed in a sealed envelope and shall be plainly marked on the outside of the envelope: **"BID B011-24 BPUB Downtown Water and Wastewater – ARPA Project 2, November 16, 2023, 2:00 PM".** This envelope shall be addressed to Diane Solitaire; Brownsville Public Utilities Board; Purchasing Department; 1155 FM 511, Olmito, Texas 78575. Bids may be delivered by mail, in person or special delivery. If forwarded by mail, the sealed envelope containing the bid itself must be enclosed in another mailing envelope addressed as specified in the bid form.

Each bid shall constitute an offer to the Board, as outlined therein, and shall be irrevocable for at least ninety (90) calendar days after the time announced for the opening thereof.

Each bid shall be accompanied by a Certified or Cashier's check payable to the order of the Brownsville Public Utilities Board, City of Brownsville, Texas for a sum not less than five (5%) percent of the total amount bid. In lieu of a check, a Bid Bond with a Corporate Surety licensed to do business in the State of Texas, may be submitted in an amount not less than five (5%) percent of the total amount bid conditioned that the BIDDER will pay the BPUB, as mutually agreed to liquidated damages, and not as a penalty, the amount specified in the Bond, unless he enters into a BPUB contract in accordance with his bid. BIDDER is required to execute a contract and furnish a Performance Bond, Payment Bond and a Certificate of Insurance. If the BIDDER fails to execute the contract and to furnish satisfactory Performance and Payment Bonds and Insurance Certificates within ten (10) calendar days from the date on which he is notified that his bid has been accepted, the amount of his check or bid bond shall be forfeited to the BPUB as mutually agreed to liquidated damages, and not as a penalty. **No bid will be considered if the Bid Security is not submitted.**

The BPUB will not be responsible in the event that the U.S. Postal Service or any other courier system fails to deliver the sealed bids to the Brownsville Public Utilities Board, Purchasing Office by the given deadline above. **No bids will be accepted via facsimile or electronic transmission.**

The BPUB specifically reserves the right to reject any or all bids, to waive irregularities or informalities in any or all bids and to accept any bid which is deemed to be in the best interest of the Board or to reject the bids. The award will be made to the responsive and responsible bidder submitting the lowest bid as determined by the BPUB.

Equal Opportunity in Employment - All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin. Bidders will be required to comply with the President's Executive Order No. 11246, as amended by Executive Order 11375, and as supplemented in Department of Labor regulations 41 CFR, Part 60. The requirements for bidders and contractors under this Order are explained in the Specifications.

Diane Solitaire
Purchasing Department
(956) 983-6366

INSTRUCTIONS TO BIDDERS

Please submit this page upon receipt

Acknowledgment Form

BPUB Downtown Water and Wastewater – ARPA Project 2

BID # B011-24

Please e-mail this page upon receipt of the bid package or legal notice. If you only received the legal notice and you want the bid package mailed, please provide a method of shipment with account number in the space designated below.

Check one:

( ) Yes, I will be able to send a bid; obtained bid package from website.

( ) Yes, I will be able to send a bid; please email the bid package.
Email: _____

( ) Yes, I will be able to send a bid; please mail the bid package using the carrier & account number listed below:
Carrier: _____
Account: _____

( ) No, I will not be able to send a bid for the following reason:

_____

_____

If you are unable to send your bid, kindly indicate your reason for "No bid" above and return this form **via email to dsolitaire@brownsville-pub.com.** This will ensure you remain active on our vendor list.

Date _____

Company:_____

Name:_____

Address:_____

City: _____State:_____ Zip Code: _____

Phone: _____Fax: _____

Email:_____

Special Instructions

Contract Information

- **Interpretation**

All requests, questions concerning terms, conditions, and technical specifications, or other communication about this solicitation shall be made in writing and addressed to the Entity's Sole Point of Contact. Only the Sole Point of Contact may be contacted regarding required elements for this IFB. The sole point of contact for this solicitation is

Diane Solitaire, Materials/Warehouse Manager
email: dsolitaire@brownsville-pub.com

Tentative Time Line

1. October 22, 2023 through November 16, 2023 – Vendor bid preparation.
2. November 16, 2023 at 2:00 PM - **Vendor must submit bid, in duplicate, sealed in an envelope to:**

Diane Solitaire, Materials/Warehouse Manager
1155 FM 511
Olmito, TX 78575

Bid # 011-24 - **BPUB Downtown Water and Wastewater – ARPA Project 2**
Due November 16, 2023 at 2:00 PM

The above noted information must be included on bid envelope and on any carrier's envelope/package. The Brownsville Public Utilities Board will not be held responsible for missing, lost or late mail. Brownsville Public Utilities Board will not accept electronic transmissions or facsimiles of sealed bids.

3. November 6, 2023 – Pre-Bid Conference at 2:00 PM
4. Pre-Bid Site Visit: Non-Mandatory , Highly recommended to be completed by the bidder independently
5. DATE QUESTIONS DUE- November 8, 2023 at 5:00 PM
6. November 16, 2023 – Open bids at 2:15 PM
7. November 20 to November 22, 2023 – Bid tabulation and evaluation of bids
8. December 11, 2023 – Presentation to Utilities Board for approval of contract

- **"Or Equal"**

Brand name and/or manufacturer's references used in this Request are descriptive – not restrictive – they are intended to generally indicate type and quality desired. Brands of like nature and quality will generally be considered. If bidding on other than referenced Specifications, please provide complete descriptive information of said material/equipment article. BPUB also reserves the legal right to specify a "sole source" component if such component is critical for integration to a larger BPUB assembly and alternative manufactured items will not meet the design and/or performance needs of the BPUB, in BPUB's sole discretion.

- **Pricing**

Bid unit prices on BPUB estimated quantities specified, extend and show total. In case of errors in extension, unit prices expressed in written words and not numerals, shall govern. Prices shall remain firm throughout the Contract.

All fields (UNIT PRICE & TOTAL PRICE) in the Bid Schedule must be filled in. The data must be complete to identify any bidding brand called for specifically.

Failure to submit any of the above information with the sealed bid may disqualify bid as non-responsive.

- **Contractor Representative**

The successful contractor agrees to send a personal representative with binding authority for the company to the Brownsville Public Utilities Board, upon request, to make any minor clarifications or adjustments and/or assist with coordination of all transactions as needed to allow Contract entry.

- **Quality of Products**

All material and equipment items specified must be new, in first class condition, including containers suitable for shipment and storage. No substitutions in standard grades or lesser quality will be accepted.

- **Determining Factors for Award**

1. Price
2. Responsibility of contractor to perform the intended work and responsiveness to the bid request.
3. Compliance with requirements of the Technical Specifications
4. Quality of performance on previous work on similar contracts
5. Recent successful completion of similar projects
6. BPUB financial and legal responsibility evaluations of any identified teaming arrangements involving significant joint ventures, sub-contractors and suppliers
7. Safety record will be considered when determining the responsibility of the bidder

- **Contract with Vendor/Entity Indebted to BPUB**

It is a policy of the BPUB to refuse to enter into a contract or other transaction with an individual, sole proprietorship, joint venture, Limited Liability Company or other entity indebted to BPUB.

- **Vendor ACH (Direct Deposit) Services**

The BPUB has implemented a payment service for vendors/contractors by depositing the contract payment directly to the contractor's/vendor's bank account. Successful vendor(s)/contractors will be required to receive payments directly through Automated Clearing House (ACH) in lieu of a paper check. **The awarded vendor must agree to receive payments via ACH (Direct Deposit).**

- **Tax Identification Number (TIN)**

In accordance with IRS Publication 515, aW9 form, or a W8 form in cases of a foreign vendor, will be required of all vendors doing business with the Brownsville PUB. If a W9 or W8 form is not made available to Brownsville PUB, the first payment will be subject to income tax withholding at a rate of 28% or 30% depending on the U.S. status and the source of income as per IRS Publication 515. **The W9 or W8 form must be included with bid response.** Attached are sample forms.

- **Unique Entity Identifier through Sam.gov**

The Unique Entity ID is a 12-character alphanumeric ID assigned to an entity by SAM.gov and is required for all contractors and subcontractors.

- **Taxes**

The City of Brownsville and its Brownsville Public Utilities Board are exempt from Federal Excise Tax, State Tax and local sales Taxes. Do not include any taxes in the bid proposal. If it is later determined that tax was included in the bid it will not be included in the tabulation or any awards. Tax exemption certificates will be furnished by BPUB upon request.

- **Signing of Bid**

Failure to sign bid will disqualify it. Person signing bid should show title or legal authority to bind their firm to a Contract.

- **EEOC Guidelines**

During the performance of this Contract, the contractor agrees not to discriminate against any employee or applicant for employment because of race, national origin, age, religion, gender, sexual preference, marital or veteran status, or physically challenging condition.

- **Texas Prevailing Wage Rate**

This project is subject to the Texas Prevailing Wage Rates as described in Texas Government Code, Chapter 2258. In accordance with the statute, contractors must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. See Exhibit C for the prevailing wages applicable to this project. Workers employed by or on behalf of the Entity shall be paid (1) not less than the general prevailing wage of per diem wages for work of a similar character in the locality in which the work is performed, and (2) not less than the general prevailing rate of per diem wages for legal holiday and overtime work. Section 2258.023 – Penalty – A contractor or subcontractor who violates this section shall pay penalty to the Entity on whose behalf the contract is made. A public body awarding a contract shall specify this penalty in the contract. Section 2258.024 – Records – A contractor and subcontractor shall keep a record showing (1) the name and occupation of each worker employed by the contractor or subcontractor in the construction of the public work; and (2) the actual per diem wages paid to each worker. The record shall be open at all reasonable hours to inspection by the officers and agents of the Entity.

- **Contract and Purchase Order**

The services shall be completed in a timely manner as specified in Specifications. A Contract for the services will be placed into effect by means of a purchase order and/or Construction Agreement issued by the Brownsville Public Utilities Board after tabulation and final Contract approval by the Board.

- **Brownsville Public Utilities Board Rights**

1. If only one or no bid is received by "submission date", the BPUB has the right to reject, re-bid, accept and/or extend the bid by up to an additional two (2) weeks from original submission date.
2. The right to reject any/or all bids and to make award as it may appear to be advantageous to the Brownsville Public Utilities Board.
3. The right to hold bid for 90-calendar days from submission date without action, and to waive all informalities in any bid.
4. The right to extend the total bid beyond the original 90-calendar day period prior to an award, if agreed upon in writing by all parties (BPUB and vendor/contractor) and if bidder/vendor holds original bid prices firm.
5. The right to terminate for cause or convenience all or any part of the unfinished portion of the Project resulting from this solicitation within seven (7) calendar days written notice; <u>for cause</u>: upon default by the vendor/contractor, for delay or non-performance by the vendor/contractor; or if it is deemed in the best interest of the BPUB <u>for BPUB's convenience</u>. (See, General Conditions Article 15)

- **Corrections**

Any interpretation, correction, or change of the Invitation to Bid will be made by written ADDENDUM. Changes or corrections will be issued by the Brownsville PUB Purchasing

Department. **Addenda will be emailed to all who have returned the Bid Acknowledgment form.** Addenda will be issued as expeditiously as possible. It is the responsibility of the vendors/contractors to determine whether all Addenda have been received. It will be the responsibility of all respondents to contact the Brownsville PUB prior to submitting a response to the Invitation to Bid to ascertain if any/all Addenda have been issued, and to obtain any all Addenda, execute them, and return Addenda with the response to the Invitation to Bid. Addenda may also be posted on BPUB's website.

1. RECEIPT AND OPENING OF BIDS:

The Brownsville Public Utilities Board, City of Brownsville, Texas (hereinafter called OWNER), invites bids on the form attached hereto, all blanks of which must be appropriately filled in, in ink, for Project entitled **"Bid B011-24, BPUB Downtown Water and Wastewater – ARPA Project 2".**

The OWNER may consider informal and non-responsive, any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn by vendor/contractor prior to the above scheduled time for the opening of bids or OWNER authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No BIDDER may withdraw a bid within at least ninety (90) calendar days after the actual date of the opening thereof.

2. INSPECTION OF SITE:

Each BIDDER shall visit the Project site of the proposed Work and fully acquaint himself with the existing conditions there relating to construction and labor, and shall fully inform himself as to the facility involved, the difficulties and restrictions attending the performance of the Contract. The BIDDER shall thoroughly examine and familiarize himself with the Drawings, Technical Specifications, and all other Contract Documents. The Contractor, by the execution of the Contract, shall in no way be relieved of any obligation under it due to his failure to receive or examine any form or legal instrument, or to visit the Project site and acquaint himself with the conditions there existing and the OWNER will be justified in rejecting any claim for extra time, or compensation, or both, based on facts regarding which Contractor should have been on notice as a result of such a diligent Project site visitation.

3. PREPARATION OF BID AND USE OF SEPARATE BID FORMS:

These Contract Documents include a complete set of bidding documents. The BIDDER shall copy all Documents listed in the table of contents under the heading BIDDING DOCUMENTS and shall submit two sets (original signed and one signed photocopy) of his bid on these forms. A bid shall be comprised of the BIDDING DOCUMENTS completed by the BIDDER plus supplemental information required by the Specifications and Contract Documents.

If any of the information submitted as part of the bid is considered to be proprietary by the BIDDER, he shall conspicuously identify such intended confidential information in his bid. BPUB is subject to the provisions of the Texas Public Information Act and cannot legally guarantee

confidentiality of submittals and may need to consult with its legal counsel and the Texas Attorney General in rendering decisions on any requested disclosures.

a) Preparation. Each bid shall be carefully prepared using the bid and bid data forms included as a part of the bidding documents. Entries on the bid and bid data forms shall be typed, using dark black ink, or legibly written in black ink. All prices shall be stated in written words and numeric figures, except where the forms provide for figures only. In case of discrepancy, especially in any sum total extensions, the amount shown in written words will generally prevail over numeric unit prices.

   The BIDDER shall acknowledge, in the space provided in the bid form, receipt of each Addendum issued for the Specifications and Documents during the bidding period.

   The BIDDER shall assemble all drawings, catalog data, and other supplementary information necessary to thoroughly describe Work, materials and equipment covered by the bid, and shall attach such supplemental information to the copies of the Specifications and documents submitted.

b) Signatures. Each BIDDER shall sign the bid with his usual signature and shall give his full business title and address. The BIDDER's corporate name stated on the bid shall be the exact legal name of the firm. The names of all persons signing should also be typed or printed below the signature.

   Bids by partnerships shall be signed with the partnership name followed by the signature and designation title/officer of one of the partners or other authorized representative. A complete list of the partners shall be included with the bid.

   Bids by a corporation shall be signed in the official corporate name of the corporation, followed by the signature and designation of the “president,” “secretary,” or other legally appropriate person authorized to bind the corporation.

   A bid by a person who affixes to his signature the word "president," "secretary," "agent," or other designation, without disclosing his principal corporation, will be rejected. Satisfactory evidence of the legal authority of the officer signing on behalf of the corporation shall be furnished. Bidding corporations shall designate the state in which they are incorporated and the address of their principal office.

c) Submittal. The original signed bid (and its accompanying photocopy) shall be transmitted to arrive at the designated BPUB address not later than the date and time stipulated in the Legal Notice and Invitation to Bid.

Submit the original signed bid (and its accompanying photocopy) to:

Brownsville Public Utilities Board
1155 FM 511

Olmito, Texas 78575
Attention: Ms. Diane Solitaire
Purchasing Department

Each bid must be submitted in duplicate as stated above (original signature and photocopy), in a sealed envelope bearing on the outside the name of the BIDDER, the bidder's address, and the name of the Project for which the bid is submitted. If forwarded by mail, the sealed envelope containing the bid itself must be enclosed in another mailing envelope addressed as specified in the bid form.

4. METHOD OF BIDDING: UNIT PRICE AND LUMP SUM.

Prices shall be firm, not subject to qualification, condition or adjustment. Prices shall be in United States dollars. Prices shall be lump sum, except where unit prices are requested by the bid forms. When unit price items are required by the bid, the unit prices for each of the several items in the bid of each BIDDER shall include its prorata share of overhead, so that the sum of the products obtained by multiplying the quantity shown for each item, by the unit price bid, represents the total bid. -Any bid not conforming to that requirement may be rejected as informal and nonresponsive. -The special attention of all BIDDERS is called to this provision, (See: General Conditions paragraph 11.9) for should conditions make it necessary to revise any unit price quantities, generally, a fifteen (15%) percent plus or minus tolerance quantity limit will be fixed for such increased or decreased quantities for which no extra compensation will be allowed, provided the net monetary value of all such additive and subtractive changes in quantities of such items of work pursuant to public competitive bidding statutes (i.e., difference in cost) shall not cumulatively increase or decrease the original Contract Price by more than twenty-five- (25%) percent. A proposed decrease only, that exceeds twenty-five (25%) percent of the original Contract Price must be agreed to in writing in advance by the Contractor.

5. DISCLOSURE BY BIDDER:

Each BIDDER shall submit with the bid documents, on the form furnished for that purpose, his Pre-Bid Disclosure Statement showing his experience record in performing the type of work embraced in the contract, his organization and equipment available for the work contemplated, and, when specifically requested by the OWNER, a detailed financial statement. The OWNER shall have the right to take such steps as it deems necessary, including telephonic contact to other owner references, to determine the ability and responsibility of the BIDDER to perform his obligations under the Contract and the BIDDER shall be responsive in furnishing the OWNER all such information and data for this purpose as it may request. OWNER reserves the right to reject any bid where an investigation of the available evidence or information does not satisfy the OWNER that the BIDDER is responsible to properly carry out the terms of the Contract. This shall also apply to any proposed subcontractor(s).

6. SUBCONTRACTS:

The BIDDER is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this Contract must be acceptable to the OWNER, and that a Pre-Bid

Disclosure Statement for each proposed subcontractor must also be submitted with the bid documents.

7. BID SECURITY:

Each bid must be accompanied by a certified or cashier's check, or a bid bond prepared on the form of the bid bond attached hereto, duly executed by the BIDDER as principal, and having as surety therein a surety company approved by the OWNER, and authorized to do business in the State of Texas, in the amount of not less than five (5%) percent of the total bid amount, but not less than $2,500.00. Such checks, or bid bonds will be returned to all except the three lowest BIDDERS within fifteen (15) calendar days after the opening of bids, and the remaining checks, or bid bonds will be returned promptly after the OWNER and the accepted successful BIDDER have executed the Contract or if no award has been made, within Ninety (90) calendar days after the date of the opening of bids. The bid security will be returned upon demand of the BIDDER at any time thereafter, so long as he has not been notified of the acceptance of his bid.

8. ADDENDA AND INTERPRETATIONS:

No oral interpretations by OWNER and its representatives shall be binding upon OWNER as to the meaning of the Plans, Specifications, Contract Documents, or other pre-bid documents.

Every request for such interpretation should be made in writing, addressed to Diane Solitaire, BPUB Purchasing Department. Any interpretation, correction, or change to the Invitation to Bid will be made by ADDENDUM. Changes or corrections will be issued by the Brownsville PUB Purchasing Department only and will be on file at the BPUB Department mentioned above. Addenda will be emailed to all who have returned the Bid Acknowledgement form. Addenda will be issued as expeditiously as possible. It is the BIDDER's responsibility to inquire as to any Addenda issued and failure of any BIDDER to receive any such Addenda or interpretation shall not relieve such BIDDER from any obligation under his bid as submitted. All Addenda so issued shall become part of the Contract Documents. Addenda may also be posted on BPUB's webpage.

Exceptions or conditional qualifications by the BIDDER to the Plans, Technical Specifications, Contract Documents, or other pre-bid documents will not be permitted at the time of submitting the Bid Documents to the OWNER, and any exceptions or conditional qualifications taken by BIDDER, will automatically deem the bid conditional and non-responsive and subject to OWNER rejection.

9. FACSIMILE MODIFICATION:

Any BIDDER may modify (not originally submit) his bid by facsimile communication at any time prior to the scheduled bid closing time for receipt of bids, provided such communication is received by the OWNER, in the BPUB Purchasing Department, prior to the bid closing time, and provided further, the OWNER is satisfied that a written confirmation of the facsimile modification, over the original signature of the BIDDER, was also mailed prior to the bid closing time. The facsimile communication should not reveal the total bid price, but only should provide the clarification, addition or subtraction, or other modification, so that the final bid prices or terms intended will not

be known by the OWNER, until the original sealed bid is opened and the Bidder's intended modification computed by OWNER.

Revised bids submitted before the opening of bids, whether forwarded by mail or facsimile, if representing an increase in excess of two percent (2%) of the original bid submittal, must have the bid security (bid bond or check) adjusted accordingly; otherwise the bid will not be considered responsive.

If the written and originally signed confirmation of a bid revision is not received within three (3) calendar days after the bid closing time, no consideration will be given to any proposed adjustment contained in the facsimile modification.

10. TIME FOR RECEIVING BIDS:

Bids received prior to the advertised hour of opening will be securely kept sealed by BPUB. The officer whose duty it is to open them will decide when the specified time has arrived, and no bid received thereafter will be considered; except that when a bid arrives by mail after the time fixed for opening, but before the public reading of all other bids is completed, and it is shown to the satisfaction of the OWNER that the non-arrival on time was due solely to delay in the mails for which the BIDDER was not responsible, such bid will be received and considered.

BIDDERS are cautioned that, while facsimile modifications of bids may be received as provided above, such modifications, if not explicit and if in any sense subject to misinterpretation, shall make the bid so modified or amended, subject to rejection for non-responsiveness.

11. OPENING OF BIDS:

At the time and place fixed for the public opening of bids, the OWNER will cause to be opened and publicly read aloud every bid received within the time set for receiving bids, irrespective of any irregularities therein. BIDDERS and other persons properly interested in a bid (subcontractors, suppliers, etc.) may be present, in person or by representative, but shall carry identification and present same to BPUB as requested.

12. WITHDRAWAL OF BIDS:

Bids may be withdrawn on written, facsimile or electronic transmission request dispatched by the BIDDER in time for delivery in the normal course of business prior to the time fixed for bid opening; provided, that written confirmation of any facsimile withdrawal over the signature of the BIDDER is placed in the mail and postmarked prior to the time set for bid opening. The bid security of any BIDDER withdrawing the bid in accordance with the foregoing conditions will be returned promptly.

13. AWARD OF CONTRACT: REJECTION OF BIDS:

The Contract will be awarded to the responsive and responsible BIDDER submitting the lowest bid complying with the conditions of the Legal Notice and Invitation for Bids. The BIDDER to

whom the award is made will be notified at the earliest possible date. The OWNER, however, reserves the right to reject any and all bids and to waive any informality in bids received, whenever such rejection or waiver is in BPUB's interest.

The OWNER reserves the right to consider as not responsible, any BIDDER who does not habitually perform with his own forces the major portions of the Work involved in construction of the improvements embraced in this proposed Contract. This provision is meant to prevent wholesale assignment and "brokering" of awarded contracts.

14. EXECUTION OF AGREEMENT: PERFORMANCE AND PAYMENT BOND:

Subsequent to the Notice of Award and within ten (10) calendar days after the prescribed forms are presented for signature, the successful BIDDER shall execute and deliver to the OWNER an Agreement in the form included in the Contract Documents in such number of copies as the OWNER may require.

Having satisfied all conditions of award as set forth elsewhere in these Documents, the successful BIDDER shall, within the period specified in the preceding paragraph, furnish a Performance Bond and Payment Bond, in accordance with the following parameters:

a.) For a Contract in excess of $100,000.00, a Performance Bond shall be executed in the full amount of the Contract, conditioned upon the faithful and timely performance of the Work in accordance with the Plans, Specifications, and Contract Documents. Said Bond shall be solely for the protection of the OWNER.

b.) For a Contract in excess of $50,000.00, a Payment Bond shall be executed in the full amount of the Contract, solely for the protection of all proper claimants supplying labor and material in the prosecution of the Work provided for in the Contract, for the use of each such claimant perfecting a proper and timely claim. Payment Bonds are required under Texas law, since no mechanics' liens are allowed against BPUB's public property assets.

When bonds are required, they shall serve as security for the faithful performance of the Contract, and for the payment of all persons, firms or corporations to whom the Contractor may become legally indebted to for labor, materials, tools, equipment, or services of any nature, including utility and transportation services employed or used by him in performing the Work. Such bonds shall be in the same form as that included in the Contract Documents and shall bear the same date as, or a date subsequent to that of the Agreement. The current power of attorney for the person who signs for any surety company shall be attached to such bonds. These bonds shall be signed by a guaranty or surety company legally authorized to do business in the State of Texas and appearing on the most recently issued (as of the date of bid opening) federally qualified U. S. Treasury Circular 570 List of Approved Sureties.

The failure of the successful BIDDER to execute such Agreement and to supply the required bonds and insurance certificates within ten (10) calendar days after the prescribed forms are presented for signature, or within such extended period as the OWNER may grant in writing, based upon

reasons determined sufficient by the OWNER, shall constitute a default, and the OWNER may either award the Contract to the next lowest responsive and responsible BIDDER, or re-advertise for bids, and may charge against the defaulting BIDDER the difference between the amount of the defaulted bid and the amount for which a final Contract for the Work is subsequently executed, irrespective of whether the amount thus due exceeds the amount of the bid bond. If a more favorable bid is received by re-advertising, the defaulting BIDDER shall have no claim against the OWNER for a bid bond refund.

15. LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT:

The successful BIDDER, upon his failure or refusal to execute and deliver the Contract, Bonds and insurance certificates required within ten (10) calendar days after he has received BPUB notice of the acceptance of his bid, shall forfeit to the OWNER, as mutually agreed to liquidated damages (and not as a penalty) for such failure or refusal, the security provided in the bid bond or otherwise deposited with his bid.

16. TIME OF COMPLETION AND LIQUIDATED DAMAGES:

BIDDER agrees by submission of his bid that PERFORMANCE TIME IS OF THE ESSENCE OF THIS CONTRACT and further agrees to commence Work on the date to be specified in a BPUB written "Notice to Proceed" issued by the OWNER and to Substantially Complete the Project as provided in Article 3 of the Construction Agreement.

BIDDER agrees by submission of his bid to pay as mutually agreed to liquidated damages, and not as a penalty, the sum as provided in said Construction Agreement, Article 3.

17. NOTICE OF SPECIAL CONDITIONS:

Attention is particularly called to those parts of the Contract Documents and Specifications which address the following:

A. Access to Work - Inspection and testing of materials.
B. Insurance requirements.
C. Indemnification by Contractor
D. Wage and Hour Provisions.
E. State Sales and Use Tax Exemption Provisions.
F. Subsurface Geologic Conditions.
G. Certification Regarding Debarment, Suspension and other Responsibility Requirements (EPA 5700-49).

18. LAWS AND REGULATIONS:

The BIDDER's attention is directed to the fact that all applicable federal, State and local laws, statutes, ordinances, codes and the rules and regulations of all authorities having jurisdiction over construction of the Project, as may be periodically amended, shall apply to the Contract throughout, and they will be mutually deemed to be included in the Contract, the same as though

herein written out in full.

19. EQUAL EMPLOYMENT OPPORTUNITY:

Attention of BIDDERS is particularly called to the requirement for ensuring that employees and applicants for employment are not discriminated against because of their race, religion, gender, age, sexual preference, physically challenging condition or national origin.

Equal Opportunity in Employment - All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin. Bidders will be required to comply with the President's Executive Order No. 11246, as amended by Executive Order 11375, and as supplemented in Department of Labor regulations 41 CFR, Part 60. The requirements for bidders and contractors under this order are explained in the General Conditions.

20. PRE-BID CONFERENCE:

A pre-bid virtual or in-person meeting between the OWNER, prospective bidders, suppliers, etc., will be held to answer any questions concerning the Work. No Addenda will be issued at this meeting. Subsequent thereto, if necessary to clear up any written questions, a written Addendum will be issued by the OWNER to all pre-bid conference attendees. The pre-bid meeting will be held at the place, time and date indicated in the Legal Notice. Attendance at the Pre-Bid Conference is NOT mandatory for prospective bidders.

21. SUBMITTAL OF TRENCH SAFETY DESIGN:

For Work involving excavations generally deeper than five (5) feet within narrow trenches, the apparent low BIDDER shall provide the OWNER with a Trench Safety System Plan and a certificate signed and sealed by a Registered Professional Engineer licensed by the State of Texas, within twenty-one (21) calendar days after the date of the opening of Bids prior to award of the Contract. Failure to timely comply may disqualify BIDDER. This Section may be “Reserved” by BPUB if not applicable to the Work.

22. INFORMATION TO BE SUBMITTED WITH BID:

Each BIDDER shall submit with his bid, the following:

a) Equipment and Materials. In addition to the information submitted on the bid and bid data forms, each BIDDER shall submit all specifications, preliminary drawings, and similar descriptive information necessary to describe completely the equipment and materials he proposes to furnish.

The bid shall be based on using new equipment and materials, which comply with the Specifications and Contract Documents in every respect, unless existing equipment is specifically noted by OWNER for reuse. If alternate or "equal" equipment and materials are indicated in the bid, it shall be understood that the OWNER will have the option of selecting any one of the alternates so indicated and such selection shall not be a cause for extra contractor compensation or

extension of time. OWNER specifically reserves the legal right to specify "sole source" equipment or materials in the Specifications when unique circumstances warrant.

b) Contractor's Field Organization and Safety Record.
   (i) An organization chart showing the names of field management, supervisory, technical personnel, and number of employees/workforce available and the details of the management, supervisory, and technical organization which he proposes to use for this Project. The successful BIDDER's organizational concept will be subject to the review and acceptance of the OWNER.
   (ii) The experience record of the Contractor's field superintendent(s) shall be submitted with the bid.
   (iii) The Contractor's job-safety record summary for the previous five (5) years
   (iv) The two most recent year's independently audited Financial Statements
   (v) List of three (3) projects completed by CONTRACTOR of both similar size and scope over the past five (5) years

23. PREFERENCE LAW:

Bid evaluations will take into consideration any Preference Laws of the State of Texas, and any reciprocity laws of other states as they may be addressed by current Texas law.

24. SUBSURFACE GEOLOGIC CONDITIONS:

Each BIDDER shall be responsible for determining prior to bidding, the types of subsurface materials which will be found. If test borings have been made on the Project site by the BPUB or its consultants, the locations and logs of the test borings are bound as an appendix to these Specifications and Documents.

It is to be expressly understood and acknowledged by the BIDDER, that any information on subsurface geology made available by OWNER for BIDDER'S convenience shall **not be a part of the Contract Documents and there is no expressed or implied guarantee of the data given, nor of the interpretation thereof.**

All excavation for this Project will be unclassified and the BIDDER shall be responsible for investigating and satisfying himself of subsurface geologic conditions (including the presence or likelihood of encountering soils requiring dewatering, rock or rock-like materials) prior to submitting his bid, which shall include any and all costs BIDDER associates with avoiding, managing or removing said subsurface geologic conditions without claim for extra compensation against OWNER.

Should BIDDER desire to perform on-site investigations prior to submitting his bid, he is required to notify the OWNER of such intentions and obtain OWNER's written permission not less than 48 hours prior to performing the investigation. BIDDER is responsible for obtaining all related insurance and necessary permits from all sources.

25. DISPOSAL OF EXCESS MATERIALS:

After completion of this Project there may be in some instances an excess of spoil material or waste material left over. In such cases where there is an excess of material, BIDDER shall load and haul it away from the job site and dispose of it in a legal manner so as not to: trespass; adversely impact any protected wetlands; adversely impact the 100 year flood plain; adversely impact any endangered species; or otherwise create drainage diversions or impoundments. No extra remuneration for this Work will be allowed.

26. EROSION AND SEDIMENT CONTROL MEASURES:

The BIDDER is expected to conduct his Work in such a manner as to minimize any soil erosion or sediment runoff from the construction site. Earth cuts and fills shall have smooth, flat side slopes, as generally indicated on the PLANS, to preclude erosion of the soil. Such operations should be timed consistent with the actual need for doing the Work and only to leave raw, unprotected surfaces for a minimum of time.

Existing lawns are to remain intact as far as practical. Such areas as are disturbed shall be duly restored by the BIDDER to as good as or better than original condition using the same type of grass, shrubs, or cover as the original. The BIDDER shall be responsible for correcting any erosion that occurs at his sole cost without claim for extra compensation.

As construction progresses, and in accordance with State and federal laws regulating stormwater runoff and management from construction sites greater than five acres in size, if applicable, (See: Section 405 of the Water Quality Act of 1987, Section 402(P) as amended), and at locations where erosion with sediment runoff occurs or is likely to occur, the BIDDER shall construct temporary ditches, perimeter siltation screens, retainage levees, drains, inlets, or other works to manage, prevent, or correct the possible conditions. Upon completion of the Work, such facilities shall be removed by contractor.

During construction, the BIDDER shall take the necessary precautions to see that erosion is controlled and sediment runoff is prevented so as to protect the quality of any neighboring water bodies.

27. SAFETY PROVISIONS:

BIDDER shall provide barricades, flares, warning signs, and/or flagmen so that danger and inconvenience to the OWNER, public, and any job site working personnel, will be mitigated. In addition to any other requirements of the Contract Documents, the BIDDER shall be responsible for familiarity and compliance with all Federal (OSHA), State, railroad and local safety rules, laws and requirements.

28. PROTECTION OF PROPERTY AND EXISTING UTILITIES:

Within developed areas, all public and private property along and adjacent to the BIDDER'S operations, including roads, driveways, lawns, yards, shrubs, drainage gradients, and trees, shall

be adequately protected, and when damages occur, they shall be repaired, replaced, or renewed or otherwise put in a condition equal to, or better than, that which existed before the BIDDER caused the damage or removal.

An attempt has been made by BPUB and the ENGINEER to locate and show all known existing utilities on the PLANS, but the possibility remains strong that some underground utilities may exist that have not been shown. The BIDDER, through mandatory contact with local utility owners, shall keep himself informed and take such precautions as necessary to avoid utility damage and unsafe working conditions for employees.

29. WAGES AND HOURS:

The most recent wage rate determination from the U.S. Department of Labor for Cameron County, Texas as amended within the previous three (3) years and as locally adopted by the BPUB, is a part of the Supplementary Conditions and controls minimum wage, hour and any fringe benefits, with the exception that no wage shall be paid below $8.00 as established locally by the BPUB.

A copy of the appropriate (building and/or heavy/highway) wage rate schedule(s) must be posted at the job site in both English and Spanish and kept posted in a conspicuous place on the site of the Project at all times during construction. The BIDDER shall familiarize himself with the included General and Supplementary Conditions Section entitled "Wage and Labor Standard Provisions." Copies of the current pre-bid wage rate schedule(s) are included in the Contract Documents, but the responsibility for initial posting and keeping same posted, rests upon the BIDDER.

30. WARRANTY/GUARANTEE:

The BIDDER shall warranty and guarantee the Work, equipment and materials for a period of at least one (1) year after date of final acceptance in writing by the OWNER. During this period, the BIDDER shall make any repairs and/or replacements of defective equipment and materials and corrections of Work due to poor workmanship or manufacturing, all as may be required for full compliance with the General Conditions, Plans and Specifications. This combined workmanship quality guarantee, and minimal equipment and materials warranty, shall apply to all matters reported by the OWNER in writing within said one (1) year period and this post-construction guarantee/warranty period shall be included in the coverage period set forth in the Performance Bond.

31. STATE SALES AND USE TAX EXEMPTION:

Pursuant to 34 Texas Administrative Code 3.291, in order for the Brownsville PUB to continue to benefit from its status as a State Sales and Use Tax Exempt Organization. Construction contracts must be awarded on a "separated contract" basis. A "separated contract" is one that distinguishes the value of the tangible personal property (materials such as pipe, bricks, lumber, concrete, paint, etc.) to be physically incorporated into the Project realty, from the total Contract Price. Under the "separated contract" format, the Contractor in effect becomes a "seller" to the Brownsville PUB of materials that are to be physically incorporated into the Project realty. As a "seller", the Contractor

will issue a "Texas Certificate of Resale" to the supplier in lieu of paying the sales tax on materials at the time of purchase. The Contractor will also issue a "Certificate of Exemption" to the supplier demonstrating that the personal property is being purchased for resale and that the resale is to the Brownsville PUB, which is a sales tax exempt entity under UTCA Tax Code Section 151.309(5). Contractors should be careful to consult the most recent guidelines of the State Comptroller of Public Accounts regarding the sales tax status of supplies and equipment that are used and/or consumed during Project Work (gas, oil, rental equipment), but that are not physically incorporated into the Project realty. Such items are generally not tax exempt. Contractors that have questions about the implementation of this statute are asked to inquire directly with the State Comptroller of Public Accounts, Tax Administration Division, State of Texas, Austin, Texas 78774. Bidders will not include any federal taxes in bid prices since the City of Brownsville and Brownsville PUB are exempt from payment of such federal taxes. "Texas Certificates of Exemption", "Texas Certificates of Resale" and "Texas Sales Tax Permits" are forms available to the Contractor through the regional offices of the State Comptroller of Public Accounts.

32. Additional Federal and State Required Contract Provisions

2 CFR 200.327 Contract provisions. The non-Federal entity's contracts should contain applicable provisions described in Appendix II to Part 200—Contract Provisions for non-Federal Entity Contracts Under Federal Awards. The non-Federal entity's contracts must contain the provisions described in Appendix II to Part 200—Contract Provisions for non-Federal Entity Contracts Under Federal Awards, as applicable. ***Language as of September 1, 2022.**

THRESHOLD	PROVISION	CITATION	PROVISION APPLIES TO
>$250,000 (Simplified Acquisition Threshold)	Contracts for more than the simplified acquisition threshold, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate.	2 CFR 200 APPENDIX II (A)	Contractor RFP/IFB Contractor RFQ Subrecipients
>$10,000	All contracts in excess of $10,000 must address termination for cause and for convenience by the non-Federal entity including the manner by which it will be affected and the basis for settlement.	2 CFR 200 APPENDIX II (B)	Contractor RFP/IFB Contractor RFQ Subrecipients
None	Equal Employment Opportunity. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of "federally assisted construction contract" in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and implementing regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor." 41 CFR 60-1.4 Equal opportunity clause. (b) Federally assisted construction contracts. (1) Except as otherwise provided, each administering agency shall require the inclusion of the following language as a condition of any grant, contract, loan, insurance, or guarantee involving federally assisted construction which is not exempt from the requirements of the equal opportunity clause: The [recipient] hereby agrees that it will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan, insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, the following equal opportunity clause: During the performance of this contract, the contractor agrees as follows: (1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:	2 CFR 200 APPENDIX II I and 41 CFR §60-1.4(b)	Contractor RFP/IFB Contractor RFQ Subrecipients

	Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause. (2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin. (3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information. (4) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment. (5) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor. (6) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders. (7) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law. (8) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States. The [recipient] further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, that if the [recipient] so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract. The [recipient] agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the recipient agency in the discharge of the agency's primary responsibility for securing compliance. The recipient further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to		

	the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the [recipient] agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the [recipient] under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such [recipient]; and refer the case to the Department of Justice for appropriate legal proceedings.		
>$10,000,000 for ARPA but State Provision Applies at any amount and/or OBJ >$2,000 for CDBG/Braided Funds	Davis-Bacon Act, as amended (40 U.S.C. 3141-3148). When required by Federal program legislation, all prime construction contracts in excess of $10,000,00 awarded by non-Federal entities must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. 3141-3144, and 3146-3148) as supplemented by Department of Labor regulations (29 CFR Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the statute, contractors must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must be required to pay wages not less than once a week. The non-Federal entity must place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation. The decision to award a contract or subcontract must be conditioned upon the acceptance of the wage determination. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency. The contracts must also include a provision for compliance with the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Act provides that each contractor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency.	2 CFR 200 APPENDIX II (D)	Contractor RFP/IFB Subrecipients
>$100,000	Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708). Where applicable, all contracts awarded by the non-Federal entity in excess of $100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.	2 CFR 200 APPENDIX II I	Contractor RFP/IFB Subrecipients
None	Rights to Inventions Made Under a Contract or Agreement. If the Federal award meets the definition of "funding agreement" under 37 CFR § 401.2 (a) and the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," the recipient or subrecipient must comply with the requirements of 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by the awarding agency.	2 CFR 200 APPENDIX II (F)	Contractor RFP/IFB Contractor RFQ Subrecipients
>$150,000	Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended – Contracts and subgrants of amounts in excess of $150,000 must contain a provision that requires the non-Federal award to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).	2 CFR 200 APPENDIX II (G)	Contractor RFP/IFB Contractor RFQ Subrecipients
>$25,000	Debarment and Suspension (Executive Orders 12549 and 12689) – A contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989	2 CFR 200 APPENDIX II (H)	Contractor RFP/IFB Contractor RFQ Subrecipients

	Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.		Vendors
>$100,000	Byrd Anti-Lobbying Amendment (31 U.S.C. 1352) – Contractors that apply or bid for an award exceeding $100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.	2 CFR 200 APPENDIX II (I) and 24 CFR §570.303	Contractor RFP/IFB Contractor RFQ Subrecipients
	See 2 CFR §200.323 - Procurement of Recovered Materials.	2 CFR 200 APPENDIX II (J)	Contractor RFP/IFB Contractor RFQ Subrecipients
	See 2 CFR §200.216 - Prohibition on certain telecommunications and video surveillance services or equipment	2 CFR 200 APPENDIX II (K)	Contractor RFP/IFB Contractor RFQ Subrecipients
	See 2 CFR §200.322 - Domestic Preferences for Procurements.	2 CFR 200 APPENDIX II (L)	Contractor RFP/IFB Contractor RFQ Subrecipients
>$10,000	An NFE (non-Federal Entity) that is a state agency or an agency of a political subdivision of a state, and the NFE's contractors must comply with Section 6002 of the Solid Waste Disposal Act. Applicable NFEs must include a contract provision requiring compliance with this requirement. This includes contracts awarded by a state agency or political subdivision of a state and its contractors for certain items, as designated by the EPA, with a purchase price greater than $10,000. Indian Tribal Governments and nonprofit organizations are not required to comply with this provision. Additional requirements are listed below.	2 CFR 200.323	Contractor RFP/IFB Contractor RFQ Subrecipients
None	The Federal awarding agency must establish conflict of interest policies for Federal awards. The non-Federal entity must disclose in writing any potential conflict of interest to the Federal awarding agency or pass-through entity in accordance with applicable Federal awarding agency policy.	2 CFR 200.112	Contractor RFP/IFB Contractor RFQ Subrecipients
None	The Federal awarding agency and the non-Federal entity should, whenever practicable, collect, transmit, and store Federal award-related information in open and machine-readable formats rather than in closed formats or on paper in accordance with applicable legislative requirements. A machine-readable format is a format in a standard computer language (not English text) that can be read automatically by a web browser or computer system. The Federal awarding agency or pass-through entity must always provide or accept paper versions of Federal award-related information to and from the non-Federal entity upon request. If paper copies are submitted, the Federal awarding agency or pass-through entity must not require more than an original and two copies. When original records are electronic and cannot be altered, there is no need to create and retain paper copies. When original records are paper, electronic versions may be substituted through the use of duplication or other forms of electronic media provided that they are subject to periodic quality control reviews, provide reasonable safeguards against alteration, and remain readable.	2 CFR 200.336	Contractor RFP/IFB Contractor RFQ Subrecipients
None	Contracting with HUB, small and minority businesses, women's business enterprises, and labor surplus area firms. (a) The non-Federal entity must take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible. (b) Affirmative steps must include: (1) Placing qualified small and minority businesses and women's business enterprises on solicitation lists; (2) Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;	2 CFR 200.321	Contractor RFP/IFB Contractor RFQ Subrecipients

	(3) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises; (4) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises; (5) Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce; and (6) Requiring the prime contractor, if subcontracts are to be let, to take the affirmative steps listed in paragraphs (b)(1) through (5) of this section.		
None	Financial records, supporting documents, statistical records, and all other non-Federal entity records pertinent to a Federal award must be retained for a period of three years from the date of submission of the final expenditure report or, for Federal awards that are renewed quarterly or annually, from the date of the submission of the quarterly or annual financial report, respectively, as reported to the Federal awarding agency or pass-through entity in the case of a subrecipient. Federal awarding agencies and pass-through entities must not impose any other record retention requirements upon non-Federal entities. **All records related to ARPA shall be maintained for 5 years per the ARPA terms, conditions, and regulations.** The only exceptions are the following: (a) If any litigation, claim, or audit is started before the expiration of the 3-year period, the records must be retained until all litigation, claims, or audit findings involving the records have been resolved and final action taken. **All records related to ARPA shall be maintained for 5 years per the ARPA terms, conditions and regulations.** (b) When the non-Federal entity is notified in writing by the Federal awarding agency, cognizant agency for audit, oversight agency for audit, cognizant agency for indirect costs, or pass-through entity to extend the retention period. (c) Records for real property and equipment acquired with Federal funds must be retained for three years after final disposition. All records related to ARPA shall be maintained for 5 years per the ARPA terms and conditions and regulations. (d) When records are transferred to or maintained by the Federal awarding agency or pass-through entity, the 3-year retention requirement is not applicable to the non-Federal entity All records related to ARPA shall be maintained for 5 years per the ARPA terms and conditions and regulations. **All records related to ARPA shall be maintained for 5 years per the ARPA terms, conditions, and regulations.** (e) Records for program income transactions after the period of performance. In some cases, recipients must report program income after the period of performance. Where there is such a requirement, the retention period for the records pertaining to the earning of the program income starts from the end of the non-Federal entity's fiscal year in which the program income is earned. (f) Indirect cost rate proposals and cost allocations plans. This paragraph applies to the following types of documents and their supporting records: Indirect cost rate computations or proposals, cost allocation plans, and any similar accounting computations of the rate at which a particular group of costs is chargeable (such as computer usage chargeback rates or composite fringe benefit rates). (1) *If submitted for negotiation.* If the proposal, plan, or other computation is required to be submitted to the Federal Government (or to the pass-through entity) to form the basis for negotiation of the rate, then the 3-year retention period for its supporting records starts from the date of such submission. **All records related to ARPA shall be maintained for 5 years per the ARPA terms, conditions, and regulations.** (2) *If not submitted for negotiation.* If the proposal, plan, or other computation is not required to be submitted to the Federal Government (or to the pass-through entity) for negotiation purposes, then the 3-year retention period for the proposal, plan, or computation and its supporting records starts from the end of the fiscal year (or other accounting period) covered by the proposal, plan, or other computation. **All records related to ARPA shall be maintained for 5 years per the ARPA terms, conditions, and regulations.**	2 CFR 200.334	Contractor RFP/IFB Contractor RFQ Subrecipients Vendors
None	CONTRACTS WITH COMPANIES ENGAGED IN BUSINESS WITH IRAN, SUDAN, OR FOREIGN TERRORIST ORGANIZATION PROHIBITED. A governmental entity may not enter into a governmental contract with a company that is identified on a list prepared and maintained under Section 806.051, 807.051, or 2252.153.The term "foreign terrorist organization" in this paragraph has the meaning assigned to such a term in Section 2252.151(2) of the Texas Government Code.	Texas Government Code 2252.152	Contractor RFP/IFB Contractor RFQ Subrecipients

>$100,000	PROVISION REQUIRED IN CONTRACT. (a) This section applies only to a contract that: (1) is between a governmental entity and a company with 10 or more full-time employees; and (2) has a value of $100,000 or more that is to be paid wholly or partly from public funds of the governmental entity. (b) A governmental entity may not enter into a contract with a company for goods or services unless the contract contains a written verification from the company that it: (1) does not boycott Israel; and (2) will not boycott Israel during the term of the contract.	Texas Government Code 2271	Contractor RFP/IFB Contractor RFQ Subrecipients Vendors
	Mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.	42 U.S.C. 6201	Contractor RFP/IFB Subrecipients
	The Firm agrees that no otherwise qualified individual with disabilities shall, solely by reason of his/her disability, be denied the benefits of, or be subjected to discrimination, including discrimination in employment, under any program or activity receiving federal financial assistance.	Section 504 of the Rehabilitation Act of 1973, as amended.	Subrecipients
ARPA Terms, Conditions, & Records	Use of Funds. a. Recipient understands and agrees that the funds disbursed under this award may only be used in compliance with section 603(c) of the Social Security Act (the Act), Treasury's regulations implementing that section, and guidance issued by Treasury regarding the foregoing. b. Recipient will determine prior to engaging in any project using this assistance that it has the institutional, managerial, and financial capability to ensure proper planning, management, and completion of such project.	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Subrecipients
ARPA Terms, Conditions, & Records	Period of Performance. The period of performance for this award begins on the date hereof and ends on December 31, 2026. As set forth in Treasury's implementing regulations, Recipients may use award funds to cover eligible costs incurred during the period that begins on March 3, 2021 and ends on December 31, 2024.	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Subrecipients
ARPA Terms, Conditions, & Records	Reporting. Recipient agrees to comply with any reporting obligations established by Treasury as they relate to this award.	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Subrecipients
ARPA Terms, Conditions, & Records	Maintenance of and Access to Records a. Recipient shall maintain records and financial documents sufficient to evidence compliance with section 603(c) of the Act, Treasury's regulations implementing that section, and guidance issued by Treasury regarding the foregoing. b. The Treasury Office of Inspector General and the Government Accountability Office, or their authorized representatives, shall have the right of access to records (electronic and otherwise) of Recipient in order to conduct audits or other investigations. c. Records shall be maintained by Recipient for a period of five (5) years after all funds have been expended or returned to Treasury, whichever is later.	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Contractor RFP/IFB Contractor RFQ Subrecipients Vendors
ARPA Terms, Conditions, & Records	Pre-award Costs. Pre-award costs, as defined in 2 C.F.R. § 200.458, may not be paid with funding from this award.	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Subrecipients
ARPA Terms, Conditions, & Records	Administrative Costs. Recipient may use funds provided under this award to cover both direct and indirect costs.	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Subrecipients
ARPA Terms, Conditions, & Records	Cost Sharing. Cost sharing or matching funds are not required to be provided by Recipient.	Section 9901 of the American	Subrecipients

		Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	
ARPA Terms, Conditions, & Records	Conflicts of Interest. Recipient understands and agrees it must maintain a conflict of interest policy consistent with 2 C.F.R. § 200.318(c) and that such conflict of interest policy is applicable to each activity funded under this award. Recipient and subrecipients must disclose in writing to Treasury or the pass-through entity, as appropriate, any potential conflict of interest affecting the awarded funds in accordance with 2 C.F.R. § 200.112.	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Contractor RFP/IFB Contractor RFQ Subrecipients Vendors
ARPA Terms, Conditions, & Records	Compliance with Applicable Law and Regulations. a. Recipient agrees to comply with the requirements of section 603 of the Act, regulations adopted by Treasury pursuant to section 603(f) of the Act, and guidance issued by Treasury regarding the foregoing. Recipient also agrees to comply with all other applicable federal statutes, regulations, and executive orders, and Recipient shall provide for such compliance by other parties in any agreements it enters into with other parties relating to this award. b. Federal regulations applicable to this award include, without limitation, the following: i. Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 C.F.R. Part 200, other than such provisions as Treasury may determine are inapplicable to this Award and subject to such exceptions as may be otherwise provided by Treasury. Subpart F – Audit Requirements of the Uniform Guidance, implementing the Single Audit Act, shall apply to this award. ii. Universal Identifier and System for Award Management (SAM), 2 C.F.R. Part 25, pursuant to which the award term set forth in Appendix A to 2 C.F.R. Part 25 is hereby incorporated by reference. iii. Reporting Subaward and Executive Compensation Information, 2 C.F.R. Part 170, pursuant to which the award term set forth in Appendix A to 2 C.F.R. Part 170 is hereby incorporated by reference. iv. OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (Non-procurement), 2 C.F.R. Part 180, including the requirement to include a term or condition in all lower tier covered transactions (contracts and subcontracts described in 2 C.F.R. Part 180, subpart B) that the award is subject to 2 C.F.R. Part 180 and Treasury's implementing regulation at 31 C.F.R. Part 19. v. Recipient Integrity and Performance Matters, pursuant to which the award term set forth in 2 C.F.R. Part 200, Appendix XII to Part 200 is hereby incorporated by reference. vi. Governmentwide Requirements for Drug-Free Workplace, 31 C.F.R. Part 20. (Subrecipient Only) vii. New Restrictions on Lobbying, 31 C.F.R. Part 21. viii. Uniform Relocation Assistance and Real Property Acquisitions Act of 1970 (42 U.S.C. §§ 4601-4655) and implementing regulations. ix. Generally applicable federal environmental laws and regulations. c. Statutes and regulations prohibiting discrimination applicable to this award include, without limitation, the following: i. Title VI of the Civil Rights Act of 1964 (42 U.S.C. §§ 2000d et seq.) and Treasury's implementing regulations at 31 C.F.R. Part 22, which prohibit discrimination on the basis of race, color, or national origin under programs or activities receiving federal financial assistance; ii. The Fair Housing Act, Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§ 3601 et seq.), which prohibits discrimination in housing on the basis of race, color, religion, national origin, sex, familial status, or disability; iii. Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794), which prohibits discrimination on the basis of disability under any program or activity receiving federal financial assistance; iv. The Age Discrimination Act of 1975, as amended (42 U.S.C. §§ 6101 et seq.), and Treasury's implementing regulations at 31 C.F.R. Part 23, which prohibit discrimination on the basis of age in programs or activities receiving federal financial assistance; and v. Title II of the Americans with Disabilities Act of 1990, as amended (42 U.S.C. §§ 12101 et seq.), which prohibits discrimination on the basis of disability under programs, activities, and services provided or made available by state and local governments or instrumentalities or agencies thereto.	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Contractor RFP/IFB Contractor RFQ Subrecipients Vendors
ARPA Terms, Conditions, & Records	Remedial Actions. In the event of Recipient's noncompliance with section 603 of the Act, other applicable laws, Treasury's implementing regulations, guidance, or any reporting or other program requirements, Treasury may impose additional conditions on the receipt of a subsequent tranche of future award funds, if any, or take other available remedies as set forth in 2 C.F.R. § 200.339. In the case of a	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2;	Subrecipients

	violation of section 603(c) of the Act regarding the use of funds, previous payments shall be subject to recoupment as provided in section 603(e) of the Act.	Section 602(b), 603(b) and/or 603 (c) as applicable	
ARPA Terms, Conditions, & Records	Hatch Act. Recipient agrees to comply, as applicable, with requirements of the Hatch Act (5 U.S.C. §§ 1501-1508 and 7324-7328), which limit certain political activities of State or local government employees whose principal employment is in connection with an activity financed in whole or in part by this federal assistance.	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Subrecipients
ARPA Terms, Conditions, & Records	False Statements. Recipient understands that making false statements or claims in connection with this award is a violation of federal law and may result in criminal, civil, or administrative sanctions, including fines, imprisonment, civil damages and penalties, debarment from participating in federal awards or contracts, and/or any other remedy available by law.	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Contractor RFP/IFB Contractor RFQ Subrecipients Vendors
ARPA Terms, Conditions, & Records	Publications. Any publications produced with funds from this award must display the following language: "This project [is being] [was] supported, in whole or in part, by federal award number [enter project FAIN] awarded to [name of Recipient] by the U.S. Department of the Treasury."	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Subrecipients
ARPA Terms, Conditions, & Records	Debts Owed the Federal Government. a. Any funds paid to Recipient (1) in excess of the amount to which Recipient is finally determined to be authorized to retain under the terms of this award; (2) that are determined by the Treasury Office of Inspector General to have been misused; or (3) that are determined by Treasury to be subject to a repayment obligation pursuant to section 603(e) of the Act and have not been repaid by Recipient shall constitute a debt to the federal government. b. Any debts determined to be owed the federal government must be paid promptly by Recipient. A debt is delinquent if it has not been paid by the date specified in Treasury's initial written demand for payment, unless other satisfactory arrangements have been made or if the Recipient knowingly or improperly retains funds that are a debt as defined in paragraph 14(a). Treasury will take any actions available to it to collect such a debt.	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Subrecipients
ARPA Terms, Conditions, & Records	Disclaimer. a. The United States expressly disclaims any and all responsibility or liability to Recipient or third persons for the actions of Recipient or third persons resulting in death, bodily injury, property damages, or any other losses resulting in any way from the performance of this award or any other losses resulting in any way from the performance of this award or any contract, or subcontract under this award. b. The acceptance of this award by Recipient does not in any way establish an agency relationship between the United States and Recipient.	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Subrecipients
ARPA Terms, Conditions, & Records	Protections for Whistleblowers. a. In accordance with 41 U.S.C. § 4712, Recipient may not discharge, demote, or otherwise discriminate against an employee in reprisal for disclosing to any of the list of persons or entities provided below, information that the employee reasonably believes is evidence of gross mismanagement of a federal contract or grant, a gross waste of federal funds, an abuse of authority relating to a federal contract or grant, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a federal contract (including the competition for or negotiation of a contract) or grant. b. The list of persons and entities referenced in the paragraph above includes the following: i. A member of Congress or a representative of a committee of Congress; ii. An Inspector General; iii. The Government Accountability Office; iv. A Treasury employee responsible for contract or grant oversight or management; v. An authorized official of the Department of Justice or other law enforcement agency; vi. A court or grand jury; or vii. A management official or other employee of Recipient, contractor, or subcontractor who has the responsibility to investigate, discover, or address misconduct. c. Recipient shall inform its employees in writing of the rights and remedies provided under this section, in the predominant native language of the workforce.	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Contractor RFP/IFB Contractor RFQ Subrecipients Vendors

ARPA Terms, Conditions, & Records	Increasing Seat Belt Use in the United States. Pursuant to Executive Order 13043, 62 FR 19217 (Apr. 18, 1997), Recipient should encourage its contractors to adopt and enforce on-the-job seat belt policies and programs for their employees when operating company-owned, rented or personally owned vehicles.	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Contractor RFP/IFB Contractor RFQ Subrecipients Vendors
ARPA Terms, Conditions, & Records	Reducing Text Messaging While Driving. Pursuant to Executive Order 13513, 74 FR 51225 (Oct. 6, 2009), Recipient should encourage its employees, subrecipients, and contractors to adopt and enforce policies that ban text messaging while driving, and Recipient should establish workplace safety policies to decrease accidents caused by distracted drivers	Section 9901 of the American Rescue Plan Act, Pub. L. No. 117-2; Section 602(b), 603(b) and/or 603 (c) as applicable	Contractor RFP/IFB Contractor RFQ Subrecipients Vendors

BID
B011-24
BPUB Purchasing Department
1155 FM 511
Olmito, Texas 78575
Due: November 16, 2023 at 2:00 PM

Bid of _____ hereinafter called BIDDER, a corporation organized and existing under the laws of the State of _____, or, a partnership, or an individual doing business as _____.

To the Brownsville Public Utilities Board of the City of Brownsville, Texas, hereinafter called OWNER.

Respected Board Members:

The undersigned BIDDER, in compliance with your Invitation to Bid for the **BPUB Downtown Water and Wastewater – ARPA Project 2**, having read and examined the Plans and Specifications with related Contract Documents and visited the site of the proposed Work, and being familiar with all of the federal, state and local conditions surrounding the construction of the proposed Project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, equipment and supplies, and to construct the Project in accordance with the Contract Documents, within the time set forth herein, and at the Total Base Bid Amount prior to OWNER options on additive/deductive alternates of: (in words and numeric figures)

_____

_____. These price(s) are to cover all expenses incurred in performing the Work required under the Contract Documents, of which this bid is a part. These price(s) are firm and shall not be subject to adjustment, provided this Bid is accepted by OWNER within ninety (90) calendar days after the time set for BPUB receipt of bids.

BIDDER hereby agrees to commence Work under this Contract on or before a date to be specified in a written "Notice to Proceed" to be issued by the OWNER, and to then fully complete the Project within the times established in Article 3 of the Construction Agreement. BIDDER further agrees to pay as liquidated damages, not as a penalty, for failure to do so, the sum(s) established in Article 3 of the Construction Agreement.

BIDDER agrees to perform all Work for which he contracts as described in the Technical Specifications and as shown on the Plans, for the prices indicated on the following Bid Form.

BID SCHEDULE
BASE BID B011-24
BROWNSVILLE PUBLIC UTILITIES BOARD

The Bidder, in compliance with the Invitation for Bids for the **BPUB Downtown Water and Wastewater – ARPA Project 2,** having examined the scope of work and written Specifications, hereby proposes to furnish construction services for the following Unit prices and lump sums.

Refer to Section 01 20 00 – Measurement and Payment for bid item descriptions for base bid, supplemental bid and alternate bid items.

Base Bid					
Item No.	**Item Description**	**Units**	**Quantity**	**Unit Price**	**Item Cost**
Water Improvements					
1	Mobilization for Water Mains (Max 5% of Bid Items 2-32)	LS	1		
2	8-Inch DR-25 PVC Water Line (includes all restraints, fittings, and appurtenances)	LF	2051		
3	3-Inch Type D HMAC Pavement	SY	1085		
4	Limestone Base (5" Compacted)	SY	1085		
5	Prime Coat (MC-30) (@ 0.20 GAL/SY)	GAL	217		
6	Tack Coat (RC-2) (@0.05 GAL/SY)	GAL	54		
7	8-Inch Isolation Gate Valve	EA	11		
8	12-Inch Isolation Gate Valve	EA	1		
9	8-Inch x 8-Inch Tee (Water Line Tie-in)	EA	8		
10	12-Inch x 8-Inch Tee (Water Line Tie-in)	EA	1		
11	16" DR-25 PVC Casing Pipe	LF	40		
12	8-Inch Hot Tap	EA	1		
13	Alternate Materials Under Existing Utilities, including Cement Stabilized Sand and Flowable Fill	CY	61		

Base Bid					
Item No.	**Item Description**	**Units**	**Quantity**	**Unit Price**	**Item Cost**
14	Double Water Service Connection (Long Side)	EA	2		
15	Trench Dewatering	LS	1		
16	Remove Existing Concrete Pavement (including Saw Cutting)	SY	36		
17	Remove Existing Asphalt Pavement (including Saw Cutting)	SY	727		
18	Replace Concrete Pavement	SY	36		
19	Remove Existing Concrete Curb and Gutter (including Saw Cutting)	LF	260		
20	Replace Existing 6-Inch Concrete Curb and Gutter	LF	260		
21	Remove Existing Concrete Valley Gutter (including Saw Cutting)	SY	49		
22	Replace Concrete Valley Gutter	SY	49		
23	Remove Existing Concrete Sidewalk	SY	20		
24	Replace Concrete Sidewalk	SY	20		
25	Remove, Salvage, Store and Reset Brick Pavers	SY	105		
26	Trench Safety System (in accordance with OSHA Requirements)	LF	2051		
27	Trench Safety Plan (designed by a Texas Licensed Professional Engineer)	LS	1		
28	Water Valve Box Adjustment with Concrete Collar	EA	15		
29	Traffic Control Plan (prepared by a Texas Licensed Professional Engineer)	LS	1		
30	Temporary Erosion, Sedimentation, and Water Pollution Prevention and Control (SWPPP)	MO	3		
31	Relocation and Repairs to Existing Utilities Allowance	LS	1	$75,000	$75,000

Base Bid					
Item No.	**Item Description**	**Units**	**Quantity**	**Unit Price**	**Item Cost**
32	Re-establishment of Landscaping Allowance	LS	1	$5,000	$5,000
	Water Improvements Subtotal (A): (Sum of Items 1-32)				

Base Bid					
Item No.	**Item Description**	**Units**	**Quantity**	**Unit Price**	**Item Cost**
Wastewater Improvements					
33	Mobilization for Sanitary Sewer (Max 5% of Bid Items 34-79)	LS	1		
34	4-foot Diameter Sanitary Sewer Fiberglass Manholes (6'-8' Depth)	EA	5		
35	4-foot Diameter Sanitary Sewer Fiberglass Manholes (8'-1”-10' Depth)	EA	11		
36	4-foot Diameter Sanitary Sewer Fiberglass Manholes (10'-1”-12' Depth)	EA	3		
37	8-Inch SDR-26 PVC Sanitary Sewer Line (Open Cut, 0'-8' Depth)	LF	501		
38	8-Inch SDR-26 PVC Sanitary Sewer Line (Open Cut, 8'-1”-10' Depth)	LF	345		
39	12-Inch SDR-26 PVC Sanitary Sewer Line (Open Cut, 0'-8' Depth)	LF	576		
40	12-Inch SDR-26 PVC Sanitary Sewer Line (Open Cut, 8'-1”-12' Depth)	LF	2243		
41	12-Inch SDR-26 PVC Sanitary Sewer Line (Open Cut, 12'-1”-14' Depth)	LF	650		
42	20-Inch DR-25 PVC Casing Pipe By Open Cut	LF	110		
43	Alternate Materials Under Existing Utilities, including Cement Stabilized Sand and Flowable Fill	CY	60		
44	Bypass Pumping	LS	1		
45	Trench Dewatering	LS	1		

Base Bid					
Item No.	**Item Description**	**Units**	**Quantity**	**Unit Price**	**Item Cost**
46	Tie-in at Existing 10" PVC Stub-Out	EA	2		
47	Single Sewer Service Connection (Short Side, One-way Clean-out)	EA	92		
48	Double Sewer Service Connection (Short Side, One-way Clean-out)	EA	85		
49	Remove Existing Grate Inlet (2' X 2')	EA	1		
50	Replace Existing Grate Inlet (2' X 2')	EA	1		
51	Remove Existing RCP (Storm Drain)	LF	6		
52	Replace Existing RCP (Storm Drain)	LF	6		
53	Hydraulic Shoring/Trench Safety System (in accordance with OSHA Requirements)	LF	4315		
54	Trench Safety Plan (designed by a Texas Licensed Professional Engineer)	LS	1		
55	Remove Existing 6-Inch Concrete Curb and Gutter	LF	104		
56	Replace 6-Inch Concrete Curb and Gutter	LF	104		
57	Remove Existing Concrete Runner	LF	48		
58	Replace Concrete Runner	LF	48		
59	Remove Existing Concrete Approach	SY	851		
60	Replace Concrete Approach	SY	851		
61	Remove Existing Concrete Sidewalk	SY	57		
62	Replace Concrete Sidewalk	SY	57		
63	Remove Existing Sanitary Sewer Manhole	EA	9		
64	Remove, Salvage, Store and Reset Brick Pavers	SY	387		

Base Bid					
Item No.	**Item Description**	**Units**	**Quantity**	**Unit Price**	**Item Cost**
65	Remove Existing Asphalt Paving (Alleys - Full Depth Removal)	SY	3373		
66	Remove Existing Concrete Pavement (Alleys – Full Depth Removal)	SY	3524		
67	Pavement Milling	SY	5674		
68	Limestone Base (9" Compacted, TxDOT Item 249 "Flexible Base")	SY	6897		
69	Geo-grid Fabric (DMS-6240 or Similar)	SY	6897		
70	3-Inch Type D HMAC Pavement	SY	9047		
71	Prime Coat (MC-30) (@ 0.20 GAL/SY)	GAL	1809		
72	Tack Coat (RC-2) (@0.05 GAL/SY)	GAL	452		
73	Remove Existing Asphalt Pavement	SY	337		
74	Pavement Markings	LF	1325		
75	Traffic Control Plan and Temporary Relocation of Alley Facilities	LS	1		
76	Temporary Erosion, Sedimentation, and Water Pollution Prevention and Control (SWPPP)	MO	12		
77	Utility Structure Reinforcement Allowance	LS	1	$100,000	$100,000
78	Relocation and Repairs of Existing Utilities Allowance	LS	1	$215,000	$215,000
79	Contaminated Soils Allowance	LS	1	$55,000	$55,000
	Wastewater Improvements Subtotal (B): (Sum of Items 33 – 79)				

See next page for supplemental bid items.

Supplemental Bid Item (SS-1 - Pipe Bursting from 13th St to International Boulevard)					
Item No.	**Item Description**	**Units**	**Quantity**	**Unit Price**	**Item Cost**
80	Mobilization and Pit Preparation (Launching/Receiving Pits)	LS	1		
81	12-Inch HDPE Sewer Pipe by Pipe Bursting	LF	443		
82	Sanitary Sewer Laterals (HDPE-PVC Re-connection)	EA	25		
	Wastewater Supplemental Bid Item Subtotal (C): (Items 80 + 81 +82)				

Base Bid Summary		
	Water and Wastewater Improvements Base Bid Total (A+B):	
	Supplemental Bid Item Total (C):	
	Water and Wastewater Base Bid + Supplemental Total (A+B+C):	

TOTAL AMOUNT OF BASE BID (A+B+C): $_____

_____

(written in words)

BID SCHEDULE
ALTENATE BID B011-24
BROWNSVILLE PUBLIC UTILITIES BOARD

The Bidder, in compliance with the Invitation for Bids for the **BPUB Downtown Water and Wastewater – ARPA Project 2,** having examined the scope of work and written Specifications, hereby proposes to furnish construction services for the following Unit prices and lump sums.

Refer to Section 01 20 00 – Measurement and Payment for bid item descriptions for base bid, supplemental bid and alternate bid items.

Alternate Bid					
Item No.	**Item Description**	**Units**	**Quantity**	**Unit Price**	**Item Cost**
Water Improvements					
1	Mobilization for Water Mains (Max 5% of Bid Items 2-32)	LS	1		
2	8-Inch DR-25 PVC Water Line (includes all restraints, fittings, and appurtenances)	LF	2051		
3	3-Inch Type D HMAC Pavement	SY	1085		
4	Limestone Base (5" Compacted)	SY	1085		
5	Prime Coat (MC-30) (@ 0.20 GAL/SY)	GAL	217		
6	Tack Coat (RC-2) (@0.05 GAL/SY)	GAL	54		
7	8-Inch Isolation Gate Valve	EA	11		
8	12-Inch Isolation Gate Valve	EA	1		
9	8-Inch x 8-Inch Tee (Water Line Tie-in)	EA	8		
10	12-Inch x 8-Inch Tee (Water Line Tie-in)	EA	1		
11	16" DR-25 PVC Casing Pipe	LF	40		
12	8-Inch Hot Tap	EA	1		
13	Alternate Materials Under Existing Utilities, including Cement Stabilized Sand and Flowable Fill	CY	61		

Alternate Bid					
Item No.	**Item Description**	**Units**	**Quantity**	**Unit Price**	**Item Cost**
14	Double Water Service Connection (Long Side)	EA	2		
15	Trench Dewatering	LS	1		
16	Remove Existing Concrete Pavement (including Saw Cutting)	SY	36		
17	Remove Existing Asphalt Pavement (including Saw Cutting)	SY	727		
18	Replace Concrete Pavement	SY	36		
19	Remove Existing Concrete Curb and Gutter (including Saw Cutting)	LF	260		
20	Replace Existing 6-Inch Concrete Curb and Gutter	LF	260		
21	Remove Existing Concrete Valley Gutter (including Saw Cutting)	SY	49		
22	Replace Concrete Valley Gutter	SY	49		
23	Remove Existing Concrete Sidewalk	SY	20		
24	Replace Concrete Sidewalk	SY	20		
25	Remove, Salvage, Store and Reset Brick Pavers	SY	105		
26	Trench Safety System (in accordance with OSHA Requirements)	LF	2051		
27	Trench Safety Plan (designed by a Texas Licensed Professional Engineer)	LS	1		
28	Water Valve Box Adjustment with Concrete Collar	EA	15		
29	Traffic Control Plan (prepared by a Texas Licensed Professional Engineer)	LS	1		
30	Temporary Erosion, Sedimentation, and Water Pollution Prevention and Control (SWPPP)	MO	3		
31	Relocation and Repairs to Existing Utilities Allowance	LS	1	$75,000	$75,000

Alternate Bid					
Item No.	**Item Description**	**Units**	**Quantity**	**Unit Price**	**Item Cost**
32	Re-establishment of Landscaping Allowance	LS	1	$5,000	$5,000
	Water Improvements Subtotal (A): (Sum of Items 1-32)				

Alternate Bid					
Item No.	**Item Description**	**Units**	**Quantity**	**Unit Price**	**Item Cost**
Wastewater Improvements					
33	Mobilization for Sanitary Sewer (Max 5% of Bid Items 34-79)	LS	1		
34	4-foot Diameter Sanitary Sewer Fiberglass Manholes (6'-8' Depth)	EA	5		
35	4-foot Diameter Sanitary Sewer Fiberglass Manholes (8'-1”-10' Depth)	EA	11		
36	4-foot Diameter Sanitary Sewer Fiberglass Manholes (10'-1”-12' Depth)	EA	3		
37	8-Inch SDR-26 PVC Sanitary Sewer Line (Open Cut, 0'-8' Depth)	LF	501		
38	8-Inch SDR-26 PVC Sanitary Sewer Line (Open Cut, 8'-1”-10' Depth)	LF	345		
42	20-Inch DR-25 PVC Casing Pipe By Open Cut	LF	110		
43	Alternate Materials Under Existing Utilities, including Cement Stabilized Sand and Flowable Fill	CY	60		
44	Bypass Pumping	LS	1		
45	Trench Dewatering	LS	1		
46	Tie-in at Existing 10" PVC Stub-Out	EA	2		
49	Remove Existing Grate Inlet (2' X 2')	EA	1		
50	Replace Existing Grate Inlet (2' X 2')	EA	1		

Alternate Bid					
Item No.	**Item Description**	**Units**	**Quantity**	**Unit Price**	**Item Cost**
51	Remove Existing RCP (Storm Drain)	LF	6		
52	Replace Existing RCP (Storm Drain)	LF	6		
53	Hydraulic Shoring/Trench Safety System (in accordance with OSHA Requirements)	LF	4315		
54	Trench Safety Plan (designed by a Texas Licensed Professional Engineer)	LS	1		
55	Remove Existing 6-Inch Concrete Curb and Gutter	LF	104		
56	Replace 6-Inch Concrete Curb and Gutter	LF	104		
57	Remove Existing Concrete Runner	LF	48		
58	Replace Concrete Runner	LF	48		
59	Remove Existing Concrete Approach	SY	851		
60	Replace Concrete Approach	SY	851		
61	Remove Existing Concrete Sidewalk	SY	57		
62	Replace Concrete Sidewalk	SY	57		
63	Remove Existing Sanitary Sewer Manhole	EA	9		
64	Remove, Salvage, Store and Reset Brick Pavers	SY	387		
65	Remove Existing Asphalt Paving (Alleys - Full Depth Removal)	SY	3373		
66	Remove Existing Concrete Pavement (Alleys – Full Depth Removal)	SY	3524		
67	Pavement Milling	SY	5674		
68	Limestone Base (9" Compacted, TxDOT Item 249 "Flexible Base")	SY	6897		

Alternate Bid					
Item No.	**Item Description**	**Units**	**Quantity**	**Unit Price**	**Item Cost**
69	Geo-grid Fabric (DMS-6240 or Similar)	SY	6897		
70	3-Inch Type D HMAC Pavement	SY	9047		
71	Prime Coat (MC-30) (@ 0.20 GAL/SY)	GAL	1809		
72	Tack Coat (RC-2) (@0.05 GAL/SY)	GAL	452		
73	Remove Existing Asphalt Pavement	SY	337		
74	Pavement Markings	LF	1325		
75	Traffic Control Plan and Temporary Relocation of Alley Facilities	LS	1		
76	Temporary Erosion, Sedimentation, and Water Pollution Prevention and Control (SWPPP)	MO	12		
77	Utility Structure Reinforcement Allowance	LS	1	$100,000	$100,000
78	Relocation and Repairs of Existing Utilities Allowance	LS	1	$215,000	$215,000
79	Contaminated Soils Allowance	LS	1	$55,000	$55,000
83	Mobilization and Pit Preparation (Pipe Bursting Equipment)	LS	1		
84	12-Inch HPDE Sewer Pipe by Pipe Bursting	LF	3469		
85	Sanitary Sewer Laterals (HDPE-PVC Re-connection)	EA	177		
	Wastewater Improvements Subtotal (D): (Sum of Items 33-38, 42-46, 49-79, 83-85)				

See next page for supplemental bid items.

Supplemental Bid Item (SS-1 - Pipe Bursting from 13th St to International Boulevard)					
Item No.	**Item Description**	**Units**	**Quantity**	**Unit Price**	**Item Cost**
80	Mobilization and Pit Preparation (Launching/Receiving Pits)	LS	1		
81	12-Inch HDPE Sewer Pipe by Pipe Bursting	LF	443		
82	Sanitary Sewer Laterals (HDPE-PVC Re-connection)	EA	25		
	Wastewater Supplemental Bid Item Subtotal (C):				

Base Bid Summary		
	Water and Wastewater Improvements Base Bid for Water and Alternate Bid Items – Pipe Bursting for Wastewater Total (A+D):	
	Supplemental Bid Item Total (C):	
	Water and Wastewater Base Bid + Supplemental Total (A+D+C):	

TOTAL AMOUNT OF BID (A+D+C): $_____

_____

(written in words)

NOTE: Quantities are estimated. The Brownsville PUB reserves the right to increase or decrease quantities as allowed by Texas law (plus or minus 25%) percent and as deemed necessary by OWNER, without impacting the quoted unit prices. Prospective bidders are encouraged to visit and assess the existing Project site and structures prior to submitting a bid.

BIDDER Acknowledges receipt of the following Addenda:

_____

_____

_____

SUBCONTRACTORS. The undersigned BIDDER proposes that he will be responsible to perform major portions of the Work at the Project site with his own forces and that specific portions of the Work not performed by the undersigned will be subcontracted and performed by the following subcontractors.

Work Subcontracted	Name of Subcontractor
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Bid amounts are to be legibly shown in both words and figures. In case of discrepancy, the unit price amount written in words will govern.

The above lump sum and unit prices shall include all labor, materials, excavation, bailing, shallow groundwater dewatering, shoring, removal, backfill, overhead, profit, insurance, etc., to cover the finished Work of the several kinds called for.

BIDDER understands that the OWNER reserves the right to reject any or all bids and to waive any informalities in the bidding and to elect to opt for any additive or deductive alternates in arriving at a final Contract price.

BIDDER agrees that this bid shall be good and may not be withdrawn for a period of ninety (90) calendar days after the scheduled bid opening.

The undersigned hereby declares that only the persons or firms interested in the bid as principal or principals are named herein, and that no other persons or firms than are herein mentioned have any interest in this Bid or in the Contract to be entered into; that this Bid is made without connection with any other person, company, or entities likewise submitting a bid or bid; and that it is in all respects for and in good faith, without collusion or fraud.

Upon receipt of written notice of the acceptance of this bid, BIDDER will execute the formal Contract attached within ten (10) calendar days and deliver the Bonds and Insurance Certificates as required under the GENERAL CONDITIONS. The Bid security attached in the sum of _____ ($_____) is to become the property of the OWNER in the event the Contract, Bonds, and insurance certificates are not executed or delivered within the time above set forth, as mutually agreed to liquidated damages and not as a penalty for the delay and additional administrative expense to the OWNER caused thereby; otherwise the Bid security will be returned upon the signing of the Contract and delivering the approved Bonds and Insurance Certificates.

Seal affixed here if BID is by a Corporation:
Respectfully submitted,

By:_____

Signature (**Failure to sign disqualifies bid)**

_____

Title

_____

Address

_____

Attest:_____

BID BOND

STATE OF §
§ KNOW ALL PERSONS BY THESE PRESENTS:
COUNTY OF §

THAT WE, the undersigned, _____ _____ as Principal, and _____ as Surety, are hereby held and firmly bound unto the BROWNSVILLE PUBLIC UTILITIES BOARD OF THE CITY OF BROWNSVILLE, TEXAS, Obligee, as OWNER in the penal sum of _____ _____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed, this _____ day of _____, 20__.

The Condition of the above obligation is such that whereas the Principal has submitted to the OWNER a certain BID attached hereto and hereby made a part hereof to enter into a Contract in writing, for construction of the **BPUB Downtown Water and Wastewater – ARPA Project 2**

NOW, THEREFORE,

(a) If said BID shall be rejected, or

(b) If said BID shall be accepted and the Principal shall execute and deliver a Contract in the form of Construction Agreement attached hereto (properly completed in accordance with said BID) and shall timely furnish any Payment and Performance Bonds required for his faithful performance of said Contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall timely furnish proper Insurance Certificates, and shall in all other respects perform the Agreement created by the BPUB acceptance of said BID,

then this obligation shall be void. Otherwise the same shall remain in full force and effect, it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BID BOND shall be in no way impaired or affected by an extension of the time within which the OWNER may accept such BID; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto legally set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed, and these presents to be signed by their legally authorized officers, the day and year first set forth above.

Signed, this _____ day of _____, 20__.

_____
Principal

_____
Surety

By:_____

IMPORTANT - Surety companies executing BONDS must be legally authorized by the State Board of Insurance to transact business in the State of Texas, and be currently listed as approved federal sureties in the most recently issued (as of the date of bid opening) edition of the U. S. Treasury Circular 570.

CONTRACTOR'S
PRE-BID DISCLOSURE STATEMENT

All questions must be answered or your bid may be deemed non-responsive and subject to rejection. The data given must be clear and comprehensive. **This statement must be notarized**. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional relevant information he desires.

1. This Pre-Bid Disclosure Statement is submitted to the Brownsville Public Utilities Board by:

_____
a Corporation, __ a Partnership, ___ a Texas Joint Venture, or __ an Individual.
Address: _____ Contractor's Telephone #: _____
City _____ State _____ Zip Code_____

2. Years in business under present business name: _____

3. Years of experience in construction work of the type called for in this Contract as: A General Contractor _____, A Subcontractor _____.

4. What projects has your organization completed? List most recent FIRST.

Contract	Type of Work	Date Completed	Owners Name and Address	Amount

5. What projects does your organization have under way as of this date?

Contract	Type of Work	Date Completed	Owners Name and Address	Amount

6. Have you ever failed to complete any work awarded to you?
___ Yes ____ No. If "Yes", state where and why. _____
_____
_____
_____

7. Are you at present in any binding arbitrations and/or lawsuits involving construction work of any type?
___ Yes ___ No. If "Yes", explain: _____
_____
_____
_____
_____

8. Explain in detail the manner in which you have inspected the work and jobsite proposed in this contract:_____
_____
_____
_____

9. Explain in detail your plan or layout for performing the work proposed in this contract:
_____
_____
_____
_____

10. If this contract is awarded to you, your company's office administrative manager for the work will be Mr. (Ms.) _____, and your resident construction superintendent will be Mr. (Ms.) _____.

11. What experience in this type of work does the individual designated as resident superintendent above have? _____
_____
_____

12. What portions of the work do you intend to subcontract?_____
_____
_____
_____
_____
_____

13. What equipment do you own or lease that is available for the proposed work?

Quantity	Description, Size Capacity, Etc.	Condition	Years in Service	Present Location

14. Have you received firm offers from all suppliers or manufacturers for all major items of material and/or equipment within the Base Bid Amount used in preparing your bid? __ Yes __ No

15. Attach resumes for the principal members of your organization, including the officers as well as the proposed superintendent for the project.

Credit available: $_____ Bank Reference: _____

Bonding Capacity available: $_____

The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by either the Owner's Engineer or Owner in verification of the recitals comprising this Pre-Bid Disclosure Statement.

The signatory of this questionnaire guarantees the truth and accuracy of all statements herein made and all answers herein expressed.

Dated this ____ day of _____, 20__.

By: _____

Title:_____

STATE OF _____

COUNTY OF _____

Subscribed and sworn to before me this ____ day of _____, 20__.

_____
Notary Public
My commission expires: _____

SUBCONTRACTOR'S
PRE-BID DISCLOSURE STATEMENT

All Subcontractor questions must be answered or the General Contractor's Bid may be deemed non-responsive and subject to rejection. The data given must be clear and comprehensive. **This statement must be notarized**. If necessary, questions may be answered on separate attached sheets. The prospective Subcontractor may submit any additional relevant information he desires.

1. This Pre-Bid Disclosure Statement is submitted to the Brownsville Public Utilities Board by: _____

__ a Corporation, __ a Partnership, __ a Texas Joint Venture, or __ an Individual.

Address: _____ Contractor's #: _____
City _____ State _____ Zip Code_____

2. Years in business under present business name: _____

3. Years of experience in construction work of the type called for in this Contract as: A General Contractor _____, A Sub-contractor _____.

4. Have you ever previously worked as a subcontractor for this General Contractor? _____ Yes; _____ No; If yes, list three most recent projects in which your company has served as a subcontractor to this General Contractor.

_____
_____
_____

5. What projects has your organization completed? List most recent FIRST.

Contract	Type of Work	Date Completed	Owners Name and Address	Amount

6. What projects does your organization have under way as of this date?

Contract	Type of Work	Date Completed	Owners Name and Address	Amount

7. Have you ever failed to complete any work awarded to you?
___ Yes ____ No. If "Yes", state where and why. _____
_____
_____
_____

8. Are you at present in any binding arbitrations and/or lawsuits involving construction work of any type?
___ Yes ___ No. If "Yes", explain: _____
_____
_____
_____
_____

9. Explain in detail the manner in which you have inspected the work and jobsite proposed in this contract:_____
_____
_____
_____

10. Explain in detail your plan or layout for performing the work proposed in this contract:
_____
_____
_____
_____

11. If this subcontract is awarded to you by the general contractor, your company's office administrative manager for the work will be Mr. (Ms.) _____, and your resident construction superintendent will be Mr. (Ms.) _____.

12. What experience in this type of work does the individual designated as resident superintendent above have? _____
_____
_____

13. What portions of the work do you intend to subtier subcontract? _____
_____
_____
_____
_____
_____

14. What equipment do you own that is available for the proposed work?

Quantity	Description, Size Capacity, Etc.	Condition	Years in Service	Present Location

15. Have you received firm offers from suppliers or manufacturers for all major items of material and/or equipment within the price totals used in preparing your subcontractor bid?
__ Yes __ No

16. Attach resumes for the principal members of your organization, including the officers as well as the proposed superintendent for the project.

Credit available: $_____ Bank Reference:_____

Bonding Capacity available: $_____

The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by either the Owner's Engineer or Owner in verification of the recitals comprising this Subcontractor Pre-Bid Disclosure Statement.

The signatory of this questionnaire guarantees the truth and accuracy of all statements herein made and all answers herein expressed.

Dated this ____ day of _____, 20__.

By: _____

Title: _____

STATE OF _____

COUNTY OF _____

Subscribed and sworn to before me this ____ day of _____, 20__.

_____

Notary Public
My commission expires: _____

REQUIRED FORMS CHECKLIST

The following documents are to be submitted as a part of the Bid/RFP/RFQ document

NAME	FORM DESCRIPTION	SUBMITTED WITH BID	
		YES ☐	NO ☐
Required Forms (if applicable)	Acknowledgement Form	☐	☐
	Debarment Certificate	☐	☐
	Ethic Statement	☐	☐
	Conflict of Interest Questionnaire	☐	☐
	W9 or W8 Form	☐	☐
	Disclosure of Lobbying Activities	☐	☐
	Form 1295	☐	☐
	Direct Deposit Form (will be provided to the awarded vendor)	☐	☐
	Residence Certification Form	☐	☐
Special Instructions (if applicable)	Bid Schedule/Cost sheet completed and signed	☐	☐
	Cashier Check or Bid Bond of 5% of Total Amount of Bid	☐	☐
	OSHA 300 Log	☐	☐
	Contractor Pre-Bid Disclosure completed, signed and notarized		
	Sub-Contractor Pre-Bid Disclosure completed, signed, and notarized		
		☐	☐
References	Complete the Previous Customer Reference Worksheet for each reference provided	☐	☐
Addenda		☐	☐
		☐	☐

Prospective Bidders are respectfully reminded to completely read and thoroughly respond to the BPUB Instructions for Bidders and Pre-Bid Disclosure Statement. When BPUB evaluates the Bids, it reviews indices regarding the prospective contractors' responsibility to perform the project based upon prior job performances for BPUB and other public owners. Additionally, BPUB carefully reviews the prospective contractors' responsiveness to the BPUB Bid Advertisement. Bidders should thoroughly check their submittal for completeness prior to responding to BPUB. Do not imbalance your Bid line items to overload portions of the work. Remember to answer all written questions in the Pre-Bid Disclosure Statement and then notarize it when signing. Bidders are often required to submit OSHA 300 Logs from prior job performance records as well. BPUB can, has, and will reject Bids that fail the responsibility and/or responsiveness

standards so as to protect the integrity of the bidding process for all participants. The Bidding community's compliance with these guideline standards will be appreciated by the BPUB.

ETHICS STATEMENT
(Complete and return with bid)

The undersigned bidder, by signing and executing this bid, certifies and represents to the Brownsville Public Utilities Board that bidder has not offered, conferred or agreed to confer any pecuniary benefit, as defined by (1.07 (a) (6) of the Texas Penal Code, or any other thing of value as consideration for the receipt of information or any special treatment of advantage relating to this bid; the bidder also certifies and represents that the bidder has not offered, conferred or agreed to confer any pecuniary benefit or other thing of value as consideration for the recipient's decision, opinion, recommendation, vote or other exercise of discretion concerning this bid, the bidder certifies and represents that bidder has neither coerced nor attempted to influence the exercise of discretion by any officer, trustee, agent or employee of the Brownsville Public Utilities Board concerning this bid on the basis of any consideration not authorized by law; the bidder also certifies and represents that bidder has not received any information not available to other bidders so as to give the undersigned a preferential advantage with respect to this bid; the bidder further certifies and represents that bidder has not violated any state, federal, or local law, regulation or ordinance relating to bribery, improper influence, collusion or the like and that bidder will not in the future offer, confer, or agree to confer any pecuniary benefit or other thing of value of any officer, trustee, agent or employee of the Brownsville Public Utilities Board in return for the person having exercised their person's official discretion, power or duty with respect to this bid; the bidder certifies and represents that it has not now and will not in the future offer, confer, or agree to confer a pecuniary benefit or other thing of value to any officer, trustee, agent, or employee of the Brownsville Public Utilities Board in connection with information regarding this bid, the submission of this bid, the award of this bid or the performance, delivery or sale pursuant to this bid.

THE VENDOR/CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD HARMLESS THE CITY OF BROWNSVILLE AND THE BROWNSVILLE PUBLIC UTILITIES BOARD, ALL OF THEIR OFFICERS, AGENTS AND EMPLOYEES FROM AND AGAINST ALL CLAIMS, ACTIONS, SUITS, DEMANDS, PROCEEDINGS, COSTS, DAMAGES, AND LIABILITIES, ARISING OUT OF, CONNECTED WITH, OR RESULTING FROM ANY NEGLIGENT ACTS OR OMISSIONS OF CONTRACTOR OR ANY AGENT, EMPLOYEE, SUBCONTRACTOR, OR SUPPLIER OF CONTRACTOR IN THE EXECUTION OR PERFORMANCE OF THIS BID.

I have read all of the specifications and general bid requirements and do hereby certify that all items submitted meet specifications.

COMPANY: _____

AGENT NAME: _____

AGENT SIGNATURE:_____

ADDRESS:_____

CITY: _____

STATE: _____ ZIP CODE: _____

TELEPHONE: _____ TELEFAX: _____

FEDERAL ID#: _____AND/OR SOCIAL SECURITY #: _____

DEVIATIONS FROM SPECIFICATIONS IF ANY:

NOTE: QUESTIONS AND CONCERNS FROM PROSPECTIVE CONTRACTORS SHOULD BE RAISED WITH OWNER AND ITS CONSULTANT (IF APPLICABLE) AND RESOLVED IF POSSIBLE, PRIOR TO THE BID SUBMITTAL DATE. ANY LISTED DEVIATIONS IN A FINALLY SUBMITTED BID MAY ALLOW THE OWNER TO REJECT A BID AS NON-RESPONSIVE.

NON-COLLUSION AFFIDAVIT

STATE OF TEXAS §
§
COUNTY OF _____ §

By the signature below, the signatory for the bidder certifies that neither he/she nor the firm, corporation, partnership or institution represented by the signatory or anyone acting for the firm bidding this project has violated the antitrust laws of this State, codified at Section 15.01, *et seq.*, Texas Business and Commerce Code, or the Federal antitrust laws, nor communicated directly or indirectly the bid made to any competitor or any other person engaged in the same line of business, nor has the signatory or anyone acting for the firm, corporation or institution submitting a bid committed any other act of collusion related to the development and submission of this bid proposal.

Signature: _____

Printed Name: _____

Title: _____

Company: _____

Date: _____

SUBSCRIBED and sworn to before me the undersigned authority by _____ on the _____ day of _____, 20_____ on behalf of said bidder.

_____
Notary Public in and for the
State of Texas

My commission expires: _____

CERTIFICATION REGARDING DEBARMENT, SUSPENSION,
AND OTHER RESPONSIBILITY MATTERS
(Complete and Return with Bid)

Name of Entity: _____
Entity Unique Entity Identifier Number _____
The prospective participant certifies to the best of their knowledge and belief that they and their principals:

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

I understand that a false statement on this certification may be grounds for rejection of this bid or termination of the award. In addition, under 18 USC Section 1001, a false statement may result in a fine up to a $10,000.00 or imprisonment for up to five (5) years, or both.

_____
Name and Title of Authorized Representative (Typed)

_____ _____
Signature of Authorized Representative Date

☐ I am unable to certify to the above statements. My explanation is attached.

EPA FORM 5700-49 (11-88)

THIS FORM MUST BE COMPLETED IN ITS ENTIRETY & SUBMITTED WITH BID RESPONSE

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor doing business with local governmental entity

	OFFICE USE ONLY
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.	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

Form provided by Texas Ethics Commission www.ethics.state.tx.us Revised 1/1/2021

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.

Form provided by Texas Ethics Commission www.ethics.state.tx.us Revised 1/1/2021

BROWNSVILLE PUBLIC UTILITIES BOARD

RESIDENCE CERTIFICATION

In accordance with Chapter 2252 of the Texas Government Code, the following will apply. The pertinent portion of the Code has been extracted and is as follows:

Section 2252.001

(3) "Nonresident bidder" refers to a person who is not a resident of Texas.

(4) " 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 place of business in this State.

Section 2252.002

A governmental entity may not award a governmental contract to a nonresident bidder unless the nonresident bidder underbids the lowest bid submitted by a responsible resident bidder by an amount that is not less than the amount by which a resident bidder would be required to underbid the nonresident bidder to obtain a comparable contract in:
(1) The state in which the nonresident's principal place of business is located; or
(2) A state in which the nonresident is a resident manufacturer.

I certify that_____(Company Name) is **a resident Texas bidder** as defined in Section 2252.001(4) of the Texas Government Code.

Signature: _____

Print Name: _____

I certify that_____(Company Name) is a **nonresident bidder** as defined in Section 2252.001(3) of the Texas Government Code and our principal place of

business is:_____
(City and State)

Signature: _____

Print Name: _____

Previous Customer Reference Worksheet

Name of Customer:		Customer Contact:
Customer Address:		Customer Phone Number:
		Customer Email:

Name of Company Performing Referenced Work:

What was the Period of Performance?		What was the Final Acceptance Date?
From: To:		
Dollar Value of Contract? $_____		What Type of Contract? ☐ Firm Fixed Price ☐ Time and Material ☐ Not to Exceed ☐ Cost Plus Fixed Fee ☐ Other, Specify:_____

Provide a brief description of the work performed for this customer (add additional page if required)

Form **W-9**
(Rev. October 2018)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

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

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

Print or type. See Specific Instructions on page 3.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.

2 Business name/disregarded entity name, if different from above

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.

☐ Individual/sole proprietor or single-member LLC ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ▶ _____

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.

☐ Other (see instructions) ▶

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any) _____

Exemption from FATCA reporting code (if any) _____

(Applies to accounts maintained outside the U.S.)

5 Address (number, street, and apt. or suite no.) See instructions.

Requester's name and address (optional)

6 City, state, and ZIP code

7 List account number(s) here (optional)

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** ▶

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.*

Form **W-8BEN-E**

(Rev. October 2021)

Department of the Treasury
Internal Revenue Service

Certificate of Status of Beneficial Owner for United States Tax Withholding and Reporting (Entities)

▶ For use by entities. Individuals must use Form W-8BEN. ▶ Section references are to the Internal Revenue Code.
▶ Go to *www.irs.gov/FormW8BENE* for instructions and the latest information.
▶ Give this form to the withholding agent or payer. Do not send to the IRS.

OMB No. 1545-1621

Do NOT use this form for: **Instead use Form:**

- U.S. entity or U.S. citizen or resident W-9
- A foreign individual . . . . . W-8BEN (Individual) or Form 8233
- A foreign individual or entity claiming that income is effectively connected with the conduct of trade or business within the United States (unless claiming treaty benefits) W-8ECI
- A foreign partnership, a foreign simple trust, or a foreign grantor trust (unless claiming treaty benefits) (see instructions for exceptions) . . W-8IMY
- A foreign government, international organization, foreign central bank of issue, foreign tax-exempt organization, foreign private foundation, or government of a U.S. possession claiming that income is effectively connected U.S. income or that is claiming the applicability of section(s) 115(2), 501(c), 892, 895, or 1443(b) (unless claiming treaty benefits) (see instructions for other exceptions) . . . . . W-8ECI or W-8EXP
- Any person acting as an intermediary (including a qualified intermediary acting as a qualified derivatives dealer) W-8IMY

Part I Identification of Beneficial Owner

1 Name of organization that is the beneficial owner

2 Country of incorporation or organization

3 Name of disregarded entity receiving the payment (if applicable, see instructions)

4 Chapter 3 Status (entity type) (Must check one box only):

- ☐ Corporation
- ☐ Partnership
- ☐ Simple trust
- ☐ Tax-exempt organization
- ☐ Complex trust
- ☐ Foreign Government - Controlled Entity
- ☐ Central Bank of Issue
- ☐ Private foundation
- ☐ Estate
- ☐ Foreign Government - Integral Part
- ☐ Grantor trust
- ☐ Disregarded entity
- ☐ International organization

If you entered disregarded entity, partnership, simple trust, or grantor trust above, is the entity a hybrid making a treaty claim? If "Yes," complete Part III. ☐ Yes ☐ No

5 Chapter 4 Status (FATCA status) (See instructions for details and complete the certification below for the entity's applicable status.)

- ☐ Nonparticipating FFI (including an FFI related to a Reporting IGA FFI other than a deemed-compliant FFI, participating FFI, or exempt beneficial owner).
- ☐ Participating FFI.
- ☐ Reporting Model 1 FFI.
- ☐ Reporting Model 2 FFI.
- ☐ Registered deemed-compliant FFI (other than a reporting Model 1 FFI, sponsored FFI, or nonreporting IGA FFI covered in Part XII). See instructions.
- ☐ Sponsored FFI. Complete Part IV.
- ☐ Certified deemed-compliant nonregistering local bank. Complete Part V.
- ☐ Certified deemed-compliant FFI with only low-value accounts. Complete Part VI.
- ☐ Certified deemed-compliant sponsored, closely held investment vehicle. Complete Part VII.
- ☐ Certified deemed-compliant limited life debt investment entity. Complete Part VIII.
- ☐ Certain investment entities that do not maintain financial accounts. Complete Part IX.
- ☐ Owner-documented FFI. Complete Part X.
- ☐ Restricted distributor. Complete Part XI.
- ☐ Nonreporting IGA FFI. Complete Part XII.
- ☐ Foreign government, government of a U.S. possession, or foreign central bank of issue. Complete Part XIII.
- ☐ International organization. Complete Part XIV.
- ☐ Exempt retirement plans. Complete Part XV.
- ☐ Entity wholly owned by exempt beneficial owners. Complete Part XVI.
- ☐ Territory financial institution. Complete Part XVII.
- ☐ Excepted nonfinancial group entity. Complete Part XVIII.
- ☐ Excepted nonfinancial start-up company. Complete Part XIX.
- ☐ Excepted nonfinancial entity in liquidation or bankruptcy. Complete Part XX.
- ☐ 501(c) organization. Complete Part XXI.
- ☐ Nonprofit organization. Complete Part XXII.
- ☐ Publicly traded NFFE or NFFE affiliate of a publicly traded corporation. Complete Part XXIII.
- ☐ Excepted territory NFFE. Complete Part XXIV.
- ☐ Active NFFE. Complete Part XXV.
- ☐ Passive NFFE. Complete Part XXVI.
- ☐ Excepted inter-affiliate FFI. Complete Part XXVII.
- ☐ Direct reporting NFFE.
- ☐ Sponsored direct reporting NFFE. Complete Part XXVIII.
- ☐ Account that is not a financial account.

6 Permanent residence address (street, apt. or suite no., or rural route). **Do not use a P.O. box or in-care-of address** (other than a registered address).

City or town, state or province. Include postal code where appropriate. | Country

7 Mailing address (if different from above)

City or town, state or province. Include postal code where appropriate. | Country

ATTACHMENT J: DISCLOSURE OF LOBBYING ACTIVITIES SF-LLL CERTIFICATION
(To be submitted with each bid or offer exceeding $100,000)

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

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

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

(c) The undersigned shall require that the language in paragraphs (a) and (b) of this anti-lobbying certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, U.S.C. § 1352 (as amended by the Lobbying Disclosure Act of 1995).

The Contractor, _____ (insert business name), certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. § 3801 et seq., apply to this certification and disclosure, if any.

SIGNATURE	
NAME OF AUTHORIZED AGENT	
TITLE OF AUTHORIZED AGENT	
DATE	

ATTACHMENT J: DISCLOSURE OF LOBBYING ACTIVITIES SF-LLL CERTIFICATION (CONTINUED)
(To be submitted with each bid or offer exceeding $100,000)

COMPLETE THIS FORM ONLY IF YOUR BID OR OFFER EXCEEDS $100,000 AND FUNDS HAVE BEEN OR WILL BE PAID FOR LOBBYING ACTIVITIES RELATED TO THIS RFP

1.Type of Federal Action:	**2. Status of Federal Action:**	**3. Report Type:**
☐ a. contract ☐ b. grant ☐ c. cooperative agreement ☐ d. loan ☐ e. loan guarantee ☐ f. loan insurance	☐ a. bid/offer/application ☐ b. initial award ☐ c. post-award	☐ a. initial filing ☐ b. material change

4. Name and Address of Reporting Entity: ☐ Prime ☐ Subawardee Tier _____, *if known:* Name: Street Address: City, State, Zip: **Congressional District, if known:**	**5. If Reporting Entity in No. 4 is Subawardee, Enter Name and Address of Prime:** Name: Street Address: City, State, Zip: **Congressional District, if known:**
6. Federal Department/Agency:	**7. Federal Program Name/Description:** CFDA Number, *if applicable*: _____
8. Federal Action Number, *if known:*	**9. Award Amount, *if known*:** **$**
10a. Name and Address of Lobbying Registrant Name (First, MI, Last): Street Address: City, State, Zip:	**10b. Individuals Performing Services** *(including address if different from No. 10a)* Name (First, MI, Last): Street Address: City, State, Zip:

11. Information requested through this form is authorized by Title 31 U.S.C., Section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Signature: _____

Name: _____ Title: **_____** **Telephone: _____ Date:** **_____**	
Federal Use Only	**Authorized for Local Reproduction Standard Form – LLL (Rev. 7-97)**

NOTICE OF AWARD

TO: _____
_____
_____

Project Description: BPUB Downtown Water and Wastewater – ARPA Project 2

Dear Sir/Madam:

The Owner, BPUB has considered the BID submitted by you for the above-described Work in response to its Legal Notice and Invitation to Bid dated <DATE> and Instruction to Bidders.

You are hereby notified that after any Owner adjustments to the Base Bid Amount to account for Owner options regarding additive and deductive alternates, your BID has been accepted in the final Contract Price amount of $_____.

You are required by the Instructions to Bidders to execute the Construction Agreement and furnish any required Contractor's Performance Bond, Payment Bond and Certificates of Insurance within ten (10) calendar days from the date you receive this Notice.

In addition with the Bonds and Insurance Certificates, you must complete, execute, and submit a Contractor Job Safety Analysis (JSA) form. The JSA form is required prior to entering into a contractual agreement with the OWNER, and will be valid for a period of thirty (30) calendar days after which you must complete, execute and submit an updated JSA form. The completed JSA form is included as a part of the Contract Documents.

If you fail to execute this Agreement and furnish any required Bonds, Insurance Certificates, or other certifications within ten (10) calendar days from the date of this Notice, Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your BID as abandoned, and as a forfeiture of your BID BOND.

The Owner will be entitled to such other rights as may be granted by law and equity.

You are required to promptly sign and return an acknowledged copy of this NOTICE OF AWARD to the Owner.

Dated this ____ day of _____, 20__.

BROWNSVILLE PUBLIC UTILITIES BOARD OF THE CITY OF BROWNSVILLE, TEXAS

By:_____
Name: Marilyn D. Gilbert, MBA
Title: General Manager & CEO

ACCEPTANCE OF NOTICE OF AWARD

Receipt of the above NOTICE OF AWARD is hereby acknowledged by:

_____ this ____ day

of _____, 20___.

By:_____

Name:_____

Title:_____

NOTICE TO PROCEED

TO:

ADDRESS:

Contract for: BPUB Downtown Water and Wastewater – ARPA Project 2

You are notified that the Contract Time under the above Contract will commence to run on _____, 20__. By that date, you are to start performing your obligations under the Contract Documents. In accordance with the Agreement, the date of Substantial Completion prior to final payment is _____, 20__.

Before you may start any Work at the site, Bonds and Insurance Certificates along with certain material submittals must be submitted and approved by the BPUB before a BPUB Purchase Order is issued and prior to the purchase and shipment of Work materials.

Brownsville Public Utilities Board:
(Owner)

BY: _____
(Authorized Signature)
NAME: Marilyn D. Gilbert, MBA

TITLE: General Manager & CEO

DATE: _____

CONSTRUCTION AGREEMENT

THIS AGREEMENT is by and between the BROWNSVILLE PUBLIC UTILITIES BOARD of the City of Brownsville, Texas (hereinafter called OWNER or BPUB) and <CONTRACTOR NAME> of <CITY & STATE> (hereinafter called CONTRACTOR), performing as an independent contractor.

OWNER and CONTRACTOR, as the Parties hereto, in consideration of the mutual covenants hereinafter set forth, agree as follows:

Article 1. WORK.

CONTRACTOR shall furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the Work described herein and complete all the Work as specified or indicated in the Contract Documents. The Work is generally described as: South Wastewater Treatment Plant Improvements (hereinafter referred to as "Work" and/or "Project").

Article 2. ENGINEER.

The Project has been designed by OWNER'S independent professional engineering consultant(s): Hazen and Sawyer (hereinafter called ENGINEER).

Article 3. CONTRACT TIME.

3.1 The Work shall be Substantially Completed in accordance with paragraph 14.8 of the General Conditions within three hundred and sixty five (365) consecutive Calendar Days after the date when the Contract Time commences to run as provided in paragraph 2.3 of the General Conditions, and finally completed and ready for final payment in accordance with paragraph 14.13 of the General Conditions within thirty (30) consecutive Calendar Days after the date of Substantial Completion as established in accordance with paragraph 14.8 of the General Conditions.

CONTRACTOR hereby acknowledges and agrees that the ENGINEER has already included in the calculation of the performance Calendar Days, normal, monthly, non-compensable rain days for Cameron County, Texas, based upon historical monthly National Oceanic and Atmospheric Administration (NOAA) record averages.

3.2 **Liquidated Damages**. OWNER and CONTRACTOR recognize that the **TIME OF PERFORMANCE IS OF THE ESSENCE** in this Agreement and that OWNER will suffer financial loss if the Work is not Substantially Complete within the time specified in Article 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. Both Parties hereto also recognize the delays, expense and difficulties involved in proving in a legal proceeding the actual loss suffered by OWNER if the Work is not Substantially Complete on time. Accordingly, instead of requiring such proof, OWNER and CONTRACTOR agree that as liquidated damages for the delay (but not as a penalty) CONTRACTOR shall pay

OWNER **FIVE HUNDRED DOLLARS AND NO CENTS** ($500.00) for each Calendar Day that expires after the time specified in Article 3.1 for Substantial Completion, until the Work is Substantially Complete.

Article 4. CONTRACT PRICE.

4.1 CONTRACTOR shall perform the Work described in the Contract Documents for the amounts shown in the CONTRACTOR'S Bid Schedule, and OWNER shall pay CONTRACTOR in current funds based on the Bid Schedule.

Article 5. PAYMENT PROCEDURES.

CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by OWNER as provided for in the General Conditions.

5.1 **Progress Payments**. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's mathematically correct Applications for Payment on or about the twentieth-fifth (25^{th}) Calendar Day after submittal of the Application for Payment each month as provided below. All progress payments shall be on the basis of the progress of the Work measured by the Schedule of Values provided for in paragraph 14.1 of the General Conditions.

5.1.2. Prior to Substantial Completion, progress payments shall be in an amount equal to ninety-five percent (95%) of the amount requested in the Application for Payment, with five percent (5%) remaining as OWNER's retainage for the Project, to be released by OWNER in accordance with Article 5.2 below.

5.1.3. Upon Substantial Completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to ninety-five percent (95%) of the Contract Price, less such amounts OWNER shall determine in accordance with paragraphs 14.7 and 14.8 of the General Conditions.

5.2 **Final Payment**. Upon final completion and acceptance of the Work after resolution of any punch list items in accordance with paragraph 14.8 and 14.13 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by Engineer as provided in said paragraphs 14.13.

Article 6. CONTRACTOR'S REPRESENTATIONS.

In order to induce OWNER to enter into this Agreement, CONTRACTOR makes the following representations to OWNER:

6.1 CONTRACTOR has familiarized himself with the Project, nature and extent of the Contract Documents, Work, and with all local conditions and federal, state and local

laws, ordinances, rules and regulations that in any manner may affect cost, progress or performance of the Work.

6.2 CONTRACTOR has made, or caused to be made, examinations and investigations of information as he deems necessary for the performance of the Work at the Contract Price, as determined by the Bid Schedule and finalized Schedule of Values as determined by Article 2 of the General Conditions, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents; and no additional examinations, investigations or similar data are, or will be required by CONTRACTOR for such purposes.

6.3 CONTRACTOR has given OWNER advanced written notice of all obvious conflicts, errors or discrepancies that he has discovered in the Contract Documents prior to bidding, and the written resolution thereof by OWNER was acceptable to CONTRACTOR.

6.4 CONTRACTOR is skilled and experienced to responsibly perform the type of Work described in the Contract Documents in a workmanlike and timely manner.

Article 7. CONTRACT DOCUMENTS.

The Contract Documents which comprise the entire Agreement between OWNER and CONTRACTOR are attached to this Construction Agreement, made a part hereof, and consist of the following:

7.1 Legal Notice and Invitation to Bid
7.2 Instructions to Bidders
7.3 Bid Forms and Bid Schedule
7.4 Bid Bond
7.5 Contractor's and Subcontractor's Pre-Bid Disclosure Statements
7.6 Notice of Award and Acceptance of Notice
7.7 Notice to Proceed
7.8 This Construction Agreement
7.9 Performance Bond
7.10 Payment Bond
7.11 General Conditions
7.12 Supplementary General Conditions
7.13 Technical Specifications
7.14 Addendum number(s)__ (page __).
7.15 CONTRACTOR's Certificate(s) of Insurance.
7.16 Construction Drawings bearing the following general title: B011-24 **BPUB Downtown Water and Wastewater – ARPA Project 2** (Sheets 1 through 45)
7.17 Any Written Amendment, including Change Orders, duly delivered after execution of this Agreement.

There are no Contract Documents other than those listed above in this Article 7. The Contract Documents may only be altered, amended or repealed by a Written Amendment (as defined in Article 1 of the General Conditions).

Article 8. MISCELLANEOUS.

8.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions shall have the meanings indicated in the General Conditions.

8.2 No assignment by a Party hereto of any rights under, or interest in, the Contract Documents will be binding on another Party hereto without the written consent of the Party sought to be bound; and specifically, but without limitation, moneys that may become due, and moneys that are due, may not be assigned without such prior written consent (except to the extent that this restriction may be limited by law); and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

8.3 OWNER and CONTRACTOR each binds himself, his partners, successors, assigns and legal representatives to the other Party hereto, his partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

8.4 The invalidity or unenforceability of any provision of the Contract Documents shall not affect the validity or enforceability of any other provision of the Contract Documents.

8.5 This Construction Agreement and the Contract Documents are subject to all applicable local, Texas, federal laws, statutes, codes, ordinances, rules and regulations.

8.6 In the event of default by CONTRACTOR under the Contract Documents, OWNER shall have all rights and remedies afforded to it at law or in equity to enforce the terms of the Contract Documents. The exercise of any one right or remedy shall be without prejudice to the enforcement of any other right or remedy allowed at law or in equity.

8.7 If any action at law or in equity is necessary by OWNER to enforce or interpret the terms of the Contract Documents, OWNER shall be entitled to reasonable attorneys' fees, court costs, expert witness fees, and any necessary and reasonable supporting disbursements, in addition to any other relief to which the OWNER is entitled.

8.8 The Contract Documents constitute the **ENTIRE AGREEMENT BETWEEN THE PARTIES** hereto and supersede any prior written or oral agreements and understandings between the Parties. The Contract can only be modified or amended by written agreement of the Parties.

8.9 These Contract Documents are governed by the laws of the State of Texas and the Parties agree that venue for any litigation/arbitration/mediation arising from these Contract Documents shall lie in Cameron County, Texas.

Article 9. OTHER REQUIREMENTS

9.1 Workers' Compensation Insurance (For additional detail see: General Conditions paragraphs 5.3.1 and 5.5.1-2

A. By signing this Agreement, CONTRACTOR certifies that it provides workers' compensation insurance coverage for all employees employed on this Project pursuant to Tex. Lab. Code Sections 401 and 406.096(a).

B. As required by Section 406.096(b) of same Code, CONTRACTOR must require each Subcontractor to certify in writing to the CONTRACTOR that the Subcontractor provides workers' compensation insurance coverage for all of the employees it employs on this Project. CONTRACTOR must provide these certifications to the OWNER within ten (10) calendar days of the Effective Date of this Agreement.

9.2 Prohibition of Contracts with Companies Engaged in Business with Iran, Sudan, or Foreign Terrorist Organizations

A. See: Tex. Gov't Code Section 2252.152, Subchapter F, which prohibits the award of governmental contracts to companies engaged in business with Iran, Sudan, or foreign terrorist organizations.

B. By signing this Agreement, CONTRACTOR certifies that it is not ineligible to be awarded this Contract under said Chapter 2252, Subchapter F.

9.3 Prohibition of Contracts with Certain Companies that Boycott Israel

A. See: Tex. Gov't Code Chapter 2271 which prohibits the award of governmental contracts to companies boycotting Israel.

B. By signing this Agreement, CONTRACTOR certifies that it does not boycott Israel and will not boycott Israel during the term of this Contract.

9.4 Certificate of Interested Parties: CONTRACTOR must complete and submit a Certificate of Interested Parties (Form 1295) to the OWNER with the signed Agreement as required by Tex. Gov't Code Section 2252.908(e).

(THE REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK)

IN WITNESS WHEREOF, the Parties hereto have signed this Construction Agreement in triplicate originals. One counterpart each has been delivered to OWNER and CONTRACTOR, and the third will be filed with the ENGINEER.

This Construction Agreement will be Effective on _____, 20__, the date when OWNER signs below.

[NOTE: THE DATE OF THE PAYMENT AND PERFORMANCE BONDS CANNOT PRECEDE THIS EFFECTIVE CONTRACT DATE.]

BROWNSVILLE PUBLIC UTILITIES BOARD	<CONTRACTOR>
By: _____	By: _____
Name: Marilyn D. Gilbert, MBA	Name: _____
Title: General Manager & CEO	Title: _____
Signature Date: _____	Signature Date: _____
Attest: _____	Attest: _____
Address for giving notices:	Address for giving notices:
Attn: _____	Attn: _____
1425 Robinhood Drive	_____
Brownsville, TX 78521	_____
(956) 983-6572	_____
<ENTER EMAIL ADDRESS>	_____

CONTRACTOR hereby acknowledges and understands that this is a "separated contract" pursuant to 34 Texas Administrative Code 3.291. The following amount of money represents that part of the total Contract Price representative of the value of tangible personal property to be physically incorporated into the Project realty: $_____._____.

[NOTE: SEE GENERAL CONDITIONS PARAGRAPH 6.16, "Taxes", and "STATE SALES AND USE TAX EXEMPTION."]

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

THAT _____
(Name of Contractor as Principal)

_____
(Address of Contractor)

a _____
(corporation, partnership, or individual)

hereinafter called Principal, and

_____
(Name of Surety)

_____
(Address of Surety)

hereinafter called Surety, are held and firmly bound unto the PUBLIC UTILITIES BOARD of the City of Brownsville, Texas, hereinafter called OWNER as Obligee, in the penal sum of _____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain Contract with the OWNER, dated the ____ day of _____, 20___, a copy of which is hereto attached and made a part hereof, for the construction of the Project: **BPUB Downtown Water and Wastewater – ARPA Project 2.**

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the one (1) year post-construction workmanship guaranty and minimum materials/equipment warranty period, and if he shall satisfy all claims and demands incurred under such Contract, and **SHALL FULLY INDEMNIFY AND SAVE HARMLESS THE OWNER FROM ALL COSTS AND DAMAGES WHICH IT MAY SUFFER BY REASON OF FAILURE TO DO SO**, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received, hereby stipulates and agrees: that no written change, extension of time, alteration or addition to the terms of the Contract or to Project Work to be performed thereunder, or the Specifications accompanying the same, shall in any ways affect its obligation on this PERFORMANCE BOND, and it does hereby waive notice

of any such written change, extension of time, alteration or addition to the terms of the Contract, or to the Project Work, or to the Specifications.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose timely filed and legally perfected claim may be unsatisfied.

This PERFORMANCE BOND is subject to and governed by Sections 2253.01-079 of the Texas Government Code (Vernon's Texas Codes Annotated) and Chapter 3503 of the Texas Insurance Code (VTCA), and all amendments thereto.

IN WITNESS WHEREOF, this instrument is executed in triplicate originals, each counterpart of which shall be deemed an original, this the ____ day of _____, 20___.

A. ATTEST: _____
(Principal)

_____ By:_____(s)
(Principal) Secretary (Signature of legally authorized representative of Principal)
Print Name _____
Print Title _____

(SEAL)

_____ _____
(Witness as to Principal) (Address)

_____ _____
(Address)

_____

B. ATTEST: _____
(Surety)

_____ By:_____
(Surety) Secretary (Signature of Attorney-in-Fact for Surety)
Print Name _____

(SEAL)

_____ _____
(Witness as to Surety) (Address)

_____ _____
(Address)

_____

NOTE: Date of PERFORMANCE BOND must not be prior to Effective Date (execution date by OWNER) of Contract. If CONTRACTOR is a Partnership, all partners should execute PERFORMANCE BOND.

IMPORTANT: Surety companies executing PERFORMANCE BONDS must be legally authorized by the Texas State Board of Insurance to transact business in the State of Texas, and be currently listed as an approved federal surety in the most recently issued edition (prior to Contract's Effective Date) of the U. S. Treasury Circular 570.

PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS:

THAT _____
(Name of Contractor as Principal)

_____
(Address of Contractor)

a _____
(corporation, partnership, or individual)

hereinafter called Principal, and

_____
(Name of Surety)

_____
(Address of Surety)

hereinafter called Surety, are held and firmly bound unto the PUBLIC UTILITIES BOARD of the City of Brownsville, Texas, hereinafter called OWNER as Obligee, the penal sum of _____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain Contract with the OWNER, dated the ____ day of _____, 20___, a copy of which is hereto attached and made a part hereof, for the construction of the: **BPUB Downtown Water and Wastewater – ARPA Project 2.**

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, SUBCONTRACTORS, and corporations furnishing materials for, or performing labor in the prosecution of the WORK provided for in such Contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and all insurance premiums on said WORK, and for all labor, performed in such WORK, whether by SUBCONTRACTORS or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to WORK to be performed thereunder, or the SPECIFICATIONS accompanying the same, shall in any wise affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract, or to the WORK, or to the Specifications.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge any remaining, timely and legally perfected right of any lawful beneficiary hereunder, whose timely filed and legally perfected claim may be unsatisfied.

This Bond is subject to and governed Sections 2253.01 of the Texas Government Code (Vernon's Texas Codes Annotated) and Chapter 3503 of the Texas Insurance Code (VTCA), and all amendments thereto.

IN WITNESS WHEREOF, this instrument is executed in triplicate, each counterpart of which shall be deemed an original, this the ____ day of _____, 20__.

ATTEST:

_____
(Principal)

_____ By:_____(s)
(Principal) Secretary (Signature)

(SEAL)

_____ _____
(Witness as to Principal) (Address)

_____ _____
(Address)

_____

ATTEST:

_____
(Surety)

_____ By:_____
(Surety) Secretary (Attorney-in-Fact)

(SEAL)

_____ _____
(Witness as to Surety) (Address)

_____ _____
(Address)

_____

NOTE: Date of PAYMENT BOND must not be prior to Effective Date (execution date by OWNER) of Contract. If Contractor is a Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing PAYMENT BONDS must be legally authorized by the Texas Board of Insurance to transact business in the State of Texas, and be currently listed as an approved federal surety in the most recently issued edition (prior to Contract's Effective Date) of the U. S. Treasury Circular 570.

ATTACH POWER OF ATTORNEY

INSERT CERTIFICATE OF INSURANCE

GENERAL CONDITIONS

OF THE

CONSTRUCTION CONTRACT

Prepared by
The Public Utilities Board of the City of Brownsville, Texas,
as a periodically reviewed and revised
Adaptation From the 1983 Base Document Prepared by

Engineers' Joint Contract Documents Committee

and originally

Issued and Published Jointly By:

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
A practice division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

AMERICAN CONSULTING ENGINEERS COUNCIL

AMERICAN SOCIETY OF CIVIL ENGINEERS

CONSTRUCTION SPECIFICATION INSTITUTE

The base document from which this adaptation (Spring 2020 BPUB) was prepared
(1983 edition) was approved and endorsed by:

The Associated General Contractors of America

TABLE OF CONTENTS OF STANDARD GENERAL CONDITIONS

GENERAL CONDITIONS

SCOPE. The Standard General Conditions of the Construction Contract prepared by the National Society of Professional Engineers (NSPE-1910-8, 1983 Edition) as periodically amended and adapted by the OWNER to meet local requirements, shall form a part of this Contract, together with the following Supplementary General Conditions. A copy of the locally amended Standard General Conditions (based upon NSPE-1910-8) is bound herewith. The following supplements modify, change, delete, or add to the General Conditions. Where any part of the General Conditions is modified or voided by any Supplementary General Conditions, the unaltered provisions of that part shall remain in effect.

ARTICLE 1. DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural, male and female thereof:

Addenda - Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the bidding documents or the Contract Documents. These Addenda are a part of the Contract Documents and modify the Drawings, Specifications or other bid documents as indicated. No verbal changes in the Work not depicted or described in writing shall be binding.

Supplements to, changes in, or corrections to the Drawings and/or Specifications issued in writing by OWNER during the period of bidding. These Addenda are a part of the Contract and modify the Drawings and/or Specifications as indicated. No verbal changes in the Work as shown or described shall become binding.

Agreement - The written and signed short-form Construction Agreement (Contract or Agreement) between OWNER and CONTRACTOR covering the Work to be performed; other Contract Documents including these General Conditions are attached to the Construction Agreement and made a part thereof as provided therein.

Alternates. Additions to; deletions from; or changes to requirements for the Project, each of which shall be bid separately and shall be included in or deleted/deducted from the Contract at the discretion of OWNER.

Application for Payment - The form developed by OWNER which is to be used by CONTRACTOR in requesting interim progress or final Contract payments and which is to include such supporting documentation as is required by the Contract Documents.

Bid - The written offer or proposal of the bidder submitted on the OWNER prescribed form setting forth in figures and in script, the prices for the Work to be performed.

Bonds - Bid, Performance and Payment Bonds procured by the CONTRACTOR from a surety authorized by the Texas Department of Insurance to conduct business in the State of Texas, and any other instruments of security as may be specified by the OWNER.

Calendar Day –A calendar day consists of twenty-four hours and is measured from midnight, to the next midnight, and shall constitute a single calendar day. Calendar days include Saturdays and Sundays. THIS IS A CALENDAR DAY CONTRACT.

Change Order - A document developed by ENGINEER, which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion or revision to the Work, or an adjustment in the Contract Price and/or the Contract Time, issued after the Effective Date of the Construction Agreement. Executed Change Orders are part of the amended Contract Documents.

Contract Documents – The Legal Notice and Invitation to Bid; Instructions to Bidder(s); Pre-Bid Disclosure Statements; Notice of Award; Notice to Proceed; The Construction Agreement; Addenda (which pertain to the Contract Documents); CONTRACTOR's Bid (including documentation accompanying the Bid and any post-Bid documentation submitted prior to the Notice of Award); the Bid, Performance and Payment Bonds; these General Conditions; the Supplementary Conditions; the Specifications and the Drawings; and those documents enumerated in Article 7 of the Construction Agreement; and those outlined in paragraphs 3.4 and 3.5 of the General Conditions..

Contract Price - The moneys payable by OWNER to CONTRACTOR under the Contract Documents as stated in the Agreement (subject to the General Conditions provisions of paragraphs 9.1 and 11.9.1 in the case of Unit Price Work).

Contract Time - The number of days ("calendar" days computed as provided in General Conditions paragraph 17.2) or the date specifically stated in the Agreement for the Substantial Completion of the Work.

CONTRACTOR - The person, firm or corporation with whom OWNER has entered into the Agreement to construct the Work.

Defective - An adjective which when modifying the word "Work" refers to "Work" that is unsatisfactory, faulty or deficient, or does not conform to, or comply with the Contract Documents, or does not meet the requirements of any inspection, referenced standard, test or approval referred to in the Contract Documents, or has been damaged prior to the time OWNER makes the final payment (unless responsibility for the protection thereof has been assumed by OWNER at Substantial Completion in accordance with General Conditions paragraph 14.8 or 14.10).

Drawings - The drawings (plans) which depict the character, design, and scope of the Work to be performed and which have been prepared and/or approved by ENGINEER and are referred to in the Contract Documents.

Effective Date of the Agreement - The date indicated in the short-form Construction Agreement document upon which it becomes legally binding and effective, but if no such date is indicated, it means the date on which the Construction Agreement is signed by OWNER.

Engineer- The private, outside, independent professional engineering consulting firm(s) named as such in the Agreement.

Field Order - A written order issued by ENGINEER which orders minor changes or contains interpretations in the Work in accordance with General Conditions paragraph 9.5, but which does not involve a change in the Contract Price or the Contract Time.

Furnish. To supply at the Work jobsite the materials, supplies, equipment, etc., referred to in the Specifications and/or Drawings. Installation is not always required of the Supplier by the Specifications, but shall be performed or arranged for by the General CONTRACTOR.

General Requirements – Division 1 of the Specifications.

Laws and/or Regulations - Federal and/or State Laws, rules, administrative agency regulations, local ordinances, local codes and/or court orders applicable to the Work performance.

Notice of Award - The written notice by OWNER to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein, within the time specified, OWNER will sign and deliver the Construction Agreement.

Notice to Proceed - A written notice given by OWNER to CONTRACTOR (with copy to ENGINEER) fixing the date on which the Contract Time will commence to run and on which CONTRACTOR shall start to perform CONTRACTOR's obligations under the Contract Documents.

OWNER'S Project Team (OPT) - The OWNER, OWNER'S Field Representative, ENGINEER, ENGINEER's Resident Project Representative, and the other entities identified in the Supplementary Conditions and the consultants, subconsultants, individuals or entities directly or indirectly employed or retained by them to provide services to the Owner.

OWNER - The City of Brownsville, acting through its Public Utilities Board (BPUB) of the City of Brownsville, Texas and its directly employed authorized representatives.

Partial Utilization - Placing a portion of the Work in service for the benefit of the OWNER and for the purpose for which it is intended (or a related purpose) before reaching Substantial Completion for all the Work.

Project – The construction of the Work to be provided to OWNER under the Contract Documents which may be the whole, or a part, as indicated elsewhere in the Contract Documents.

Provide – To furnish and install the materials, supplies, equipment, etc. referred to in the Specifications and/or Drawings, at the location shown or otherwise approved at the Project Work job-site.

Site Observers - Resident Project Representative - The authorized representative of ENGINEER who is assigned to periodically observe the Work at the site of the Project, or any part

thereof, on behalf of OWNER. OWNER'S Field Representative – the authorized representative of OWNER who observes the daily Work progress on behalf of OWNER. These two Representatives will coordinate with each other.

Shop Drawings - All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by, or for CONTRACTOR, to illustrate some portion of the Work, and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by CONTRACTOR to ENGINEER, to illustrate material or equipment for some portion of the Work.

Special Conditions – Those portions of the Contract Documents unique to this Project and often mandated by third-party regulatory and funding authorities.

Specifications - Those portions of the Contract Documents consisting of written technical descriptions for the design configuration and/or performance standard for materials, equipment, any specified construction systems, standards and workmanship, as applied to the Work and certain administrative details applicable thereto.

Standard Abbreviations. Wherever reference is made to standard specifications, standards of quality or performance, as established by a recognized national authority, the reference may be by initials and acronyms as generally recognized throughout the engineering and construction industries.

Subcontractor – An individual, firm or corporation having a direct contract with CONTRACTOR, or with any other Subcontractor (subtier), for the performance of a part of the Work at the Project site.

Substantial Completion - The Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER as evidenced by its ENGINEER's definitive written and signed certificate of Substantial Completion, and that it is apparently sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the OWNER's purposes for which it is intended; or if there is no such certificate issued by ENGINEER, when final payment is due in accordance with General Conditions paragraph 14.13. The terms "Substantially Complete" and "Substantially Completed" as applied to any Work refer to the Substantial Completion thereof.

Supplementary Conditions - The part of the Contract Documents which amends or supplements these General Conditions.

Supplier - A manufacturer, fabricator, supplier, distributor, materialman or third-party vendor.

Underground Facilities - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such manmade facilities or attachments, and any outer encasements containing such facilities (vaults, conduits) which have been installed underground to furnish/transport any of the following services or materials: electricity, gases, steam, liquid

petroleum products, telephone or other related data communications, cable television, sewage, storm drainage, traffic or other electronic control systems or potable water.

Unit Price Work - Work to be paid for on the basis of unit prices for ENGINEER/OWNER estimated quantities.

Work - The entire completed construction or the various separately identifiable parts thereof, required to be furnished by the CONTRACTOR under the Contract Documents. Work is the result of performing services, furnishing labor and furnishing and incorporating materials and equipment into the construction Project, all as required by the Contract Documents.

Work Directive Change - A written directive to CONTRACTOR, issued on or after the Effective Date of the Agreement and signed by OWNER, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed as provided in General Conditions paragraph 4.2 or 4.3 or to emergencies under General Conditions paragraph 6.24. A Work Directive Change may not change the Contract Price or the Contract Time, but is evidence that the parties expect that the change directed or documented by a Work Directive Change will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Time as provided in General Conditions paragraph 10.2.

Working Day. When and if applicable, a week day (Monday through Friday only, inclusive) in which weather conditions are such that Work can be performed in a normal manner. Weekends (Saturday, Sunday) and OWNER holidays shall not be considered working days.

Written Amendment - A written amendment of the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the non-engineering or non-technical (rather the commercial terms, legal provisions, etc.), rather than Work-related, aspects of the Contract Documents. Written Amendments are normally embodied in a Change Order once construction commences.

ARTICLE 2. PRELIMINARY MATTERS

Delivery of Bonds:

2.1 When CONTRACTOR delivers the triplicate original executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as CONTRACTOR may be required to furnish in accordance with paragraph 5.1.

Copies of Documents:

2.2 OWNER shall furnish to CONTRACTOR up to ten (10) copies (unless otherwise specified in the Supplementary Conditions) of the Contract Documents as are reasonably necessary for the execution of the Work. Additional copies will be furnished to CONTRACTOR, upon request, at the cost of reproduction reimbursable to OWNER.

Commencement of Contract Time; Notice to Proceed:

2.3 The Contract Time will commence to run and be accounted for on the date indicated in the Notice to Proceed. A Notice to Proceed may be given by OWNER at any time after the Effective Date of the Agreement. The CONTRACTOR should be prepared to perform Work as soon as Contract Time commences.

Starting the Project:

2.4 CONTRACTOR is obligated to perform the Work on the date when the Contract Time commences to run, but no Work shall be done at the Project site prior to the date on which the Contract Time commences to run per the Notice to Proceed.

Before Starting Construction:

2.5 Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby. CONTRACTOR shall be in **DEFAULT** to OWNER for failure to report to ENGINEER any obvious conflict, error, or discrepancy in the Contract Documents, if CONTRACTOR had actual knowledge thereof, or should reasonably have known thereof pursuant to customary construction industry standards.

2.6 Within ten (10) calendar days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for review:

2.6.1 an estimated Work Progress Schedule indicating the starting and completion dates of the various critical stages of the Work; and

2.6.2 a preliminary Schedule of Shop Drawing submissions; and

2.6.3 a preliminary Schedule of Values for all of the Work, which will include quantities and prices of items aggregating the total Contract Price and will subdivide the Work into logical component parts in sufficient detail to later serve as the basis for measuring actual Project progress and substantiating monthly payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work which will be automatically confirmed in writing by CONTRACTOR at the time of submission to ENGINEER.

2.7 By the tenth (10th) calendar day after award of the Contract by OWNER, CONTRACTOR shall deliver to OWNER (with copy to ENGINEER) original certificates (and any other evidence of insurance requested by OWNER) which CONTRACTOR is required to purchase and maintain in accordance with Article 5.

Preconstruction Conference:

2.8 After the Effective Date of the Agreement, but before CONTRACTOR starts the Work at the Project site, a mandatory conference attended by CONTRACTOR, ENGINEER, OWNER and others as appropriate, will be held to discuss the Schedules referred to in paragraph 2.6, to discuss procedures for managing exchanges of Shop Drawings and other submittals and for processing Applications for Payment; and to establish a working and pragmatic understanding among the Project participants as to the general progress and administration of the Work.

Finalizing Schedules:

2.9 At least ten (10) calendar days before submission of the first monthly Application for Payment, a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to finalize the various Schedules submitted in accordance with Article 2.6. The finalized Progress Schedule will be acceptable to ENGINEER as providing an orderly progression of the Work to completion within the Contract Time, but such acceptance will neither impose on ENGINEER responsibility for the progress or scheduling of the Work, nor relieve CONTRACTOR from full responsibility therefore. CONTRACTOR acknowledges the ENGINEER has already included in the calculation of the performance calendar days agreed to by CONTRACTOR by its Bid submission in this calendar day Contract, normal non-compensable monthly rain days for Cameron County, Texas. The CONTRACTOR shall update this Progress Schedule no less than monthly at each payment submittal. The CONTRACTOR shall only include in the submittal any abnormal and unusual rain days that exceed those typically experienced in Cameron County, Texas, based upon historical monthly National Oceanic and Atmospheric Administration (NOAA) record averages (rain days will be verified by the ENGINEER and the Site Observers weekly), and any OWNER approved time extensions in the modified Progress Schedule. The amended monthly Work Progress Schedule shall be reviewed and accepted by the ENGINEER and the OWNER monthly as a pre-condition to payment to CONTRACTOR. The finalized Schedule of Shop Drawing submissions will be acceptable to ENGINEER as providing a workable arrangement for processing the exchange of submissions. The finalized Schedule of Values will be acceptable to ENGINEER as to form and substance.

ARTICLE 3. CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

Intent:

3.1 The Contract Documents comprise the entire agreement between OWNER and CONTRACTOR concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of Cameron County, Texas.

3.2 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. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents as being required of CONTRACTOR to produce the OWNER'S intended result will be supplied by CONTRACTOR, whether or not specifically called for. When words which have a well-known

technical or trade meaning are used to describe Work, materials or equipment, such words shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, whether such reference is specific or by implication, shall mean the latest amended standard specification, manual, code or Laws or Regulations in effect at the time of opening of Bids (or, on the Effective Date of the Construction Agreement, if there were no Bids for a specialty project), except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR, ENGINEER or any of their consultants, agents or employees from those set forth in the Contract Documents , nor shall it be effective to assign to ENGINEER, or any of ENGINEER's subconsultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of paragraphs 9.15 or 9.16. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER in writing as provided in paragraph 9.4.

3.3 If, during the performance of the Work, CONTRACTOR finds a conflict, error or discrepancy in the Contract Documents, CONTRACTOR shall immediately report same to ENGINEER in writing, and before proceeding with the Work affected thereby, shall obtain a written interpretation or clarification from ENGINEER. CONTRACTOR shall be in **DEFAULT** to OWNER for failure to report any obvious conflict, error or discrepancy in the Contract Documents if CONTRACTOR had actual knowledge thereof, or should reasonably have known thereof, pursuant to customary construction industry standards.

Amending and Supplementing Contract Documents:

3.4 The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following written ways:

3.4.1 a formal Written Amendment,

3.4.2 a Change Order (pursuant to definition and paragraph 10.4), or

3.4.3 a Work Directive Change (pursuant to definition and paragraph 10.1).

As indicated in paragraphs 11.2 and 12.1, Contract Price and Contract Time may only be changed by a Change Order or a Written Amendment.

3.5 In addition, the requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized in one or more of the following ways:

3.5.1 a Field Order (pursuant to definition and paragraph 9.5),

3.5.2 OWNER Engineer's approval of a Shop Drawing or sample (pursuant to

definition and paragraphs 6.25 through 6.30), or

3.5.3 OWNER Engineer's written interpretation or clarification (pursuant to paragraph 9.4).

Reuse of Documents:

3.6 Neither CONTRACTOR, nor any Subcontractor (including sub-tier subcontractors) or Supplier, or other related person or organization performing or furnishing any of the Project Work to OWNER, shall have or acquire any title to, or ownership rights in, any of the Drawings, Specifications or other Contract Documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER, and they shall not reuse any of them on extensions of the Project or any other project without written consent of OWNER and ENGINEER, and specific written verification or adaptation by ENGINEER for a fee. All Drawings, Specifications or other Documents (or copies of any thereof) are upon completion of the Project to become the property of OWNER. Further use thereof without written consent of OWNER and ENGINEER is prohibited and solely at the risk of the user.

ARTICLE 4. AVAILABILITY OF LANDS: PHYSICAL CONDITIONS: REFERENCE POINTS

Availability of Lands:

4.1 OWNER shall furnish, as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way, licenses and easements for access thereto and such other lands which are specifically designated by OWNER for the use of CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by OWNER, unless otherwise provided in the Contract Documents. If CONTRACTOR believes that any delay in OWNER's furnishing of these lands, rights-of-way, licenses or easements entitles CONTRACTOR to an extension of the Contract Time, CONTRACTOR may make a claim therefore as provided in Article 12. CONTRACTOR may privately and separately provide at his own option and non-reimbursable cost, for any and all additional lands, and access thereto, that may be required for CONTRACTOR'S temporary construction facilities or storage of materials and equipment.

4.2 **Physical Condition:**

4.2.1 Explorations and Reports: Reference is made to the Supplementary Conditions for any identification of any reports of geotechnical explorations and tests of subsurface conditions at the Project site that may have been utilized by ENGINEER in preparation of the Contract Documents. Any of these geotechnical explorations and reports are expressly not part of these Contract Documents. CONTRACTOR may not rely upon the accuracy of the technical data contained in any such reports, nor upon non-technical data, interpretations or opinions contained therein or for the completeness thereof, for CONTRACTOR's purposes. Except as indicated in the immediately preceding sentence and in paragraph 4.2.6, CONTRACTOR shall have full responsibility with respect to CONTRACTOR'S advanced, pre-bid exploration, testing and

determining any CONTRACTOR risk and cost associated with encountering any subsurface conditions at the Project site.

4.2.2 **Existing Structures:** Reference is made to the Supplementary Conditions for any identification of those Drawings of physical conditions in or relating to existing surface or subsurface structures (except Underground Facilities referred to in paragraph 4.3) which are at or contiguous to the Project site that have been utilized by ENGINEER in preparation of the Contract Documents. CONTRACTOR may rely upon the accuracy of the technical data actually contained in such drawings, but not for the current physical conditions or description completeness thereof for CONTRACTOR's purposes. Except as indicated in the immediately preceding sentence and in paragraph 4.2.6, CONTRACTOR shall have full responsibility with respect to current locating, verification, investigation of, and encountering physical conditions in or relating to such structures.

4.2.3. **Report of Differing Conditions:** If CONTRACTOR believes that:

4.2.3.1 any technical data on which CONTRACTOR is entitled to rely as provided in paragraphs 4.2.1 and 4.2.2 is inaccurate, or

4.2.3.2 any physical condition uncovered or revealed at the Project site differs materially from that indicated, reflected or referred to in the Contract Documents,

CONTRACTOR shall, promptly after becoming aware thereof and before performing any Work in connection therewith (except in an emergency as permitted by paragraph 6.22), notify OWNER's Field Representative and ENGINEER's Resident Project Representative in writing about the inaccuracy or difference.

4.2.4 **ENGINEER's Review:** ENGINEER will promptly review the pertinent conditions, determine the necessity of obtaining any additional explorations or tests with respect thereto, and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER's findings and conclusions.

4.2.5 **Possible Document Change:** If ENGINEER concludes that there is a material error in the Contract Documents, or that because of newly discovered, latent physical conditions, a change in the Contract Documents is required, a Work Directive Change or a Change Order may be issued as provided in Article 10 to reflect and document the consequences of the inaccuracy or difference.

4.2.6 **Possible Price and Time Adjustments:** In each such case, an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, or any combination thereof, may be allowable to the extent that they are attributable to any such inaccuracy or difference. If OWNER and CONTRACTOR are unable to agree as to the financial impact or length thereof, a CONTRACTOR or OWNER claim may be made therefore as provided in Articles 11 and 12. All increases or decreases in the Contract Price shall be governed by all State and local statutes, codes, laws, ordinances, rules and regulations governing public competitive bidding and Change Orders.

Physical Conditions

4.3 **Underground Facilities:**

4.3.1 **Shown or Indicated:** The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Project site is only based on existing available information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities, (Non-OWNER utilities, pipeline companies, railroads, etc.) or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

4.3.1.1 OWNER and ENGINEER shall not be responsible for the actual current conditions, accuracy or completeness of any such third-party information or data; and,

4.3.1.2 CONTRACTOR shall have full responsibility before commencement of related Work for reviewing and checking all such current information and data; for locating all actual current Underground Facilities shown or indicated in the Contract Documents, for coordination of the Work with the owners of such Underground Facilities during construction; for the safety and protection thereof as provided in paragraph 6.20 and; paying for the repair of any damage thereto resulting from the Work; the cost of all of which is mutually considered between OWNER and CONTRACTOR as having been included in the CONTRACTOR'S original Contract Price.

4.3.2 Not Shown or Indicated: If an Underground Facility is uncovered or revealed at or contiguous to the Project site which was not shown or indicated in the Contract Documents, and which CONTRACTOR could not reasonably have been expected to be aware of under customary construction industry standards, CONTRACTOR shall, promptly after becoming aware thereof and before performing any Work affected thereby (except in an emergency as permitted by paragraph 6.22), identify the owner of such Underground Facility and give written notice thereof to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility to determine the extent to which the Contract Documents should be modified to reflect and document any consequences of the existence of the Underground Facility, and the Contract Documents may be amended or supplemented to the extent necessary. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility as provided in paragraph 6.20. CONTRACTOR may be allowed an increase in the Contract Price or an extension of the Contract Time, or both, to the extent that they are attributable to the existence of any Underground Facility that was not shown or indicated in the Contract Documents, and which CONTRACTOR could not reasonably have been expected to be aware of pursuant to customary construction industry standards. If the parties are unable to agree as to the financial impact or length thereof, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12. All increases or decreases in the Contract Price shall be governed by all State and local statutes, codes, laws, ordinances, rules and regulations governing public competitive bidding and Change Orders.

Reference Points:

4.4. CONTRACTOR shall be responsible for laying out the Work (unless otherwise specified by OWNER in the General Requirements), and shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of ENGINEER. CONTRACTOR shall report to ENGINEER whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations, and CONTRACTOR shall be responsible for the accurate replacement or relocation of such reference points by CONTRACTOR-retained professionally qualified personnel (not including OWNER or ENGINEER representatives).

ARTICLE 5. BONDS AND INSURANCE

Performance and Payment Bonds:

For a Contract in excess of $100,000.00, a Performance Bond shall be procured and executed by CONTRACTOR in the full amount of the Contract Price conditioned upon the faithful performance of the Work for OWNER in accordance with the Plans, Specifications and Contract Documents. Said Bond shall be solely for the protection of the OWNER.

For a Contract in excess of $50,000.00, a Payment Bond shall be executed in the full amount of the Contract Price, for the primary protection of all claimants against the surety for non-payment in supplying labor, materials and equipment in the prosecution of the Work provided for in the Contract, for the use of each such claimant timely perfecting a proper claim against surety.

5.1 CONTRACTOR shall furnish Performance and Payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance of the Work for OWNER and payment of all CONTRACTOR's labor, materials, equipment and supply obligations under the Contract Documents. **These Bonds shall remain in effect by CONTRACTOR at least until one year after the date when final payment becomes due,** except as otherwise provided by Law or Regulation or by the Contract Documents. CONTRACTOR shall also furnish any such other bonds as may be required by the Supplementary Conditions (e.g. any maintenance, extended warranty, special indemnity, etc.). All Bonds shall be in the forms prescribed by Law or Regulation or by the Contract Documents and be executed by such sureties as are authorized to do business in the State of Texas. All Bonds signed by an agent ("attorney in fact") must be accompanied by a certified copy of the authority to act on behalf of the surety.

5.2 If the surety on any Bond furnished by CONTRACTOR is declared a bankrupt or becomes insolvent, or its right to do business in Texas is terminated or it ceases to meet the requirements of paragraph 5.1, CONTRACTOR shall within five (5) calendar days thereafter substitute another Bond and surety, both of which must be acceptable to OWNER.

Contractor's Liability Insurance:

5.3 CONTRACTOR shall purchase and maintain such commercial general liability and other insurance coverages as are appropriate for the Work being performed and furnished, and as

will provide protection from claims set forth below which may arise out of, or result from, CONTRACTOR's performance and furnishing of the Work and CONTRACTOR's other obligations under the Contract Documents; whether it is to be performed or furnished by CONTRACTOR, by any Subcontractor, by anyone directly or indirectly employed by any of them to perform or furnish any of the Work; or by anyone for whose acts and/or omissions any of them may be liable:

5.3.1 Claims under workers' compensation, disability benefits and other similar employee benefit acts. This is a Texas public works Contract and any CONTRACTOR'S or Subcontractor's attempted rejection of the worker's compensation act, and thereby substituting a CONTRACTOR'S or Subcontractor's self-insurance reserve, is specifically prohibited by Texas law.

5.3.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees traditionally covered by employer's liability insurance;

5.3.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;

5.3.4 Claims for damages insured by personal injury liability coverage which are sustained: (a) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR; or (b) by any other person for any other reason;

5.3.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom;

5.3.6 Claims arising out of operation of Laws or Regulations for damages because of bodily injury or death of any person or for damage to property; and

5.3.7 Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any owned or hired motor vehicle.

The various insurance coverages required by this Article 5 shall include the specific type coverage and be underwritten for not less than the limits of liability and coverage amounts provided herein below or in the Supplementary Conditions, or required by law, whichever is greater. The commercial general liability insurance shall include completed operations insurance. All of the policies of insurance so required to be purchased and maintained (or the certificates or other evidence thereof) shall be of an "occurrence"-type, when applicable, and shall contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least (30) thirty days prior written notice has been given to OWNER by certified mail. All such insurance shall remain in effect until final payment and at all times thereafter when CONTRACTOR may be correcting, removing or replacing defective Work in accordance with paragraph 13.12. In addition, CONTRACTOR shall maintain such completed operations insurance for at least two (2) years after final payment and furnish OWNER with evidence of

continuation of such insurance at final payment and one year thereafter. Insurance coverage furnished under the Contract Documents (except for Workmen's Compensation and any professional engineering errors and omissions liability insurance that CONTRACTOR or his agent might carry applicable to this Project) shall include the City of Brownsville and BPUB as OWNER, and their respective City Commissioners, public officials, officers, Board Members, and employees, as named additional insureds and hereinafter known as "additional insureds."

The following entities are to also be specifically named as additional insureds:

1. City of Brownsville, Texas
   Attn: City Secretary Griselda Rosas
   City Plaza, First Floor
   1034 E. Levee St.
   Brownsville, Texas 78520

2. Brownsville Public Utilities Board
   1425 Robinhood Drive
   Brownsville, TX 78521

Contractual Liability Insurance:

5.4 The commercial general liability insurance required by paragraph 5.3 will include contractual liability insurance applicable to CONTRACTOR's INDEMNITY obligations under paragraphs 6.32 and 6.33.

5.5 Specific Coverages of Insurance Required by Owner:

5.5.1 Workmen's Compensation and Employer's Liability. This insurance shall protect the laborer, and insure the CONTRACTOR, and insulate the additional insureds, against all claims under applicable Texas workmen's compensation laws, pursuant to subparagraph 5.3.1. The additional insureds shall also be protected under an Employer's Liability policy against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a workmen's compensation law. This Employer's Liability policy shall include an "all states" endorsement.

5.5.2. **Mandatory TWCC Rule 28 TAC Sect. 110.110 Adapted Language**

(A) **Definitions:**

Certificate of coverage ("certificate") - A copy of a certificate of insurance, or a coverage agreement, showing statutory workers' compensation insurance coverage for the person's or entity's (CONTRACTOR's) employees providing services on this public works Project, for the duration of this Project.

"Duration of the Project" - includes the time from the beginning of the Work on this Project until the CONTRACTOR's/person's Work on this Project has been completed and accepted by the OWNER.

“Persons providing services on the Project” ("subcontractor" in § 406.096) - includes all persons or entities performing all or part of the services the CONTRACTOR has undertaken to perform on this Project, regardless of whether that person contracted directly with the CONTRACTOR and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on this Project.

"Services" - include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to this Project.

(B) The CONTRACTOR shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, § 401.011(44) for all employees of the CONTRACTOR providing services on this Project, for the duration of this Project.

(C) The CONTRACTOR must provide a certificate of coverage to the OWNER prior to being awarded the Contract.

(D) If the coverage period shown on the CONTRACTOR'S current certificate of coverage ends during the duration of this Project, the CONTRACTOR must, prior to the end of the coverage period, file a new certificate of coverage with the OWNER showing that coverage has been extended.

(E) The CONTRACTOR shall obtain from each person providing services on this Project, and provide to the OWNER:

(1) a certificate of coverage, prior to that person beginning Work on this Project, so the OWNER will have on file certificates of coverage showing coverage for all persons providing services on this Project; and

(2) no later than seven (7) calendar days after receipt by the CONTRACTOR, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of this Project.

(F) The CONTRACTOR shall retain all required certificates of coverage for the duration of this Project and for three (3) years thereafter.

(G) The CONTRACTOR shall notify the OWNER in writing by certified mail or personal delivery, within ten (10) calendar days after the CONTRACTOR knew or should have known, of any change that materially affects the provision of coverage

of any person providing services on this Project.

(H) The CONTRACTOR shall post on this Project site a notice, in the text, form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on this Project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

(I) The CONTRACTOR shall contractually require each person with whom it contracts to provide services on this Project, to:

(1) provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, § 401.011(44) for all of its employees providing services on this Project, for the duration of this Project;

(2) provide to the CONTRACTOR, prior to that person beginning Work on this Project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on this Project, for the duration of this Project;

(3) provide the CONTRACTOR, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of this Project;

(4) obtain from each other person with whom it contracts, and provide to the CONTRACTOR:

(a) a certificate of coverage, prior to the other person beginning Work on this Project; and

(b) a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of this Project;

(5) retain all required certificates of coverage on file for the duration of this Project and for three (3) years thereafter;

(6) notify the OWNER in writing by certified mail or personal delivery, within ten (10) calendar days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on this Project; and

(7) contractually require each person with whom it contracts, to perform as

required by clauses (I)-(1-7) of this subparagraph, with the certificates of coverage to be provided to the person for whom they are providing services.

(J) By signing this Contract or providing or causing to be provided a certificate of coverage, the CONTRACTOR is representing to the OWNER that all employees of the CONTRACTOR who will provide services on this Project will be covered by workers' compensation coverage for the duration of this Project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier. Providing false or misleading information may subject the CONTRACTOR to administrative penalties, criminal penalties, civil penalties, or other civil actions.

(K) The CONTRACTOR's failure to comply with any of these provisions is a breach of Contract by the CONTRACTOR which entitles the OWNER to declare the Contract void if the CONTRACTOR does not remedy the breach within ten (10) calendar days after receipt of notice of breach from the OWNER.

The liability limits shall not be less than:

Workmen's compensation	Texas Statutory Limits
Employer's liability	$100,000.00 each occurrence

5.5.3 Comprehensive Business Automobile Liability. This insurance shall be written in comprehensive business form and shall protect the CONTRACTOR and the additional insureds against all claims described under Section 5.3.7. of the General Conditions of the Contract Documents and arising from the use of motor vehicles, and shall cover, on or off the Project site, all motor vehicles licensed for highway use, whether they are owned, non-owned, or hired.

The liability limits shall not be less than:

Bodily Injury and property damage	$500,000.00 combined single limit each occurrence

5.5.4 Commercial General Liability. This insurance shall be an "occurrence" type policy written in commercial form and shall protect the CONTRACTOR and the additional insureds against all claims described in Sections 5.3, 5.3.3., 5.3.4., 5.3.5., 5.3.6, 5.4 of the General Conditions of the Contract Documents arising out of any intentional or negligent act and/or omission of the CONTRACTOR or his agents, employees, or subcontractors. This policy shall also include protection against claims insured by usual personal injury liability coverage.

The liability limits shall not be less than:

Personal Injury and property damage	$1,000,000.00 combined single limit each occurrence and

and $1,000,000.00 aggregate

If the CONTRACTOR'S Work, or Work under his direction, requires blasting, explosive conditions, or underground operations, the commercial general liability coverage shall contain no exclusion relative to blasting, exploding, collapse of structures, or damage to underground property.

5.5.5 Excess Umbrella Liability Policy. This insurance shall protect the CONTRACTOR and the additional insureds against all claims in excess of the limits provided under the employer's liability, comprehensive business automobile liability, and commercial general liability policies. The liability limits of the umbrella policy shall not be less than $2,000,000.00. The policy shall be an "occurrence" type policy.

5.5.6 Transportation Insurance. This insurance shall be of the "all risks" type and shall protect the CONTRACTOR and the OWNER from all insurable risks of physical loss or damage to equipment and materials in transit to the Project jobsite and until the OWNER receives the equipment and materials at the Project jobsite. The coverage amount shall be not less than one-half of the full amount of the total Contract Price.

Transportation insurance shall provide for losses to be payable to the CONTRACTOR and the OWNER as their respective legal interests may appear.

5.5.7 All policies required under paragraph 5.5 herein shall contain a "cross liability" or "severability of interest" clause or endorsement. Notwithstanding any other provision of these policies, the insurance afforded shall apply separately to each insured, named insured, or additional insured with respect to any claim, suit, or judgment made or brought by or for any other insured, named insured, or additional insured, as though a separate policy had been issued to each, except the insurer's liability shall not be increased beyond the amount or amounts for which the insurer would have been liable had only one insured been named.

5.5.8 CONTRACTOR shall require each of his Subcontractors to procure and maintain during the life of his subcontract, Subcontractor's Commercial General Liability and Property Damage Insurance of the type specified in subparagraphs 5.5.1, 5.5.2, 5.5.3, 5.5.4 and paragraph 5.6 hereof, in the same amounts as required by OWNER for CONTRACROR, unless alternative amounts are approved in writing by OWNER.

5.5.9 The insurance required under subparagraphs 5.5.1, 5.5.2, 5.5.3, 5.5.4 and paragraph 5.6 hereof shall provide adequate protection for CONTRACTOR and his Subcontractors respectively against damage claims which may arise from operations under this Contract, whether such operation is by the insured or by anyone directly or indirectly employed by him, and also, against any special hazards which may be encountered in the performance of this Contract.

5.5.10 CONTRACTOR shall not commence any Work under this Contract until he has obtained all the insurance coverage required under this Article 5. and such insurance has been approved by OWNER; nor shall CONTRACTOR allow any Subcontractor to commence Work on this Contract until the insurance required by the Subcontractor has been so obtained and

approved.

Property Insurance:

5.6 Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain property insurance upon the Work at the Project site to the full insurable value thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions, established by current customary construction industry standards given the type of Work in Cameron County, Texas and value thereof, or as may be required by Laws and Regulations). This insurance shall include the interests of OWNER, CONTRACTOR, and Subcontractors, in the Work, all of whom shall be listed as insured or additional insured parties, which shall insure against the perils of fire and extended coverage and shall include "all risk" insurance for physical loss and damage including theft, vandalism and malicious mischief, collapse and water damage, and such other perils as may be provided in the Supplementary Conditions (e.g. flood, wind, etc.); and shall include damages, losses and expenses arising out of or resulting from any insured loss or cost incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers, architects, attorneys and other professionals). If not covered under the "all risk" insurance or otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain similar property insurance on portions of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for Payment. The policies of insurance required to be purchased and maintained by CONTRACTOR in accordance with this paragraph shall be of an "occurrence"-type, when applicable, and contain a provision that the coverage afforded will not be canceled or materially changed until at least (30) thirty calendar days prior written notice has been given to OWNER by certified mail.

5.6.1 Property Insurance Coverage. This insurance shall protect CONTRACTOR and the additional insureds against all claims described in Section 5.6 and shall provide the following minimum amounts:

Property Insurance Coverage: Provide Full Contract Price Amount or $100,000.00 Minimum, whichever is greater.

Waiver of Rights:

5.7 Waiver

5.7.1 CONTRACTOR waives all rights against OWNER, (unless OWNER or other named entities as additional insureds were solely negligent), for all losses and damages caused by any of the perils covered by the policies of insurance provided in response to paragraph 5.6 and any other property insurance applicable to the Work, and also waives all such rights against all other entities named as additional insureds in such policies for losses and damages so caused. As required by paragraph 6.12, each subcontract between CONTRACTOR and a Subcontractor will contain similar “flow down” waiver provisions by the Subcontractor in favor of CONTRACTOR, OWNER, ENGINEER and their respective sub-consultants, and all other entities named as additional insureds.

5.7.2 CONTRACTOR intends that any policies provided in response to paragraph 5.6 shall protect all of the entities insured and provide primary coverage for all losses and damages caused by the perils covered thereby. Accordingly, all such policies shall 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 of the entities named as insured or additional insured, and if the insurers require separate waiver forms to be signed by any Subcontractor, CONTRACTOR will obtain the same.

Acceptance of Insurance:

5.8 If OWNER has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained by CONTRACTOR in accordance with paragraphs 5.3, 5.4, 5.5 and 5.6 on the basis of the coverages not complying with the Contract Documents, OWNER will attempt to notify CONTRACTOR in writing thereof within ten (10) calendar days of the date of delivery of such certificates to OWNER in accordance with paragraph 2.7. CONTRACTOR shall provide to the OWNER such additional information regarding the insurance provided by CONTRACTOR as the OWNER may reasonably request. Failure on the part of the OWNER or its agents to detect an insurance deficiency as compared to the insurance requirements of the Contract shall not constitute a waiver by the OWNER of the insurance requirements which CONTRACTOR and/or Subcontractor must contractually meet to be in compliance herewith.

Partial Utilization - Property Insurance:

5.9 If OWNER finds it necessary to occupy, use, or operate a portion or portions of the Work prior to Substantial Completion of all the Work, such use, occupancy or operation may be accomplished in accordance with paragraph 14.10. CONTRACTOR shall have the obligation to inform the insurers of OWNER's intent to so occupy, use or operate a portion or portions of the Work. The insurers of CONTRACTOR providing the property insurance shall consent to such use, occupancy or operation by endorsement on the policy or policies, but the property insurance shall not be canceled or lapse on account of any such partial use, occupancy, or operation by OWNER.

ARTICLE 6. CONTRACTOR'S RESPONSIBILITIES

Supervision and Superintendence:

6.1 CONTRACTOR shall supervise 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 and customary construction industry standards. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, procedures, safety and quality control of construction, but CONTRACTOR shall not be responsible for any negligence of others in any design or selection of a specific means, method, technique, sequence or procedure of construction which is indicated in and required by the Contract Documents. CONTRACTOR shall be solely responsible to guarantee that the

finished Work complies accurately with the Contract Documents and CONTRACTOR shall not rely upon the OWNER's and/or ENGINEER'S construction observation to accomplish same.

6.2 CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent, who shall not be replaced without written notice to OWNER and ENGINEER, except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the site and shall have authority to act on behalf of CONTRACTOR. All communications given to the superintendent shall be as binding as if given directly to CONTRACTOR.

Labor, Materials and Equipment:

6.3 CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out the Work, oversee quality control, monitor safety, and perform construction of the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Project site. Except in connection with the safety or protection of persons or the Work or property at the Project site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the Project site shall be performed during regular daily working hours (generally eight (8) hours between 7:00 A. M. and 6:00 P.M.) as may be specifically set forth by the OWNER, and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday or any legal holiday without OWNER's advanced written consent. Preference employment shall be given to resident citizens of the Cameron County, Texas area where such persons are available and fully qualified to perform the Work to which the employment relates.

6.3.1 CONTRACTOR shall acquaint himself with all matters and conditions concerning the Project site and any existing construction. Any practical and constructive criticism or exception regarding any feature of the Work must be presented in writing to OWNER at least ten (10) calendar days prior to bidding. After the Contract Agreement to perform the Work has been signed by CONTRACTOR, it shall then be his responsibility to provide satisfactory Work that will meet the full intent of the Contract Documents. CONTRACTOR shall then pursue this Work with the other trades so that all phases of the Work may be properly coordinated without delays or damage to any parts of the Work.

6.4 Unless otherwise specified in the General Requirements, CONTRACTOR shall furnish and assume full responsibility for all 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 furnishing, performance, testing, start-up and completion of the Work.

6.4.1 CONTRACTOR shall provide and maintain suitable weather-tight, washable, sanitary toilet facilities for all workers for the entire construction period. CONTRACTOR shall comply with all requirements of applicable health authorities. When toilet facilities are no longer required, promptly remove them from the Project site, disinfect and clean the surface area as required. CONTRACTOR shall keep each toilet facility swept and supplied with toilet tissue at all times.

6.5 All materials and equipment shall be of good quality and new, except as otherwise specifically provided in the Contract Documents. Sometimes a project specification may require salvage and reinstallation of OWNER's recently acquired machinery and equipment pre-existing at a project site. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment procured for the Project. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable Supplier, except as otherwise provided in the Contract Documents; but no provision of any such Supplier instructions will be effective to assign to ENGINEER any duty or authority to supervise or direct the furnishing or performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.15 or 9.16.

6.6 CONTRACTOR shall notify OWNER and ENGINEER in writing of any conflict between the manufacturer's directions and the Contract Documents and shall not perform any Work on any item until such conflict has been resolved. Upon award of the Contract, CONTRACTOR will secure a certificate of exemption from the Texas State Comptroller to preserve the OWNER's exemption from Limited Sales, Excise and Use Tax in an amount representing that part of the total Contract Price representative of the value of tangible personal property to be physically incorporated into the Project realty. The certificate of exemption must contain a statement to the effect that such materials or property have been, or will be, utilized in the performance of the Contract to the full extent of the amount for which a certificate of exemption is requested.

6.6.1 Except where otherwise specified, CONTRACTOR shall, at all times, provide protection against weather, so as to maintain all Work, materials and fixtures free from injury or damages. All new Work likely to be damaged by weather shall be covered or otherwise protected as required.

6.6.2 While it is appreciated that CONTRACTOR has to maintain continuous construction operations and sequences, it should be understood that the OWNER's electric, gas, water, wastewater production and distribution systems must function during the Contract period with a minimum of inconvenience to the OWNER's customers and the OWNER. Requirements of the: Texas Commission on Environmental Quality (TCEQ); Texas Railroad Commission (TRC); Electric Reliability Council of Texas (ERCOT); and the State and federal regulatory agencies having jurisdiction over the Project site, must be met by CONTRACTOR. It is therefore incumbent on CONTRACTOR to plan ahead on the basis of integrating his construction sequencing program as far as possible into the normal operating sequence of the various utility systems to avoid or minimalize disruption of services. No departure from the normal operating sequence of the utility systems will be allowed, except with the specific advanced written agreement of OWNER.

6.6.3 CONTRACTOR shall notify OWNER and ENGINEER in writing a minimum of forty-eight (48) hours in advance of any Work which will be tied into the existing utility systems. Method of tie-in shall be submitted to ENGINEER for his approval prior to any Work being performed. At no time shall contaminated water that has not been disinfected be

allowed to seep into any existing waterlines, and at no time shall sewage be allowed to flow into surrounding Project areas. Connections will be made during times of daily minimum sewage flows, if required by Project.

6.6.4 CONTRACTOR shall coordinate his Work with that of other contractors whose work may occur at a conflicting time and location. The coordination shall be such that CONTRACTOR's Work will be maintained at a normal rate. Any priority of contractors' performance disputes will be decided by OWNER, after consultation with ENGINEER.

6.6.5 All Work that is performed on, across or along International Boundary and Water Control Commission levees must conform to all I.B. & W.C.C. requirements. All Work performed on, across or along Brownsville Irrigation and Drainage District or the Cameron County Water Control and Improvement District No.16 canals or ditches must conform to all District requirements.

6.6.6 Satisfactory access or detour roads shall be provided by CONTRACTOR where necessary due to his construction.

6.6.7 If required by the Bid or Project Specifications, or by law for the type of excavation construction being performed, CONTRACTOR and his Registered Professional Engineer shall develop the Trench Safety System Plan and shall provide any necessary shoring, bracing and/or sheeting pursuant to Section 756.023 of the Texas Health and Safety Code and OSHA 29 C.F.R. 1926, Subpart P, Vol. 54 No. 209 of the Federal Register, October 31, 1989, pp. 45959-45991, and, as provided in Section 11 - "Trench Excavation and Shoring Safety Plan" of the OWNER's Standard Specifications.

6.6.8 CONTRACTOR shall routinely provide adequate barricades and warning devices in conformance with the guidelines for Traffic Control as established by the Texas Department of Transportation (TDOT) in the Texas Manual on Uniform Traffic Control Devices (TMUTCD). This provision shall be incidental and subsidiary to the rest of the Work in this Contract, and shall not constitute a separate CONTRACTOR pay item.

6.6.9 CONTRACTOR shall provide to OWNER the services of technical representative(s) from Supplier(s) for CONTRACTOR furnished equipment, for a sufficient period of time to assist in start-up and initial adjustment of all installed or delivered equipment, and to train, advise and consult with OWNER's operating personnel, if appropriate for the Project.

6.6.9.1 For each mechanical system, CONTRACTOR shall provide to OWNER a written certification from the manufacturer's representative that the products of the manufacturer have been installed by CONTRACTOR in conformance with the manufacturer's requirements and recommendations.

6.6.10 All items of equipment required for this Contract shall be Bid to provide as part of the Contract Price, any literature explaining "Operation and Maintenance" (O&M) of that item of equipment. If a manufacturer does not print such a standard O&M manual, CONTRACTOR shall develop and provide OWNER with a customized manual approved in

writing by the manufacturer.

Adjusting Progress Schedule:

6.7 CONTRACTOR shall submit to ENGINEER for the Project record and acceptance only, and not approval or concurrence to the extent indicated in paragraph 2.9, periodic adjustments in the Progress Schedule to reflect the impact thereon of new Project developments; these revised Schedules will conform generally to the Progress Schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

Substitutes or "Or-Equal" Items:

6.8

6.8.1 As a general rule, the OWNER and ENGINEER prefer all determinations regarding proposed Substitutions of materials or equipment as potential "or-equal-items" be resolved during the pre-Bid phase. Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item, or the name of a particular Supplier, the naming of the item is intended to establish the type, function, performance standard and quality required. In some instances, the OWNER, after consultation with ENGINEER, is legally allowed to "sole source" a specific material or component of equipment when its design and/or performance is required to integrate with a larger OWNER system that will remain in place, or that OWNER has an inventory of spare parts for, or that OWNER has a long favorable, performance reliability history with. Unless the material or equipment name is followed by words indicating that no substitution is permitted, materials or equipment of other Suppliers generally may be accepted by ENGINEER, if sufficient information is submitted by CONTRACTOR to allow ENGINEER to determine that the material or equipment proposed is equivalent, or equal to, that named by ENGINEER. The procedure for review by ENGINEER will include the following as supplemented in the General Requirements. Requests for review of substitute items of material and equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall make written application to ENGINEER for acceptance thereof, certifying in writing that the proposed substitute will adequately perform the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The CONTRACTOR'S written application will state that the evaluation and acceptance of the proposed substitute will not prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not acceptance of the substitute for use 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 any other work on the Project by other contractors) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any vendor license fee or royalty. All variations of the proposed substitute from that specified will be identified in the CONTRACTOR'S written application and available maintenance, repair and replacement parts and service will be indicated. The CONTRACTOR'S written application will also contain an itemized estimate of all costs or savings that will result directly or indirectly from acceptance of such substitute, including costs of redesign, operation, performance, and potential claims or protests of other contractors

affected by any resulting change, all of which shall be considered by ENGINEER in evaluating the proposed substitute. ENGINEER may require CONTRACTOR to furnish at CONTRACTOR's non-compensable expense additional data about the proposed substitute.

6.8.2 If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, CONTRACTOR may generally furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to ENGINEER, if CONTRACTOR submits sufficient written information to allow ENGINEER to determine that the substitute proposed can be legally utilized by CONTRACTOR (e.g. patented or licensed processes) and is equivalent to that indicated or required by the Contract Documents. OWNER may have similar legal rights to "sole source" as generally indicated above in paragraph 6.8.1. The procedure for review by ENGINEER will be similar to that provided in paragraph 6.8.1 above, as applied by ENGINEER and as may be supplemented in the General Requirements.

6.8.3 ENGINEER will be allowed a reasonable time within which to evaluate each proposed substitute. ENGINEER will be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without ENGINEER's prior written acceptance which will be evidenced by either a Change Order or an approved Shop Drawing. OWNER may require CONTRACTOR to furnish at CONTRACTOR's non-compensable expense, a special performance guaranty bond or other form of surety with respect to any accepted substitute. ENGINEER will record time required by ENGINEER and any ENGINEER's outside technical consultants in evaluating substitutions proposed by CONTRACTOR and in making any required changes in the Contract Documents occasioned thereby. Whether or not ENGINEER accepts a proposed substitute, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and any ENGINEER's consultants for evaluating each proposed substitute.

Concerning Subcontractors, Suppliers and Others:

6.9

6.9.1 CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization (including those acceptable to OWNER and ENGINEER as indicated in paragraph 6.8), whether initially or as a substitute, against whom OWNER or ENGINEER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

6.9.2 The Pre-Bid documents require the CONTRACTOR to identify Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of material and equipment), to be submitted to OWNER at the time of bidding. OWNER's or ENGINEER's acceptance (either in writing or by failing to make written objection thereto) of any such Subcontractor, Supplier or other person or organization so identified by CONTRACTOR may be revoked by OWNER or ENGINEER on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable substitute. The Contract Price may be increased by the difference in the cost occasioned by such substitution and an appropriate Change Order or written Amendment may be executed by the OWNER and

CONTRACTOR. All increases or decreases in the Contract Price shall be governed by all State and local statutes, codes, laws, ordinances, rules and regulations governing public competitive bidding and maximum Change Order limits. No acceptance by OWNER or ENGINEER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of OWNER or ENGINEER to reject any defective or non-compliant Work.

6.10 CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and/or omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct contract or indirect relationship with CONTRACTOR, just as CONTRACTOR is responsible to the OWNER for CONTRACTOR's own acts and/or omissions. Nothing in the Contract Documents shall create any contractual relationship between OWNER or ENGINEER and any such Subcontractor, subtier subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of OWNER to pay or to supervise the payment of any moneys due any such Subcontractor, subtier subcontractor, Supplier or other person or organization, except as may otherwise be required by Laws and Regulations.

6.11 The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

6.12 All Work performed for CONTRACTOR by a Subcontractor will be pursuant to an appropriate written agreement between CONTRACTOR and the Subcontractor, which specifically binds the Subcontractor through appropriate "flow down" provisions, to the applicable terms and conditions of the Contract Documents for the benefit of OWNER, and contains waiver provisions as required by paragraph 5.7.

Patent Fees and Royalties:

6.13 CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device, which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work, and if to the actual knowledge of OWNER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. **CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS THE CITY OF BROWNSVILLE AND THE BROWNSVILLE PUBLIC UTILITIES BOARD, INCLUDING THEIR RESPECTIVE COMMISSIONERS, BOARD MEMBERS OFFICERS AND EMPLOYEES (INDEMNITEES) AGAINST ANY CLAIMS, DAMAGES, LOSSES AND EXPENSES (INCLUDING ATTORNEYS' FEES AND COURT COSTS) ARISING OUT OF 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, AND SHALL DEFEND ALL SUCH CLAIMS IN CONNECTION WITH ANY ALLEGED INFRINGEMENT OF SUCH RIGHTS. IT IS THE EXPRESSED**

INTENTION OF THE PARTIES HERETO THAT THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH IS INDEMNITY BY CONTRACTOR TO INDEMNIFY AND PROTECT INDEMNITEES FROM THE CONSEQUENCES OF OWNER'S OWN NEGLIGENCE WHERE THAT NEGLIGENCE ON THE PART OF THE OWNER IS A CONCURRING CAUSE OF THE CLAIMS, DAMAGES, LOSSES, AND EXPENSES REFERENCED ABOVE. FURTHERMORE, THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH SHALL HAVE NO APPLICATION TO ANY CLAIM, DAMAGE, LOSS AND EXPENSE REFERENCED ABOVE WHERE SUCH RESULTS FROM THE SOLE NEGLIGENCE OF THE OWNER INDEPENDENT OF THE FAULT OF ANY OTHER PERSON OR ENTITY.

Permits:

6.14 Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids. CONTRACTOR shall pay all charges of utility owners with the exception of those normally charged by OWNER, for connections to the Work, and OWNER shall pay all charges of such third-party utility owners for facility capital costs related thereto such as impact fees or plant investment fees, if any.

6.14.1 Fires shall not be built on the Project premises except by the express consent of OWNER and Brownsville City and/or County Fire Marshall.

Laws and Regulations:

6.15

6.15.1 CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to furnishing and performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, OWNER shall not be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

6.15.2 If CONTRACTOR has actual knowledge that the Specifications or Drawings are at variance with any Laws or Regulations, CONTRACTOR shall give ENGINEER prompt written notice thereof, and any necessary changes will be authorized by OWNER by one of the methods indicated in paragraph 3.4. If CONTRACTOR performs any Work knowing, or having reason to know, that it is contrary to such Laws or Regulations, and without such advanced written notice to ENGINEER, CONTRACTOR shall bear all costs arising therefrom; however, it shall not be CONTRACTOR's original and primary responsibility to make certain that the Specifications and Drawings are in accordance with such Laws and Regulations.

Taxes:

6.16 "Pursuant to 34 Texas Administrative Code 3.291, in order for the OWNER to

continue to benefit from its status as a State Sales and Use Tax Exempt Organization, after August 14, 1991 public works construction contracts must be awarded on a "separated contract" basis. A "separated contract" is one where the CONTRACTOR distinguishes in writing prior to starting Work, between the value of the tangible personal property (materials such as pipe, bricks, lumber, concrete, paint, etc.) to be physically incorporated into the Project real estate from the total Contract price. Under the "separated contract" format, the CONTRACTOR in effect becomes a "seller" to the OWNER of materials that are to be physically incorporated into the Project real estate. As a "seller", the CONTRACTOR will issue a "Texas Certificate of Resale" to the CONTRACTOR'S supplier in lieu of paying the sales tax on the Project materials at the time of purchase. The CONTRACTOR will also issue a "Certificate of Exemption" to the supplier, demonstrating that the personal property is being purchased for resale and that the resale is to a public owner, the City of Brownsville, Texas, and its BPUB, which are sales tax exempt entities under UTCA Tax Code Section 151.309(5). CONTRACTOR should be careful to consult the most recent guidelines of the Texas State Comptroller of Public Accounts regarding the sales tax status of supplies and equipment that are used and consumed during Project Work (e.g. gas, oil, fluids, rental equipment, etc.), but that are not physically incorporated into the Project real estate. Such items are generally not tax exempt. If the CONTRACTOR has questions about the implementation of this policy he is asked to inquire with the State Comptroller of Public Accounts, Tax Administration Division, State of Texas, Austin, Texas 78774. The CONTRACTOR will not include any federal taxes in Bid prices since the OWNER is exempt from payment of such taxes. "Texas Certificates of Exemption", "Texas Certificates of Resale" and "Texas Sales Tax Permits" are forms available to the CONTRACTOR through the regional offices of the Texas State Comptroller of Public Accounts."

6.16.1. On the last page of the Construction Agreement a blank is provided for the CONTRACTOR to fill in an amount in dollars and cents indicating the Bid price of all materials and other tangible personal property included in the total Bid that will be physically incorporated into the Project real estate. The amount to be filled in by CONTRACTOR has reference to all of such materials and other tangible personal property as will actually be physically incorporated into the final result of the Work covered by the Contract. "Tangible personal property" means personal property which may be seen, weighed, measured, felt or touched, or which is in any other manner perceptible to the senses.

6.16.2. Upon award of the Contract, OWNER will, on written request of CONTRACTOR, furnish CONTRACTOR with a certificate of exemption from the Texas Limited Sales, Excise and Use Tax in only an amount not exceeding the above mentioned bid price for materials and other tangible personal property that will be physically incorporated into the Project real estate. Such written request by CONTRACTOR must contain a statement to the effect that such materials or property will be utilized in the performance of the Contract, to the full extent of the amount for which a certificate of exemption is requested. The Texas Comptroller of Public Accounts often audits contractors regarding compliance with these paragraph 6.16 provisions.

Use of Premises:

6.17 CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the Project site and land and areas identified in and permitted by the Contract Documents, or otherwise privately acquired by the CONTRACTOR, and other land and areas permitted by Laws and Regulations, rights-of-way, permits and easements. CONTRACTOR shall assume full responsibility for any damage to any Project land or area, and to the owner or occupant of any land or areas contiguous thereto, resulting from the performance of the Work. Should any claim be made against OWNER by any such adjacent owner or occupant because of the performance of the Work, CONTRACTOR shall promptly attempt to settle with such other party by agreement, or otherwise resolve the claim by mediation, arbitration or at law. **CONTRACTOR SHALL INDEMNIFY, AND HOLD HARMLESS THE CITY OF BROWNSVILLE AND THE BPUB INCLUDING THEIR RESPECTIVE COMMISSIONERS, BOARD MEMBERS OFFICER'S AND EMPLOYEES (INDEMNITEES) FROM AND AGAINST ALL CLAIMS, DAMAGES, LOSSES AND EXPENSES (INCLUDING, BUT NOT LIMITED TO, FEES OF ENGINEERS, ARCHITECTS, ATTORNEYS AND OTHER PROFESSIONALS AND COURT COSTS) ARISING DIRECTLY, INDIRECTLY OR CONSEQUENTIALLY OUT OF ANY ACTION, LEGAL OR EQUITABLE, BROUGHT BY ANY SUCH OTHER THIRD PARTY ENTITY AGAINST OWNER, TO THE EXTENT BASED ON A CLAIM ARISING OUT OF CONTRACTOR'S NEGLIGENT PERFORMANCE OF THE WORK. IT IS THE EXPRESSED INTENT OF THE PARTIES HERETO THAT THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH IS INDEMNITY BY CONTRACTOR TO INDEMNIFY AND PROTECT THE INDEMNITEES FROM THE CONSEQUENCES OF THE INDEMNITEES' OWN NEGLIGENCE, WHEN THAT NEGLIGENCE ON THE PART OF THE INDEMNITEES IS A CONCURRING CAUSE OF THE INJURY, DEATH OR DAMAGE.**

FURTHERMORE, THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH SHALL HAVE NO APPLICATION TO ANY CLAIM, LOSS, DAMAGE, CAUSE OF ACTION, SUIT, AND LIABILITY WHERE THE INJURY, DEATH OR DAMAGE RESULTS FROM THE SOLE NEGLIGENCE OF THE INDEMNITEES, INDEPENDENT OF THE FAULT OF ANY OTHER PERSON OR ENTITY.

6.18 During the progress of the Work, CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work, CONTRACTOR shall remove and legally dispose of all waste materials, rubbish and debris from and about the premises, as well as all tools, appliances, construction equipment and machinery, and surplus materials, and shall leave the Project site clean and ready for occupancy by OWNER. CONTRACTOR shall restore to original condition all property not designated for alteration by the Contract Documents.

6.19 CONTRACTOR shall be confined to all working real estate and easements provided by OWNER, unless CONTRACTOR separately and privately secures at his own non-reimbursable cost, additional private temporary construction easements. Generally, storage of excavation material and all CONTRACTOR equipment and material shall remain within the limits of Project and working easements.

6.20 CONTRACTOR shall not weight load or permit any part of any structure or utility to be loaded in any manner that will endanger the structure or utility, nor shall CONTRACTOR subject any part of the Work or adjacent property to surcharge stresses or pressures, or loss of subjacent or lateral support, that will endanger it.

Record Documents:

6.21 CONTRACTOR shall as a precondition to interim monthly progress payments, show evidence of regularly maintaining and updating and storing in a safe place at the Project site, one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Directive Changes, Field Orders and any written interpretations and clarifications (issued pursuant to paragraph 9.4) in good order and periodically annotated to show all changes made by CONTRACTOR during construction. These periodically updated record documents, together with all approved samples and a counterpart of all approved Shop Drawings, will be at all times available to ENGINEER for on-site reference. Upon completion of the Work, these record documents, samples and Shop Drawings, will be delivered to ENGINEER for OWNER record retention.

Safety and Protection:

6.22 CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of employees and the general public, and shall also provide the necessary protection to prevent damage, injury or loss to:

6.22.1 other persons and organizations who may be required to properly visit the Project site;

6.22.2 all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Project site; and

6.22.3 other property at the Project site or adjacent thereto, including drainage gradients, trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and Underground Facilities not designated for removal, relocation or replacement in the course of construction.

6.22.4 Driveways, culverts, storm sewer inlets and laterals, and other public or private property that is destroyed or removed during the construction shall be replaced to its original or better condition by CONTRACTOR. Temporary drainage and any subgrade dewatering is to be provided by CONTRACTOR in the total Contract Price as necessary to protect and complete the Work.

6.22.5 CONTRACTOR is responsible for locating any underground obstacles. It is not represented by OWNER or ENGINEER that the Plans show all previous or current sewers, waterlines, electric lines, gas lines, telephone lines and other underground obstacles and utilities. CONTRACTOR shall exercise caution to prevent damage to existing utilities and other obstacles or facilities not meant for demolition or construction modifications during the progress of the

construction Work, taking care to locate same in advance of the actual Work. OWNER or ENGINEER will render reasonable assistance to CONTRACTOR in the matter of determining the location of existing utilities by making available such existing maps, records, and other available existing information as may be accessible to OWNER or ENGINEER, when requested to do so, but the accuracy of such information will not be guaranteed by OWNER or ENGINEER. CONTRACTOR shall make repairs and/or replacements to all damage to existing utilities resulting from his operations. Where a pipe, duct or other structure of a utility is exposed, which, in the opinion of ENGINEER requires strengthening, altering, shielding or moving, if that utility owner does not cure the situation itself, CONTRACTOR shall perform such Work on same as ENGINEER may order in writing after consultation by ENGINEER with the affected utility owner, that Work, if any, may be paid for by OWNER as extra Work. Should CONTRACTOR, in the layout of his Work, encounter any pipe, underground utility or structure, the location of which has not been furnished to him by ENGINEER, he shall bring such conditions to the attention of ENGINEER for ENGINEER, OWNER and CONTRACTOR discussion to determine the CONTRACTOR'S method to be used to pin in place, remove or bypass such obstructions.

6.22.6 It is essential that in the event of any CONTRACTOR damage being caused to existing utilities, that immediate attention be given to their repair. Any repair work carried out shall be at the non-reimbursable cost of CONTRACTOR and shall be performed to the complete satisfaction of ENGINEER and OWNER, who will acknowledge same in writing. It is therefore, the duty of CONTRACTOR, prior to Bid submittal if possible, and no later than the commencement of construction, to inspect and accurately record in writing to OWNER and ENGINEER, the pre-existing condition of any utility which he reasonably suspects or knows to be damaged, faulty, or defective. In addition, any such utilities so recorded, which in the opinion of CONTRACTOR may deteriorate further as a result of the proposed mode of construction operations should be protected. CONTRACTOR shall discuss with OWNER and ENGINEER what appropriate remedial measures should be employed by CONTRACTOR or utility owner to reach a resolution.

CONTRACTOR shall comply with all applicable Laws and Regulations of any public body having jurisdiction for the safety of persons or property, or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and utility owners, the scheduling and location(s), that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, restoration and replacement of their property. All damage, injury or loss to any property referred to in paragraphs 6.22.3 and 6.22.4 caused, directly or indirectly, in whole or in part by CONTRACTOR, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work; or anyone for whose acts any of them may be liable; shall be remedied by CONTRACTOR. CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.13 that the Work is acceptable to ENGINEER (except as otherwise expressly provided in connection with Substantial Completion).

6.23 CONTRACTOR shall designate in writing to OWNER a responsible representative

at the Project site whose duty shall be the management of risk and safety, and that person shall make a concerted effort to assist workers and visitors at the Project site to prevent accidents. This person shall be CONTRACTOR's superintendent, unless otherwise designated in writing by CONTRACTOR to OWNER.

Emergencies:

6.24 In emergencies affecting the safety or protection of persons, or the Work, or property at the Project site or adjacent thereto, CONTRACTOR, without special written or oral instruction or authorization from ENGINEER or OWNER, is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If ENGINEER determines that a change in the Work or Contract Documents is recommended because of the CONTRACTOR's prompt action taken in response to an emergency, a Work Directive Change or Change Order may be issued by OWNER to document the consequences of any changes or variations.

Shop Drawings and Samples:

6.25 After checking and verifying all field measurements and after complying with applicable procedures specified in the General Requirements, CONTRACTOR shall submit to ENGINEER for review and approval, in accordance with the accepted Schedule of Shop Drawing submissions (see process in paragraphs 2.6 and 2.9), or for other appropriate action if so indicated in the Supplementary Conditions, a copy of all Shop Drawings, to ENGINEER, which will bear a stamp or specific written indication by ENGINEER that CONTRACTOR has satisfied CONTRACTOR's submission review responsibilities under the Contract Documents. All submissions will be identified as the ENGINEER may require. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable ENGINEER to efficiently and comprehensively review the CONTRACTOR’s information as required.

6.25.1 Before ordering any material or doing any Work, CONTRACTOR will verify all measurements of any existing and new Work and shall be responsible for their correctness. Any differences which may be found shall be submitted to ENGINEER for consideration before proceeding with the Work. No extra compensation will be allowed to CONTRACTOR because of differences between actual dimensions and measurements indicated on the Drawings.

6.26 CONTRACTOR shall also submit to ENGINEER for review and approval with such promptness as to cause no delay in Work, all samples required by the Contract Documents. All samples will have been checked by and accompanied by a specific written indication that CONTRACTOR has internally satisfied CONTRACTOR's submission review responsibilities under the Contract Documents and will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which the material is intended.

6.27

6.27.1 Before submission of each Shop Drawing or sample, CONTRACTOR shall have internally determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar data with respect thereto and reviewed or coordinated each Shop Drawing or sample with other Shop Drawings and samples, and with the requirements of the Work and the Contract Documents.

6.27.2 At the time of each submission, CONTRACTOR shall give ENGINEER specific written notice of each variation that the Shop Drawings or samples may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation to be made on each Shop Drawing submitted to ENGINEER for review and approval, of each such CONTRACTOR variation.

6.28 ENGINEER will review and approve with reasonable promptness, Shop Drawings and samples, but ENGINEER's review and approval will be only for general conformance with the design concept of the Project and for compliance with the information given in the Contract Documents, and shall not extend to CONTRACTOR's means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents), or to CONTRACTOR's safety precautions or programs incident thereto. The review and approval of a separate or component item will not indicate approval of the assembly into which the item integrally functions. 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 ENGINEER's specific attention in writing to the most current revisions, other than the corrections called for by ENGINEER on previous CONTRACTOR submittals.

6.29 ENGINEER's review and approval of Shop Drawings or samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents, unless CONTRACTOR has in writing called ENGINEER's specific attention to each such variation at the time of submission as required by paragraph 6.27.2, and ENGINEER has given written approval of each such variation by a specific written notation thereof incorporated in or accompanying the Shop Drawing or sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for CONTRACTOR's errors or omissions in the Shop Drawings, or from responsibility for having complied with the provisions of paragraph 6.27.1.

6.30 Where a Shop Drawing or sample is required by the Specifications, any related Work performed prior to ENGINEER'S review and approval of the pertinent submission will be at the sole risk, and non-reimbursable expense and responsibility of CONTRACTOR.

Continuing the Work:

6.31 CONTRACTOR shall carry on the Work and adhere to the Progress Schedule during any and all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as OWNER may otherwise agree to in writing.

INDEMNIFICATION:

6.32 CONTRACTOR AGREES TO AND SHALL INDEMNIFY AND HOLD HARMLESS THE CITY OF BROWNSVILLE AND THE BROWNSVILLE PUBLIC UTILITIES BOARD, INCLUDING THEIR RESCPECTIVE COMMISSIONERS, BOARD MEMBERS, OFFICERS, AND EMPLOYEES (INDEMNITEES) FROM AND AGAINST ANY AND ALL CLAIMS, LOSSES, DAMAGES, CAUSES OF ACTION, SUITS, AND LIABILITY OF EVERY KIND, INCLUDING ALL EXPENSES OF LITIGATION, COURT COSTS, AND ATTORNEY'S FEES, FOR INJURY TO OR DEATH OF ANY PERSON, OR FOR DAMAGE TO ANY PROPERTY, ARISING OUT OR IN CONNECTION WITH THE NEGLIGENT PERFORMANCE OF THE WORK, PROVIDED THAT SUCH CLAIM, DAMAGE, LOSS, LIABILITY OR EXPENSE: (A) IS ATTRIBUTABLE TO BODILY INJURY, SICKNESS, DISEASE OR DEATH OR TO INJURY OR DESTRUCTION OF TANGIBLE PROPERTY, INCLUDING THE LOSS OF USE RESULTING THEREFROM; AND (B) IS CAUSED IN WHOLE OR IN PART BY ANY CONDITION OF THE WORK OR MATERIALS, OR BY ANY NEGLIGENT ACT OR OMISSION OF CONTRACTOR, ANY SUBTIER SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY CONTRACTOR OR ANY SUBCONTRACTOR OR ANYONE FOR WHOSE ACTS CONTRACTOR OR ANY SUBCONTRACTOR MAY BE LIABLE UNDER THIS CONTRACT.

SUCH INDEMNITY SHALL APPLY WHERE THE CLAIMS, LOSSES, DAMAGES, CAUSES OF ACTION, SUITS, OR LIABILITY ARISE IN PART FROM THE CONCURRENT NEGLIGENCE OF INDEMNITEES.

IT IS THE EXPRESSED INTENTION OF THE PARTIES HERETO, BOTH CONTRACTOR AND INDEMNITEES THAT THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH IS INDEMNITY BY THE CONTRACTOR, TO INDEMNIFY AND PROTECT INDEMNITEES FROM THE CONSEQUENCES OF INDEMNITEE'S OWN NEGLIGENCE, WHERE THAT NEGLIGENCE IS A CONCURRING CAUSE OF THE INJURY, DEATH OR DAMAGE. FURTHERMORE, HOWEVER, THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH SHALL HAVE <u>NO APPLICATION</u> TO ANY CLAIM, LOSS, DAMAGE, CAUSE OF ACTION, SUIT, AND LIABILITY WHERE THE INJURY OR DEATH OR DAMAGE RESULTS FROM THE SOLE NEGLIGENCE OF THE INDEMNITEES, INDEPENDENT OF THE FAULT OF ANY OTHER PERSON OR ENTITY.

6.33 IN ANY AND ALL CLAIMS AGAINST INDEMNITEES OR ANY OF THEIR CONSULTANTS, AGENTS OR EMPLOYEES BY ANY EMPLOYEE OF CONTRACTOR, ANY SUBCONTRACTOR, ANY PERSON OR ORGANIZATION DIRECTLY OR INDIRECTLY EMPLOYED BY ANY OF THEM TO PERFORM OR FURNISH ANY OF THE WORK, OR ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE, THE INDEMNIFICATION OBLIGATION UNDER PARAGRAPH 6.32 SHALL NOT BE LIMITED IN ANY WAY BY ANY LIMITATION ON THE AMOUNT OR TYPE OF DAMAGES, COMPENSATION OR BENEFITS PAYABLE BY

OR FOR CONTRACTOR, OR ANY SUCH SUBCONTRACTOR, OR OTHER PERSON OR ORGANIZATION UNDER WORKERS' OR WORKMEN'S COMPENSATION ACTS, DISABILITY BENEFIT ACTS OR OTHER EMPLOYEE BENEFIT ACTS.

6.34 THE OBLIGATIONS OF CONTRACTOR UNDER PARAGRAPH 6.32 SHALL NOT EXTEND TO ANY LIABILITY OF ENGINEER ARISING OUT OF THE PREPARATION OR APPROVAL OF PROJECT MAPS, DRAWINGS, DESIGNS, PLANS, SPECIFICATIONS, OPINIONS, CALCULATIONS, REPORTS, AND SURVEYS.,

6.35 CONTRACTOR shall perform all phases of Work, other than general clean-up, through the duration of the Contract, as defined in these General and any Supplementary Conditions. If CONTRACTOR desires to perform Work, other than general clean-up, during weekends or holidays, prior proper arrangements must be made in writing with OWNER, or any other regulatory agency regarding such Work.

6.35.1 General. This Contract shall be based upon payment by CONTRACTOR and his Subcontractors of wage rates not less than the General Prevailing Wage Rate of per diem wages for work of a similar character in Cameron County, Texas, for each type of laborer, workman or mechanic needed to implement the Contract at the Project Site, and not less than the general prevailing rate of per diem wages for legal holiday and overtime Work. The Schedule of General Prevailing Wage Rates specifically adopted by the OWNER for this Project, and other important Wage and Labor Standard Provisions are included in these Contract Documents in the Supplementary Conditions. Pursuant to local OWNER labor policy, no Project worker shall be paid less than $8.00 per hour, regardless of the adopted wage listings in the attached U. S. Department of Labor General Wage Decision for Cameron County, Texas.

CONTRACTOR shall at minimum comply with all requirements of the prevailing wage law of the State of Texas, Texas Revised Civil Statutes, Texas Government Code (TGC) Section 2259.001 et seq., including the latest amendments thereto, and those special local wage provisions adopted by OWNER. When in conflict, the more stringent requirements apply to CONTRACTOR.

6.35.2 Records. CONTRACTOR and each Subcontractor shall keep an accurate record showing the names and occupations of all classifications of laborers, workmen, and mechanics employed, together with the actual wages paid to each worker. At all reasonable working hours, such CONTRACTOR records shall be open to inspection by the representatives of the OWNER. With each monthly application for payment, CONTRACTOR shall provide to ENGINEER a certified copy of such payroll records as necessary to substantiate compliance with this provision during the period of time for which the application for payment pertains. OWNER shall take cognizance of any and all employee complaints regarding any violations of the requirements of TGC Section 2259.001 et seq.

6.35.3 Penalty. In case CONTRACTOR and any Subcontractor fail to comply with the prevailing wage law, by statutory authority, CONTRACTOR shall forfeit to the OWNER $60.00 per calendar day, or portion thereof, for each laborer, workman, or mechanic who is paid

less than the specified local rate for any Work done under the Contract.

6.35.4 Hours of Labor. CONTRACTOR shall comply with all requirements of the hours of work on public works in accordance with the laws of the State of Texas, Texas Revised Civil Statutes, Articles 5165.1 to 5165.3, including the latest amendments thereto.

No CONTRACTOR or Subcontractor contracting for any part of the Contract Work which may require or involve the employment of laborers, workers or mechanics at the Project Site, shall require or permit any laborer, workman or mechanic in any work week in which he is employed on such Work, to work in excess of forty (40) hours in such work week, unless such laborer, workman or mechanic receives compensation at a rate not less than one and one-half times his basic rate of pay, for all hours in excess of forty (40) hours in such work week.

6.35.5 Equal Employment Opportunities. The CONTRACTOR shall not discriminate against any employee or applicant for employment because of race, religion, gender, sexual preference, national origin, age, physically challenged condition, or a political belief or affiliation, and will comply with all State and federal statutes applicable to CONTRACTOR which relate to employment discrimination.

6.35.6 Veterans Preference. Pursuant to Texas Revised Civil Statutes, Article 4413(31), including the latest amendments thereto, CONTRACTOR shall give preference in employment to honorably discharged veterans who were engaged in the military services of the United States in time of war or conflict and who are, and have been, citizens of Texas for not less than five (5) years.

ARTICLE 7. OTHER WORK

Related Work at Site:

7.1 OWNER may perform other separate work related to the Project at the site by OWNER's own forces, have other work performed by utility owners, or award other direct construction contracts therefor, which shall contain General Conditions similar to these. If the fact that such other work is to be performed was not originally noted in these Contract Documents, advance written notice thereof will be given to CONTRACTOR prior to OWNER authorizing any such other work; and, if CONTRACTOR believes that such other work performance will involve additional expense to CONTRACTOR, or requires additional time, and the Parties hereto are unable to agree as to the extent thereof, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12. All increases or decreases in the Contract Price shall be governed by all State and local laws, statutes, codes, ordinances, rules and regulations governing public competitive bidding and Change Orders.

7.2 CONTRACTOR shall afford each utility owner and other contractor who is a party to a separate direct contract with OWNER (or OWNER, if OWNER itself is performing the additional work with OWNER's employees) proper and safe access to the Project site and a reasonable opportunity for the introduction and storage of materials and equipment, and the execution of such separate work, and shall properly connect and coordinate the Work with their

separate work. CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. CONTRACTOR shall not endanger any separate work of others by cutting, excavating or otherwise altering their work, and will only cut or alter their work with the written consent of ENGINEER and the consent of other contractor(s), persons whose separate work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of such utility owners and other contractors, to the extent that there are comparable provisions for the benefit of CONTRACTOR in said separate direct contracts between OWNER and such other utility owners and other contractors.

7.3 If any part of CONTRACTOR's Work depends upon the separate work of any such other contractor or utility owner (or OWNER) for proper execution or results, CONTRACTOR shall inspect and promptly report to ENGINEER in writing any delays, defects or deficiencies in such other work that renders it unavailable or unsuitable for such integration, proper execution and results of CONTRACTOR'S Work. CONTRACTOR's failure to so report will constitute an acceptance of the other separate work as fit and proper for integration with CONTRACTOR's Work, except for latent or non-apparent defects and deficiencies in the other work.

Coordination:

7.4 If OWNER contracts with others for the performance of other separate work on the Project at the Project site, the person or organization who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified by OWNER in the Supplementary Conditions, or OWNER'S WORK DIRECTIVE CHANGE, and the specific matters to be covered by such authority and responsibility will be itemized, and the extent of such authority and responsibilities will be provided, in the Supplementary Conditions or OWNER'S WORK DIRECTIVE CHANGE.

ARTICLE 8. OWNER'S RESPONSIBILITIES

8.1 OWNER shall issue all written and oral communications to CONTRACTOR through OWNER's Field Representative and/or ENGINEER.

8.2 In case of termination of the employment of ENGINEER, OWNER shall appoint a replacement Engineer whose status under the Contract Documents shall be that of the former ENGINEER.

8.3 OWNER shall furnish the data required of OWNER under the Contract Documents promptly, and shall make eligible payments to CONTRACTOR within the time periods allowed by the Contract Documents and State prompt pay statutes, after payments are due as provided in Article 14.

8.4 OWNER's duties in respect to providing lands and easements and providing any recent existing available engineering surveys to establish CONTRACTOR construction reference points are set forth in paragraphs 4.1 and 4.4. Paragraph 4.2 refers to OWNER's identifying and making available to CONTRACTOR copies of any existing and available reports of explorations

and tests of subsurface pre-existing conditions at the Project site which are not part of the Contract Documents, but which have been utilized by ENGINEER in generally preparing the Drawings and Specifications.

8.5 OWNER is obligated to consider and may execute Change Orders as indicated in paragraph 10.4.

8.6 OWNER's responsibility in respect to certain inspections, tests and approvals is set forth in paragraphs 13.3 through 13.5.

8.7 In connection with OWNER's right to stop Work or suspend Work, see paragraphs 13.10 and 15.1. Paragraph 15.2 outlines OWNER's right to terminate services of CONTRACTOR under certain circumstances.

ARTICLE 9. ENGINEER'S STATUS DURING CONSTRUCTION

Owner's Representative:

9.1 OWNER's private consulting ENGINEER (generally through its Resident Project Representative) will be OWNER's primary representative during the construction period. OWNER's Field Representative will be the secondary representative during the construction period.

Visits to Site:

9.2 ENGINEER, routinely through the Resident Project Representative will make periodic visits to the site at intervals appropriate to the various stages of construction to observe the progress and general quality of the executed Work and to determine, in general, for the benefit of OWNER only, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous on-site observations to check the quality or quantity of the Work, because CONTRACTOR is solely responsible for same. ENGINEER's efforts will be directed toward providing for OWNER only, a greater degree of confidence that the CONTRACTOR's completed Work will conform to the Contract Documents. On the basis of such limited visits and on-site observations as an experienced and qualified design professional, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to advise OWNER of any obvious defects and deficiencies in the Work.

On-Site Project Representation:

9.3 OWNER will generally furnish a Project Field Representative to assist ENGINEER in observing the daily performance of the Work for the sole benefit of the OWNER. This is an option available to OWNER that need not be exercised, nor may it be relied upon by the CONTRACTOR in any way to satisfy CONTRACTOR's quality control responsibility. The secondary duties, responsibilities and limitations of authority of any such OWNER Field Representative and any assistants will be determined by the OWNER.

Clarifications and Interpretations:

9.4 ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as ENGINEER may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. If CONTRACTOR believes that a written clarification or interpretation by ENGINEER justifies an increase in the Contract Price or an extension of the Contract Time, and the OWNER and CONTRACTOR are unable to agree to the basis, amount or extent thereof, CONTRACTOR may make a claim therefore as provided in Article 11 or Article 12. Any increases or decreases in the Contract Price shall be governed by all State and local laws, statutes, codes, ordinances, rules and regulations governing public competitive bidding and Change Orders.

Authorized Variations in Work:

9.5 ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Time, and are consistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER, and also on CONTRACTOR who shall promptly perform the Work involved. If CONTRACTOR believes that a Field Order justifies an increase in the Contract Price or an extension of the Contract Time, CONTRACTOR may make a claim therefore as provided in Article 11 or 12. Any increases or decreases in the Contract Price shall be governed by all State and local laws, statutes, codes, ordinances, rules and regulations governing public competitive bidding and Change Orders.

Rejecting Defective Work:

9.6 ENGINEER will have the authority to disapprove or reject Work which ENGINEER believes to be defective, and will also have authority to require special inspection or testing of the Work as provided in paragraph 13.9, whether or not the Work is fabricated, installed or completed.

Shop Drawings, Change Orders and Payments:

9.7 In connection with ENGINEER's responsibility for Shop Drawings and samples, see paragraphs 6.25 through 6.30 inclusive.

9.8 In connection with ENGINEER's responsibilities as to Change Orders, see Articles 10, 11 and 12.

9.9 In connection with ENGINEER's responsibilities in respect to Applications for Payment, etc., see Article 14.

Determinations for Unit Prices:

9.10 ENGINEER will determine the final actual quantities and classifications of any Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR, 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 decisions thereon will be final and binding upon OWNER and CONTRACTOR.

Decisions on Disputes:

9.11 ENGINEER will be the interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work, and claims under Articles 11 and 12 in respect of changes in the Contract Price or Contract Time, will be referred initially to ENGINEER in writing, with a request for a formal decision in accordance with this paragraph, which ENGINEER will render in writing within a reasonable time. Written notice of each such claim, dispute and other matter will be delivered by the claimant (OWNER or CONTRACTOR) to ENGINEER and opposing Party no later than thirty (30) calendar days after the occurrence of the event giving rise thereto, and written supporting data will be submitted to ENGINEER and the other Party within sixty (60) calendar days after such occurrence, unless ENGINEER allows claimant an additional period of time in writing to ascertain more accurate data in support of the claim.

9.12 When functioning as interpreter and judge under paragraphs 9.10 and 9.11, it is hereby mutually agreed between OWNER and CONTRACTOR that ENGINEER will not be personally liable in connection with any non-negligent interpretation or decision rendered in good faith in such official and professional engineering capacity. The rendering of a decision by ENGINEER pursuant to paragraphs 9.10 and 9.11 with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.13) will be a condition precedent to any exercise by CONTRACTOR and/or OWNER of such rights or remedies they may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such claim, dispute or other matter.

Limitations on ENGINEER's Responsibilities:

9.13 Neither ENGINEER's authority to act under this Article 9, or elsewhere in the Contract Documents, nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority, shall give rise to any personal or corporate duty or responsibility of ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization performing any of the Work, or to any surety for any of them.

9.14 Whenever in the Contract Documents the terms: "as ordered"; "as directed"; "as required"; "as allowed"; "as approved"; or terms of like effect or import are used, or the adjectives: "reasonable"; "suitable"; "acceptable"; "proper"; or "satisfactory"; or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of ENGINEER as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for general compliance with the Contract Documents (unless there is a specific statement

indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty to supervise or direct the furnishing, performance, or quality control of the CONTRACTOR's Work or any duty or authority to undertake responsibility of the CONTRACTOR contrary to the provisions of paragraph 9.15 or 9.16.

9.15 ENGINEER will not be responsible for CONTRACTOR's means, methods, techniques, quality control, sequences or procedures of construction, or the safety precautions and programs incident thereto, for which CONTRACTOR shall be solely responsible. ENGINEER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

9.16 ENGINEER will not be responsible for the acts and/or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

ARTICLE 10. CHANGES IN THE WORK

10.1 Without invalidating the Agreement and without notice to any surety, OWNER may, at any time, or from time to time, order additions, deletions or revisions in the Work that are in compliance with State public competitive bidding statutes and laws governing Change Orders; these will be authorized by a Written Amendment, a Change Order, or a Work Directive Change. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved, which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

10.2 If OWNER and CONTRACTOR are unable to agree as to the extent, if any, of an increase or decrease in the Contract Price, or an extension or shortening of the Contract Time that should be allowed as a result of a Work Directive Change, a claim may be made therefore as provided in Article 11 or Article 12. All increases or decreases in the Contract Price shall be governed by all State and local laws, statutes, codes, ordinances, rules and regulations governing public competitive bidding and Change Orders.

10.3 CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in paragraphs 3.4 and 3.5, except in the case of an emergency as provided in paragraph 6.24, and except in the case of uncovering Work as provided in paragraph 13.9.

10.4 OWNER and CONTRACTOR may execute appropriate Change Orders (or Written Amendments) covering:

10.4.1 changes in the Work which are ordered by OWNER pursuant to paragraph 10.1; are required because of willing and informed acceptance of defective Work by OWNER under paragraph 13.13; or OWNER correcting defective Work under paragraph 13.14; or are otherwise agreed to by the Parties;

10.4.2 changes in the Contract Price or Contract Time which are agreed to by the Parties; and

10.4.3 changes in the Contract Price or Contract Time which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 9.11; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the Progress Schedule as provided in paragraph 6.31.

10.5 If notice 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 Time) is required by the provisions of any Bond to be given to a surety by CONTRACTOR, the giving of any such notice will be CONTRACTOR'S sole responsibility, and the amount of each applicable Bond may be adjusted accordingly.

ARTICLE 11. CHANGE OF CONTRACT PRICE

11.1 The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to CONTRACTOR for properly performing the Work. All original duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR shall be at his expense without change in the original Contract Price.

11.2 The Contract Price may only be changed by a Change Order or by a Written Amendment. Any claim for an increase or decrease in the Contract Price shall be based on initial written notice delivered promptly by the CONTRACTOR or OWNER to the other Party, and to ENGINEER promptly (but in no event later than thirty (30) calendar days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall follow and be delivered within sixty (60) calendar days after such occurrence (unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim), and shall be accompanied by claimant's written statement that the amount claimed covers all known amounts (direct, indirect and consequential) to which the claimant believes he is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Price shall be determined by ENGINEER in accordance with paragraph 9.11, if OWNER and CONTRACTOR cannot otherwise agree on the amount involved. No claim for an adjustment in the Contract Price will be valid, and will be deemed legally waived under this Contract, if not submitted in accordance with this paragraph 11.2.

11.3 The value of any Work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:

11.3.1 Where the Work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the actual quantities of the Work items involved (subject to the provisions of paragraphs 11.9.1. through 11.9.3. inclusive).

11.3.2 By mutual acceptance of a lump sum (which may include an allowance for

overhead and profit not necessarily in accordance with paragraph 11.6.2.1).

11.3.3 On the basis of the Cost of the Work (determined as provided in paragraphs 11.4 and 11.5), plus a CONTRACTOR's Fee for overhead and profit (determined as provided in paragraphs 11.6 and 11.7).

Cost of the Work:

11.4 The term "Cost of the Work" means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the Cameron County, Texas area and shall include only the following items, and shall not include any of the costs itemized in paragraph 11.5:

11.4.1 Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under Schedules of Job Classifications as set forth by OWNER in the Supplementary Conditions of the Contract Documents. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of any fringe benefits, if any, which shall include social security contributions, unemployment, excise and payroll taxes, workers' or workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday, as may be applicable thereto. Such employees shall include superintendents and foremen at the Project site. The expenses of performing Work after regular daily working hours on Saturday, Sunday or on legal holidays shall be included in the above, to the extent authorized in an advanced written approval notice by OWNER.

11.4.2 Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR, unless OWNER deposits funds with CONTRACTOR with which to make advanced payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds and all returns from sale of surplus materials and equipment, shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.

11.4.3 Payments made by CONTRACTOR to the Subcontractors for Work performed by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from Subcontractors acceptable to CONTRACTOR, and shall deliver such bids to OWNER who will then determine which bid will be accepted. If a 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 shall be determined in the same manner as CONTRACTOR's Cost of the Work. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable. CONTRACTOR shall accomplish the applicability of the Contract Documents to Subcontractor agreements by using either "flow down" provisions or appropriate recitations in the subcontract agreements of parts of these Contract Documents.

11.4.4 Costs of special consultants (including but not limited to engineers,

architects, testing laboratories, surveyors, attorneys and accountants) employed for services specifically related to the Work.

11.4.5 Supplemental costs actually incurred including the following:

11.4.5.1 The proportion of necessary transportation, travel and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

11.4.5.2 Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the Project site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used, but not consumed, which remain the property of CONTRACTOR.

11.4.5.3 Rentals of all construction equipment and machinery and the parts thereof, whether rented from CONTRACTOR or others, in accordance with written rental agreements produced to OWNER as requested, and the costs of transportation, loading, unloading, installation, dismantling and removal thereof (all in accordance with terms of said rental agreements). The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

11.4.5.4 Any sales, consumer, use or similar taxes actually paid as related to the Work that OWNER is not exempt from paying, and for which CONTRACTOR is liable, as imposed by Laws and Regulations.

11.4.5.5 Deposits forfeited 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 any royalty payments and fees for permits and licenses.

11.4.5.6 Losses and damages (and related expenses), not compensated to CONTRACTOR by insurance or otherwise, to the Work, or otherwise sustained by CONTRACTOR in connection with the proper performance and furnishing of the Work, provided they have resulted from causes other than the intentional and/or negligent acts and/or omissions of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them, or for whose acts and/or omissions any of them may be liable. Such losses shall include settlements made with the advanced written consent and approval of OWNER. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's Fee. If, however, any such loss or damage requires reconstruction and CONTRACTOR is placed in charge thereof, CONTRACTOR shall be paid for reconstruction services, only at a fee proportionate to that stated in paragraph 11.6.2.

11.4.5.7 The cost of utilities, fuel and sanitary facilities at the Project site.

11.4.5.8 Minor expenses such as telefaxes, long distance telephone calls, telephone service at the Project site, express mailings and similar petty cash items in connection with the Work.

11.4.5.9 Cost of premiums for any additional Bond and insurance coverages required because of any additive Change Orders to the Work.

11.5 The term "Cost of the Work" shall not include any of the following:

11.5.1 Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the Project site or in CONTRACTOR's principal or a branch office for general administration of the Work and not specifically included in the agreed upon Schedule of Job Classifications referred to in paragraph 11.4.1, or specifically covered by paragraph 11.4.4, all of which are to be considered administrative costs covered by the CONTRACTOR's Fee.

11.5.2 Expenses of CONTRACTOR's principal and branch offices, other than any CONTRACTOR's office at the Project site.

11.5.3 Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent CONTRACTOR payments.

11.5.4 Cost of premiums for all Bonds and for all insurance, whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the types of coverage and amounts thereof (except for the cost of premiums covered by subparagraph 11.4.5.9 above).

11.5.5 Costs resulting from the intentional and/or negligent acts and/or omissions of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them, or for whose acts and/or omissions any of them may be liable, including but not limited to, the correction of defective Work, salvaging or disposal of materials or equipment wrongly supplied, and repairing any damage to real or personal property.

11.5.6 Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 11.4.

CONTRACTOR's Fee:

11.6 The CONTRACTOR's Fee allowed to CONTRACTOR for overhead and profit shall be determined as follows:

11.6.1 a mutually acceptable fixed fee; or if none can be agreed upon,

11.6.2 a fee based on the following percentages of the various portions of the Cost of the Work:

11.6.2.1 for costs incurred under paragraphs 11.4.1 and 11.4.2, the CONTRACTOR's Fee shall be fifteen (15%) percent;

11.6.2.2 for costs incurred under paragraph 11.4.3, the CONTRACTOR's Fee shall be five (5%) percent; and if a subcontract is on the basis of Cost of the Work Plus a Fee, the maximum allowable to CONTRACTOR on account of overhead and profit of all Subcontractors shall be fifteen (15%) percent;

11.6.2.3 no fee shall be payable on the basis of costs itemized under paragraphs 11.4.4, 11.4.5 and 11.5;

11.6.2.4 the amount of credit to be allowed by CONTRACTOR to OWNER for any such Contract change which results in a net decrease in cost will be the amount of the actual net decrease, plus a deduction in CONTRACTOR's Fee by an amount equal to ten (10%) percent of the net decrease; and

11.6.2.5 when both additions and credits are involved in any one Contract change, the adjustment in CONTRACTOR'S Fee shall be computed on the basis of the net change in accordance with paragraphs 11.6.2.1 through 11.6.2.4, inclusive.

11.7 Whenever the cost of any Work is to be determined pursuant to paragraph 11.4 or 11.5, CONTRACTOR will timely submit in a written form acceptable to ENGINEER, an itemized cost breakdown together with supporting data.

Cash Allowances:

11.8 It is understood that CONTRACTOR has included in the Contract Price any and all allowances so named in the Contract Documents and shall cause the Work so covered thereby to be done by such Subcontractors or Suppliers, and for such sums within the limit of the allowances as may be acceptable to ENGINEER. CONTRACTOR agrees that:

11.8.1 Any allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Project site, and all applicable non-exempt taxes; and

11.8.2 CONTRACTOR's costs for managing on the Project site, labor, materials and equipment installation costs, overhead, profit and other expenses already contemplated for determining the allowances have been included in the Contract Price and not in the allowances. No demand for additional payment on account of any of such costs will be valid.

Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

Unit Price Work:

11.9

11.9.1 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 established unit prices for each separately identified item of Unit Price Work, multiplied by the estimated quantity of each item as indicated in the Agreement. The ENGINEER'S estimated quantities of items of Unit Price Work are not guaranteed by the OWNER to be actually performed and are solely for the purpose of comparison of bids and determining an initial Contract Price. Determinations of the actual final quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER in accordance with Paragraph 9.10.

11.9.2 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.

11.9.3 Where the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the ENGINEER's estimated quantity of such item indicated in the Contract Documents (generally plus or minus fifteen percent (15%), and there is no corresponding and offsetting adjustment(s) with respect to any other Unit Price item(s) of Work, and if CONTRACTOR believes that CONTRACTOR has incurred additional expense as a result thereof, CONTRACTOR may make a timely claim for an increase in the Contract Price in accordance with Article 11 and any applicable State law, if the Parties are unable to otherwise agree as to the amount of any such increase. OWNER is also able to file a similar timely claim with ENGINEER if OWNER believes that the quantity of Unit Price Work items has significantly increased to the point that OWNER believes it is owed a credit from CONTRACTOR for any volume discount pricing that CONTRACTOR should have received by purchasing such additional quantities.

ARTICLE 12 -- CHANGE OF CONTRACT TIME

12.1 The Contract Time may only be changed by a Change Order or a Written Amendment. Any claim for an extension or shortening of the Contract Time shall be based on initial written notice delivered by the CONTRACTOR or OWNER to the ENGINEER and to the other Party (but in no event later than thirty (30) calendar days) after the occurrence of the event giving rise to the claim, and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall follow and be delivered within sixty (60) calendar days after such occurrence (unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the claimant's written statement that the time adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Time shall be determined by ENGINEER in accordance with paragraph 9.11, if OWNER and CONTRACTOR cannot otherwise agree. No claim for an adjustment in the Contract Time will be valid and will be

deemed legally waived under this Contract, if not submitted in accordance with the requirements of this paragraph 12.1.

12.2 The Contract Time will be extended in an amount equal to time lost due to delays beyond the reasonable control of CONTRACTOR, so long as CONTRACTOR has made good faith efforts to mitigate delaying impacts and if a claim is made therefore as provided in paragraph 12.1. Such delays shall include, but not be limited to, acts, omissions, or neglect by OWNER or others performing additional separate work as contemplated by Article 7, or to fires, floods exceeding the 100 year frequency in Cameron County, labor disputes, epidemics, extremely abnormal weather for Cameron County, Texas, as may be described further in these Contract Documents, or Acts of God.

12.3 **ALL TIME LIMITS STATED IN THE CONTRACT DOCUMENTS ARE MUTUALLY AGREED TO BE OF THE ESSENCE OF THE AGREEMENT**. The provisions of this Article 12 shall not exclude recovery for damages (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court costs) for delay by either Party.

ARTICLE 13 -- WARRANTY AND GUARANTEE; TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

Warranty and Guarantee:

13.1 CONTRACTOR warrants and guarantees to OWNER that all Work will be in accordance with the Contract Documents and will not be defective. Prompt notice of any obvious patent Work defects discovered by OWNER or ENGINEER shall be promptly given to CONTRACTOR in writing. All defective Work, whether or not in place, may be rejected, corrected or accepted as provided in this Article 13. In case of dispute as to the cause of improper functioning of all or any part of the Work, the burden of proof that CONTRACTOR has complied with the Contract Documents rests with CONTRACTOR for this Work. He shall submit in writing to ENGINEER his opinion and basis of proof for the adequacy of his Work. OWNER may have those tests made, which OWNER deems advisable, by an independent testing laboratory of OWNER's choice. If any test so made indicates a defect in material or workmanship, or that one or more manufactured components of the Work are performing below the standard set by the manufacturer's public data and specifications, or the Specifications of these Contract Documents, the entire cost of all such tests shall be paid for by CONTRACTOR, and he shall also pay for retesting of the corrected Work, until in the ENGINEER's opinion, it functions satisfactorily. The Work shall be guaranteed to be free from defects due to faulty workmanship or material for a period of one (1) year from the date of OWNER issue of the Certificate of Acceptance. Work found to be improper or imperfect shall be replaced or redone without cost to OWNER within the one year guarantee period. Neither the Certificate of Acceptance, final payment, or any other provision of the Contract Documents shall relieve CONTRACTOR from his workmanship guarantee. Failure of CONTRACTOR to repair or replace faulty Work entitles OWNER to repair or replace the same and recover the costs from CONTRACTOR and/or his Surety. CONTRACTOR shall be the sole guarantor of the Work installed under this Contract and no third party guarantees/warranties by Subcontractors or suppliers of various components or materials will

be acceptable; nor shall agreements with Subcontractors or material or component suppliers by CONTRACTOR reduce CONTRACTOR's sole responsibility to OWNER under this Agreement. All equipment shall be warrantied and/or guaranteed by either CONTRACTOR or its supplier/manufacturer by assignment to OWNER, for at least one (1) year from the date of OWNER acceptance of the entire Project. It is anticipated by OWNER and acknowledged by CONTRACTOR that many equipment and material warranties from suppliers/manufacturers shall extend well beyond the initial one (1) year post acceptance period. The CONTRACTOR shall transfer by assignment to the OWNER any and all third party supplier and manufacturer warranties and/or guaranties that remain in effect beyond the one (1) year workmanship guarantee/warranty period. At the option of the OWNER, all materials/equipment are also warrantied or guaranteed to OWNER for one (1) year from the date of any early partial acceptance of Work, and beneficial use of a completed system component of Work prior to full integration with the entire completed Project.

Access to Work:

13.2. ENGINEER AND ENGINEER's representatives, other representatives of OWNER, testing agencies and governmental agencies with jurisdictional interests, will have access to the Work at reasonable times for their observation, inspecting and testing. CONTRACTOR shall promptly provide proper and safe conditions for such authorized and identified reasonable access in accordance with any Occupational Safety and Health Administration (OSHA) and CONTRACTOR's safety program and insurance requirements.

It is agreed by CONTRACTOR that OWNER shall be and is hereby authorized to appoint from time to time, OWNER's subordinate supervisors, observers, and/or inspectors, as the OWNER may deem proper to inspect the material furnished and observe the Work performed under this Agreement, and to see that the material is furnished and Work is generally performed in accordance with the Specifications. This OWNER function, for OWNER's sole benefit, does not excuse the CONTRACTOR from his own quality control assurance, which is solely his responsibility. CONTRACTOR shall furnish all reasonable aid and assistance required by the ENGINEER, and OWNER's subordinate supervisors, observers and/or inspectors to perform observation, inspection and examination of the Work and all parts of the Work. CONTRACTOR shall regard and obey the directions and instructions of the ENGINEER and any OWNER subordinate supervisors, observers and/or inspector so appointed, when such directions are consistent with the obligations of the Contact Documents and included Specifications, provided, however, that should CONTRACTOR object to any order by any OWNER subordinate supervisor or inspector, CONTRACTOR may within ten (10) calendar days submit written notice to ENGINEER for his decision. Except as herein before provided, the authority of OWNER's subordinate supervisors or inspectors shall be limited to the rejection of unsatisfactory Work and materials and to the potential short-term suspension of the Work, until the questions of Work acceptability can be referred to ENGINEER.

13.2.1. CONTRACTOR shall cooperate with any OWNER-provided testing laboratory for the purpose of allowing services of the laboratory to be timely and properly performed. CONTRACTOR shall provide OWNER's representative and testing laboratory a minimum of twenty-four (24) hours notice of readiness for all testing as required by the

Specifications or customary construction industry standards. OWNER shall bear the cost of density and concrete testing, for the first test only. Testing of equipment, lines and valves shall be the responsibility of CONTRACTOR and he shall notify ENGINEER and OWNER's Field Representative of his scheduled time for such tests, so that the test can be witnessed by ENGINEER and OWNER'S Field Representative. If initial tests show failure, the CONTRACTOR shall incur the non-reimbursable costs of retesting the areas that failed after CONTRACTOR's corrective action has been taken, including the per diem personnel and equipment costs incurred by OWNER in said retesting. The per diem costs shall be determined based on the hourly wage plus reasonable overhead of ENGINEER's and OWNER's personnel needed to be present at the Project site during retesting, and by the locally prevailing rental rate for the vehicles and equipment utilized in retesting. These retesting costs shall be paid by CONTRACTOR prior to OWNER's interim conditional acceptance of the Work improvements.

Tests and Inspections:

13.3. CONTRACTOR shall give ENGINEER and /or OWNER's Field Representative timely notice of readiness of the Work for all required inspections, tests or approvals.

13.4. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) to specifically be inspected, tested or approved, CONTRACTOR shall assume full responsibility therefore, pay all costs as included in the Contract Price in connection therewith, and furnish ENGINEER the required final certificates of inspection, testing or approval. CONTRACTOR shall also be responsible for and shall pay all non-reimbursable costs in connection with any special inspection or testing required in connection with OWNER's or ENGINEER's approval and acceptance of an alternative Supplier of "or equal" proposed substitutions of materials or equipment proposed by CONTRACTOR to be incorporated in the Work, or of alternative materials or equipment submitted for approval prior to CONTRACTOR's purchase thereof, for incorporation in the Work. The cost of all routine inspections, tests and approvals, other than any of those special inspections which may be required by the Contract Documents to be paid by CONTRACTOR, shall be paid by OWNER (unless otherwise specified).

13.5 All inspections, tests or approvals, other than those required by Laws or Regulations of any public body having jurisdiction, shall be performed by organizations acceptable to OWNER (or by ENGINEER, if so specified).

13.6 If any Work (including the work of others) that is to be inspected, tested or approved is backfilled or otherwise built-in or concealed by CONTRACTOR without written concurrence of ENGINEER, it must, if requested in writing by ENGINEER, be uncovered and revealed for ENGINEER's Resident Project Representative and OWNER Field Representative observation. Such uncovering shall be at CONTRACTOR's non-reimbursable expense, unless CONTRACTOR has given ENGINEER timely written notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness (not to exceed three (3) days) in written response to such CONTRACTOR notice.

13.7 Neither observations by ENGINEER nor inspections, tests or approvals by others shall relieve CONTRACTOR from CONTRACTOR's sole obligations to perform the Work and

constantly employ quality control in accordance with the Contract Documents.

Uncovering Work:

13.8 If any Work is backfilled contrary to the advanced written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for ENGINEER's observation and replaced at CONTRACTOR's non-reimbursable expense.

13.9 If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's written request, shall uncover, expose or otherwise make available for observation, inspection or testing as ENGINEER may require, that portion of the Work in question shall be uncovered by CONTRACTOR by furnishing all necessary labor, material and equipment to uncover same. If it is found that such Work is defective, CONTRACTOR shall bear all direct, indirect and consequential non-reimbursable costs of such uncovering, exposure, observation, inspection and testing, and of the satisfactory repair, replacement and reconstruction, (including but not limited to fees and charges of ENGINEER, architects, attorneys and other professionals), and OWNER shall be entitled to an appropriate decrease in the Contract Price for that portion of these costs that CONTRACTOR does not otherwise reimburse to OWNER; and if the Parties are unable to agree as to the amount thereof, OWNER may make a claim therefore as provided in Article 11. If, however, such Work is not found to be defective, CONTRACTOR may be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, repair, replacement and reconstruction; and, if the Parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12. All increases or decreases in the Contract Price shall be governed by all State and local laws, statutes, codes, ordinances, rules and regulations governing public competitive bidding and Change Orders.

Owner May Stop the Work:

13.10 If the Work is defective in the opinion of the ENGINEER and OWNER, or CONTRACTOR fails to supply sufficient skilled workers, Subcontractors, or suitable materials or equipment, or otherwise fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may issue a written order for CONTRACTOR to stop the Work, or any portion thereof, until the cause for such stop Work order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR, or any other entity.

Correction or Removal of Defective Work:

13.11 If required by ENGINEER, CONTRACTOR shall promptly, as directed in writing, either correct all defective Work, whether or not fabricated, installed or completed, if the Work has been rejected by ENGINEER, and remove it from the Project site and replace it with non-defective Work. CONTRACTOR shall bear all direct, indirect and consequential non-reimbursable costs of such correction or removal (including but not limited to fees and charges of

ENGINEER, architects, attorneys and other professionals) made necessary thereby.

One Year Workmanship Correction Period:

13.12 If within one (1) year after the date of OWNER issuance of the Certificate of Acceptance, or such longer period of time as may be prescribed by Laws or Regulations, or by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents, any Work is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions, either correct such defective Work, or, if it has been rejected by OWNER, remove it from the Project site and replace it with non-defective Work. If CONTRACTOR does not promptly comply with the terms of such OWNER instructions, or in an emergency where CONTRACTOR delay would cause serious risk of loss or damage to OWNER's facilities, OWNER may have the defective Work corrected, or the rejected Work removed and replaced, and all direct, indirect and consequential costs of such removal and replacement (including but not limited to fees and charges of ENGINEER, architects, attorneys and other professionals) will be charged to and paid by CONTRACTOR. In special circumstances, where a particular item of equipment is placed in continuous service by OWNER before acceptance of all the Work, the minimum one (1) year workmanship guarantee and/or equipment warranty correction periods for that item may start to run from an earlier date, if so provided in the Specifications or by Written Contract Amendment.

Acceptance of Defective Work:

13.13 If instead of requiring correction or removal and replacement of defective Work, OWNER (and, prior to ENGINEER's recommendation of final Project payment), prefers to accept it "as is," OWNER may do so in writing. CONTRACTOR shall bear all reasonable direct, indirect and consequential non-reimbursable costs attributable to OWNER's evaluation of, and determination to accept such defective Work (such OWNER costs to be approved by ENGINEER as to reasonableness and may include but not be limited to fees and charges of ENGINEER and any OWNER's, architects, attorneys and other professionals). If any such OWNER acceptance occurs prior to ENGINEER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions to the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the Parties are unable to agree as to the amount thereof, OWNER or CONTRACTOR may make a written claim therefore as provided in Article 11. If the acceptance occurs after such final Project payment, an appropriate amount as determined by OWNER will be charged to and paid by CONTRACTOR to OWNER.

OWNER May Correct Defective Work:

13.14 If CONTRACTOR fails within seven (7) calendar days after written notice by ENGINEER to proceed to correct, and to actually correct defective Work; or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.11; or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents; or if CONTRACTOR fails to comply with any other provision of the Contract Documents; OWNER may, after the pre-requisite seven (7) calendar days written notice to CONTRACTOR, correct and

remedy any such CONTRACTOR deficiency. In exercising the rights and remedies under this paragraph, OWNER shall proceed with reasonable expediency. To the extent necessary to complete corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the Work and Project site; take possession of all or part of the Work; and temporarily suspend CONTRACTOR's Work related thereto; take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Project site; and incorporate in the Work all Project materials, and CONTRACTOR shall allow OWNER and ENGINEER, representatives and employees such access to the Project site as may be necessary to enable OWNER to exercise the rights and remedies under this paragraph. All direct, indirect and consequential costs of OWNER in exercising such rights and remedies will be charged against CONTRACTOR, in an amount approved as to reasonableness by ENGINEER, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the Parties are unable to agree as to the amount thereof, OWNER or CONTRACTOR may make a claim therefore as provided in Article 11. Such direct, indirect and consequential OWNER costs will include, but not be limited to: fees and charges of ENGINEER; OWNER's architects; attorneys; and other professionals; all court costs; and all costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of CONTRACTOR's defective Work. CONTRACTOR shall not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies under this paragraph 13.4.

ARTICLE 14 -- PAYMENTS TO CONTRACTOR AND COMPLETION

Schedule of Values:

14.1 The Schedule of Values established as provided in paragraph 2.9 will serve as the basis for monthly progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units actually completed, multiplied by the per unit price. CONTRACTOR, ENGINEER and OWNER shall also mutually address in the Schedule of Values any periodic CONTRACTOR reimbursements or direct OWNER payments to third-party vendors producing any specially fabricated goods and equipment with longer lead times prior to delivery to the Project site.

Application for Progress Payment:

14.2 At least twenty (20) calendar days before each progress payment is scheduled (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review, an Application for Payment accurately completed and signed by CONTRACTOR, covering the Work completed as of the date of the Application, and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work, but delivered and suitably stored at the Site, or at another bonded and insured secure location off the nearby Project site as agreed to in an advanced writing signed by CONTRACTOR and OWNER, the Application for Payment shall also be accompanied by a bill of sale, invoice, affidavit of bill(s) paid, or other documentation warrantying that OWNER

has actually received the title ownership of Project materials and equipment still within the care, custody and control of CONTRACTOR for Project Work purposes and free and clear of any attempted liens, charges, security interests and encumbrances (which are hereinafter in these General Conditions referred to as "Encumbrances"), and evidence that the materials and equipment are covered by appropriate property insurance and other security arrangements to protect OWNER's legal interest therein, all of which will be satisfactory to OWNER. The amount of OWNER retainage with respect to progress payments, five percent (5%), is stipulated in the Agreement.

CONTRACTOR's Warranty of Title:

14.3 CONTRACTOR warrants and guarantees that title to any Work equipment and materials itemized in any Application for Payment, whether incorporated in the Project, or delivered and stored at or nearby the Project site, will pass to OWNER no later than the time of any progress payment, free and clear of any and all Encumbrances.

Review of Applications for Progress Payment:

14.4 ENGINEER will, within twenty (20) calendar days after receipt of each Application for Payment from CONTRACTOR, either indicate in writing a recommendation for OWNER payment and process the Application, or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR will make the necessary corrections and promptly resubmit the Application. Twenty (20) calendar days after presentation of the Application for Payment to OWNER with ENGINEER's recommendation, the payment amount recommended will (subject to the provisions of the last sentence of paragraph 14.7) become due, and when due will be promptly paid by OWNER to CONTRACTOR, preferably by electronic transfer.

14.5 ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based upon ENGINEER's limited periodic on-site observations of the Work in progress as an experienced and qualified design professional; and on ENGINEER's review of the Application for Payment and the accompanying data and Schedules; that the Work has progressed to the estimated percentage completion point indicated, that, to the best of ENGINEER's knowledge, information and belief, the status of the Work is in apparent general accordance with the Contract Documents (subject to: a later evaluation of the Work as a functioning whole; prior to or upon Substantial Completion; and subject to the results of any subsequent tests called for in the Contract Documents; and subject to a final determination of quantities and classifications for Unit Price Work under paragraph 9.10; and subject to any other qualifications stated in the ENGINEER's recommendation to OWNER); and that CONTRACTOR is entitled to payment of the amount recommended. However, by recommending any such payment, ENGINEER will not thereby be deemed to have represented that exhaustive or continuous on-site inspections have been made to check the CONTRACTOR's quality or the quantity of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents, or that there may not be other matters or issues between the Parties that might entitle CONTRACTOR to be paid additionally by OWNER, or OWNER to withhold payment to CONTRACTOR.

14.6 ENGINEER's recommendation of final Project payment will constitute an additional representation by ENGINEER to OWNER that to the best of ENGINEER's knowledge, the conditions precedent to CONTRACTOR's being entitled to final Project payment, as set forth in paragraph 14.13, have been fulfilled.

14.7 ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's professional opinion, it would be incorrect to make such representations to OWNER. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence, or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in ENGINEER's opinion, to protect OWNER from Project loss because:

14.7.1 the Work is defective, or completed Work has been damaged requiring CONTRACTOR correction or replacement.

14.7.2 the Contract Price has been reduced by Written Amendment or Change Order.

14.7.3 OWNER has been required to correct defective Work or complete Work in accordance with paragraph 13.14, or

14.7.4 because of ENGINEER's actual knowledge of the occurrence of any of the events enumerated in paragraphs 15.2.1 through 15.2.9 inclusive.

OWNER may for its own benefit and protection and not for the direct benefit of any third parties, refuse to make CONTRACTOR payment in whole or in part of the amount recommended by ENGINEER, because claims have been made against OWNER on account of CONTRACTOR's improper performance of the Work; or payment bond claims and inquiries have been filed with OWNER or surety by third-parties in connection with the Work and OWNER may wish to consult with CONTRACTOR and/or CONTRACTOR’s surety about the status of CONTRACTOR sub-tier payments, or there are other items entitling OWNER to a set-off against the payment amount recommended, but OWNER must give CONTRACTOR written notice stating the reasons for any non-payment to CONTRACTOR.

Substantial Completion:

14.8 When CONTRACTOR considers the entire Work ready for OWNER’s intended purpose and use, CONTRACTOR shall notify ENGINEER in writing that the entire Work is Substantially Complete (except for minor items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Within a reasonable time thereafter, OWNER, ENGINEER and CONTRACTOR shall make a joint inspection of the Work to determine the status of Project completion. If ENGINEER does not consider the Work Substantially Complete, ENGINEER will promptly notify CONTRACTOR in writing giving the reasons therefore. If ENGINEER considers the Work Substantially Complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion

which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of pending Work items to be completed or corrected by CONTRACTOR before final payment ("punch-list"). OWNER shall have ten (10) calendar days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not Substantially Complete, ENGINEER will within twenty (20) calendar days after submission of the tentative certificate to OWNER, notify CONTRACTOR in writing, stating the reasons for no accomplishment of Substantial Completion. If, after consideration of OWNER's written objections regarding non-issuance of a Substantial Completion certificate, ENGINEER considers the Work Substantially Complete, ENGINEER will within said twenty (20) calendar days execute and deliver to OWNER and CONTRACTOR, a definitive certificate of Substantial Completion (with a final punch list of items to be completed or corrected) reflecting such changes from the tentative list as ENGINEER believes justified, after consideration of any objections from OWNER. At the time of delivery of the definitive certificate of Substantial Completion, ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to the division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to any Project security, operation, safety, maintenance, HVAC, utilities, insurance, warranties, and guarantees. OWNER and CONTRACTOR shall agree in writing regarding the final division of responsibilities, and so inform ENGINEER.

14.9 OWNER shall have the right to exclude CONTRACTOR from portions of the Project site after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to portions of the Work to complete or correct items on the final punch list.

Partial Utilization:

14.10 Use by OWNER of any finished part of the Work, which has specifically been identified in the Contract Documents, or which OWNER, ENGINEER and CONTRACTOR subsequently agree constitutes a separately functioning and useable part of the Work that can be utilized by OWNER without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work, subject to the following:

14.10.1 OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for OWNER's intended use and purpose and Substantially Complete. If CONTRACTOR agrees, CONTRACTOR will certify in writing to OWNER and ENGINEER that said part of the Work is Substantially Complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Additionally, CONTRACTOR at any time may notify OWNER and ENGINEER in writing, that CONTRACTOR considers any such part of the Work ready for OWNER's intended use and purpose, and substantially complete, and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after such CONTRACTOR request, OWNER, ENGINEER and CONTRACTOR shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER considers that part of the Work to be Substantially Complete, the provisions of paragraphs 14.8 and 14.9 will apply with respect to issuance of any certification of Substantial Completion for that part of the

Work, and finalizing the division of responsibilities and access thereto.

14.10.2 OWNER may at any time request CONTRACTOR in writing to permit OWNER to take over operation of any such part of the Work, although it is not Substantially Complete. A copy of such request will be sent to ENGINEER and within a reasonable time thereafter, OWNER, ENGINEER and CONTRACTOR shall make an inspection of that part of the Work to determine its status of completion and will prepare a punch-list of the items remaining to be completed or corrected thereon before final payment. If CONTRACTOR does not object in writing to OWNER and ENGINEER within seven (7) calendar days that such part of the Work is not ready for separate operation by OWNER, ENGINEER will finalize the list of items to be completed or corrected and will deliver such list to OWNER and CONTRACTOR, together with a written statement as to the division of responsibilities pending final payment between OWNER and CONTRACTOR, with respect to security, operation, safety, maintenance, HVAC, utilities, insurance, warranties and guarantees for that part of the Work, which will become binding upon OWNER and CONTRACTOR at the time when OWNER takes over such operation (unless they shall have otherwise agreed in writing and so informed ENGINEER). During such OWNER operation and prior to Substantial Completion of such part of the Work, OWNER shall allow CONTRACTOR reasonable access to complete or correct items on any punch list, and to complete other related Work.

14.10.3 No OWNER use, occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirements of paragraph 5.9 in respect of CONTRACTOR's property insurance notice and endorsement.

Final Inspection:

14.11 Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, ENGINEER will make a final inspection with OWNER and CONTRACTOR and will notify CONTRACTOR in writing of all particulars (a revised short-list) in which this inspection reveals that the Work is incomplete or defective. CONTRACTOR shall immediately take such corrective measures as are necessary to remedy such remaining deficiencies.

A qualified person(s) representing CONTRACTOR shall be present at this final inspection. Prior to this inspection, all Work shall have been completed, tested, adjusted and in final operating condition, if required by the Project Specifications.

Final Application for Payment:

14.12 After CONTRACTOR has completed all such final Work corrections to the satisfaction of ENGINEER and delivered certificates of inspection, marked-up record documents, if any, depicting as-built conditions (as provided in paragraph 6.21) and other important documents--all as required by the Contract Documents; and after ENGINEER has indicated that the Work is acceptable (subject to the provisions of paragraph 14.16), CONTRACTOR may make application for final payment following the procedure for monthly progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract

Documents, together with complete and legally effective releases or waivers (satisfactory to OWNER) of all third-party claims arising out of, or filed in connection with the Work. In lieu thereof and as approved by OWNER, CONTRACTOR may furnish third-party receipts or releases in full; a sworn affidavit of CONTRACTOR that the releases and receipts include prior CONTRACTOR payments for all labor, services, material and equipment for which a timely Payment Bond claim could be filed, and that all payrolls, material and equipment bills, and other CONTRACTOR indebtedness connected with the Work, for which OWNER or OWNER's property might in any way be encumbered, have been paid or otherwise satisfied; and a written consent of the Surety to OWNER's final payment, if any is required by CONTRACTOR's Surety. **IF ANY SUBCONTRACTOR OR SUPPLIER FAILS TO FURNISH CONTRACTOR A RELEASE OR RECEIPT IN FULL, CONTRACTOR MAY FURNISH A SPECIAL INDEMNITY BOND, OR OTHER COLLATERAL SATISFACTORY TO OWNER, TO INDEMNIFY, HOLD HARMLESS, AND FULLY PROTECT OWNER AGAINST ANY POTENTIAL THIRD-PARTY CLAIM.**

Final Payment and Acceptance:

14.13 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 (all as required by the Contract Documents), ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will, within twenty (20) calendar days after receipt of the final Application for Payment, indicate in writing, ENGINEER's recommendation to OWNER for payment and process the Application for Payment. Thereupon ENGINEER will give written notice to OWNER and CONTRACTOR that the Work is acceptable, subject to the provisions of paragraph 14.16. Otherwise, ENGINEER will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall promptly make the necessary corrections and resubmit the Application. Thirty (30) calendar days after presentation to OWNER of the final Application for Payment and accompanying documentation, in appropriate final form and substance, and with ENGINEER's recommendation and notice of acceptability, the final amount recommended by ENGINEER will become due and will be paid by OWNER to CONTRACTOR.

CONTRACTOR shall submit satisfactory evidence to the OWNER and ENGINEER that all payrolls, and other CONTRACTOR indebtedness connected with the Work have been paid, before a Final Certificate of Acceptance is issued.

14.14 If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed, and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.1, the written consent of the surety to the partial payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such Payment. Such partial payment

shall be made under the terms and conditions governing final payment, except that it shall not constitute a final waiver of claims by OWNER.

Contractor's Continuing Obligation:

14.15 CONTRACTOR'S obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or final payment by ENGINEER; nor the issuance of a Certificate of Substantial Completion or Final Acceptance; nor any payment by OWNER to CONTRACTOR under the Contract Documents; nor any use or occupancy of the Work or any part thereof by OWNER; nor any act of Work acceptance by OWNER; nor any failure to do so; nor the issuance of a notice of acceptability by ENGINEER pursuant to paragraph 14.13; nor any correction of defective Work by OWNER, will constitute an acceptance of Work not in accordance with the Contract Documents, or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents (except as provided in paragraph 14.16).

Waiver of Claims:

14.16 The making and acceptance of final payment will constitute:

14.16.1 a waiver of all claims by OWNER against CONTRACTOR, except any timely filed third party claims arising from unsettled payment bond claims; from latently defective Work appearing after final inspection pursuant to paragraph 14.11; or from failure to comply with the Contract Documents or the terms of any special guarantees specified therein; however, it will not constitute a waiver by OWNER of any rights regarding CONTRACTOR's continuing obligations under the Contract Documents; and

14.16.2 a waiver of all claims by CONTRACTOR against OWNER, other than those previously, properly, and timely made in writing and still unsettled.

ARTICLE 15 -- SUSPENSION OF WORK AND TERMINATION

Owner May Suspend Work:

15.1 OWNER may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than ninety (90) cumulative (not necessarily consecutive) calendar days by notice in writing to CONTRACTOR and ENGINEER, which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR may be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension, if CONTRACTOR demonstrates an approved claim therefore as provided in Articles 11 and 12. Any increase or decrease in the Contract Price shall be governed by all State and local laws, statutes, codes, ordinances, rules and regulations governing public competitive bidding and Change Orders.

Owner May Terminate:

15.2 Upon the occurrence of any one or more of the following events:

15.2.1 if CONTRACTOR commences a voluntary case under any chapter of the Bankruptcy Code (Title 11, United States Code), as now or hereafter in effect, or if CONTRACTOR takes any equivalent or similar action by filing a petition or otherwise, under any other federal or Texas law in effect at such time, relating to the bankruptcy or insolvency;

15.2.2 if a petition is filed against CONTRACTOR under any chapter of the Bankruptcy Code as now or hereafter in effect at the time of filing, or if a petition is filed seeking any such equivalent or similar relief against CONTRACTOR under any other federal or Texas law in effect at the time relating to bankruptcy or insolvency;

15.2.3 if CONTRACTOR makes a general assignment for the benefit of creditors;

15.2.4 if a trustee, receiver, custodian or agent of CONTRACTOR is appointed under applicable law or under contract, whose appointment or authority to take charge of the property of CONTRACTOR is for the purpose of enforcing a lien against such CONTRACTOR property, or for the purpose of general administration of such CONTRACTOR property, for the benefit of CONTRACTOR's creditors;

15.2.5 if CONTRACTOR admits in writing an inability to pay its debts generally as they become due;

15.2.6 if CONTRACTOR persistently fails to perform the Work in accordance with the Contract Documents (including but not limited to, failure to supply sufficient skilled workers or equipment, or failure to adhere to the Progress Schedule established under paragraph 2.9, as revised from time to time);

15.2.7 if CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;

15.2.8 if CONTRACTOR disregards the rights of OWNER; or

15.2.9 if CONTRACTOR otherwise violates in any substantial and material way, any provisions of the Contract Documents;

OWNER may, after giving CONTRACTOR and the surety seven (7) calendar days written notice, and to the extent permitted by Laws and Regulations: terminate the services of CONTRACTOR; exclude CONTRACTOR from the Project site and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment and machinery at the Project site; and use the same to the full extent they could be used by CONTRACTOR (without OWNER liability to CONTRACTOR for trespass or conversion), and finish the Work as OWNER may deem expedient. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds the OWNER's direct, indirect and consequential costs of completing the Work (including but not limited to fees and charges of ENGINEER, other engineers, architects, attorneys and other professionals and court

costs), such excess will be paid to CONTRACTOR or surety. If such OWNER costs exceed such unpaid balance of the Contract Price, CONTRACTOR or surety shall pay the difference to OWNER. Such costs incurred by OWNER will be approved as to reasonableness by ENGINEER and incorporated in a Change Order, but when exercising any rights or remedies under this paragraph, OWNER shall not be required to obtain the lowest price for the Work performed.

15.3 Where CONTRACTOR's services have been so terminated by OWNER, that termination will not affect any rights or remedies of OWNER under this continuing Agreement against CONTRACTOR then existing, or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by OWNER will not release CONTRACTOR from ongoing liability under this Agreement.

15.4 Upon seven (7) calendar days written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy, elect to abandon the Work and terminate the Agreement for OWNER's convenience. In such case, CONTRACTOR shall mitigate demobilization costs as best as possible and be paid for all Work properly executed and expenses sustained, plus reasonable termination expenses, which will include, but not be limited to, direct, indirect and consequential costs (including, but not limited to, fees and charges of CONTRACTOR's engineers, architects, attorneys and other professionals).

ARTICLE 16 -- TIME FOR SUBSTANTIAL COMPLETION AND LIQUIDATED DAMAGES.

16.1. IT IS HEREBY UNDERSTOOD AND MUTUALLY AGREED, BY AND BETWEEN THE PARTIES HERETO, THAT THE DATE OF BEGINNING, RATE OF PROGRESS AND THE TIME FOR SUBSTANTIAL COMPLETION OF THE WORK TO BE PERFORMED HEREUNDER ARE ESSENTIAL CONDITIONS OF THIS CONTRACT; and it is further mutually understood and agreed, by and between the Parties hereto, that the time to perform the Work embraced in this Contract shall be commenced on a date to be specified in the Notice to Proceed.

16.2 CONTRACTOR hereby agrees that said Work shall be prosecuted regularly, diligently, and uninterrupted at such rate of progress as will insure Substantial Completion thereof within the time specified. It is expressly understood and mutually agreed, by and between the Parties hereto, that the time for the Substantial Completion of the Work described herein in calendar days is a reasonable time for Substantial Completion of same, taking into consideration the average climatic range and weather conditions the CONTRACTOR must reasonably anticipate is already included in the calculation of the performance time specified herein, and CONTRACTOR has assessed the usual industrial and labor conditions prevailing in the Cameron County area.

16.3 If CONTRACTOR shall neglect, fail or refuse to Substantially Complete the Work within the mutually agreed to time herein specified, then CONTRACTOR does hereby agree, as a part of the consideration for the awarding of this Contract, to pay the OWNER the mutually agreed to amount specified in the Construction Agreement, not as a penalty, but as liquidated damages for such breach of Contract for each and every calendar day that CONTRACTOR shall be in

default, after the time stipulated in the Contract Documents for Substantially Completing the Work.

16.4 The damage to OWNER by reason of this Work not being Substantially Completed as of the mutually agreed to performance time period are incapable of definite ascertainment by either Party, and therefore the Parties hereto have mutually fixed and limited such damages to the sum stipulated in the Construction Agreement for each calendar day the Project runs beyond such Substantial Completion date, and the mutual agreement for such damages constitutes a part of the consideration for entering the Agreement. It is further mutually agreed that **TIME IS OF THE ESSENCE** for each and every portion of this Agreement and of the Specifications, wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract, any additional time is allowed for the Substantial Completion of any Work, the new time fixed by such extension shall also be **OF THE ESSENCE** for this Agreement. Provided that CONTRACTOR shall not be assessed with the mutually agreed to liquidated damages or any excess cost when the delay in the Substantial Completion of Work is due:

16.4.1 To any preference, priority or allocation order duly issued by the United States Federal Government.

16.4.2 To unforeseeable causes beyond the control and without the fault or negligence of CONTRACTOR, including, but not restricted to: Acts of God; or of the public enemy; acts of the OWNER; acts of another contractor in the performance of a separate contract with the OWNER; fires; floods exceeding the 100 year frequency in Cameron County, Texas; epidemics; quarantine restrictions; strikes; freight embargoes and unusually severe weather not customary for the Cameron County, Texas area and not already included in the calculation of the performance time specified herein.

16.4.3 To any delays of Subcontractors and/or CONTRACTOR's equipment/material suppliers occasioned by any of the causes specified in 16.4.1 or 16.4.2.

16.4.4 Provided further, that CONTRACTOR shall immediately attempt to mitigate the impacts of the delay, and within seven (7) calendar days from the beginning of such delay, notify OWNER, in writing, of the causes for the delay. ENGINEER and OWNER shall then ascertain the facts and extent of the delay and OWNER will notify CONTRACTOR within a reasonable time of OWNER's decision in the matter regarding any adjustment to the Contract Time and a mutually acceptable Project Schedule recovery plan.

ARTICLE 17 -- MISCELLANEOUS

Giving Notice:

17.1 Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly performed if delivered in person to the CONTRACTOR's Project Superintendent or mailed to an officer of the corporation in the case of the CONTRACTOR; or to the General Manager and CEO of the BPUB in the case of the OWNER; or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address

known to the provider of the notice. **PROVIDING TIMELY NOTICE AS REQUIRED BY THE NUMEROUS PARAGRAPHS HEREIN IS A MUTUALLY AGREED TO ESSENTIAL TERM OF THIS CONTRACT FOR BOTH PARTIES, AND FAILURE TO PROVIDE SAME CONSTITUTES A MATERIAL BREACH OF THE CONTRACT AND A WAIVER OF CERTAIN REMEDIES THAT OTHERWISE WOULD HAVE BEEN AVAILABLE TO A PARTY HEREUNDER HAD PROPER TIMELY NOTICE BEEN PROVIDED.**

Computation of Calendar Day Time:

17.2 When any period of time is referred to in the Contract Documents by "days", and the OWNER'S format for scheduling the performance time on the Project is by utilizing calendar days in lieu of "working days," it will be computed as calendar days, to exclude the first and include the last calendar day of such measured period. If the last calendar day of any such period falls on a calendar day listed as a local BPUB holiday by the Contract Documents, such calendar day will be omitted from the computation.

17.2.1 A calendar day consists of twenty-four (24) hours and is measured from midnight on one day, to the next midnight, and shall constitute a single calendar day.

General:

17.3 Should OWNER suffer injury or damage to person or property because of any error, omission or negligent act of the CONTRACTOR, or of any of the CONTRACTOR's, Subcontractor's, employees or agents, or others for whose negligent acts and/or omissions CONTRACTOR is legally liable, OWNER's claim will be made in writing to the CONTRACTOR within a reasonable time of the first occurrence or observation of such injury or damage. The provisions of this paragraph 17.3 shall not be construed as a substitute for, or a waiver of, the legal provisions of any applicable statute of limitations or repose.

17.4 The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the Parties hereto, and, in particular but without limitation, the conditions, warranties, guarantees and obligations imposed upon CONTRACTOR by paragraphs 6.32, 13.1, 13.12, 13.14, 14.3 and 15.2, and all of the rights and remedies available to OWNER thereunder; are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to OWNER which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this paragraph 17.4 will be as effective as if repeated specifically in all the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply. All representations, conditions, warranties and guarantees made in the Contract Documents will survive the execution, final payment and termination or completion of the Agreement. All CONTRACTOR recitations contained in any document required by OWNER, whether delivered at the time of the execution of the Construction Agreement, or at a later date, shall constitute legal and binding representations, warranties and guarantees by CONTRACTOR herein.

17.5 CONTRACTOR shall comply with the "anti-kickback" provisions of the Copeland Act now codified at 18 U. S. C. A. §874, and all amendments or modifications of the original Act of June 13, 1934.

SUPPLEMENTARY CONDITIONS

SECTION 1 - WAGE AND LABOR STANDARD PROVISIONS - 100% NON - FEDERALLY FUNDED CONSTRUCTION

Contents

1. GENERAL STATEMENT

This is a 100% Non-Federally funded and competitively bid Public Works Contract and Article 5159a, Revised Civil Statutes of Texas, as amended, requires that not less than the general prevailing wage rates (minimum hourly base pay and minimum hourly fringe benefit contribution) for work of similar character be paid to Contractor and Subcontractor employees. These local prevailing and adopted wage rates are derived from the most current applicable federal prevailing wage rates for Cameron County, Texas as published by the United States Department of Labor, (DOL) Dallas, Texas. Copies of the wage rates applicable to the Project at the time of bidding are contained at the end of this Supplementary Conditions Section 1, and are included instruments of this Contract and full compliance with same shall be required.

Any deviation from Wage and Labor Standard Provisions compliance may be cause for OWNER's withholding either interim or final payment to the CONTRACTOR until such deviations are properly corrected.

2. OWNER'S FINANCE DEPARTMENT WAGE & HOUR OFFICE, PROJECT RESPONSIBILITIES

The OWNER's FINANCE DEPARTMENT is primarily responsible for all Wage and Labor Standard Provisions investigation and enforcement and will monitor CONTRACTOR/Subcontractor practices to assure the OWNER that:

a. Appropriate weekly compliance statements and payroll records are submitted to the OWNER by the CONTRACTOR/Subcontractors and that such are reviewed for compliance with Wage and Labor Standard Provisions.

b. Apprentices/trainees working on the Project are properly identified by CONTRACTOR/Subcontractor on payroll records and documented as being included in programs currently sanctioned by appropriate federal or Texas regulatory agencies.

c. Applicable Wage Determination Decisions, including any applicable modifications, and related statements are posted at the Project Work site by the CONTRACTOR and that proper job classifications and commensurate minimum hourly base and any applicable fringe wage rates are paid.

d. Employees are periodically interviewed (at random) on each Project as required.

e. That no person employed by CONTRACTOR/Subcontractor is induced against his will, by any means, to give up any part of the compensation to which he is otherwise entitled.

f. That any and all periodic administrative directives to the Wage & Hour Monitor (TITLE) from the OWNER's Finance Department and Board of Trustees are being implemented.

3. CLAIMS & DISPUTES PERTAINING TO WAGE RATES

Claims and disputes not promptly and routinely settled by the CONTRACTOR/Subcontractor and employees pertaining to wage rates, or to job classifications of labor employed upon the Work covered by this Contract, shall be reported by the employee in writing, within sixty (60) Calendar Days of employee's receipt of any allegedly incorrect classification, wage or benefit report, to the Wage & Hour Monitor for further investigation. Claims and disputes not reported by the employee to the Wage & Hour Monitor in writing within the sixty (60) Calendar Day period shall be deemed waived by the employee for the purposes of the OWNER administering and enforcing the OWNER's Contract rights against the CONTRACTOR on behalf of the employee. Waiver by the employee of this OWNER intervention shall not constitute waiver by the OWNER or employee to independently pursue contractual rights it has against the CONTRACTOR/Subcontractor for breach of Contract and other sanctions available to enforce the Wage and Labor Standard Provisions.

4. BREACH OF WAGE AND LABOR STANDARD PROVISIONS

The OWNER reserves the right to terminate this Contract for cause if the CONTRACTOR/Subcontractors shall knowingly and continuously breach, without timely restitution or cure, any of these governing Wage and Labor Standard Provisions. A knowing and unremedied proven violation of these Wage and Labor Standard Provisions may also be grounds for a "non-responsibility" determination by OWNER thereby jeopardizing CONTRACTOR/Subcontractor from future OWNER contracts for lack of responsibility to perform future work, as determined by the OWNER. Recurrent violations, whether remedied or not, will be considered by the OWNER when assessing the responsibility history of a potential contractor/subcontractor prior to competitive award of future OWNER Public Works projects. The general OWNER remedies stated in this paragraph 4. above, are not exhaustive and not cumulative, for the OWNER reserves legal and contractual rights to other specific remedies outlined herein below and in other parts of this Contract and as are allowed by applicable OWNER resolutions, Texas and federal statutes.

5. EMPLOYMENT OF LABORERS/MECHANICS NOT LISTED IN WAGE DETERMINATION DECISION

In the event the CONTRACTOR/Subcontractor discovers that construction of a particular Work element requires a certain employee classification and skill that is not listed in the wage determination decision contained in the original Contract Documents, CONTRACTOR/Subcontractors will make prompt inquiry (at least twenty-one (21) Calendar Days before bidding, if possible) to the OWNER identifying that class of laborers/mechanics not listed in the current pre-bid wage determination decision who are intended to be employed, or who are being employed, under the Contract. Using his best judgment and information resources available to him at the time, and any similar, prior OWNER or Federal Department of Labor decisions, the Wage & Hour Monitor, shall

classify said laborers/mechanics by issuing a special local wage determination decision to the bidders or CONTRACTOR/Subcontractor, which shall be enforced by the OWNER.

6. MINIMUM WAGE

All laborers/mechanics employed to construct the Work governed by this Contract shall be paid not less than weekly the full amount of wages due (minimum hourly base pay and any applicable minimum hourly fringe benefit contribution for all hours worked, including overtime) for the immediately preceding pay period, computed at wage and fringe rates not less than those contained in the wage determination decision included in this Contract. Only payroll deductions as are mandated by Texas or federal law, and those legal deductions previously approved in writing by the employee, or as are otherwise permitted by Texas or federal law, may be withheld by the CONTRACTOR/Subcontractor.

Should the CONTRACTOR/Subcontractor subscribe to fringe benefit programs for employees, such programs shall be fully approved by the OWNER in adopting a previous U.S. Department of Labor decision on such fringe benefit programs or by applying DOL criteria, in rendering a local decision on the adequacy of the fringe benefit programs. The approved programs shall be in place at the time of OWNER's Contract execution and the provisions thereof shall be disclosed to the CONTRACTOR, for legal review prior to Project commencement, if a written request for same is submitted by CONTRACTOR/Subcontractor prior to CONTACTOR's execution of the Construction Agreement.

Regular CONTRACTOR/Subcontractor contributions made to, or costs incurred for, approved fringe benefit plans, funds or other benefit programs that cover periods of time greater than the one week payroll period (e.g. monthly or quarterly, etc.) shall be prorated by the CONTRACTOR/Subcontractor on weekly CONTRACTOR payroll records to reflect the equivalent value of the hourly and weekly summary of fringe benefits per employee.

7. OVERTIME COMPENSATION ON NON-FEDERALLY FUNDED PROJECTS

No CONTRACTOR/Subcontractor contracting for any part of the federally funded Contract Work (except for Project site related security guard services), which may require or involve the employment of laborers/mechanics, shall require or permit any laborer/mechanic in any seven (7) Calendar Day Work period in which he, she is employed on such Work, to Work in excess of forty (40) hours in such Work period, unless said laborer/mechanic receives compensation at a rate not less than one and one-half (1 ½) times the basic hourly rate of pay for all hours worked in excess of forty (40) hours in a seven (7) Calendar Day Work period. Any applicable fringe benefits must be paid for straight time and overtime; however, fringe benefits are not included when computing the overtime rate. Salaried employees performing labor or mechanic work on this contract may NOT be exempted from overtime.

8. PAYMENT OF CASH EQUIVALENT FRINGE BENEFITS

The CONTRACTOR/Subcontractor is allowed to pay a minimum hourly cash equivalent of any applicable minimum hourly fringe benefits listed in the wage determination decision, in lieu of the contribution of benefits to a permissible fringe benefit plan, for all hours worked, including overtime, as described in paragraphs 6. and 7. above. An employee is not allowed to receive less than the minimum hourly basic rate of pay specified in the applicable wage determination decision.

9. WORK CONDUCTED ON HOLIDAYS-

If a laborer/mechanic is employed in the normal course and scope of his or her Work on the jobsite on New Year's Day, Martin Luther King Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Christmas Day, or any additional local OWNER holidays specified by the OWNER in the Contract Documents or the Calendar Days observed as such in any given year, Work shall be paid for at no less than one and one-half (1 1/2) times the regular minimum hourly base pay regardless of the total number of hours the laborer/mechanic has accumulated during the pay period.

10. UNDERPAYMENT OF WAGES OR SALARIES

a. When a "full investigation" (as called for in and as construed under Article 5159a, Sec. 2 and as may be further generally described in any administrative directive to the Wage & Hour Monitor from the OWNER), evidences underpayment of wages by CONTRACTOR/Subcontractor to laborers/mechanics employed upon the Work covered by this Contract, the OWNER, in addition to such other rights as may be afforded it under Texas and/or federal law and/or this Contract, shall withhold from the CONTRACTOR, out of any payments (interim progress and/or final) due the CONTRACTOR, so much thereof as the OWNER may consider necessary to secure ultimate payment by the appropriate entity to such laborers/mechanics, of full wages required by this Contract, plus possible penalty (See b. below). The amount so withheld, excluding any possible penalty to be retained by the OWNER, may be disbursed at an appropriate time after "full investigation" by the Wage & Hour Monitor, for and on behalf of the CONTRACTOR/Subcontractor (as may be appropriate), to the respective laborers/mechanics to whom the same is due, or on their behalf to fringe benefit plans, funds, or programs for any type of minimum fringe benefits prescribed in the applicable wage determination decision.

b. Article 5159a, Revised Civil Statutes of Texas, as amended, states that the CONTRACTOR shall forfeit as a penalty to the OWNER the sum of sixty dollars ($60.00) for each Calendar Day, or portion thereof, for each laborer, workman, or mechanic, who is paid less than the said stipulated rate for any Work done under this Contract, whether by the CONTRACTOR himself, or by any Subcontractor working under him. Pursuant to and supplemental to this statutory authority, the OWNER and the CONTRACTOR/Subcontractor contractually acknowledge and agree that said sixty dollar ($60.00) statutory penalty shall apply to any violations

of paragraphs 6,7, or 9 herein, resulting from CONTRACTOR/Subcontractor underpayment violations.

c. If unpaid or underpaid workers cannot be located by the CONTRACTOR/Subcontractor or the OWNER after diligent efforts to accomplish same, unpaid or underpaid wages shall be reserved by the OWNER in a special "unfound worker's account" established by the OWNER, for such CONTRACTOR/Subcontractor employees. If after one (1) year from the final acceptance of the Project by the OWNER, workers still cannot be located, in order that the OWNER can make effective interim re-use of the penalty money, such wages and any associated statutory penalties may be used to defray actual costs incurred by the OWNER in attempting to locate said workers, and any remaining monies may then revert back to the OWNER's original funding source for the Project. However, unpaid or underpaid workers for which money was originally reserved are eligible to claim recovery from the OWNER for a period of not-to-exceed three (3) years from the final acceptance of the Project by the OWNER. Claimant recovery after expiration of the three (3) year period is prohibited.

11. DISPLAYING WAGE DETERMINATION DECISIONS/AND NOTICE TO LABORERS/MECHANICS STATEMENT

The applicable wage determination decision(s) as described at the end of this Supplementary Conditions Section 1 (and as specifically included in each project contract), outlining the various worker classifications and mandatory minimum wages and minimum hourly fringe benefit deductions, if any, of laborers/mechanics employed and to be employed upon the Work covered by this CONTRACT, shall be displayed by the CONTRACTOR/Subcontractor at the site of Work in a conspicuous and prominent public place, readily and routinely accessible to workers for the duration of the Project. In addition, the CONTRACTOR/Subcontractor agrees with the contents of the following statement, and shall display same, in English and Spanish, near the display of the wage determination decision at the Project site of Work:

NOTICE TO LABORERS/MECHANICS

Both the Brownsville Public Utilities Board and the CONTRACTOR/Subcontractor agree that you must be compensated with not less than the minimum hourly base pay and any required minimum hourly fringe benefit contribution in accordance with the wage rates publicly posted at this jobsite, and as are applicable to the classification of Work you perform.

Additionally, you must be paid not less than one and one-half times (1 ½) your basic hourly rate of pay for any hours worked over 40 in any seven (7) Calendar Day Work period, and for any Work conducted on New Year's Day, Martin Luther King Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, and Christmas Day and other possible locally observed holiday(s), or the Calendar Days observed as such in any given year.

Apprentice and trainee hourly wage rates and ratios apply only to apprentices and trainees recognized under approved Federal, or State, apprenticeship training programs registered with the Bureau of Apprenticeship and Training, U.S. Dept. of Labor.

If you believe that your employer is not paying the posted minimum wage for the type of Work you do, you must make direct inquiry to your employer and also inquire in writing, within sixty (60) Calendar Days of your receipt of any allegedly incorrect wage or benefit check or report, to the BPUB Wage & Hour Monitor. It is mandatory that you promptly file written inquiry of any allegedly incorrect wage or benefit checks or reports with the BPUB's Wage & Hour Monitor within the sixty (60) Calendar Day period, so that you do not waive your potential right of recovery under the provisions of the BPUB's construction Contract that governs this Project.

Both the BPUB and the CONTRACTOR/Subcontractor agree that no laborer/mechanic who files a complaint or inquiry concerning alleged underpayment of wages or benefits, shall be discharged by the employer, or in any other manner be discriminated against by the employer, for filing such complaint or inquiry.

12. PAYROLLS & BASIC PAYROLL RECORDS

a. The CONTRACTOR and each Subcontractor shall prepare payroll reports in accordance with the "General Guideline" instructions furnished by the OWNER of the Project. Such payroll submittals shall contain the name and address of each such employee, his correct labor classification, rate of pay, daily and weekly number of hours worked, any deductions made, and actual basic hourly and fringe benefits paid. The CONTRACTOR shall submit payroll records each week, and no later than seven (7) working days following completion of the workweek being processed, to the OWNER. These payroll records shall include certified copies of all payrolls of the CONTRACTOR and of his Subcontractors, it being understood that the CONTRACTOR shall be responsible for the submission and general mathematical accuracy of payrolls from all of his Subcontractors. Each such payroll submittal shall be on forms deemed satisfactory to the Wage & Hour Monitor and shall contain a "Weekly Statement of Compliance", as called for by the Contract Documents. Such payrolls will be forwarded to the Wage & Hour Monitor.

b. Copies of payroll submittals and basic supporting payroll records of the CONTRACTOR/Subcontractors accounting for all laborers/mechanics employed under the Work covered by this Contract, shall be maintained by CONTRACTOR/Subcontractor during the course of the Work, and preserved for a period of three (3) years after completion of the Project. The CONTRACTORS/Subcontractors shall maintain records which demonstrate: any contractor commitment to provide fringe benefits to employees as may be mandated by the applicable wage determination decision; that the plan or program is adjudged financially responsible by the appropriate approving authority, (i.e. U.S. Department of Labor, U.S. Department of Treasury, etc.); and that the provisions, policies, certificates, and description of benefits of the plan or program as may be periodically amended, have been clearly communicated in a timely manner and in writing, to the laborers/mechanics affected, prior to their performing Work on the Project.

c. The CONTRACTOR/Subcontractor shall make the above records available for inspection, copying, or transcribing by the Wage & Hour Monitor of the OWNER at reasonable times and locations for purposes of monitoring compliance with this Contract.

13. LABOR DISPUTES

The CONTRACTOR/Subcontractor shall immediately notify the Wage & Hour Monitor or his designated representative of any actual or impending CONTRACTOR/Subcontractor labor dispute which may affect, or is affecting, the Project Performance Schedule of the CONTRACTOR's or any Subcontractor's Work. In addition, the CONTRACTOR/Subcontractor shall consider all appropriate measures to eliminate or minimize the effect of such labor disputes on the Project Progress Schedule, including but not limited to such measures as: promptly seeking injunctive relief if appropriate; seeking appropriate legal or equitable actions or remedies; taking such measures as establishing a reserved gate, as appropriate; if reasonably feasible, seeking other sources of supply or service; and any other measures that may be appropriately utilized to mitigate or eliminate the adverse Project jobsite and scheduling effects of the labor dispute.

14. COMPLAINTS, PROCEEDINGS, OR TESTIMONY BY EMPLOYEES

No laborers/mechanics to whom the wage, salary, or other labor standard provisions of this Contract are applicable shall be discharged, or in any other manner discriminated against by the CONTRACTOR/Subcontractors, because such employee has filed any formal inquiry or complaint, or instituted or caused to be instituted, any legal or equitable proceeding, or has testified, or is about to testify, in any such proceeding under or relating to the wage and labor standards applicable under this Contact.

15. EMPLOYEE INTERVIEWS TO ASSURE WAGE AND LABOR STANDARD COMPLIANCE

CONTRACTOR/Subcontractors shall allow expeditious jobsite entry of the Wage & Hour Monitor displaying and presenting proper OWNER identification credentials to the jobsite superintendent or his representative. While on the jobsite, the Wage & Hour Monitor shall observe all CONTRACTOR jobsite rules and regulations concerning safety, internal security and fire prevention. CONTRACTOR/Subcontractors shall allow Project employees to be separately and confidentially interviewed at random for a reasonable duration of time by the Wage & Hour Monitor to facilitate compliance determinations regarding adherence by the CONTRACTOR/Subcontractor to these Wage and Labor Standard Provisions.

16. "ANTI-KICKBACK" PROVISION

No person employed in the construction or repair of any OWNER public works Project shall be induced, by any means, to give up to any CONTRACTOR/Subcontractor or public

official or employee, any part of the hourly and/or fringe benefit compensation to which he or she is otherwise entitled.

17. "FALSE OR DECEPTIVE INFORMATION" PROVISION

Any person employed by the CONTRACTOR/Subcontractor in the construction or repair of any OWNER public works Project, who is proven to have knowingly and willfully falsified, concealed or covered up by any deceptive trick, scheme, or device a material fact, or made any false, fictitious or fraudulent statement or representation, or made or used any false writing or document knowing the same to contain any false, fictitious or fraudulent statement or entry, shall be permanently removed from the Project jobsite by the CONTRACTOR/Subcontractor. The OWNER reserves the right to terminate this Contract for cause as a result of serious and uncured violations of this provision.

18. EMPLOYMENT OF APPRENTICES/TRAINEES

a. Apprentices will be permitted to work at less than the predetermined rate for the Work they perform when they are employed and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship & Training, or with a Texas Apprenticeship Agency recognized by the Bureau, or if a person is employed in his first ninety (90) Calendar Days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship & Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen in any craft classification shall not be greater than the ratio under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not a trainee as defined in (b) below, or is not registered or otherwise employed as stated above, shall be paid the wage rate for the classification of Work he actually performs. The CONTRACTOR/Subcontractor is required to furnish to the Wage & Hour Monitor of the OWNER, a copy of the certification, along with the payroll record that the employee is first listed on. The wage rate paid apprentices shall be not less than the specified rate in the registered program for the apprentice's level of progress expressed as the appropriate percentage of the journeyman's rate contained in the applicable wage determination decision.

b. Trainees will be permitted to work at less than the predetermined rate for the Work performed when they are employed pursuant to an individually registered program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen shall not be greater than that permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress. Any employee listed on the payroll at a trainee wage rate, who is not registered and participating in a training plan approved by the Employment and Training Administration, shall be paid not less than the wage rate determined by the classification of Work he actually performs. The

CONTRACTOR/Subcontractor is required to furnish a copy of the trainee program certification, registration of employee-trainees, ratios and wage rates prescribed in the program, along with the payroll record that the employee is first listed on, to the Wage & Hour Monitor of the OWNER. In the event the Employment and Training Administration withdraws approval of a training program, the CONTRACTOR/Subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the Work performed until an acceptable program is approved by the Employment and Training Administration.

c. Paragraphs 18.a. and b. above shall not operate to exclude training programs approved by the OFCCP, United States Department of Labor and as adopted by the Associated General Contractors (AGC) of Texas, Highway, Heavy, Utilities and Industrial Branch. Guidelines for these training programs shall be the same as those established for federally funded projects. This sub-paragraph 15.c. shall not apply to those portions of a project deemed to be building construction.

d. **RATIOS, APPRENTICE TO JOURNEYMAN:**

The Ratio of Apprentice to Journeyman for this Project shall be the same as the Ratio permitted under the plan approved by the Employment and Training Administration, Bureau of Apprenticeship and Training, U.S. Department of Labor, by craft. A copy of the allowable Ratios is included with the applicable Wage Determination Decision at the end of this Supplementary Conditions Section 1.

When a "full investigation" (as called for in, and as construed under Article 5159a, Sec. 2), evidences a violation of the Apprentice or Trainee to Journeyman ratios effective for CONTRACTOR/Subcontractor employees working on this Contract, the OWNER, in addition to such other rights as may be afforded it under Texas and/or federal law and/or other sections of this Contract (especially paragraph 10 Underpayment of Wages), shall withhold from the CONTRACTOR, out of any payments (interim progress and/or final) due the CONTRACTOR, the liquidated damages (not a penalty) sum of seventy-five dollars ($75.00) for each Calendar Day, or portion thereof, for each certified Apprentice or Trainee employee assigned to a Journeyman that exceeds the maximum allowable Apprentice/Trainee to Journeyman ratio stipulated for any Work done under this Contract, whether by the CONTRACTOR himself, or by any Subcontractor working under him.

19. JOBSITE CONDITIONS

CONTRACTORS/Subcontractors will not allow any person employed for the Project to work in surroundings or under construction conditions which are unsanitary, unhealthy, hazardous, or dangerous as governed by industry standards and appropriate local, Texas and federal statutes, ordinances, and regulatory guidelines.

20. EMPLOYMENT OF CERTAIN PERSONS PROHIBITED

a. The CONTRACTOR/Subcontractor shall knowingly only employ persons of appropriate ages commensurate with the degree of required skill, strength, maturity and judgment associated with the activity to be engaged in, but not less than the age of fourteen (14) years, as governed by Chapter 51 "Employment of Children", Texas Labor Code, (Vernon's Texas Codes Annotated) (as may be amended), and Texas Department of Labor and Standards rulings and interpretations associated with that statute. It is hereby noted that in some circumstances generally governed by this paragraph, a federal statute (see: Fair Labor Standards Act, 29 USCS Section 212; Volume 6A of the Bureau of National Affairs Wage Hour Manual at Paragraph 96:1; "Child Labor Requirements in Nonagricultural Occupations" WH Publication 1330, July 1978 as may be amended), could pre-empt the Texas Statute and therefore be the controlling law on this subject. The CONTRACTOR/Subcontractor should seek clarification from Texas and federal agencies and legal counsel when hiring adolescent employees for particular job classifications.

b. Prohibited persons not to be employed are also those persons who, at the time of employment for this Contract, are serving sentence in a penal or correctional institution, except that prior approval by the Wage & Hour Monitor is required to employ any person participating in a supervised work release or furlough program that is sanctioned by appropriate Texas or federal correctional agencies.

c. The CONTRACTOR/Subcontractors shall be responsible for compliance with the provisions of the "Immigration Reform and Control Act of 1986" Public Law 99-603, and any related Texas enabling or implementing statutes, especially as they apply in combination to the unlawful employment of aliens and unfair immigration-related employment practices affecting this Contract.

21. PROVISIONS TO BE INCLUDED IN SUBCONTRACTS

The CONTRACTOR shall cause these Wage and Labor Standard Provisions, or reasonably similar contextual adaptations hereof, and any other appropriate Texas and federal labor provisions, to be inserted (or referenced by "flow down" provisions) in all subcontracts relative to the Work to bind Subcontractors (and any sub-tier subcontractors) to the same Wage and Labor Standards as contained in these Supplementary Conditions and other Contract Documents insofar as applicable to the Work of Subcontractors or sub-tier subcontractors, and to give the CONTRACTOR similar, if not greater, general contractual authority over the Subcontractor, or sub-tier subcontractors, as the OWNER may exercise over the CONTRACTOR.

<INSERT APPLICABLE DAVIS BACON WAGE RATES>

"General Decision Number: TX20230003 01/06/2023

Superseded General Decision Number: TX20220003

State: Texas

Construction Types: Heavy and Highway

Counties: Cameron, Hidalgo and Webb Counties in Texas.

HEAVY & HIGHWAY CONSTRUCTION PROJECTS

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 $16.20 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 2023.
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 $12.15 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 2023.

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 http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/06/2023

SUTX2011-003 08/02/2011

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER (Paving & Structures)	$ 12.46 **	
FORM BUILDER/FORM SETTER (Structures)	$ 12.30 **	
FORM SETTER (Paving & Curb)	$ 12.16 **	
LABORER		
Asphalt Raker	$ 10.61 **	
Flagger	$ 9.10 **	
Laborer, Common	$ 9.86 **	
Laborer, Utility	$ 11.53 **	
Pipelayer	$ 11.87 **	
Work Zone Barricade Servicer	$ 12.88 **	
POWER EQUIPMENT OPERATOR:		
Asphalt Distributor	$ 13.48 **	
Asphalt Paving Machine	$ 12.25 **	
Broom or Sweeper	$ 10.33 **	
Crane, Lattice Boom 80 Tons or Less	$ 14.39 **	
Crawler Tractor	$ 16.63	
Excavator, 50,000 lbs or less	$ 12.56 **	
Excavator, over 50,000 lbs	$ 15.23 **	
Foundation Drill, Truck Mounted	$ 16.86	
Front End Loader Operator, Over 3 CY	$ 13.69 **	
Front End Loader, 3 CY or less	$ 13.49 **	

Loader/Backhoe.....$ 12.77 **
Mechanic.....$ 15.47 **
Milling Machine.....$ 14.64 **
Motor Grader Operator,
Rough.....$ 14.62 **
Motor Grader, Fine Grade....$ 16.52
Scraper.....$ 11.07 **

Servicer.....$ 12.34 **

Steel Worker (Reinforcing).....$ 14.07 **

TRUCK DRIVER
Lowboy-Float.....$ 13.63 **
Single Axle.....$ 10.82 **
Single or Tandem Axle Dump..$ 14.53 **
Tandem Axle Tractor with
Semi Trailer.....$ 12.12 **

WELDER.....$ 14.02 **

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 ($16.20) or 13658 ($12.15). 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"

PART II – TECHNICAL SPECIFICATIONS

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PART II – TECHNICAL SPECIFICATIONS

DESCRIPTION

DIVISION 33

33 01 30.23 – PIPE BURSTING

33 05 16 – CONCRETE FOR UTILITY CONSTRUCTION

33 05 39.23 – REINFORCED CONCRETE PIPE

33 05 61 – UTILITY STRUCTURES

33 14 13 – WATERLINE PIPE WORK

33 31 11 – SANITARY SEWER PIPE WORK

33 39 30 – FIBERGLASS MANHOLES

DIVISION 40

40 05 00 – BASIC MECHANICAL REQUIREMENTS

40 05 31 – PVC, CPVC PIPE

40 05 33 – HIGH DENSITY POLYETHYLENE (HDPE)

40 05 51 – VALVES, GENERAL

40 05 61 – GATE VALVES

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SECTION 01 11 00

SUMMARY OF WORK

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Summary
2. Location and Description of Work
3. Construction Contracts, This Project
4. Construction Contracts, Other Projects
5. Work by Others
6. Work by Owner
7. Owner Furnished Equipment and Materials
8. Owner Assigned Procurement Contracts
9. Owner Pre-selected Equipment and Materials
10. Sequence and Progress of Work
11. Contractor's Use of Site
12. Easements and Rights-of-Way
13. Notices to Owners and Authorities of Properties Adjacent to the Work
14. Salvage of Equipment and Materials
15. Partial Utilization by Owner

1.02 LOCATION AND DESCRIPTION OF WORK

A. The Work is located at the following Site:

1. Project Site Name: Downtown Water and Wastewater Project 2
2. Multiple locations in downtown Brownsville including:

a. Along 10th Street between Levee Street and Jefferson Street (water)

b. Along 11th Street between Washington Street and Adams Street (water)

c. Along 12th Street between Elizabeth Street and Washington Street and between Adams Street and Jefferson Street (water)

d. Along 13th Street between Elizabeth Street and Washington Street (water)

e. Along the alley located between Elizabeth Street and Washington Street from 7th Street to International Boulevard (sewer)

f. Along the alley between Washington Street and Adams Street from 7th Street to 11th Street (sewer)

g. Along 10th Street between Elizabeth Street and Adams Street (sewer)

h. Along 11th Street between Washington Street and Adams Street (sewer)

i. Along 12th Street between Elizabeth Street and Jefferson Street (sewer)

3. Locations are approximate and actual limits of work shall be as shown on the Drawings.

B. The Work to be performed under this Contract includes, but is not limited to, constructing the Work described below and all appurtenances related to the Work. The Work shall be as follows:

1. Installation of approximately 328 linear feet of 8" PVC waterline and service connections in 13th Street between Elizabeth and Washington Street.

2. Installation of approximately 326 linear feet of 8" PVC waterline and service connections in 12th Street between Elizabeth and Washington Street.

3. Installation of approximately 321 linear feet of 8" PVC waterline and service connections in 12th Street between Adams and Jefferson Street.

4. Installation of approximately 968 linear feet of 8" PVC waterline and service connections in 10th Street between Levee and Adams Street.

5. Installation of new water service connections in 11th Street between Washington and Adams Street.

6. Installation of approximately 2,083 linear feet of 12" PVC sewer line, service connections, and manholes along the alley located between Elizabeth Street and Washington Street from 7th Street to 13th Street

7. Installation of approximately 365 linear feet of 12” HDPE sewer line, service connections, and manholes along the alley located between Elizabeth Street and Washington Street from 13th Street to International Boulevard. This portion of the work is to be installed using pipe bursting.

8. Installation of approximately 1,105 linear feet of 12” PVC sewer line, service connections, and manholes along the alley between Washington Street and Adams Street from 7th Street to 11th Street

9. Installation of approximately 140 linear feet of 8” PVC sewer line, service connections, and manholes along 11th Street between Washington Street and Adams Street

10. Installation of approximately 237 linear feet of 8” PVC sewer line, service connections, and manholes along 12th Street between Elizabeth Street and Jefferson Street

11. Installation of approximately 125 linear feet of 8” PVC sewer line, service connections, and manholes along 12th Street between Elizabeth Street and Washington Street

12. Installation of approximately 124 linear feet of 8” PVC sewer line, service connections, and manholes along 13th Street between Elizabeth Street and Washington Street

13. Installation of approximately 126 linear feet of 8” PVC sewer line, service connections, and manholes along 10th Street between Elizabeth Street and Washington Street

C. Locations and quantities are approximate and actual limits of work and improvements shall be as shown on the Drawings.

D. Other improvements associated with surface restoration, various appurtenances, and other supporting work activities are not specifically listed for clarity.

1.03 CONSTRUCTION CONTRACTS, THIS PROJECT

A. The Contracts under which the Project will be constructed are:

1. Work specified in Divisions 01 through 40 (inclusive) of the Specifications.

2. Work shown on sheets 1 through 45 (inclusive) of the Drawings.

1.04 CONSTRUCTION CONTRACTS, OTHER PROJECTS

A. Downtown Water and Wastewater Project 1 – STV

1.05 WORK BY OTHERS (NOT USED)

1.06 WORK BY OWNER

A. Owner will perform the following in connection with the Work: Inspections of materials, installation, and appurtenances that will affect Owner's operation, unless otherwise specified or indicated.

1.07 OWNER-FURNISHED EQUIPMENT AND MATERIALS (NOT USED)

1.08 OWNER ASSIGNED PROCUREMENT DOCUMENTS (NOT USED)

1.09 OWNER PRE-SELECTED EQUIPMENT AND MATERIALS (NOT USED)

1.10 SEQUENCE AND PROGRESS OF WORK

A. Requirements for sequencing and coordinating with Owner's operations, including maintenance of operations during construction, and requirements for tie-ins and shutdowns, are in Section 01 14 00 – Coordination with Owner's Operations.

1.11 CONTRACTOR'S USE OF SITE

A. Contractors' use of the Site shall be confined to the areas shown. Contractors shall share use of the Site with other contractors and others specified in this Section.

B. Contractor shall move stored products that interfere with operations of Owner, other contractors, or others performing work for Owner.

C. Contractor shall be responsible for securing staging locations in the vicinity of the project. Any costs associated with staging (property rental, security and safety features, lighting, etc.) shall be included in the Contractor's bid. No additional payment shall be made for these items.

1.12 EASEMENTS AND RIGHTS-OF-WAY

A. Easements and rights-of-way will be provided by Owner in accordance with the General Conditions. Confine construction operations to within Owner's property, public rights-of-way, easements obtained by Owner, and the limits shown. Use care in placing construction tools, equipment, excavated materials, and products to be incorporated into the Work to avoid damaging property and interfering with traffic. Do not enter private property outside the construction limits without permission from the owner of the property.

1.13 NOTICES TO OWNERS AND AUTHORITIES OF PROPERTIES ADJACENT TO THE WORK

A. Notify owners of adjacent property and utilities when execution of the Work may affect their property, facilities, or use of property.

B. When it is necessary to temporarily obstruct access to property, or when utility service connection will be interrupted, provide notices sufficiently in advance to enable affected persons to provide for their needs. Conform notices to Laws and Regulations and, whether delivered orally or in writing, include appropriate information concerning the interruption and instructions on how to limit inconvenience caused.

C. Notify utility owners and other concerned entities at least 48 hours prior to cutting or closing streets or other traffic areas or excavating near Underground Facilities or exposed utilities.

D. Refer to Section 01 55 26 for requirements of temporary traffic control plan.

1.14 SALVAGE OF EQUIPMENT AND MATERIALS

A. Existing equipment and material removed by Contractor shall not be reused in the Work, except where specified or indicated.

B. Carefully remove in manner to prevent damage all equipment and materials specified or indicated to be salvaged and reused or to remain property of Owner. Store and protect salvaged items specified or indicated to be used in the Work. Replace in kind or with new items equipment, materials, and components damaged in removal, storage, or handling through carelessness or improper procedures.

C. Contractor may furnish and install new items, with Engineer's approval, instead of those specified or indicated to be salvaged and reused, in which case such removed items will become Contractor's property.

1.15 PARTIAL UTILIZATION BY OWNER

A. Owner reserves the right to enter and use portions of the Work prior to Certificate of Substantial Completion is issued by Engineer.

B. Owner shall be responsible to prevent premature connections by private and public parties, persons or groups of persons, before Engineer issues Certificate of Substantial Completion for the portion of Work being partially utilized by Owner.

C. Contractor shall cooperate with Owner, Owner's agents, and Engineer to accelerate completion of Work designed for partial utilization by Owner in accordance with Contractor's progress schedule.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 14 00

COORDINATION WITH OWNER'S OPERATIONS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Requirements for coordinating with Owner's operations during the Work and included requirements for tie-ins and shutdowns necessary to complete the Work without impact on Owner's operations except as allowed in this Section.

2. Contractor shall provide labor, materials, tools, equipment and incidentals shown, specified and required to coordinate with Owner's operations during the Work.

B. General Requirements:

1. Except for shutdowns specified in this Section, perform the Work such that Owner's facility remains in continuous satisfactory operation during the Project. Schedule and conduct the Work such that the Work does not: impede Owner's production or processes, create potential hazards to operating equipment and personnel, reduce the quality of the facility's products or effluent, or cause odors or other nuisances.

2. Work not specifically covered in this Section or in referenced Sections may, in general, be completed at any time during regular working hours in accordance with the General Conditions and Supplementary Conditions, subject to the requirements in this Section.

3. Contractor has the option of providing additional temporary facilities that can eliminate or mitigate a constraint without additional cost to Owner, provided such additional temporary facilities: do not present hazards to the public, personnel, structures, and equipment; that such additional temporary facilities do not adversely affect Owner's ability to comply with Laws and Regulations, permits, and operating requirements; that such temporary facilities do not generate or foster the generation of odors and other nuisances; and that requirements of the Contract Documents are fulfilled.

4. Coordinate shutdowns with Owner and Engineer. When possible, combine multiple tie-ins into a single shutdown to minimize impacts on Owner's operations and processes.

5. Do not shut off or disconnect existing operating systems, unless accepted by Engineer in writing. Operation of existing equipment will be by Owner unless otherwise specified or indicated. Where necessary for the Work, Contractor shall

seal or bulkhead Owner-operated gates and valves to prevent leakage that may affect the Work, Owner's operations, or both. Provide temporary watertight plugs, bulkheads, and line stops as required. After completing the Work, remove seals, plugs, bulkhead, and line stops to satisfaction of Engineer.

C. Continuous Treatment Provision (NOT USED)

D. Related Sections:

1. Section 01 11 00 – Summary of Work

2. Section 01 25 00 – Substitution Procedures

3. Section 01 73 00 – Demolition and Execution of Work

1.02 REFERENCES

A. Definitions: A "shutdown" is when a portion of the normal operation of Owner's facility, whether equipment, systems, piping, or conduit, has to be temporarily suspended or taken out of service to perform the Work.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Review installation procedures under other Specification sections and coordinate Work that must be performed with or before the Work specified in this Section.

2. Notify other contractors in advance of Work requiring coordination with Owner's operations, to provide other contractors sufficient time for work included in their contracts that must be installed with or before Work specified in this Section.

3. When possible, combine multiple tie-ins into a single shutdown to minimize impacts on Owner's operations and processes.

B. Pre-Shutdown Meetings: Contractor shall schedule and conduct meeting with Owner and Engineer prior to scheduling any shutdowns, but a minimum of 7 days in advance.

C. Sequencing:

1. Perform the Work in the specified sequence. Certain phases or stages of the Work may require working 24-hour days or work during hours outside of regular working hours. Work may be accelerated from a later stage to an earlier stage if Owner's operations are not adversely affected by proposed sequence change, with Engineer's acceptance. Stages specified in this Section are sequential in performance of the Work.

D. Scheduling:

1. Work that may interrupt normal operations shall be accomplished at times convenient to Owner.

2. Furnish at the Site, in close proximity to the shutdown and tie-in work areas, tools, equipment, spare parts and materials, both temporary and permanent, necessary to successfully complete the shutdown. Complete to the extent possible, prefabrication of piping and other assemblies prior to the associated shutdown Demonstrate to Engineer's satisfaction that Contractor has complied with these requirements before commencing the shutdown.

3. If Contractor's operations cause an unscheduled interruption of Owner's operations, immediately re-establish satisfactory operation for Owner.

4. Unscheduled shutdowns or interruptions of continued safe and satisfactory operation of Owner's facilities that result in fines or penalties by authorities having jurisdiction shall be paid solely by Contractor if, in Engineer's opinion, Contractor did not conform to the requirements of the Contract Documents, or was negligent in the Work, or did not exercise proper precautions in conducting the Work.

5. Work requiring service interruptions for tie-ins shall be performed during scheduled shutdowns.

6. Temporary, short-term shutdowns of smaller piping, conduits, equipment, and systems may be required. Coordinate requirements for such shutdowns with Engineer and Owner.

1.04 SUBMITTALS

A. Action/Informational Submittals:

1. Substitute Sequence Submittal: When deviation from specified sequence is proposed, provide submittal explaining in detail the proposed sequence change and its effects, including evidence that Owner's operations will not be adversely affected by proposed change. List benefits of proposed sequence change, including benefits to Progress Schedule. Submit in accordance with Section 01 25 00 – Substitution Procedures.

2. Shutdown Planning Submittal:

a. For each shutdown, submit an inventory of labor and materials required to perform the shutdown and tie-in tasks, an estimate of time required to accomplish the complete shutdown including time for Owner to take down and start up existing equipment, systems, or conduits, and written description of steps required to complete the Work associated with the shutdown.

b.

Furnish submittal to Engineer at least thirty (30) days prior to proposed shutdown start date. Do not start shutdown until obtaining Engineer's acceptance of shutdown planning submittal.

c.

Shutdown Notification: After acceptance of shutdown planning submittal and prior to starting the shutdown, provide written notification to Owner and Engineer of date and time each shutdown is to start. Provide notification at least 72 hours in advance of each shutdown.

1.05 SITE CONDITIONS

A. General Constraints: Specified in the Contract Documents are the sequence and shutdown durations, where applicable, for Owner's equipment, systems, and conduits that are to be taken out of service temporarily for the Work. New equipment, materials, and systems may be used by Owner after the specified field quality controls and testing are successfully completed and the materials or equipment are Substantially Complete.

B. The following constraints apply to coordination with Owner's operations:

1. Operational Access: Owner's personnel shall have access to equipment and areas that remain in operation.

2. Schedule and perform system start-ups for Monday through Thursday. Systems shall not be placed into operation on Friday, Saturday, and Sunday without prior approval of Owner.

3. Dead End Valves or Pipe: Provide blind flanges, watertight bulkheads, or valves at temporary and permanent terminuses of pipes and conduits. Blind flanges and bulkheads shall be suitable for the service and braced and blocked, as required, or otherwise restrained as directed by Engineer. Temporary valves shall be suitable for their associated service. Where valve is provided at permanent terminus of pipe or conduit, also provide on downstream side of valve a blind flange with drain/flushing connection.

1.06 SUGGESTED SEQUENCE OF WORK

A. Contractor shall supply a work sequencing plan coordinated with a phased traffic control plan to be approved by authorized Brownsville Public Utilities Board and City of Brownsville personnel. The phased traffic control plan, signed by a Texas licensed professional engineer, shall be provided by the contractor. All temporary asphalt paving shall be completed prior to opening lanes and moving to other project areas.

B. Contractor shall complete pipe installation in one area at a time. Areas are defined in 01 11 00, 1.02 (B), but generally consist of continuous segments of pipe installed along a same street or alley.

C. For water mains, Contractor is advised that all tie-ins must be completed within a four hour period

D. Contractor shall be limited to shut down one block at a time, such that only two adjacent intersecting streets are closed. A block shall be defined as extending between two adjacent streets (i.e. 10th Street and 11th Street or 12th Street and 13th Street).

E. Contractor shall install and satisfactorily test temporary bypass pumping systems in the presence of the Owner's representative prior to placing any existing facilities offline.

1.07 TIE-INS

A. Table 01 14 00-A in this Section lists connections by Contractor to existing facilities. Table 01 14 00-A may not include all tie-ins required for the Work; Contractor shall perform tie-ins required to complete the Work. For tie-ins not included in Table 01 14 00-A, obtain requirements for tie-ins from Engineer.

1.08 SHUTDOWNS

A. General:

1. Work that may interrupt normal operations shall be accomplished at times convenient to Owner.

2. Furnish at the Site, in close proximity to the shutdown and tie-in work areas, tools, equipment, spare parts and materials, both temporary and permanent, necessary to successfully complete the shutdown. Complete to the extent possible, prefabrication of piping and other assemblies prior to the associated shutdown. Demonstrate to Engineer's satisfaction that Contractor has complied with these requirements before commencing the shutdown.

3. If Contractor's operations cause an unscheduled interruption of Owner's operations, immediately re-establish satisfactory operation for Owner.

4. Unscheduled shutdowns or interruptions of continued safe and satisfactory operation of Owner's facilities that result in fines or penalties by authorities having jurisdiction shall be paid solely by Contractor if, in Engineer's opinion, Contractor did not conform to the requirements of the Contract Documents, or was negligent in the Work, or did not exercise proper precautions in conducting the Work.

5. Shutdowns shall be in accordance with Table 01 14 00-B of this Section. Work requiring service interruptions for tie-ins shall be performed during scheduled shutdowns.

6. Temporary, short-term shutdowns of smaller piping, conduits, equipment, and systems may not be included in Table 01 14 00-B. This also applies to temporary

shutdowns of other utilities. Coordinate requirements for such shutdowns with Engineer, Owner, and contact at each utility.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 GENERAL

A. In addition to requirements of this Section, conform to requirements of Section 01 73 00 – Demolition and Execution of Work.

B. Refer to Table 01 14 00-A in this Section for detailed tie-in schedule.

3.02 DETAILED SHUTDOWN REQUIREMENTS:

A. Prior to Typical Shutdown:

1. Obtain Engineer's acceptance of proposed shutdown planning submittal and shutdown notification submittal.

2. Submittal and approval of all shop drawings required.

3. Coordinate with plant operations on timing of shutdown and provide required notice to Owner.

4. Bring necessary piping, couplings, valves, equipment, and appurtenances to the work areas.

5. Assist Owner in preparing to take utilities temporarily out of service.

6. Coordinate other tie-ins to be performed simultaneously.

7. Install and ensure functionality of temporary systems as applicable.

B. During Typical Shutdown:

1. Owner will operate isolation valves.

2. Remove existing equipment, piping, and accessories as required.

3. Verify operation of new equipment, materials, and systems.

4. Following approval from Engineer, return equipment and system to operation with Owner.

C. Following Typical Shutdown:

1. Verify functionality of equipment and system.

2. Verify operation of new equipment and systems, and verify that joints in piping are watertight or gastight as applicable.

3. Repair joints that are not watertight or gastight as applicable.

4. Remove temporary systems as applicable.

3.03 PROPOSED SHUTDOWN SEQUENCE (NOT USED)

Tie-In No.	New Line Size and Service	Connecting Line Size	Tie-In Building/Location	Tie In Description	Remarks
1A	Proposed WL-1 8” PVC Water	8” PVC	Drawing C-2 Station 10+50 at Intersection of Elizabeth and 13th Street	Tie-in new 8” water line to existing 8” water line. Shutdown duration shall be no more than 4 hours.	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
1B	Proposed WL-1 8” PVC Water	8” PVC	Drawing C-2 Station 13+78 at Intersection of Washington and 13th Street	Tie-in new 8” water line to existing 8” water line. Shutdown duration shall be no more than 4 hours.	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
2A	Proposed WL-2 8” PVC Water	8” PVC	Drawing C-3 Station 10+50 at Intersection of Elizabeth and 12th Street	Tie-in new 8” water line to existing 8” water line. Shutdown duration shall be no more than 4 hours.	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
2B	Proposed WL-2 8” PVC Water	8” PVC	Drawing Sheet C-3 Station 13+77 at Intersection of Washington and 12th Street	Tie-in new 8” water line to existing 8” water line. Shutdown duration shall be no more than 4 hours.	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
3A	Proposed WL-3 8” PVC Water	8” PVC	Drawing C-4 Station 10+50 at Intersection of Adams and 12th Street	Tie-in new 8” water line to existing 8” water line. Shutdown duration shall be no more than 4 hours.	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
3B	Proposed WL-3 8” PVC Water	8” PVC	Drawing C-4 Station 13+71 at Intersection of Jefferson and 12th Street	Tie-in new 8” water line to existing 8” water line. Shutdown duration shall be no more than 4 hours.	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
4	Proposed WL-4 Water Service Connections	1” Water Line Services	Drawing C-8 Station 10+90 and Station 12+65 on 11th Street	Service line connections to existing 6” water main. Tie-in shall be done without placing water main offline.	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
5A	Proposed WL-5 8” PVC Water	8” PVC	Drawing C-5 Station 10+50 at Intersection of Levee and 10th Street	Tie-in new 8” water line to existing 8” water line. Shutdown duration shall be no more than 4 hours.	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
5B	Proposed WL-5 8” PVC Water	8” PVC	Drawing C-7 Station 20+20 at Intersection of Adams and 10th Street	Tie-in new 8” water line to existing 8” water line. A “hot tap” is required at this location because of missing isolation valves.	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.

Tie-In No.	New Line Size and Service	Connecting Line Size	Tie-In Building/Location	Tie In Description	Remarks
6A	Proposed SS-1 12” PVC Sewer	12” PVC	Drawing C-10 Station 10+50 at Intersection of Elizabeth/Washington Alley and 7th Street	New 12” PVC Sewer tie-in to existing fiberglass manhole. Contractor may be required to temporarily bypass flow through manhole. Survey indicates a minimum of five additional sewer connections (excluding proposed).	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
6B	Proposed SS-1 12” PVC Sewer	12” PVC	Drawing C-15 Station 35+75 at Duty Free Parking Lot on International Boulevard	New manhole to be tied-in to existing sanitary sewer. Contractor may be required to temporarily bypass flow through manhole. Survey indicates a minimum of one sewer connection.	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
7A	Proposed SS-2 10” PVC Sewer	10” PVC	Drawing C-16 Station 10+50 at Intersection of Washington/Adams Alley and 7th Street	New 12” PVC Sewer tie-in to existing fiberglass manhole. Contractor may be required to temporarily bypass flow through manhole. Survey indicates a minimum of five additional sewer connections (excluding proposed).	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
7B	Proposed SS-2 10” PVC Sewer	10” PVC	Drawing C-18 Station 20+79 at Intersection of Washington/Adams Alley and 10th Street	New manhole to be tied-in to existing sanitary sewer. Contractor may be required to temporarily bypass flow through manhole. Survey indicates a minimum of one additional sewer connection (excluding proposed).	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
8	Proposed SS-3 8” PVC Sewer	Manhole with new 8” PVC connections	Drawing C-19 Station 12+09 at Intersection of Washington/Adams Alley and 11th Street	New manhole to be tied-in to existing sanitary sewer. Contractor may be required to temporarily bypass flow through manhole. Survey indicates a minimum of two additional sewer connections (excluding proposed).	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
9A	Proposed SS-4 8” PVC Sewer	Manhole with new 8” PVC connections	Drawing C-20 Station 12+03 at Intersection of Adams/Jefferson Alley and 12th Street	New manhole to be tied-in to existing sanitary sewer. Contractor may be required to temporarily bypass flow through manhole. Survey indicates a minimum of one additional sewer connections (excluding proposed).	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
9B	Proposed SS-4 8” PVC Sewer	Manhole with new 8” PVC connections	Drawing C-20 Station 13+14 in Adams/Jefferson Alley (south of 12th Street)	New manhole to be tied-in to existing sanitary sewer. Contractor may be required to temporarily bypass flow through manhole. Survey indicates a minimum of one additional sewer connections (excluding proposed).	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
10	Proposed SS-5 8” PVC Sewer	Manhole with new 8” PVC connections	Drawing C-21 Station 10+50 in Elizabeth/Washington Alley and 13th Street	Tie-in manhole is part of SS-1. This segment cannot be tied-in until SS-1 construction is complete.	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.

Tie-In No.	New Line Size and Service	Connecting Line Size	Tie-In Building/Location	Tie In Description	Remarks
11	Proposed SS-6 8” PVC Sewer	Manhole with new 8” PVC connections	Drawing C-22 Station 10+50 in Elizabeth/Washington Alley and 12th Street	Tie-in manhole is part of SS-1. This segment cannot be tied-in until SS-1 construction is complete.	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.
12	Proposed SS-7 8” PVC Sewer	Manhole with new 8” PVC connections	Drawing C-23 Station 10+50 in Elizabeth/Washington Alley and 10th Street	Tie-in manhole is part of SS-1. This segment cannot be tied-in until SS-1 construction is complete.	Tie-in shall be coordinated with Owner Representative. An Owner Representative shall be on-site during the tie-in process.

Note: Manhole connections included in table are based on available survey information. Contractor shall verify all connections and determine requirements for flow bypass during manhole tie-in activities. Number of connections listed is a minimum number and additional connections may exist at manholes.

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SECTION 01 20 00

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Items listed in this Section refer to and are the same pay items listed in the Bid Form and constitute all pay items for completing the Work.

2. Compensation for all services, items, materials, and equipment shall be include in prices stipulated for lump sum and unit price pay items listed in this Section and included in the Contract.

3. No direct or separate payment will be made for providing miscellaneous temporary or accessory works, bonds, insurance, or other requirements of the General Conditions, Supplementary Conditions, General Requirements, and other requirements of the Contract Documents.

4. Each lump sum and unit bid price shall include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

B. Related Sections:

1. Payments to Contractor: Refer to General Conditions, Supplementary Conditions, and Agreement.

2. Changes to Contract Price: Refer to General Conditions, Supplementary Conditions, and Section 01 26 00 – Contract Modification Procedures.

1.02 ENGINEER'S ESTIMATE OF QUANTITIES

A. ENGINEER'S and OWNER's estimated quantities for unit price pay items, as listed in the Bid Form, are approximate only and are included solely for the purpose of comparison of Bids. Owner does not expressly or by implication agree that the nature of the materials encountered below the surface of the ground or the actual quantities of material encountered or required will correspond therewith and reserves the right to increase or decrease any quantity or to eliminate any quantity as Owner may deem necessary. Contractor will not be entitled to any adjustment in a unit bid price as a result of any change in an estimated quantity and agrees to accept the aforesaid unit bid prices as complete and total compensation for any additions caused by changes or alterations in the Work ordered by Owner.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Contractor shall include all additional Work items, services, goods, resources, and manpower necessary for installation of the Work to provide a completely functional system in accordance with the Contract Documents. Contractor shall include these costs associated with providing a completely functional system within the listed items on the Bid Form and as specified herein.

B. Bid Items:

1. Item 1 – Mobilization for Water Mains: This item includes, but is not limited to, all transportation of contractor's personnel, equipment, and operating supplies to the site, establishment of necessary general facilities for the Contractor's operation at the site, transportation of Contractor's personnel, equipment, and operating supplies to another location with the designated site, relocation of necessary general facilities for the Contractor's operation from one location to another location on the Site, transportation of Contractor's personnel, equipment, and operating supplies away from the Site including disassembly and site clean-up. This bid item includes mobilization associated with the installation of water lines only. Mobilization does not include activities for specific items of work that are for which payment is provided elsewhere in the contract.

2. Item 2 –8-Inch DR-25 PVC Water Line: This item includes, but is not limited to, all labor materials and equipment required to furnish and install 8" PVC C900 DR 18 pipe with fittings by open cut method at the locations and grades indicated on the plans. Fittings for PVC water pipe shall be ductile iron of the bell and spigot, or mechanical joint type, shall be restrained, and shall be Class 250 in accordance with AWWA C110-77. Payment shall be on a unit price basis and shall include all costs required to adequately protect and support existing utilities; have utility companies repair any damage inflicted to their lines by the Contractor; any cleanup, property damages, fines, etc. resulting from damage inflicted to any utility line by the Contractor; and all other items required to provide a complete installation, except for items included in other bid items.

3. Item 3 – 3-inch Type D HMAC Pavement: This item includes all labor materials and equipment required for the placement of 3-Inch Type D HMAC Asphalt Pavement. All existing asphalt pavement to be removed that abuts concrete pavement to remain (public or private) shall be saw cut in a smooth straight line. Measurement and payment for 3-Inch Type D HMAC Asphalt Pavement shall be on a unit price basis per square yard installed and shall include all costs required for a complete installation, including striping, directional arrows and placement of any other thermoplastic paint markings to match pre-construction conditions.

4. Item 4 – Limestone Base: This item includes all labor, materials and equipment required for placement limestone base, including any required compaction.

Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work.

5. Item 5 – Prime Coat: This item includes all labor, materials and equipment required for placement of prime coat. Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work.

6. Item 6 – Tack Coat: This item includes all labor, materials and equipment required for placement of tack coat. Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work.

7. Item 7 – 8-Inch Isolation Gate Valve: This item includes all labor, materials and equipment required to furnish and install 8" Isolation Gate Valves at locations shown on the Drawings. Payment shall be on a unit price basis for each valve installed including, but not limited to, the cost associated with the gate valve, valve stem, valve stem extension, hardware, thrust restraint, valve box with concrete pad, excavation and compaction and all other incidentals necessary to complete the work.

8. Item 8 –12-Inch Isolation Gate Valve: This item includes all labor, materials and equipment required to furnish and install 8" Isolation Gate Valves at locations shown on the Drawings. Payment shall be on a unit price basis for each valve installed including, but not limited to, the cost associated with the gate valve, valve stem, valve stem extension, hardware, thrust restraint, valve box with concrete pad, excavation and compaction and all other incidentals necessary to complete the work.

9. Item 9 –8-inch x 8-inch Water Line Tie-in: This item shall include all labor, materials and equipment required to connect new water lines to the existing water line as shown on the Drawings. This item includes, but is not limited to, coordination with BPUB for line isolation during tie-in, dewatering of existing line, installation of solid sleeve(s), replacement of existing water line at the connection, and any other incidentals required to complete the work. Fittings for PVC water pipe shall be ductile iron of the bell and spigot, or mechanical joint type, shall be restrained, and shall be Class 250 in accordance with AWWA C110-77. Payment shall be on a unit price basis for each tie-in.

10. Item 10 –12-inch x 8-inch Water line Tie-in: This item shall include all labor, materials and equipment required to connect new water lines to the existing water line as shown on the Drawings. This item includes, but is not limited to, coordination with BPUB for line isolation during tie-in, dewatering of existing line, installation of solid sleeve(s), replacement of existing water line at the connection, and any other incidentals required to complete the work. Fittings for PVC water pipe shall be ductile iron of the bell and spigot, or mechanical joint type, shall be restrained and shall be Class 250 in accordance with AWWA C110-77. Payment shall be on a unit price basis for each tie-in.

11. Item 11 –16-inch DR-25 PVC Casing Pipe: This item includes all labor, materials and equipment required to furnish and install 16” PVC casing pipe for utility crossings. Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work.

12. Item 12 –8-inch Hot Tap: This item includes all labor, materials and equipment required for installation and removal of a hot tap to allow tie-in of water lines without any shutdowns. Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work.

13. Item 13 –Alternate Materials Under Existing Utilities: This item includes all labor, materials and equipment required for placement of alternate materials, including cement stabilized sand and flowable fill, under existing utilities where proper compaction cannot be obtained or tested. Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work.

14. Item 14 – Double Water Service Connection (Long Side): This item includes all labor, materials and equipment required to furnish and install 1” Water Service (Long Side shall be defined as the services on the opposite side of the street with respect to the proposed water line). Payment shall be on a unit price basis and shall include service strap saddles, corporation stop, angle stop, and all other items required for a complete installation. Contractor to terminate service line based on locations specified in the drawings. Any cost associated with providing temporary water service during construction shall be considered subsidiary to this pay item.

15. Item 15 – Trench Dewatering: This item includes all labor, materials and equipment required for installing, operating, maintaining and removing a temporary trench dewatering system as needed for the installation of water lines. Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work, including any temporary piping, fittings, pumps, and any other appurtenances required to dewater and dispose of water in accordance with local regulatory requirements.

16. Item 16 – Remove Existing Concrete Pavement: This item includes all labor, materials and equipment to remove and dispose of existing reinforced concrete pavement. All existing concrete pavement to be removed that abuts concrete pavement to remain shall be saw cut in a smooth straight line. Payment shall be on a unit price basis and shall include all incidental items to complete the work. Any work or existing facilities damaged during the removal of the existing reinforced concrete pavement shall be replaced at the Contractor’s expense including, but not limited to, Flex-Base.

17. Item 17 – Remove Existing Asphalt Pavement: This item includes all labor, materials and equipment to remove and dispose of existing asphalt pavement. All existing concrete pavement to be removed that abuts concrete pavement to

remain shall be saw cut in a smooth straight line. Payment shall be on a unit price basis and shall include all incidental items to complete the work. Any work or existing facilities damaged during the removal of the existing reinforced concrete pavement shall be replaced at the Contractor's expense including, but not limited to, Flex-Base.

18. Item 18 – Replace Concrete Pavement: This item includes all labor, equipment, and materials necessary to replace reinforced concrete pavement. This bid item is to include, where indicated on the plans, all placement of concrete pavement, subgrade, and any required reinforcement. Payment shall be on a unit price basis and include all incidental items necessary to complete the work.

19. Item 19 – Remove Existing 6-Inch Concrete Curb and Gutter: This item includes all materials, labor, and equipment to remove and dispose of existing concrete curb. Payment shall be on a unit price basis and include all incidental items necessary to complete the work.

20. Item 20 – Replace Existing 6-Inch Concrete Curb and Gutter: This item includes all labor, equipment, and materials necessary for the placement of concrete curb at the locations shown on the plans. Payment shall be on a unit price basis and shall include all incidental items necessary to complete the work, including the replacement of any existing concrete curb drains.

21. Item 21 – Remove Existing Concrete Valley Gutter: This item includes all materials, labor, and equipment to remove reinforced concrete valley gutter and dispose of the existing concrete. All existing concrete pavement to be removed that abuts concrete pavement to remain shall be saw cut in a smooth straight line. Payment shall be on a unit price basis and shall include all incidental items necessary to complete the work.

22. Item 22 – Replace Concrete Valley Gutter: This item includes all labor, materials and equipment to replace concrete valley gutters. This bid item is to include placement of concrete pavement, reinforcement, and subgrade preparation. Payment shall be on a unit price basis and shall include all incidental items necessary to complete the work.

23. Item 23 – Remove Existing Concrete Sidewalk: This item includes materials, labor, and equipment to remove existing concrete sidewalk and dispose of the existing concrete as shown on the plans. All existing concrete sidewalk pavement to be removed that abuts concrete pavement to remain shall be saw cut in a smooth straight line. Payment shall be on a unit price basis and include all incidental items necessary to complete the work.

24. Item 24 – Replace Concrete Sidewalk: This item includes all labor, materials, and equipment for the installation of 4-inch reinforced concrete sidewalk. Installation of the sidewalk shall include matching the existing surface finish, installation of joints, concrete, reinforcing, subgrade preparation, compaction, and all other incidental

items necessary for a complete installation in accordance with the project requirements. Payment shall be on a unit price basis and shall include all incidental items necessary to complete the work.

25. Item 25 – Remove, Salvage, Store and Reset Brick Pavers: This item includes all labor, materials and equipment necessary to remove, salvage, store and reset brick pavers. Any existing facilities damaged during the removal and resetting of brick pavers shall be replaced at the Contractor's expense. Payment shall be on a unit price basis and includes reestablishing cushion sand and subgrade to existing matching adjacent grades, replacement of damaged brick pavers in a similar kind and color, and all other incidental items necessary to complete the work.

26. Item 26 – Trench Safety System: This item shall include all work necessary for installation of Trench Safety for proposed water line construction. Trench Safety shall be per linear foot installed. The Contractor's trench safety system shall include all shoring and/or bracing necessary to adequately provide a safety trench for the proposed line construction on this project. The Contractor shall have a trench safety plan prepared, signed, and sealed by a professional Engineer licensed in the state of Texas, which is included in Item 27. This item includes all work necessary to provide Trench Safety as required by the plan and all incidentals needed to complete the work.

27. Item 27 – Trench Safety Plan: This item shall include all work necessary for drawings, specifications, details in relation to a Trench Safety Plan designed by a licensed professional engineer in the State of Texas. Measurement and Payment: Trench safety plan will be a lump sum bid item. The trench safety plan to be prepared, signed, and sealed by a professional Engineer licensed in the state of Texas. This item includes all work necessary to provide Trench Safety Plan as required and all incidentals needed to complete the work. Trench Safety Plan shall be submitted to Owner prior to construction.

28. Item 28 – Water Valve Box Adjustment: This Item shall include all work necessary for Water Valve Box Adjustment with Concrete Collar. This item shall be full compensation for all materials, tools, equipment, labor, and all other incidentals necessary to complete the work, including disposal of existing damaged valve boxes and adjustments to water valve boxes to meet any existing adjacent road grade. Payment shall be made on a unit price basis for each location identified on site by City of Brownsville or BPUB personnel and shall include all labor, equipment, materials, watering, and all incidentals necessary to complete the work

29. Item 29 – Traffic Control Plan: This item shall include all work necessary for drawings, specifications, details in relation to a Traffic Control Plan prepared by a licensed professional engineer in the State of Texas. Traffic control plan should correspond with the contractor's phased construction sequencing plan. Traffic Control Plan will be a lump sum bid item. The Traffic Control Plan shall be prepared, signed, and sealed by a professional Engineer licensed in the State of

Texas. This item includes all work necessary to provide traffic control plans as required and all incidentals needed to complete the work. Traffic control plans be submitted to Owner prior to construction

30. Item 30 – Temporary Erosion, Sedimentation and Water Pollution Prevention and Control (SWPPP): This item is to include all work for SWPPP and implementation which includes the preparation of a stormwater pollution prevention plan in accordance with EPA and TCEQ criteria for NPDES Phase II. Measurement and Payment: SWPPP >1 acre shall be on a lump sum basis. This item shall include SWPPP, notice of termination (NOT), inspections, maintenance, and all other requirements until final acceptance of the project.

31. Item 31 – Allowance for Relocation and Repairs to Existing Utilities: Payments under this item shall only be made with prior approval from the Owner for relocation and repairs to existing utilities deemed to be unforeseen conditions. Payment will not be approved for utilities damaged by the Contractor due to their failure to protect utilities indicated on the Drawings or marked by Texas 811. Contractor will be required to provide a complete itemized proposal for each item for which they seek payment, including a breakdown of labor, materials and equipment and any other backup information requested by the Owner to justify the cost.

32. Item 32: Allowance for Re-establishment of Landscaping: Payments under this item shall only be made with prior approval from the Owner for plants, trees, planter beds, irrigation lines, sprinkler heads and any other disturbed landscaping items outside of paver and sidewalk limits along corridors. Contractor will be required to provide a complete itemized proposal for each item for which they seek payment, including a breakdown of labor, materials and equipment and any other backup information requested by the Owner to justify the cost.

33. Item 33 – Mobilization for Sanitary Sewer: This item includes, but is not limited to, all transportation of contractor’s personnel, equipment, and operating supplies to the site, establishment of necessary general facilities for the Contractor’s operation at the site, transportation of Contractor’s personnel, equipment, and operating supplies to another location with the designated site, relocation of necessary general facilities for the Contractor’s operation from one location to another location on the Site, transportation of Contractor’s personnel, equipment, and operating supplies away from the Site including disassembly and site clean-up. This bid item includes mobilization associated with the installation of sanitary sewer lines only. Mobilization does not include activities for specific items of work that are for which payment is provided elsewhere in the contract.

34. Item 34 – SS Fiberglass Manholes 6’-8’ Depth: This item includes all labor, materials and equipment necessary to install 4-foot diameter fiberglass manholes between 6’ and 8’ in depth (measured as the finished elevation inside the manhole). This item includes any compaction and subgrade preparation, cast-in-

place concrete base, grade rings, manhole frame and cover, concrete collar, sanitary sewer connections, grouting, testing, expansion pre-formed joint sealant and any other incidental items necessary to complete the work. Payment shall be on a unit price basis and shall be inclusive of all work needed to provide a fully functional installation.

35. Item 35 – SS Fiberglass Manholes 8'-10' Depth: This item includes all labor, materials and equipment necessary to install 4-foot diameter fiberglass manholes between 8' and 10' in depth (measured as the finished elevation inside the manhole). This item includes any compaction and subgrade preparation, cast-in-place concrete base, grade rings, manhole frame and cover, concrete collar, sanitary sewer connections, grouting, testing, expansion pre-formed joint sealant and any other incidental items necessary to complete the work. Payment shall be on a unit price basis and shall be inclusive of all work needed to provide a fully functional installation.

36. Item 36 – SS Fiberglass Manholes 10'-12' Depth: This item includes all labor, materials and equipment necessary to install 4-foot diameter fiberglass manholes between 10' and 12' in depth (measured as the finished elevation inside the manhole). This item includes any compaction and subgrade preparation, cast-in-place concrete base, grade rings, manhole frame and cover, concrete collar, sanitary sewer connections, grouting, testing, expansion pre-formed joint sealant and any other incidental items necessary to complete the work. Payment shall be on a unit price basis and shall be inclusive of all work needed to provide a fully functional installation.

37. Item 37 – 8" SDR-26 PVC Pipe Sanitary Sewer Line 0'-8' Depth: This item includes, but is not limited to, all labor materials and equipment required to furnish and install 8" PVC C900 SDR 26 pipe by open cut method at depth between 0' and 8' (measured at the invert of the pipe) at the locations and grades indicated on the plans. Payment shall be on a unit price basis and shall include all costs required to adequately protect and support existing utilities; have utility companies repair any damage inflicted to their lines by the Contractor; any cleanup, property damages, fines, etc. resulting from damage inflicted to any utility line by the Contractor; and all other items required to provide a complete installation, except for items included in other bid items.

38. Item 38 – 8" SDR-26 PVC Pipe Sanitary Sewer Line 8'-1"-10' Depth: This item includes, but is not limited to, all labor materials and equipment required to furnish and install 8" PVC C900 SDR 26 pipe by open cut method at depth between 8'-1" and 10' (measured at the invert of the pipe) at the locations and grades indicated on the plans. Payment shall be on a unit price basis and shall include all costs required to adequately protect and support existing utilities; have utility companies repair any damage inflicted to their lines by the Contractor; any cleanup, property damages, fines, etc. resulting from damage inflicted to any utility line by the

Contractor; and all other items required to provide a complete installation, except for items included in other bid items.

39. Item 39 – 12” SDR-26 PVC Pipe Sanitary Sewer Line 0’-8’ Depth: This item includes, but is not limited to, all labor materials and equipment required to furnish and install 12” PVC C900 SDR 26 pipe by open cut method at depth between 0’ and 8’ (measured at the invert of the pipe) at the locations and grades indicated on the plans. Payment shall be on a unit price basis and shall include all costs required to adequately protect and support existing utilities; have utility companies repair any damage inflicted to their lines by the Contractor; any cleanup, property damages, fines, etc. resulting from damage inflicted to any utility line by the Contractor; and all other items required to provide a complete installation, except for items included in other bid items.

40. Item 40 – 12” SDR-26 PVC Pipe Sanitary Sewer Line 8’-1”-12’ Depth: This item includes, but is not limited to, all labor materials and equipment required to furnish and install 12” PVC C900 SDR 26 pipe by open cut method at depth between 8’-1” and 12’ (measured at the invert of the pipe) at the locations and grades indicated on the plans. Payment shall be on a unit price basis and shall include all costs required to adequately protect and support existing utilities; have utility companies repair any damage inflicted to their lines by the Contractor; any cleanup, property damages, fines, etc. resulting from damage inflicted to any utility line by the Contractor; and all other items required to provide a complete installation, except for items included in other bid items.

41. Item 41 – 12” SDR-26 PVC Pipe Sanitary Sewer Line 12’-1”-14’ Depth: This item includes, but is not limited to, all labor materials and equipment required to furnish and install 12” PVC C900 SDR 26 pipe by open cut method at depth between 12’-1” and 14’ (measured at the invert of the pipe) at the locations and grades indicated on the plans. Payment shall be on a unit price basis and shall include all costs required to adequately protect and support existing utilities; have utility companies repair any damage inflicted to their lines by the Contractor; any cleanup, property damages, fines, etc. resulting from damage inflicted to any utility line by the Contractor; and all other items required to provide a complete installation, except for items included in other bid items.

42. Item 42 – 20” DR-25 PVC Casing Pipe: This item includes all labor, materials and equipment required to furnish and install 20” PVC casing pipe at utility crossings. Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work.

43. Item 43 – Alternate Materials Under Existing Utilities: This item includes all labor, materials and equipment required for placement of alternate materials, including cement stabilized sand and flowable fill, under existing utilities where proper compaction cannot be obtained or tested. Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work.

44. Item 44 – Bypass Pumping: This item includes, but is not limited to, all labor, materials and equipment required to furnish, install, maintain, and remove a temporary bypass system for sanitary sewer. Bid item includes any necessary temporary piping (including piping associated with lateral connections), fittings, pumps, and other appurtenances. Contractor shall also include in this item multiple relocations of the bypass system as the work progresses. Payment shall be on a lump sum basis and be based on the overall progress of sanitary sewer work.

45. Item 45 – Trench Dewatering: This item includes, but is not limited to, all labor, materials and equipment required to furnish, install, maintain, and remove a temporary trench dewatering system. Payment shall be on a lump sum basis and be based on the overall progress of sanitary sewer work and shall include any temporary piping, fittings, pumps, and any other appurtenances required to dewater and dispose of water in accordance with local regulatory requirements.

46. Item 46 – Tie-in at Existing 10” PVC Stub-Out: This item includes all labor, materials and equipment required for installation of tie-ins at 10” PVC stub-outs. Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work.

47. Item 47 – Single Sewer Service Connection (Short Side, One Way Cleanout): This item includes all labor, materials and equipment required to furnish and install a single sewer service connection (Short Side shall be defined as the services on the same side of the street with respect to the proposed sewer line). Payment shall be on a unit price basis and shall include all appurtenances required for a complete installation.

48. Item 48 – Double Sewer Service Connection (Short Side, One Way Cleanout): This item includes all labor, materials and equipment required to furnish and install a double sewer service connection (Short Side shall be defined as the services on the same side of the street with respect to the proposed sewer line). Payment shall be on a unit price basis and shall include all appurtenances required for a complete installation.

49. Item 49 – Remove Existing Grate Inlet: This item includes, but is not limited to, all labor, materials and equipment required to remove and dispose of existing grate inlets. Payment shall be on a unit price basis.

50. Item 50 – Replace Existing Grate Inlet: This item includes, but is not limited to, all labor, materials and equipment required to install new grate inlets including all appurtenances for a complete installation. Payment shall be on a unit price basis.

51. Item 51 – Remove Existing RCP: This item includes, but is not limited to, all labor, materials and equipment required to remove and dispose of existing reinforced concrete pipe used for storm drains. Payment shall be on a unit price basis.

52. Item 52 – Replace Existing RCP: This item includes, but is not limited to, all labor, materials and equipment required to install new reinforced concrete pipe used for storm drains. Payment shall be on a unit price basis.

53. Item 53 – Trench Safety System: This item shall include all work necessary for installation of Trench Safety for proposed sanitary sewer line construction. Trench Safety shall be per linear foot installed. The Contractor's trench safety system shall include all shoring and/or bracing necessary to adequately provide a safety trench for the proposed line construction on this project. The Contractor shall have a trench safety plan prepared, signed, and sealed by a professional Engineer licensed in the state of Texas as included in Item 54. This item includes all work necessary to provide Trench Safety as required by the Plan and all incidentals needed to complete the work, including the installation of hydraulic shoring if required by the Trench Safety Plan.

54. Item 54 – Trench Safety Plan: This item shall include all work necessary for drawings, specifications, details in relation to a Trench Safety Plan provided by a licensed professional engineer in the State of Texas. Measurement and Payment: Trench safety plan will be a lump sum bid item. The Trench Safety Plan shall be prepared, signed, and sealed by a professional Engineer licensed in the State of Texas. This item includes all work necessary to provide Trench Safety Plan as required and all incidentals needed to complete the work. Trench Safety Plan shall be submitted to Owner prior to construction.

55. Item 55 – Remove Existing 6-Inch Concrete Curb and Gutter: This item includes all materials, labor, and equipment to remove existing concrete curb and dispose of the existing concrete associated with sanitary sewer lines. Payment shall be on a unit price basis and included the cost of concrete removal and disposal and all incidental items necessary to complete the work.

56. Item 56 – Replace Existing 6-Inch Concrete Curb and Gutter: This item includes the placement of concrete curb at the locations shown on the plans associated with sanitary sewer lines. Payment shall be on a unit price basis and include all incidental items necessary to complete the work.

57. Item 57 – Remove Existing Concrete Runner: This item includes all materials, labor, and equipment to remove existing concrete runner associated with sanitary sewer lines. Payment shall be on a unit price basis and include all incidental items necessary to complete the work.

58. Item 58 – Replace Concrete Runner: This item includes the placement of concrete runner at the locations shown on the plans associated with sanitary sewer lines. Payment shall be on a unit price basis and include all incidental items necessary to complete the work.

59. Item 59 – Remove Existing Concrete Approach: This item includes all materials, labor, and equipment to remove existing concrete approach associated with

sanitary sewer lines. Payment shall be on a unit price basis and include all incidental items necessary to complete the work.

60. Item 58 – Replace Concrete Approach: This item includes the placement of concrete approach at the locations shown on the plans associated with sanitary sewer lines. Payment shall be on a unit price basis and include all incidental items necessary to complete the work.

61. Item 61 – Remove Existing Concrete Sidewalk: This item includes materials, labor, and equipment to remove existing concrete sidewalk and dispose of the existing concrete associated with sanitary sewer lines as shown on the plans. All existing concrete sidewalk pavement to be removed that abuts concrete pavement to remain shall be saw cut in a smooth straight line. Payment shall be on a unit price basis and include the cost of all incidental items necessary to complete the work.

62. Item 62 – Replace Concrete Sidewalk: This item includes all labor, materials, and equipment for the installation of 4-inch reinforced concrete sidewalk associated with sanitary sewer lines. Installation of the sidewalk shall include matching the existing surface finish, installation of joints, concrete, reinforcing, subgrade preparation, compaction, and all other incidental items necessary for a complete installation in accordance with the project requirements. Payment shall be on a unit price basis and include all incidental items necessary to complete the work.

63. Item 63 – Remove Existing Sanitary Sewer Manhole – This item includes all labor, materials and equipment required for the removal and disposal of existing sanitary sewer manholes, which are mostly composed of brick. Contractor shall account for locations where a complete removal is required in order to accommodate new sanitary sewer lines. Payment shall be on a unit price basis and include all incidental items necessary to complete the work.

64. Item 64 - Remove, Salvage, Store and Reset Brick Pavers: This item includes all labor, materials and equipment necessary to remove, salvage, store and reset brick pavers associated with sanitary sewer lines. Any existing facilities damaged during the removal and resetting of brick pavers shall be replaced at the Contractor’s expense. Payment shall be on a unit price basis and includes reestablishing cushion sand and subgrade to existing matching adjacent grades, replacement of damaged brick pavers in a similar kind and color, and all other incidental items necessary to complete the work.

65. Item 65 – Remove Existing Concrete Pavement: This item includes all labor, materials and equipment to remove existing reinforced concrete pavement and dispose of the existing concrete associated with sanitary sewer lines. All existing concrete pavement to be removed that abuts concrete pavement to remain shall be saw cut in a smooth straight line. Payment shall be on a unit price basis and shall include all costs to complete the work and all other incidental items. Any work or existing facilities damaged during the removal of the existing reinforced

concrete pavement shall be replaced at the Contractor's expense including, but not limited to, Flex-Base.

66. Item 66 – Remove Existing Asphalt Pavement: This item includes all labor, materials and equipment to remove existing asphalt pavement and dispose of the existing asphalt associated with sanitary sewer lines. All existing concrete pavement to be removed that abuts concrete pavement to remain shall be saw cut in a smooth straight line. Payment shall be on a unit price basis and shall include all costs to complete the work and all other incidental items. Any work or existing facilities damaged during the removal of the existing reinforced concrete pavement shall be replaced at the Contractor's expense including, but not limited to, Flex-Base.

67. Item 67 – Pavement Milling: This item includes all labor, materials and equipment required for pavement milling within alleys. Payment shall be made on a unit price basis and shall include surface preparation, cleaning and all other incidental items necessary to complete the work.

68. Item 68 – Limestone Base: This item includes all labor, materials and equipment required for placement of limestone base associated with sanitary sewer lines, including compaction. Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work.

69. Item 69 – Geogrid Fabric: This item includes all labor, materials and equipment required for installation of geogrid fabric associated with sanitary sewer lines. Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work.

70. Item 70 – 3-inch Type D HMAC Pavement: This item includes all labor materials and equipment required for the placement of 3-Inch Type D HMAC Asphalt Pavement associated with sanitary sewer lines. All existing asphalt pavement to be removed that abuts concrete pavement to remain (public or private) shall be saw cut in a smooth straight line. Measurement and payment for 3-Inch Type D HMAC Asphalt Pavement shall be on a unit price basis per square yard installed and shall include all costs required for a complete installation.

71. Item 71 – Prime Coat: This item includes all labor, materials and equipment required for placement of prime coat associated with sanitary sewer lines. Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work.

72. Item 72 – Tack Coat: This item includes all labor, materials and equipment required for placement of tack coat associated with sanitary sewer lines. Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work.

73. Item 73 – Remove Existing Asphalt Pavement: This item includes all labor, materials and equipment to remove existing asphalt pavement and dispose of the existing asphalt associated with sanitary sewer lines. All existing concrete pavement to be removed that abuts concrete pavement to remain shall be saw cut in a smooth straight line. Payment shall be on a unit price basis and shall include all costs to complete the work and all other incidental items. Any work or existing facilities damaged during the removal of the existing reinforced concrete pavement shall be replaced at the Contractor's expense including, but not limited to, Flex-Base.

74. Item 74 – Pavement Markings: This item includes all labor, materials and equipment required for placement of pavement markings to match pre-construction conditions. Payment shall be made on a unit price basis and shall include all incidental items necessary to complete the work.

75. Item 75 – Traffic Control Plan and Temporary Relocation of Alley Facilities: This item shall include all work necessary for drawings, specifications, details in relation to a Traffic Control Plan provided by a licensed professional engineer in the State of Texas. Traffic Control Plan shall correspond with the contractor's phased construction sequencing plan. Traffic Control Plan shall be a lump sum bid item. The Traffic Control Plan shall be prepared, signed, and sealed by a professional Engineer licensed in the State of Texas. This item includes all work necessary to provide traffic control plans as required and all incidentals needed to complete the work. Traffic Control Plan shall be submitted to Owner prior to construction. Bid item shall also include temporary relocation of facilities including, but not limited to, solid waste collection, parking areas, etc.

76. Item 76 – Temporary Erosion, Sedimentation and Water Pollution Prevention and Control (SWPPP): This item is to include all work for SWPPP and Implementation which includes the preparation of a stormwater pollution prevention plan in accordance with EPA and TCEQ criteria for NPDES Phase II. Measurement and Payment: SWPPP >1 acre shall be on a lump sum basis. This item shall include SWPPP, notice of termination (NOT), inspections, maintenance, and all other requirements until final acceptance of the project.

77. Item 77 – Allowance for Utility Structure Reinforcement: Payments under this item shall only be made with prior approval from the Owner for reinforcement or replacement of utility structures, including poles, guy wires and other similar structures. Payment will not be approved for utilities damaged by the Contractor due to their failure to protect utilities indicated on the Drawings or marked by Texas 811. Contractor will be required to provide a complete itemized proposal for each item for which they seek payment, including a breakdown of labor, materials and equipment and any other backup information requested by the Owner to justify the cost.

78. Item 78 - Allowance for Relocation and Repairs to Existing Utilities: Payments under this item shall only be made with prior approval from the Owner for relocation and repairs to existing utilities deemed to be unforeseen conditions. Payment will not be approved for utilities damaged by the Contractor due to their failure to protect utilities indicated on the Drawings or marked by Texas 811. Contractor will be required to provide a complete itemized proposal for each item for which they seek payment, including a breakdown of labor, materials and equipment and any other backup information requested by the Owner to justify the cost.

79. Item 79 – Allowance for Contaminated Soils or Groundwater: Payments under this item shall only be made with prior approval from the Owner for added costs associated with the identification, treatment or disposal of contaminated soils or groundwater. Contractor will be required to provide a complete itemized proposal for each item for which they seek payment, including a breakdown of labor, materials and equipment and any other backup information requested by the Owner to justify the cost.

Supplemental Bid Items

80. Item 80 – Mobilization and Pit Preparation: This item shall include all labor, materials and equipment for mobilization and preparation associated with pipe bursting activities, including, but not limited to, laying out pits, excavating for pits, removal of asphalt or any other surface improvements, shoring pits, dewatering pits, and any other ancillary work. Pits shall include both launching and receiving pits associated with supplemental bid items. Payment for this item shall be on a lump sum basis.

81. Item 81 – 12-inch HDPE Sewer Pipe by Pipe Bursting: This item shall include all labor, materials and equipment associated with the installation of 12-inch HDPE sanitary sewer using the pipe bursting method. Payment for this item shall be on a unit price basis and shall include all ancillary work required for a complete installation.

82. Item 82 – Sanitary Sewer Laterals: This item shall include all labor, materials, and equipment associated with the reconnection of existing sanitary sewer laterals upon installation of HDPE pipe using the pipe bursting method. Payment for this item shall be on a unit price basis only for laterals associated with Bid Item 81 and shall include all ancillary work required for a complete installation.

Alternate Bid Items

83. Item 83 – Mobilization and Pit Preparation: This item shall include all labor, materials and equipment for mobilization and preparation associated with pipe bursting activities, including, but not limited to, laying out pits, excavating for pits, removal of asphalt or any other surface improvements, shoring pits, dewatering pits, and any other ancillary work. Pits shall include both multiple launching and

receiving pits associated with alternate bid items. Payment for this item shall be on a lump sum basis.

84. Item 84 – 12-inch HDPE Sewer Pipe by Pipe Bursting: This item shall include all labor, materials and equipment associated with the installation of 12-inch HDPE sanitary sewer using the pipe bursting method as an alternate method of installation. Payment for this item shall be on a unit price basis and shall include all ancillary work required for a complete installation.

85. Item 82 – Sanitary Sewer Laterals: This item shall include all labor, materials, and equipment associated with the reconnection of existing sanitary sewer laterals upon installation of HDPE pipe using the pipe bursting method as an alternate method of installation. Payment for this item shall be on a unit price basis only for laterals associated with Bid Item 81 and shall include all ancillary work required for a complete installation.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Procedural requirements for product substitutions.

2. Procedural requirements for substitute construction methods or procedures, when construction methods or procedures are specified.

B. Requests for substitutions of equipment and material shall conform to the requirements of the General Conditions and Supplemental Conditions.

C. Procedure for substitution requests and review including evaluation, reimbursement, acceptance, and determination shall be in accordance with General Conditions and Supplemental Conditions.

1.02 REFERENCES

A. Definitions: The following words or terms are not defined but, when used in this Section, have the following meaning:

1. “Acceptable Manufacturers” considered for substitution include suppliers of equipment and material of proven reliability, and as manufactured by reputable manufacturers having experience in the production of specified equipment and material. Equipment furnished shall be designed, constructed, and installed in accordance with the industry accepted practices and shall operate satisfactorily when installed in accordance with the Contract Documents.

2. “Products” includes materials, equipment, machinery, components, fixtures, systems, and other goods incorporated in the Work. Products do not include machinery and equipment used for preparing, fabricating, conveying, erecting, or installing the Work. Products include Owner-furnished goods incorporated in the Work where use of such goods is specifically required in the Contract Documents.

1.03 ADMINSTRATIVE REQUIREMENTS

A. Contractor’s Responsibilities: In submitting request for substitution, Contractor represents that:

1. Contractor has investigated proposed substitution and determined that it is equivalent to item, product, method, or procedure specified, as applicable.

2. Contractor will provide the same or better guarantees or warranties for proposed substitution as for the specified product, manufacturer, method, or procedure, as applicable.

3. Contractor waives all Claims for additional costs or extension of time related to proposed substitution that subsequently may become apparent.

4. Contractor shall submit a minimum of five (5) successful installations of the manufacturer's equipment of the same model, size, and type as specified in the Contract Documents.

5. All costs associated with incorporation of a substitution shall be borne by the Contractor, including but not limited to, the cost of redesign and construction provisions.

B. Engineer's Review: A proposed substitution will not be accepted for review if:

1. Approval would require changes in design concept or a substantial revision of the Contract Documents.

2. Approval would delay completion of the Work or the work of other contractors.

3. Substitution request is indicated or implied on a Shop Drawing or other submittal, or on a request for interpretation or clarification, and is not accompanied by Contractor's formal request for substitution.

4. If the substitution is not clearly substantiated by performance criteria as providing an equivalent or superior performing installation.

C. All costs associated with Engineer's review of a substitution shall be recorded by Engineer, submitted to Owner, and charged to Contractor.

D. If Engineer does not approve the proposed substitute, Contractor shall provide the specified product, manufacturer, method, or procedure, as applicable.

E. Approval of a substitution request will not relieve Contractor from requirement for submitting Shop Drawings as set forth in the Contract Documents.

F. Product Substitutions Procedure:

1. Requests for approval of substitute products or items will be considered for a period of 30 days after the Effective Date of the Agreement. After end of specified period, requests will be considered only in case of unavailability of a specified product or other conditions beyond Contractor's control.

2. Submit copies of request for substitution.

3. Submit separate requests for each substitution.

4. In addition to requirements of the General Conditions and information required on substitution request forms, include with request the following:

    a. Product identification, including manufacturer's name and address.

    b. Manufacturer's literature with product description, performance and test data, and reference standards with which product complies.

    c. Samples, if appropriate.

    d. Name and address of similar projects on which product was used, and date of installation.

    e. Certified tests, where applicable, by an independent laboratory attesting the proposed substitution is equal.

    f. Cost information for the proposed substitution and the specified products.

    g. Lead time information for the proposed substitution and specified products.

    h. All other submittal requirements indicated in the individual Specification Sections associated with the specified equipment and material.

G. Construction Methods Substitutions Procedures:

1. Where construction methods or procedures are specified, for a period of 30 days after the Effective Date of the Agreement, Engineer will consider Contractor's written requests for substitute construction methods or procedures specified.

2. Submit copies of request for substitution.

3. Submit separate request for each substitution.

4. In addition to requirements of the General Conditions and information required on substitution request forms, include with request the following:

    a. Detailed description of proposed method or procedure.

    b. Itemized comparison of the proposed substitution with the specified method or procedure.

    c. Drawings illustrating method or procedure.

    d. Other data required by Engineer to establish that proposed substitution is equivalent to specified method or procedure.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Section includes:

1. General Conditions and Supplementary Conditions provision expansion, including the following:

a. Requests for interpretation.

b. Clarification notices

c. Field Orders

d. Work Change Directives

e. Proposal requests

f. Change Proposals

g. Change Orders

1.02 ADMINISTRATIVE REQUIREMENTS

A. Submit Contract modification documents to Engineer's contact person and address in the Contract Documents.

B. Retain at Contractor's office and at the Site complete copy of each Contract modification document and related documents, and Engineer's response.

C. At the Owner's request, forms may be submitted, processed and executed in electronic format in lieu of hard copies. Such procedure shall be established during the Pre-Construction Meeting.

1.03 REQUEST FOR INTERPRETATION

A. General:

1. Submit written or electronic requests for interpretation to Engineer. Contractor and Owner may submit requests for interpretation.

2. Submit request for interpretation to obtain clarification or interpretation of the Contract Documents. Report conflicts, errors, ambiguities, and discrepancies in the Contract Documents using requests for interpretation.

3. Do not submit request for interpretation when other form of communication is appropriate, such as submittals, requests for substitutions or “or equals”, notices, ordinary correspondence, or other form of communication. Improperly prepared or inappropriate requests for interpretation will be returned without response or action.

B. Procedure:

1. Submit one original (hard copy or electronic) of each request for interpretation. Submit each request for interpretation with separate letter of transmittal if hard copies are submitted.

2. Engineer will provide timely review of requests for interpretation. Allow sufficient time for review and response.

3. Engineer will maintain log of requests for interpretation. Copy of log will be provided upon request.

4. Engineer will provide written response to each request for interpretation. One copy of Engineer’s response will be distributed to:

a. Contractor

b. Owner

c. Engineer

d. Owner’s Site Representative (OSR)

C. If Engineer requests additional information to make an interpretation, provide information requested within ten (10) days, unless Engineer allows additional time, via correspondence referring to request for interpretation number.

D. If Contractor or Owner believes that a change in the Contract Price or Contract Times or other change to the Contract is required, notify Engineer and Owner in writing before proceeding with the Work associated with the request for interpretation.

E. Submit each request for interpretation on a form acceptable to Engineer.

1. Number each request for interpretation as follows: Numbering system shall be the Contract number and designation followed by a hyphen and three-digit sequential number.

2. In space provided on form, describe the interpretation requested. Provide additional sheets as necessary. Include text and sketches as required in sufficient detail for engineer's response.

3. When applicable, request for interpretation shall include Contractor's recommended resolution.

1.04 CLARIFICATION NOTICES

A. General:

1. Clarification notices, when required, will be initiated and issued by Engineer.

2. Clarification notices do not change the Contract Price or Contract Times, and do not alter the Contract Documents.

3. Clarification notices will be issued as correspondence or using clarification notice form, with additional information as required.

B. Procedure:

1. Electronic copies of Clarification Notices will be maintained, stored, and distributed by electronic construction document management system.

2. If Contractor believes that a change in the Contract Price or the Contract Times or other change to the Contract is required, notify Engineer and Owner in writing before proceeding with the Work associated with clarification notice.

3. If clarification notice is unclear, submit request for interpretation.

1.05 FIELD ORDERS

A. General:

1. Field Orders, when required, will be initiated and issued by Engineer.

2. Field Orders authorize minor variations in the Work but do not change the Contract Price or Contract Times.

3. Field Orders will be in the form of Engineers Joint Contract Documents Committee (EJCDC) document C-942, "Field Order" or other Engineer's accepted form.

4. Engineer will maintain a log of Field Orders issued.

B. Procedure.

1. Electronic copies of Field Orders will be maintained, stored, and distributed by electronic construction document management system.

2. If Contractor believes that a change in the Contract Price or the Contract Times or other change to the Contract is required, immediately notify Engineer and Owner in writing before proceeding with the Work associated with the Field Order.

3. If the Field Order is unclear, submit request for interpretation.

1.06 WORK CHANGE DIRECTIVE

A. General:

1. Work Change Directives, when required, order additions, deletions, or revisions to the Work.

2. Work Change Directives do not change the Contract Price or Contract Times but are evidence that the parties to the Contract expect that the change ordered or documented by the Work Change Directive will be incorporated in subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

3. Work Change Directives will be in the form of EJCDC document C-940, “Work Change Directive” or other Engineer’s accepted form.

B. Procedure:

1. Three originals of Work Change Directive signed by Owner and Engineer will be furnished to Contractor, who shall promptly sign each original Work Change Directive and, within five days of receipt, return all originals to Engineer.

2. Original, signed Work Change Directives will be distributed as follows:

   a. Contractor: One original

   b. Owner: One original

   c. Engineer: One original

3. One hard copy of each Work Change Directive will be distributed to: Owner’s Site Representative (OSR).

4. Document for the Work performed under each separate Work Change Directive, for each day, the number and type of workers employed and hours worked; equipment used including manufacturer, model, and year of equipment, and number of hours; materials used, receipts for and descriptions of materials and equipment incorporated into the Work, invoices and labor and equipment breakdowns for Subcontractors and Suppliers, and other information required by Owner or Engineer, in a format acceptable to Engineer. Submit this documentation to Engineer as a Change Proposal.

1.07 PROPOSAL REQUESTS

A. General:

1. Proposal requests may be initiated by Engineer or Owner.

2. Proposal requests are for requesting the effect on the Contract Price and the Contract Times and other information relative to contemplated changes in the Work. Proposal requests do not authorize changes or variations in the Work, and do not change the Contract Price or Contract Times or terms of the Contract.

3. Proposal requests will be furnished using the proposal request form included with this Section.

B. Procedure.

1. One copy of each signed proposal request will be furnished to Contractor with one copy each to:

a. Owner

b. Engineer

c. Owner's Site Representative (OSR)

2. Submit request for interpretation to clarify conflicts, errors, ambiguities, and discrepancies in proposal request.

3. Upon receipt of proposal request, Contractor shall prepare and submit a Change Proposal, in accordance with this Section, for the proposed Work described in the proposal request.

1.08 CHANGE PROPOSALS

A. General.

1. Submit written Change Proposal to Engineer in response to each proposal request, and when Contractor believes a change in the Contract Price or Contract Times or other change to the terms of the Contract is required.

B. Procedure.

1. Submit to Engineer one original and one copy of each Change Proposal with accompanying documentation, and simultaneously submit two copies to Owner. Submit each Change Proposal with separate letter of transmittal.

2. Engineer will review Change Proposal and either request additional information from Contractor or provide to Owner recommendation regarding approval of the Change Proposal.

3. When Engineer requests additional information to render a decision, submit required information within five days of receipt of Engineer's request, unless Engineer allows more time. Submit the required information via correspondence that refers to Change Proposal number.

4. Upon completing review, one copy of Engineer's written response, if any, will be distributed to:

    a. Contractor

    b. Owner

    c. Engineer

    d. Owner's Site Representative (OSR)

5. If Change Proposal is recommended for approval by Engineer and approved by Owner, a Change Order will be issued.

6. If parties do not agree on terms for the change, Owner or Contractor may file a Claim against the other, in accordance with the General Conditions and the Supplementary Conditions.

C. Each Change Proposal shall be submitted on a Change Proposal form acceptable to Engineer and Owner.

1. Number each Change Proposal as follows: Numbering system shall be the Contract number and designation followed by a hyphen and three-digit sequential number. Example: First Change Proposal for the general contract for project named "Contract 23" would be, "Proposal No. 23-001".

2. In space provided on form:

    a. Describe scope of each proposed change. Include text and sketches on additional sheets as required to provide detail sufficient for Engineer's review and response. If a change item is submitted in response to proposal request, write in as scope, "In accordance with Change Proposal Request No." followed by the proposal request number. Provide written clarifications, if any, to scope of change.

    b. Provide justification for each proposed change. If change is in response to proposal request, write in as justification, "In accordance with Change Proposal Request No." followed by the proposal request number.

c. List the total change in the Contract Price and Contract Times for each proposed change.

3. Unless otherwise directed by Engineer, attach to the Change Proposal detailed breakdowns of pricing (Cost of the Work and Contractor's fee) including:

a. List of Work tasks to accomplish the change.

b. For each task, labor cost breakdown including labor classification, total hours per labor classification, and hourly cost rate for each labor classification.

c. Construction equipment and machinery to be used, including manufacturer, model, and year of manufacture, and number of hours for each.

d. Detailed breakdown of materials and equipment to be incorporated into the Work, including quantities, unit costs, and total cost, with Supplier's written quotations.

e. Breakdowns of the Cost of the Work and fee for Subcontractors, including labor, construction equipment and machinery, and materials and equipment incorporated into the Work, other costs, and Subcontractor fees.

f. Breakdown of other costs eligible, in accordance with the General Conditions and the Supplementary Conditions.

g. Other information required by Engineer.

h. Contractor's fees applied to eligible Contractor costs and eligible Subcontractor costs.

1.09 CHANGE ORDERS

A. General:

1. Change Orders will be recommended by Engineer and signed by Owner, and Contractor, to authorize additions, deletions, or revisions to the Work, or changes to the Contract Price or Contract Times.

2. Change Orders will be in the form of EJCDC document C-941, "Change Order" or other Engineer's accepted form.

B. Procedure.

1. Five originals of each Change Order will be furnished to Contractor, who shall sign each original Change Order and return all originals to Engineer within five days of receipt.

2. Engineer will sign each original Change Order and forward them to Owner.

3. After approval and signature of all parties, three executed original copies will be returned to Engineer. Engineer will distribute as follows:

    a. Contractor: One original

    b. Owner: One original

    c. Engineer: One original

4. One copy of each Change Order will be distributed to:

    a. Owner's Site Representative (OSR)

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 SCHEDULE

A. 2013 EJCDC Form C-942, Field Order

B. 2013 EJCDC Form C-940, Work Change Directive

C. 2013 EJCDC Form C-941, Change Order

END OF SECTION

Field Order No. _____

Date of Issuance:	Effective Date:
Owner:	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer:	Engineer's Project No.:
Project:	Contract Name:

Contractor is hereby directed to promptly execute this Field Order, issued in accordance with General Conditions Paragraph 9.04, 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(s) Drawing(s) / Detail(s)

Description:

Attachments:

ISSUED:	RECEIVED:
By: _____	By: _____
Engineer (Authorized Signature)	Contractor (Authorized Signature)
Title: _____	Title: _____
Date: _____	Date: _____

Copy to: Owner

Work Change Directive No. _____

Date of Issuance:	Effective Date:
Owner:	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer:	Engineer's Project No.:
Project:	Contract Name:

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

Description:

Attachments: [List documents supporting change]

Purpose for Work Change Directive:
Directive to proceed promptly with the Work described herein, prior to agreeing to changes on Contract Price and Contract Time, is issued due to: [check one or both of the following]

☐ Non-agreement on pricing of proposed change.

☐ Necessity to proceed for schedule or other Project reasons.

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

Contract Price $ _____ [increase] [decrease].

Contract Time ____ days [increase] [decrease].

Basis of estimated change in Contract Price:

☐ Lump Sum ☐ Unit Price

☐ Cost of the Work ☐ Other

RECOMMENDED:	AUTHORIZED BY:	RECEIVED:
By: _____	By: _____	By: _____
Engineer (Authorized Signature)	Owner (Authorized Signature)	Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

Approved by Funding Agency (if applicable)

By: _____ Date: _____

Title: _____

Change Order No. _____

Date of Issuance:	Effective Date:
Owner:	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer:	Engineer's Project No.:
Project:	Contract Name:

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

Description:

Attachments: [List documents supporting change]

CHANGE IN CONTRACT PRICE	CHANGE IN CONTRACT TIMES
Original Contract Price: $	[note changes in Milestones if applicable] Original Contract Times: Substantial Completion: Ready for Final Payment: days or dates
[Increase] [Decrease] from previously approved Change Orders No. to No. : $	[Increase] [Decrease] from previously approved Change Orders No. to No. : Substantial Completion: Ready for Final Payment: days
Contract Price prior to this Change Order: $	Contract Times prior to this Change Order: Substantial Completion: Ready for Final Payment: days or dates
[Increase] [Decrease] of this Change Order: $	[Increase] [Decrease] of this Change Order: Substantial Completion: Ready for Final Payment: days or dates
Contract Price incorporating this Change Order: $	Contract Times with all approved Change Orders: Substantial Completion: Ready for Final Payment: days or dates

RECOMMENDED:	ACCEPTED:	ACCEPTED:
By: _____	By: _____	By: _____
Engineer (if required)	Owner (Authorized Signature)	Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

Approved Funding Agency (if required)

By: _____ Date: _____

Title: _____

SECTION 01 29 76

PROGRESS PAYMENT PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Administrative and procedural requirements for progress payment to the Contractor by the Owner.

B. Related Sections:

1. Section 01 77 19 – Closeout Requirements.

1.02 ADMINSTRATIVE REQUIREMENTS

A. General: Contractor's request for payment shall be in accordance with the Agreement, General Conditions and Supplementary Conditions, and the Specifications.

B. At the Owner's request, Contractor may be eligible to submit payment requests in electronic format. Such procedures shall be reviewed and agreed upon during the Pre-Construction Meeting.

C. General Procedure:

1. Review with Owner's Site Representative (OSR) quantities and the Work proposed for inclusion in each progress payment. Application for Payment shall cover only the Work and quantities recommended by the RPR/OSR.

2. Submit to Engineer five originals of each complete Application for Payment and other documents to accompany the Application for Payment.

3. Engineer will act on request for payment in accordance with the General Conditions and Supplementary Conditions.

D. Requirements:

1. Completed Application for Payment form, including summary/signature page, progress estimate sheets, and stored materials summary. Progress estimate sheets shall have the same level of detail as the Schedule of Values.

2. For materials and equipment not incorporated in the Work but suitably stored, submit documentation in accordance with the General Conditions and Supplementary Conditions. Legibly indicate on invoice or bill of sale the specific materials or equipment included in the payment request and corresponding bid/payment item number for each.

3. Contractor's Affidavit is required for payment application and requests beginning with the second application for payment.

4. For payment requests that include payment for Work under an allowance, submit documentation acceptable to Owner of the authorization of allowance Work. At a minimum, such documentation shall be of similar detail as Change Proposals referenced in Section 01 26 00 – Contract Modification Procedures.

5. For payment requests (other than request for final payment) that include reduction or payment of retainage in an amount greater than that required in the Contract Documents, submit on form acceptable to Owner consent of surety to partial release or reduction of retainage.

E. Requirements for request for final payment are in the General Conditions, as modified by the Supplementary Conditions, and Section 01 77 19 – Closeout Requirements.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Pre-Construction Meeting:

a. Purpose of conference is to designate responsible personnel, establish working relationships, discuss preliminary schedules submitted by Contractor, and review administrative and procedural requirements for the Project. Matters requiring coordination will be discussed and procedures for handling such matters will be established.

b. Date, Time and Location: Conference will be held after execution of the Contract and before Work starts at the Site. Owner's representative will establish the date, time, and location of conference and notify the interested and involved parties.

2. Progress Meetings:

a. Progress meetings will be held throughout the Project. Contractor shall attend each progress meeting prepared to discuss in detail all items on the agenda.

b. At a minimum, Contractor shall be prepared to discuss work completed, look-ahead schedule and status of overall construction progress.

c. Engineer will preside at progress meetings and will prepare and distribute minutes of progress meetings to all meeting participants and others as requested.

d. Date, Time and Location:

1) Regular Meetings: Every month on a day and time agreeable to Owner, Engineer, and Contractor.

2) Location mutually agreed upon by Owner, Contractor, and Engineer. At the Owner's request, meeting may be held virtually.

e. Additional meetings may be conducted as progress of Work requires at a mutually agreed date, time and location.

1.02 ADMINSTRATIVE REQUIREMENTS

A. Pre-Construction Meeting:

1. Contractor shall provide pre-construction meeting submittals with sufficient number of copies for each attendee:

2. Required Attendees:

a. Contractor

1) Project manager.

2) Site superintendent.

3) Safety representative.

4) Major Subcontractors.

b. Owner.

c. Engineer.

d. Owner’s Site Representative (OSR).

e. Representatives of governmental or other regulatory agencies.

3. Contractor shall prepare and submit a health and safety plan, including confined space entry plan, as specified in this Section prior to the pre-construction meeting.

4. Agenda, minimum:

a. Procedural requirements:

1) Designation of responsible personnel

2) Use of Site and Owner’s requirements, including general regards for community relations

3) Delivery of materials and equipment to the Site

4) Safety and first aid procedures

5) Confined space entry plan

6) Security procedures

7) Housekeeping procedures

b. Administrative requirements:

1) Distribution of Contract Documents.

2) Shop Drawing submittal procedures.

3) Maintaining record documents at the Site.

4) Contract modification procedures

5) Processing of Payment Application

c. Site mobilization requirements:

1) Working hours, overtime, and holidays.

2) Field offices, trailers, and staging areas.

3) Temporary facilities and utilities, including usage and coordination.

4) Temporary controls, such as sediment and erosion control, noise, dust, storm water, and other measures.

5) Access to Site, access roads, and parking for construction vehicles.

6) Protection of traffic and existing property, including site barriers and temporary fencing.

7) Security

8) Storage of materials and equipment.

9) Reference points and benchmarks, surveys and layouts.

10) Site maintenance during the project, including cleaning and removal of trash and debris.

11) Site restoration.

d. Schedules

1) Preliminary construction schedule

2) Critical work sequencing

3) Preliminary Shop Drawing submittal schedule

4) Preliminary Schedule of Values

B. Progress Meetings:

1. Progress meetings frequency shall be conducted as specified in this Section, unless modified and agreed upon by Owner, Contractor, and Engineer. Additional meetings may be conducted as progress of Work requires.

2. Contractor shall provide submittals specified in this Section prior to each progress meeting.

3. Attendance:

a. Contractor, including project manager, site superintendent, safety representative, and representatives of Subcontractors and Suppliers as required.

b. Engineer, including project manager (or designated representative), Resident Project Representative (if any), others as required by Engineer.

c. Owner, including Owner's Site Representative (if any).

d. Subcontractors, only with Engineer's approval or request, as required in the agenda.

4. Agenda, minimum:

a. Review, comment, and amendment (if required) of minutes of previous progress meeting.

b. Review of progress since the previous progress meeting.

c. Planned progress through next 30 – 60 days.

d. Review of Progress Schedule

1) Contract Times, including Milestones (if any)

2) Critical path.

3) Schedules for fabrication and delivery of materials and equipment.

4) Corrective measures, if required.

e. Submittals:

1) Review of status of critical submittals.

2) Review revisions to schedule of submittals.

f. Contract Modifications:

1) Requests for interpretation

2) Clarification notices

3) Field Orders

4) Proposal requests

5) Change Proposals

6) Work Change Directives.

7) Change Orders.

8) Claims.

g. Applications for progress payments.

h. Problems, conflicts, and observations.

i. Quality standards, testing, and inspections.

j. Coordination between parties.

k. Site management issues, including access, security, maintenance and protection of traffic, maintenance, cleaning, and other Site issues.

l. Safety.

m. Permits.

n. Record documents status.

o. Punch list status, as applicable.

p. Other business.

1.03 SUBMITTALS

A. Pre-Construction Meeting Submittals:

1. Prior to the conference, submit the following preliminary schedules in accordance with the General Conditions:

1) Progress schedule

2) Schedule of submittals

3) Schedule of values

2. Contractor’s safety and first aid procedures.

3. Confined space entry plan.

4. List of emergency contact information

B. Progress Meeting Submittals:

1. List of Work accomplished since the previous progress meeting.

2. Up-to-date Progress Schedule.

3. Up-to-date Schedule of Submittals.

4. Detailed “look-ahead” schedule of Work planned through the next progress meeting, with specific starting and ending dates for each activity, including shutdowns, deliveries of important materials and equipment, Milestones (if any), and important activities affecting the Owner, Project, and Site.

5. When applicable, list of upcoming, planned time off (with dates) for personnel with significant roles on the Project, and the designated contact person in their absence.

1.04 EMERGENCY CONTACT INFORMATION

A. Contractor shall provide list of emergency contact information for 24-hour use throughout the Project. Emergency contact information shall be updated and kept current throughout the Project. If personnel or contact information change, provide updated emergency contact information list at the next progress meeting.

B. Contractor’s list of emergency contact information shall include:

1. Contractor’s project manager’s office, field office, cellular, and home telephone numbers.

2. Contractor’s Site superintendent’s office, field office, cellular, and home telephone numbers.

3. Contractor’s foreman’s field office, cellular (if available), and home telephone numbers.

4. Major Subcontractors’ and Suppliers’ office, cellular, and home telephone numbers of project manager and foreman (when applicable).

C. Additional Emergency Contact Information:

1. Owner’s Project Manager: office, cellular, and home telephone numbers.

2. Owner’s central 24-hour emergency telephone number.

3. Engineer’s project engineer’s office, cellular, and home telephone numbers.

4. Owner’s Site Representative’s office, field office, cellular, and home telephone numbers.

5. Emergency telephone numbers, including: “Emergency: Dial 911”, and seven-digit telephone numbers for the hospital, ambulance, police, and fire department nearest to the Site. Provide names of each of these institutions.

6. Other involved entities as applicable.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 32 00

CONSTRUCTION PROGRESS SCHEDULE

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes: Detailed requirements and/or procedures for, including but not limited to, the Preliminary Project Schedule, Project Schedule Updates, Project Schedule development, Time Impact Analysis, and Recovery Schedules

B. The Contractor shall develop, revise, and provide all information and input required for the Project Schedule for the performance of the Work in accordance with the requirements of the Contract Documents in general and, in particular, this section. The Progress Schedule shall incorporate the requirements of General Conditions, Supplementary Conditions, and all items specified in this section.

C. Except as otherwise provided herein or elsewhere in the Contract Documents, the planning, scheduling, coordination, and execution of the Work is the sole responsibility of the Contractor.

1.02 REFERENCES

A. Definitions:

1. Activity: An element of the construction work that has the following specific characteristics: consumes time, consumes resources, has a definable start and finish, is assignable, and is measurable.

2. Constraint: An imposed date on the Progress Schedule or an imposed tie between Activities. The Contract Times are Constraints.

3. CPM Progress Schedule: Computerized Progress Schedule in Critical Path Method (CPM) format which accounts for the entire Work, defines the interrelationships between elements of the Work, reflects the uncompleted Work, and indicates the sequence with which the Work has been completed, indicates the sequence in which uncompleted Work will be completed, and indicates the duration of each Activity.

4. Critical Path: The continuous chain of Activities with the longest duration for completion within the Contract Times.

5. Early Start: The earliest possible date an activity can start according to the assigned relationships among activities.

6. Early Finish: The earliest possible date an activity can finish according to the assigned relationships among the activities.

7. Late Finish: The latest possible date an activity can finish without extending the Contract Times.

8. Late Start: The latest possible date an activity can start without extending the Contract Times.

9. Total Float: The total number of days that an activity (or chain of activities) can be delayed without affecting the Contract Times. Total float for each activity shall be calculated as the difference between Early Finish and Late Finish.

10. Network Diagram: A time-scaled logic diagram depicting the durations and relationships of the activities.

11. Work Areas, Area, or System: A logical breakdown of the Project elements or a group of activities which, when collectively assembled, are readily identifiable on the Project (for example, yard piping, a structure or building, a treatment process, or other logical grouping).

1.03 ADMINSTRATIVE REQUIREMENTS

A. Initial Progress Schedule:

1. Type and Organization of Progress Schedules:

a. Prepare one Progress Schedule covering the entire Project using Primavera Planner (P6 or newer), or Microsoft Project scheduling software.

b. Schedule submittals shall include the electronic native file format (i.e., scheduling software file), and a PDF file of the schedule's logic diagram.

c. Time Scale: Indicate first date of each work week.

d. Activity Designations: Indicate concise description of the Work represented by the activity and related Specification Section number. The Work related to each activity shall be limited to one work trade and one construction area.

2. Submitted PDF files shall be in a Gantt Chart Format and shall show the following:

a. Activity identification number.

b. Activity description.

c. Activity duration (in workdays).

d. Activity percent complete

e. Start, Early Start, Late Start, Finish, Early Finish, and Late Finish Dates

f. Total Float for each Activity.

g. Critical Path denoted.

3. Organization:

a. Group shop drawings, samples and other submittals into a separate sub-schedule that is part of the Progress Schedule.

b. Group deliveries of materials and equipment into a separate sub-schedule that is part of the Progress Schedule.

c. Group construction into Work Area sub-schedules (that are part of the Progress Schedule) by Activity.

d. Clearly indicate the Critical Path on the Progress Schedule.

e. Organize each work area sub-schedule by Specification number.

4. Preliminary Progress Schedule:

a. Contractor shall submit to Engineer the Preliminary Progress Schedule within ten (10) days after Notice to Proceed.

5. Initial Acceptance of Progress Schedule:

a. At least 10 days before submission of the first Application for Payment, Contractor shall schedule a conference at the Site for review of the Preliminary Progress Schedule.

1) Attendees shall include Contractor, Engineer, Owner, and others as required.

2) Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the Progress Schedule.

3) Owner reserves the right to not make progress payment to Contractor until acceptable Progress Schedule, and other

reports and schedule-related documents required are submitted to Engineer.

b. Initially-accepted Progress Schedule shall be identified as the Baseline Progress Schedule. The Baseline Progress Schedule shall not be revised without Owner and Engineer approval.

B. Project Schedule Updates:

1. Project Schedule Updates shall be prepared on a monthly basis throughout the entire Contract Time and until Project Final Completion. The Engineer will not recommend progress payments by the Owner until a complete Project Schedule Update (including Schedule Narrative Report) is received, reviewed, and accepted by the Engineer.

2. The update to the Progress Schedule shall be based on retained logic. Progress override logic is not allowed.

3. Required scheduling software, and schedule organization, format, and content for updated Progress Schedules are identical to that required in this Section for initial Progress Schedules.

4. For all Project Schedule Updates, the percent complete reported for individual Activities shall be based on Work accepted and paid for the by Owner in monthly pay applications. Failure to comply with this requirement shall be result in rejection of the submitted update. Rejection of the Project Schedule Update will in turn result in the Engineer not recommending progress payments by the Owner.

5. Monthly Progress Schedule Updates shall be accompanied by a Schedule Narrative Report. The report shall:

a. Describe Work completed within the preceding month.

b. Describe Work planned for the following month (including a look-ahead schedule).

c. Identify proposed changes or revisions to the Baseline Progress Schedule.

d. Identify all Work performed out of sequence.

e. Identify problem areas.

f. Identify current or anticipated conditions which may delay the Work.

1.04 PROJECT SCHEUDLE DEVELOPMENT

A. The schedule shall cover the entire Contact Time, and the Work shall be scheduled to complete the Project within the Contract Time.

B. The Schedule's Late Finish Date shall equal the Contract Completion Date.

C. All activities except for the NTP and Final Completion shall have a predecessor and a successor. No open-ended activities will be permitted. Note that NTP shall have a successor or successors and Final Completion shall have a predecessor or predecessors.

D. Proposed durations assigned to each activity shall be the Contractor's best estimate of time required to complete the activity, considering the scope and resources planned for the activity.

E. The durations of activities shall be expressed in whole working days, with a maximum duration of 20 workdays each, unless otherwise approved or directed by the Engineer or the Owner. The duration of non-construction activities including mobilization, shop drawings, fabrication of materials and equipment, and delivery of materials and equipment may exceed this limitation.

F. The Schedule shall incorporate in detail all elements of the Work contained within the Contract Documents. Specific elements of the Work to incorporate into the schedule include but are not limited to the following:

1. Notice to Proceed.

2. Mobilization and demobilization.

3. Submittals including O&M Manuals. Note that durations for Engineer review time shall be 30 working days unless specified elsewhere in these Contract Documents.

4. Fabrication and procurement activities.

5. Temporary construction activities and relocations

6. Permitting

7. Erosion control

8. Site clearing

9. Site restoration

10. All requirements for coordination with Owner operations

11. Concrete curing and form removal

12. All testing activities

13. Inspections as required by local authorities.

14. Interim Milestones as defined by this Contact or as deemed critical as the project progresses.

15. All requirements related to facility startup and commissioning.

16. Substantial Completion (including the period for performing the punch list)

17. Final Completion

1.05 TIME IMPACT ANALYSIS

A. General:

1. Prepare and submit a time impact analysis when one or more of the following occurs:

    a. Change Order proposal is prepared.

    b. Work Change Directive affecting the Progress Schedule is issued.

    c. When delays are experienced.

2. Time impact analysis shall illustrate the influence of each Change Order, Work Change Directive, or delay.

3. Each time impact analysis shall include a sketch (fragnet) demonstrating how Contractor proposes to incorporate the changes in the Project or, as applicable, delays into the Progress Schedule. Fragnet shall include all logic, and additions required as result of said Change Order, Work Change Directive, or delay.

4. Fragnet shall show all CPM logic revisions for the Work associated with the Change Order, Work Change Directive, or delay and its relationship to other Activities.

5. Timing of Time Impact Analysis:

    a. Submit each time impact analysis within 7 days after the following, as applicable:

        1) Start of the delay.

        2) After the submittal of Change Order proposal to Engineer

3) After Contractor's Receipt of Work Change Directive.

b. Failure to Submit Time Impact Analysis: When General Contractor does not submit time impact analysis for a specific change or delay under the General Contract, within the specified period of time for such submittal, such non-submittal shall be construed that no extension of the Contract Times is required.

B. Evaluation by Engineer and Acceptance:

1. Engineer's evaluation of each time impact analysis comprised of complete information will be completed in timely manner after Engineer's receipt. Changes in the Contract Times will be made only by Change Order.

2. When mutual agreement is reached between the parties, incorporate changes into the next Progress Schedule and update the associated fragnets illustrating the influence of changes and delays.

1.06 RECOVERY SCHEDULES

A. General:

1. When updated Progress Schedule indicates that the ability to comply with the Contract Times falls 30 or more days behind schedule, and there is no excusable delay, Change Order, or Work Change Directive to support an extension of the Contract Times, Contractor shall prepare and submit a Progress Schedule demonstrating Contractor's plan to accelerate the Project to achieve compliance with the Contract Times (i.e., "recovery schedule") for Engineer's acceptance.

2. Submit recovery schedule within 14 days after submittal of updated Progress Schedule where need for recovery schedule is indicated.

B. Implementation of Recovery Schedule:

1. At no additional cost to Owner, Contractor shall do one or more of the following:

a. Furnish additional labor and construction equipment.

b. Employ additional work shifts.

c. Expedite procurement of materials and equipment to be incorporated into the Work.

d. Other measures necessary to complete the Work within the Contract Times.

2. Upon acceptance of recovery schedule by Engineer, incorporate recovery schedule into the next Progress Schedule update.

C. Lack of Action: Contractor's refusal, failure or neglect to submit a recovery schedule, shall constitute reasonable evidence that Contractor is not prosecuting the Work or separable part thereof with the diligence that will ensure completion within the Contract Times. Such lack of action shall constitute sufficient basis for Owner to exercise remedies available to Owner under the Contract Documents

1.07 USE OF FLOAT

A. Total Float and Contract Float belong to the Project and may be used by Owner, to accommodate modifications, regardless of origination, in the Work or to mitigate the effect of events that may delay performance or completion of the Work.

B. Changes or delays that influence scheduled work activities with float that do not extend the critical path will not be justification for an extension in Contract Time.

1.08 SUBMITTALS

A. Action/Informational Submittals:

1. Initial Progress Schedules:

a. Preliminary Progress Schedule

b. Acceptable Progress Schedule (Baseline)

2. Progress Schedule Updates:

a. Progress Schedule updates shall comply with requirements of this Section and shall include updated Progress Schedule and Schedule Narrative Report.

b. Submit updated Progress Schedule at each progress meeting. If a Progress Schedule remains unchanged from one progress meeting to the next, submit a written statement to that effect.

3. Time Impact Analyses: Submit in accordance with this Section.

4. Recovery Schedule: Submit in accordance with this Section.

5. Qualifications: Progress Schedule preparer, and other personnel that will assist Progress Schedule preparer in preparing and maintaining the Progress Schedule.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Contractor shall provide submittals in accordance with the General Conditions as modified by the Supplementary Conditions, and this Section.

2. Contractor is responsible for confirming and correcting dimensions, for information pertaining to the fabrication processes and to techniques of construction, and for coordinating the work of all trades. Contractor's signature of submittal's stamp and letter of transmittal shall be Contractor's representation that Contractor has met his obligations under the Contract Documents relative to that submittal.

3. Contractor is responsible for including any deviations from the Technical Specifications in their cover letter. Approval of shop drawings will not waive Contractor's responsibility for meeting requirements of the Contract Documents unless deviations are specifically noted.

B. Related Sections:

1. Section 01 25 00 – Substitution Procedures.

2. Section 01 78 39 – Project Record Documents.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Types of Submittals: When type of submittal is not specified and is not specified in this Section, Engineer will determine type of submittal.

1. Action/Informational Submittals:

a. Shop Drawings.

b. Product data.

c. Delegated design submittals in accordance with the General Conditions and as modified by the Supplemental Conditions.

d. Samples.

e. Testing plans, procedures, and testing limitations.

f. Design data not sealed and signed by a design professional retained by Contractor, Subcontractor, or Supplier.

g. Pre-construction test and evaluation reports, such as reports on pilot testing, subsurface investigations, potential Hazardous Environmental Conditions, and similar reports.

h. Supplier instructions, including installation data, and instructions for handling, starting-up, and troubleshooting.

i. Sustainable design submittals (other than sustainable design closeout documentation).

j. Lesson plans for training and instruction of Owner's personnel.

2. Closeout Submittals:

a. Maintenance contracts.

b. Operations and maintenance data.

c. Bonds, such as maintenance bonds and bonds for a specific product or system.

d. Warranty documentation.

e. Record documentation.

f. Sustainable design closeout documentation.

g. Software.

3. Maintenance Material Submittals:

a. Maintenance materials schedule and checklist.

b. Spare parts.

c. Extra stock materials.

d. Tools.

4. Quality Assurance Submittals:

a. Performance affidavits.

b. Certificates.

c. Source quality control submittals (other than testing plans, procedures, and testing limitations), including results of shop testing.

d. Field or Site quality control submittals (other than testing plans, procedures, and testing limitations), including results of operating and acceptability tests at the Site.

e. Supplier reports.

f. Special procedure submittals, including health and safety plans and other procedural submittals.

g. Qualifications statements.

B. Submittal Requirements:

1. Contractor shall submit electronic copy of submittals for Engineer's review via Procore Document Management unless otherwise specified in individual Specification Sections. Acceptable electronic formats is Adobe PDF.

2. Upon approval, Contractor shall provide Owner's representative with two hard copies. These hard copies shall be transmitted within 5 calendar days of approval.

3. Submittal shall be accompanied by letter of transmittal containing date, project title, Contractor's name, number and title of submittal, list of relevant Specification Sections, notification of deviations from Contract Documents, and other material required for Engineer's review.

C. Scheduling:

1. Provide submittals well in advance of the Work following Engineer's approval or acceptance of the associated submittal. Work covered by a submittal will not be included in progress payments until approval or acceptance of related submittals has been obtained in accordance with the Contract Documents.

2. Submittals shall be provided by Contractor with at least thirty (30) working days for review and processing.

1.03 SCHEDULE OF SUBMITTALS

A. Schedule of Submittals, as specified in this Section:

1. Timing:

a. Provide submittal within time frames specified in the Contract Documents.

b. Provide updated Schedule of Submittals with each submittal of the updated Progress Schedule.

2. Content: In accordance with the General Conditions as modified by the Supplementary Conditions, and this Section. Requirements for content of preliminary Schedule of Submittals and subsequent submittals of the Schedule of Submittals are identical.

    a. Identify submittals required in the Contract Documents. Updates of Schedule of Submittals shall show scheduled dates and actual dates for completed tasks. Indicate submittals that are on the Project's critical path.

    b. Indicate the following for each submittal:

        1) Date when submittals are requested and received from Supplier.

        2) Date when certification is received from Supplier and when submitted to Engineer.

        3) Date when submittals are submitted to Engineer and returned with disposition from Engineer.

        4) Date when submittals are revised by Supplier and submitted to Engineer.

        5) Date when submittals are returned with "Furnish as Submitted" (FAS) or "Furnish as Corrected" (FAC) disposition from Engineer.

        6) Date when approved submittals are returned to Supplier.

        7) Date of Supplier scheduled delivery of equipment and material.

        8) Date of actual delivery of equipment and material.

        9) Whether submittal will be for a substitution or "equal". Procedures for substitutions and "or equals" are specified in the General Conditions and the Section 01 25 00 – Substitution Procedures.

        10) For submittals for materials or equipment, date by which material or equipment must be at the Site to avoid delaying the Work and to avoid delaying the work of other contractors.

3. Prepare Schedule of Submittals using same software, and in same format, specified for Progress Schedules.

4. Coordinate Schedule of Submittals with the Progress Schedule.

5. Schedule of Submittals that is not compatible with the Progress Schedule, or that does not indicate submittals on the Project's critical path, or that places extraordinary demands on Engineer for time and resources, is unacceptable. Do not include submittals not required by the Contract Documents.

6. In preparing Schedule of Submittals:

    a. Considering the nature and complexity of each submittal, allow sufficient time for review and revision.

    b. Reasonable time shall be allowed for: Engineer's review and processing of submittals, for submittals to be revised and resubmitted, and for returning submittals to Contractor.

    c. Identify and accordingly schedule submittals that are expected to have long anticipated review times.

1.04 ACTION/INFORMATIONAL SUBMITTALS

A. Provide the following Submittals in accordance with the individual Specification Sections, including, but not limited to, the following:

1. Product Data:

    a. Catalog cut-sheets

    b. Descriptive bulletins/brochures/specifications

    c. Material of construction data, including details on all components including applicable ASTM designations.

    d. Lifting, erection, installation, and adjustment instructions, and recommendations.

    e. Finish/treatment data, including interior and exterior shop coating systems.

    f. Equipment/material weight/loading data, including total uncrated weight of the equipment plus the approximate weight of shipped materials. Support locations and loads that will be transmitted to bases and foundations following installation. Size, placement, and embedment requirements of anchor bolts.

    g. Complete information regarding location, type, size, and length of all field welds in accordance with "Standard Welding Symbols" AWS A2.0 of the American Welding Society. Special conditions shall be fully explained by notes and details.

    h. Motor data including horsepower; enclosure type; voltage; insulation class; temperature rise and results of dielectric tests; service-rating; rotative speed; motor speed-torque relationship; efficiency and power factor at ½, ¾, and full load; slip at full load; running, full load, and locked rotor current values; safe running time-current curves; motor protective devices; and interconnection diagrams.

i. Engineering design data, calculations, and system analyses

j. Digital system documentation

k. Operating sequence descriptions

l. Software/programming documentation

m. Manufacturer's instructions

2. Shop Drawings:

a. Equipment and material layout drawings, including panel layout drawings.

b. System schematics and diagrams including, but not limited to, piping systems; HVAC and ventilation systems; process equipment systems; electrical operating systems; wiring diagrams; controls, alarm and communication systems.

c. Layout and installation drawings (interior and exterior) for all pipes, valves, fittings, sewers, drains, heating and ventilation ducts, all electrical, heating, ventilating and other conduits, plumbing lines, electrical cable trays, lighting fixture layouts, and circuiting, instrumentation, interconnection wiring diagrams, communications, power supply, alarm circuits, etc.

d. Layout and installation drawings shall show connections to structures, equipment, sleeves, valves, fittings, etc.

e. Drawings shall show the location and type of all supports, hangers, foundations, etc., and the required clearances to operate valves, equipment, etc.

f. Drawings for pipes, ducts, conduits, etc., shall show all 3 inch and larger electrical conduits and pressure piping, electrical cable trays, heating and ventilation ducts or pipes, structure, manholes or any other feature within four (4) feet (measured as the clear dimension) from the pipe duct, conduit, etc., for which the profile is drawn.

g. Equipment and material schedules.

3. Delegated design submittals, which include documents prepared, sealed, and signed by a design professional retained by Contractor, Subcontractor, or Supplier for materials and equipment to be incorporated into the completed Work. Delegated design submittals do not include submittals related to temporary construction unless specified otherwise in the related Specification Section. Delegated design submittals include: design drawings, design data including calculations, specifications, certifications, and other submittals prepared by such design professional.

B. Samples:

1. General Requirements:

a. Conform submittal of Samples to the General Conditions as modified by the Supplementary Conditions, this Section, and the Specification Section in which the Sample is specified.

b. Furnish at the same time Samples and submittals that are related to the same unit of Work or Specification Section. Engineer will not review submittals without associated Samples and will not review Samples without associated submittals.

c. Samples shall clearly illustrate functional characteristics of product, all related parts and attachments, and full range of color, texture, pattern, and material.

2. Submittal Requirements:

a. Securely label or tag Samples with submittal identification number. Label or tag shall not cover, conceal, or alter appearance or features of Sample. Label or tag shall not be separated from the Sample.

b. Submit number of Samples required in Specifications. If number of Samples is not specified in the associated Specification Section, provide at least one identical Samples of each item required for Engineer's approval. If Contractor requires Sample(s) for Contractor's use, notify Engineer in writing and provide additional Sample(s). Contractor is responsible for furnishing, shipping, and transporting additional Samples.

c. Deliver one Sample to Engineer's field office at the Site. Deliver balance of Samples to location directed by Engineer.

1.05 CLOSEOUT SUBMITTALS

A. Provide the following Closeout Submittals in accordance with the individual Specification Sections, including, but not limited to, the following:

1. Maintenance contracts

2. Bonds for specific products or systems

3. Warranty documentation

4. Sustainable design closeout documentation.

5. Software programming and documentation.

B. On documents such as maintenance contracts and bonds, include on each document furnished original signature of entity issuing the document.

C. Record Documentation: Submit in accordance with Section 01 78 39 – Project Record Documents.

D. Disposition: Dispositions and meanings are the same as specified for Informational Submittals.

1.06 MAINTENANCE MATERIAL SUBMITTALS (NOT USED)

1.07 CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall review, coordinate, and verify submittals with Subcontractors, Manufacturers, and Suppliers, including field measurements at Site, in accordance with the General Conditions and as modified by Supplemental Conditions prior to submitting material for Engineer's review.

B. Contractor shall clearly and concisely indicate and mark equipment and material being submitted to meet the intent of the Contract Documents. Equipment and material not being submitted shall be deleted, stricken through, or otherwise designated not being submitted. Equipment and material data sheets shall be included once with cross references throughout the submittal. Multiple equipment and material data sheets for the same item within a submittal may receive a rejected disposition until corrected.

1. Individual Specification Sections require a Compliance, Deviations, and Exceptions (CD&E) letter to be included with the submittal. When specified, submittals provided without the CD&E letter shall receive a rejected disposition without review.

2. CD&E letter requirements:

a. Include a copy of entire Specification section with each paragraph and subparagraph noted with "C", "D", or "E" to indicate if equipment and material being provided is in compliance (C), deviates (D), or exceptions (E) are taken with the Contract Documents.

1) Compliance (C): Full compliance with the specified requirement.

2) Deviation (D): Deviation from the specified requirement.

3) Exception (E): Exception with the specified requirement.

b. Include all comments, deviations and exceptions taken to the Contract Documents by the Contractor and Equipment Manufacturer/Supplier.

c. Any requirements with the letter "D" or "E" beside them shall be provided with a full typewritten explanation of the deviation/exception. Handwritten explanation of the deviations/exceptions is not acceptable.

d. Address deviations and exceptions taken to each Contract Drawing related to the Specification section.

C. Contractor shall provide Contractor's stamp of approval certifying submittal material has been reviewed and conform to the Contract Documents prior to submitting material for Engineer's review.

D. Contractor shall provide written notice of deviations or variations that submittal may have with the Contract Documents.

E. Contractor shall provide bound, dated, labeled, tabulated, and consecutively numbered submittals as specified in the individual Specification Section. Label shall contain the following:

1. Specification Section.

2. Referenced Drawing number.

3. Subcontractor or Supplier name.

4. Type of equipment and/or materials.

F. Contractor shall perform the following after receiving Engineer's review disposition:

1. Order, fabricate, or ship equipment and materials included in the submittal (pending Engineer's review of source quality control submittals) with the following disposition:

a. "Furnish as Submitted" (FAS).

b. "Furnish as Corrected" (FAC).

c. "Furnish as Corrected – Confirm" (FACC), only portions of Work that do not require resubmittal for Engineer's review.

2. Resubmittal requirements:

a. Partial resubmittal of "Furnish as Corrected – Confirm" (FACC) returned dispositions, until Engineer's disposition is either "Furnish as Submitted" (FAS) or "Furnish as Corrected" (FAC).

b. Full resubmittal of material with Engineer's disposition of "Revise and Resubmit" (R&R), until Engineer's disposition is "Furnish as Submitted"

(FAS), “Furnish as Corrected” (FAC), or “Furnish as Corrected – Confirm” (FACC) that requires a partial resubmittal.

c. Contractor shall be responsible for Engineer’s charges to Owner if submittals are not approved within the number of specified submittals in accordance with the General Conditions. Engineer’s charges shall include, but not limited to, additional review effort, meetings, and conference calls with Contractor, Subcontractor, or Supplier.

1.08 ENGINEER’S REVIEW

A. Engineer’s review of the Contractor’s submittal shall not relieve Contractor’s responsibility under the Contract Document in accordance with the General Conditions and as modified in the Supplemental Conditions. An acceptance of a submittal shall be intended to mean the Engineer does not have specific objection to the submitted material, subject to conformance with the Contract Drawings and Specifications.

B. Engineer’s review of Contractor’s submittal shall be confined to general arrangement and compliance with the Contract Documents, and shall not be for the purpose of checking dimensions, weights, clearances, fittings, tolerances, interferences, coordination of Subcontractor work, etc.

C. Review Dispositions:

1. “Furnish as Submitted” (FAS) – No exceptions are taken.

2. “Furnish as Corrected” (FAC) – Minor corrections are noted for Contractor’s correction.

3. “Furnish as Corrected – Confirm” (FACC) – Corrections are noted and partial resubmittal shall be made as noted.

4. “Revise and Resubmit” (R&R) – Corrections are noted and complete resubmittal shall be made. Submittal does not conform to applicable requirements of the Contract Documents and is not acceptable. Revise submittal and re-submit to indicate acceptability and conformance with the Contract Documents.

5. “Receipt Acknowledged” (RA) –

a. Information included in submittal conforms to the applicable requirements of the Contract Documents and is acceptable. No further action by Contractor is required relative to this submittal, and the Work covered by the submittal may proceed, and products with submittals with this disposition may be shipped or operated, as applicable.

b. Information included in submittal is for Project record purposes and does not require Engineer’s review or approval.

6. “Rejected” (R) – Information included in submittal does not conform to the applicable requirements of the Contract Documents and is unacceptable. Contractor shall submit products and materials as specified in the Contract Documents or provide required information for substitution as specified in the Contract Documents for consideration by Engineer.

D. Electronic Submittal Return to Contractor: Electronic submittals shall be returned electronically with dispositions provided.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 42 00

REFERENCES

PART 1 – GENERAL

1.01 SUMMARY

A. Definitions and terminology applicable to all the Contract Documents are included in the General Conditions and Supplementary Conditions.

1.02 REFERENCES

A. Abbreviations and Acronyms: Common abbreviations that may be found in the Contract Documents are listed below. Additional abbreviations are acronyms are included in the drawings.

alternating current	a-c
ampere	A
Architectural Barriers Act	ABA
Americans with Disabilities Act	ADA
Americans with Disabilities Act Accessibility Guidelines	ADAAG
ante meridian	a.m.
average	avg
biochemical oxygen demand	BOD
brake horsepower	bhp
British thermal unit	Btu
Centigrade (or Celsius)	C
chlorinated polyvinyl chloride	CPVC
Code of Federal Regulations	CFR
cubic inch	cu in
cubic foot	cu ft
cubic yard	cdu yd, or CY
cubic feet per minute	cfm
cubic feet per second	cfs

degree Centigrade (or Celsius)	degrees C or ºC
degrees Fahrenheit	degrees F or ºF
diameter	dia
direct current	d-c
dollars	$
each	ea
efficiency	eff
Fahrenheit	F
feet	ft
feet per hour	fph
feet per minute	fpm
feet per second	fps
figure	Fig
flange	flg
foot-pound	ft-lb
gallon	gal
gallons per hour	gph
gallons per minute	gpm
gallons per second	gps
gram	g
grams per liter	g/L
Hertz	Hz
horsepower	hp or HP
hour	hr
human-machine interface	HMI
inch	in.
inches water gage	in. w.g.
inch-pound	in.-lb
inside diameter	ID

iron pipe size	IPS
thousand pounds	kips
thousand pounds per square inch	ksi
kilovolt-ampere	kva
kilowatt	kw
linear foot	lin ft or LF
liter	L
maximum	max
mercury	Hg
milligram	mg
milligrams per liter	mg/l or mg/L
milliliter	ml
millimeter	mm
million gallons per day	mgd or MGD
million gallons	MG
minimum	min
national pipe threads	NPT
net positive suction head	NPSH
net positive suction head available	NPSHA
net positive suction head required	NPSHR
nominal pipe size	NPS
number	no.
operator interface terminal	OIT
ounce	oz
ounce-force	ozf
outside diameter	OD
parts per hundred	pph
parts per million	ppm
parts per billion	ppb

polyvinyl chloride	PVC
post meridian	p.m.
pound	lb
pounds per square inch	psi
pounds per square inch absolute	psia
pounds per square inch gauge	psig
pounds per square foot	psf
process control system	PCS
programmable logic controller	PLC
revolutions per minute	rpm
second	sec
specific gravity	sp gr or SG
square	sq
square foot	sq ft or sf
square inch	sq in.
square yard	sq yd or SY
standard	std
standard cubic feet per minute	scfm
total dynamic head	TDH

B. Definitions: Terminology used in the Specifications includes:

1. “Indicated” refers to graphic representations, notes, or schedules on the Drawings, or to other paragraphs or schedules in the Specifications and similar locations in the Contract Documents.

2. “Shown”, “noted”, “scheduled”, and “specified” are used to help the user locate the reference without limitation on the location.

3. “Installer”, “applicator”, or “erector” is Contractor or another entity engaged by Contractor, either as an employee or subcontractor, to perform a particular construction activity, including installation, erection, application or similar Work. Installers shall be experienced in the Work that installer is engaged to perform.

4. “Experienced”, when used with the term “installer” means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; being familiar with Laws and Regulations; and having complied with requirements of authorities having jurisdiction, and complying with requirements of the Supplier of the material or equipment being installed.

5. Trades: Use of a term such as “carpentry” does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter”, unless otherwise indicated in the Contract Documents or required by Laws or Regulations. Such terminology also does not imply that specified requirements apply exclusively to trade personnel of the corresponding generic name.

6. “Assigned specialists” and similar terms: Certain Sections of the Specifications require that specific construction activities be performed by specialists recognized as experts in those operations. Engage said specialists for those activities, and their engagement is a requirement over which Contractor has no option. These requirements do not conflict with enforcement of building codes and other Laws and Regulations. Also, such requirements are not intended to interfere with local trade union jurisdictional settlements and similar conventions. Such assignments shall not relieve Contractor of responsibility for complying with the requirements of the Contract Documents.

C. Reference Standards:

1. Refer to General Conditions, as may be modified by the Supplementary Conditions, relative to reference standards and resolving discrepancies between reference standards and the Contract Documents. Provisions of reference standards are in effect in accordance with the Specifications.

2. Copies of Standards: Each entity engaged in the Work shall be familiar with reference standards applicable to its construction activity. Copies of applicable reference standards are not bound with the Contract Documents. Where reference standards are needed for a construction activity, obtain copies of standards from the publication source.

3. Abbreviations and Names: Where reference standards, specifications, codes, manuals, Laws or Regulations, or other published data of international, national, regional or local organizations are referred to in the Contract Documents, the organization issuing the standard may be referred to by their acronym or abbreviation only.

4. Following acronyms or abbreviations that may appear in the Contract Documents shall have the meanings indicated below. Listing is alphabetical by acronym.

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACIFS	American Cast Iron Flange Standards
ACS	American Chemical Society
ADC	Air Diffusion Council
ADSC	International Association of Foundation Drilling.
AEIC	Association of Edison Illuminating Companies
AF&PA	American Forest and Paper Association
ABMA	American Bearing Manufacturers Association (formerly Anti- Friction Bearing Manufacturers Association (ABMA))
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHDGA	American Hot Dip Galvanizers Association
AI	Asphalt Institute
AIA	American Institute of Architects
AIChE	American Institute of Chemical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALSC	American Lumber Standards Committee
AMA	Acoustical Materials Association
AMCA	Air Movement and Control Association
AMP	National Association of Architectural Metal Manufacturers, Architectural Metal Products Division
ANSI	American National Standards Institute
APA	The Engineered Wood Association
API	American Petroleum Institute

APHA	American Public Health Association
AREA	American Railway Engineering Association
ARI	Air Conditioning and Refrigeration Institute
ASA	American Standards Association
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society for Non-Destructive Testing
ASQ	American Society for Quality
ASSE	American Society of Safety Engineers
ASTM	American Society for Testing and Materials
AWCI	Association of the Wall and Ceiling Industry
AWI	Architectural Woodwork Institute
AWPA	American Wood Protection Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BAAQMD	Bay Area Air Quality Management District
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association
BOCA	Building Officials and Code Administrators
CBMA	Certified Ballast Manufacturers Association
CDA	Copper Development Association
CEMA	Conveyor Equipment Manufacturers Association
CGA	Compressed Gas Association
CISCA	Ceilings and Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute

CMAA	Crane Manufacturers Association of America
CPSC	Consumer Product Safety Commission
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute
DIN	Deutsches Institut fur Normung eV (German Institute for Standardization)
DIPRA	Ductile Iron Pipe Research Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ETL	Intertek Testing Services, Inc. (formerly ETL Testing Laboratories, Inc.)
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FM	Factory Mutual (FM Global)
FRPI	Fiberglass Reinforced Plastics Institute
FS	Federal Specification
GA	Gypsum Association
GANA	Glass Association of North America
HEW	United States Department of Health, Education and Welfare
HI	Hydraulic Institute
HMI	Hoist Manufacturers Institute
HUD	United States Department of Housing and Urban Development
IBC	International Building Code
ICC	International Code Council
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
IFI	Industrial Fasteners Institute
IFCEA	Insulated Power Cable Engineers Association

IRI	Industrial Risk Insurers
ISA	Instrumentation, Systems, and Automation Society (formerly Instrument Society of America)
ISO	Insurance Services Office
IOS	International Organization for Standardization
LPI	Lightning Protection Institute
MIA	Marble Institute of America
ML/SFA	Metal Lath/Steel Framing Association
MS	Military Specifications
MSS	Manufacturers' Standardization Society
MMA	Monorail Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NAPF	National Association of Pipe Fabricators, Inc.
NARUC	National Association of Regulatory Utilities Commissioners
NBHA	National Builders Hardware Association
NBS	United States Department of Commerce, National Bureau of Standards
NCMA	National Concrete Masonry Association
NEC	National Electric Code
NELMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NHPMA	Northern Hardwood and Pine Manufacturers Association
NIST	United States Department of Commerce, National Institute of Standards and Technology

NLGA	National Lumber Grades Authority
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	National Sanitation Foundation
NSSGA	National Stone, Sand, and Gravel Association
NTMA	National Terrazzo and Mosaic Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PEI	Porcelain Enamel Institute
PFI	Pipe Fabrication Institute
PPI	Plastics Pipe Institute
PGMC	Primary Glass Manufacturers Council
PS	Product Standards Section, United States Department of Commerce
RCSC	Research Council on Structural Connections (part of AISC)
RMA	Rubber Manufacturers Association
SAE	Society of Automotive Engineers
SBCCI	Southern Building Code Congress International, Inc.
SCAQMD	Southern California Air Quality Management District
SCPRF	Structural Clay Products Research Foundation
SCTE	Society of Cable Telecommunications Engineers
SDI	Steel Deck Institute
SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturing Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractor’s National Association
SPI	Society of the Plastics Industry
SPIB	Southern Pine Inspection Bureau
SSPC	Society for Protective Coatings

SWI	Steel Window Institute
TCNA	Tile Council of North America
TCEQ	Texas Commission on Environmental Quality
TEMA	Tubular Exchanger Manufacturers Association
TxDOT	Texas Department of Transportation
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
USAB	United States Access Board
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
USGBC	United States Green Building Council
USGS	United States Geological Survey
USPHS	United States Public Health Service
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association
WCMA	Wood Component Manufacturers Association
MDMA	Window and Door Manufacturers Association
WWEMA	Water and Wastewater Equipment Manufacturers Association
WWPA	Western Wood Products Association

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 45 23

TESTING SERVICES FURNISHED BY CONTRACTOR

PART 1 – GENERAL

1.01 SUMMARY

A. This specification addresses requirements for testing services specifically required to be provided by the Contractor. This section does not apply to any testing required to be provided by the Owner or Owner's representative.

B. This section does not apply to any Special Inspections as required by Section 01 45 33. Special Inspections cannot be provided by the Contractor in accordance with the Governing Building Code.

C. Contractor shall employ and pay for independent testing entity to perform specified services covered by this specification. Entity selected shall be subject to approval by Engineer.

D. Inspection, sampling, and testing shall be as specified in the individual Specification Sections.

E. Related Sections, but not limited to, the following:

1. Section 31 00 01 – Earthwork
2. Section 31 05 16 – Aggregate Materials
3. Section 31 23 24 – Flowable Fill
4. Section 32 10 00 – Paving and Surfacing
5. Section 33 05 61 – Utility Structures
6. Section 03 21 00 – Reinforcing Steel.
7. Section 03 30 00 – Cast-in-Place Concrete

1.02 ADMINISTRATIVE REQUIREMENTS

A. Contractor's Responsibilities:

1. Provide to laboratory representative samples of materials to be tested, in required quantities.
2. Provide labor and facilities:

a. To provide access to the Work to be tested, and where required, to Suppliers' operations.

b. To obtain and handle samples at the Site.

c. To facilitate inspections and tests.

d. For testing entity's exclusive use for storage and curing of test samples.

e. Forms for preparing concrete test beams and cylinders.

3. Notify testing entity, Engineer, and Owner's Representative sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests. Lead time for scheduling of tests shall be established during the pre-construction meeting.

4. Arrange with testing entity and pay for additional services, sampling, and testing required for Contractor's convenience (e.g. additional concrete cylinders, fees related to minimum testing quantities when those quantities are not met due to convenience, etc.)

5. Provide to testing entity the preliminary design mix proposed for concrete, and other material mixes that require testing by the testing laboratory.

6. Provide to testing entity a representative sample of backfill material to establish baseline for relative compaction (Proctor testing). Contractor shall be responsible for obtaining Proctor test results ahead of the first relative compaction test.

B. Testing Entity's Responsibilities:

1. Cooperate with Contractor and Engineer and provide qualified personnel promptly when notified.

2. Perform specified inspections, sampling, and testing of materials and methods of construction; comply with applicable standards; ascertain compliance with requirements of the Contract Documents.

3. Promptly notify Engineer and Contractor of irregularities or deficiencies in the Work observed during performance of services.

4. Submit specified quantity of report copies of inspections and tests to Contractor and Engineer.

5. Perform additional tests and services as required to ensure compliance with the Contract Documents.

6. Obtain written approval from Engineer or Owner's Representative before performing work outside of the scope of work originally agreed upon with the Owner.

C. Report Requirements:

1. Electronic Submittal of testing reports.

2. Include the following information:

a. Date issued.

b. Project title, number, and name of the Site.

c. Testing laboratory name and address.

d. Name and signature of inspector or person obtaining samples.

e. Date of inspection or sampling.

f. Record of temperature and weather.

g. Date of test.

h. Identification of material or product tested and associated Specification Section.

i. Location in the Project.

j. Type of inspection or test.

k. Results of tests and observations regarding compliance with the Contract Documents.

1.03 SUBMITTALS

A. Submit copies of material and product test reports where required by the Contract Documents and as requested by Engineer.

B. Quality Assurance Submittals:

1. Qualifications statement indicating experience and facilities for tests required under the Contract Documents.

2. Copy of report of inspection of facilities during most recent NIST inspection tour. Include memorandum of remedies of deficiencies reported during inspection.

3. Copy of certificate of calibration for each instrument or measuring device proposed for use, by accredited calibration agency.

1.04 QUALIFICATIONS

A. Comply with applicable requirements of ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.

B. Laboratory shall be authorized to operate in the same State or Commonwealth as the Site. Where applicable, laboratory shall be certified by the authority having jurisdiction for the types of testing required.

C. Testing equipment used by laboratory will be calibrated at maximum twelve month intervals by devices of accuracy traceable to either NIST's Standard Reference Materials (SRM), ISO 17025, General Requirements for the Competence of Testing and Calibration Laboratories, or certified by State, Commonwealth, or local bureau of weights and measures, or values of natural physical constants generally accepted in the engineering and scientific community.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 51 00

TEMPORARY UTILITIES

PART 1 – GENERAL

1.01 SUMMARY

A. Contractor shall provide temporary utilities required for the Project and to complete the Work.

1. Make arrangements with utility service companies for temporary services and obtain required permits and approvals for temporary utilities. This includes, but is not limited to, facilitating the temporary relocation of solid waste bins and dumpsters to locations accessible by the solid waste utility.

2. Pay utility service costs, including connection fees, required for the Work as needed.

3. Continuously maintain adequate utilities for all purposes during the Project, until removal of temporary utilities and temporary facilities. At minimum, provide and maintain temporary utilities through Substantial Completion and removal of temporary field offices and sheds.

4. Should Owner occupy part of the Project prior to Substantial Completion of the entire Work, cost of utilities consumed via temporary utilities serving the portion occupied by Owner will be shared proportionately between Owner and Contractor as mutually agreed to by the parties.

5. Maintain, including cleaning, temporary utilities and continuously provide consumables as required.

6. Temporary utilities and temporary facilities shall be adequate for personnel using the Site and requirements of Project.

7. Provide temporary utilities and temporary facilities in compliance with Laws and Regulations and, when applicable, requirements of utility owners.

B. Provide the following temporary utilities:

1. Electricity and lighting.

2. Telephone and communications.

3. Heating.

4. Sanitary facilities.

5. Water service.

6. First-aid facilities.

7. Fire protection.

1.02 ADMINSTRATIVE REQUIREMENTS

A. Use of Owner's System:

1. Existing Utility Systems: Do not use systems in existing buildings or structures for temporary utilities without Owner's or property owner's written permission and mutually acceptable basis agreed upon by the parties for proportionate sharing of costs.

2. Use of Permanent Utility Systems Provided Under the Project:

a. Permanent lighting, water, heating, ventilating, and fire protection systems and first-aid facilities may be used to provide temporary utilities and temporary facilities if the following are met:

1) Obtain Owner's written permission to use permanent systems.

2) Permanent systems to be used for temporary utilities or temporary facilities shall have achieved Substantial Completion, including complete functionality of all controls.

3) Contractor shall pay all costs while using permanent system, including operation, maintenance, replacement of consumables, and provide replacement parts.

b. Do not use the following permanent facilities:

1) Telephone and communication facilities.

2) Sanitary facilities.

1.03 SYSTEM DESCRIPTION

A. Electricity and lighting:

1. Contractor shall provide electrical and lighting service for construction field offices, sheds, storage containers, etc. and as required for the Work.

2. General 120/240 V service requirements:

a. Contractor shall provide 120/240 V, single phase, 3-wire temporary system for small power requirements and general lighting.

b. Contractor shall provide main disconnect, overcurrent protection, meter outlet, branch circuit breakers, and wiring for temporary service to the Contractor's field office service connections. Contractor shall provide equipment and appurtenances in accordance with electricity service provider and applicable standards and codes

c. Contractor shall register the 120/240 V electrical service meter in the Contractor's name and shall be responsible for electrical charges at no additional cost to the Owner.

d. Contractor shall provide electrical service other than 120/240 V, single phase, 3-wire service as required for the Work at the Contractor's own expense.

3. General lighting requirements:

a. Contractor shall provide a minimum of 10 foot candles for enclosed and partially enclosed structures for performing the Work.

b. Contractor shall provide a night lighting circuit for security. Light intensity shall be a minimum of 2 foot candles.

4. Contractor shall energize the electrical system 15-minutes prior to and following regular work day hours at the work area. Required from Monday through Friday, all inclusive.

5. Contractor shall energize the night lighting system at end of typical working day and de-energize at start of typical working day. System shall be continuously energized on Saturdays, Sundays, and holidays.

6. Contractor shall provide an independent grounding cable connected directly to the structure, building, and equipment for erection and fabrication by electrical welders. Grounding by adjacent conduit, piping, etc. shall be prohibited at the work area.

7. Contractor shall coordinate usage of temporary electrical system with Subcontractors, Suppliers, and Owner including the following:

a. Usage is suitable for 120V, single phase, 60 Hz operation with a maximum operating input of 1,500 volt-amperes.

b. One unit connected to a single outlet.

c. Restrict usage in case of overloading circuits to correct loading.

B. Telephone and communications: Contractor shall provide temporary telephone and communications required for its operations at the work area and for summoning emergency medical assistance.

C. Heating:

1. Contractor shall provide temporary heating, ventilation coverings and enclosures necessary to protect the Work and materials against wetness and temperature damage, to dry out the Work, and to facilitate the Work in structures.

2. Equipment, fuel, materials, personnel and methods used shall be adequate to maintain critical installation temperatures and ventilation of Work at all times in areas where necessary to perform the Work.

3. Enclosed structures shall have a minimum temperature of 50°F, unless otherwise specified, where Work is performed.

4. Contractor shall provide sufficient heat to maintain a minimum temperature of 65°F before and during application of interior finishing, painting, coating, etc.

5. Contractor shall replace any Work damaged by dampness or insufficient/abnormal heating at no cost to the Owner.

D. Sanitary facilities:

1. Contractor shall provide suitably-enclosed chemical or self-contained toilets for Contractor's employees and visitors to the work area. Location of temporary toilets shall be acceptable to Owner and screened from public observation.

2. Facilities shall be maintained and provided in accordance with State Labor Regulations and local ordinances. Contents shall be removed and disposed in accordance with local and state regulations as required.

3. Contractor shall be prohibited from committing nuisances within, on, or in the vicinity of the work area.

E. Water service:

1. Contractor shall provide temporary water service for the Work including for construction purposes, sanitary facilities, fire protection, field office, and cleaning purposes.

2. Contractor shall provide potable water for Contractor's personnel either by portable containers or drinking fountains.

3. Contractor shall provide temporary hose bibs, hoses, and watertight barrels for the distribution of water.

4. Contractor shall provide freeze protection for water service.

F. First-aid facilities:

1. Contractor shall provide temporary first-aid stations at or immediately adjacent to the Site's major work areas. Contractor shall provide temporary first-aid stations inside its temporary field office. Locations of first-aid stations shall be determined by Contractor's safety representative.

2. Contractor shall provide list of emergency telephone numbers at each hardwired telephone at the Site. List shall be in accordance with the list of emergency contact information required in Section 01 31 19 – Project Meetings.

G. Fire protection:

1. Contractor shall comply with NFPA 241, Safeguarding Building Construction, Alteration, and Demolition Operations, and requirements of fire marshals and authorities having jurisdiction at the work area.

2. Contractor shall provide temporary fire exits, fire extinguishers, hoses and safety devices as required by authorities having jurisdiction.

3. Contractor shall notify Engineer, Owner, and fire marshals in the event of fire at the work area including, but not limited to, fuel tanks and similar hazardous utilities and devices. Contractor shall cooperate with Owner of fuel tank and utilities to prevent occurrence of fire or explosion.

4. Contractor shall perform safety precautions and comply with fire marshal's instructions in the event of fire.

PART 2 – PRODUCTS

2.01 EQUIPMENT

A. Materials and equipment for temporary systems may be new or used but shall be adequate for purposes intended and shall not create unsafe conditions and shall comply with Laws and Regulations.

B. Provide required materials, equipment, and facilities, including piping, wiring, and controls.

C. Electrical system requirements: System shall consist of wiring, switches, insulated supports, poles, fixtures, sockets, receptacles, lamps, guards, cutouts and fuses as required for completion of the Work.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install temporary facilities in neat, orderly, manner, and make structurally, mechanically, and electrically sound throughout.

B. Location of Temporary Utilities and Temporary Facilities:

1. Locate temporary systems for proper function and service.

2. Temporary systems shall not interfere with or provide hazards or nuisances to: the Work under this and other contracts, movement of personnel, traffic areas, materials handling, hoisting systems, storage areas, finishes, and work of utility companies.

3. Do not install temporary utilities on the ground, with the exception of temporary extension cords, hoses, and similar systems in place for short durations.

C. Modify and extend temporary systems as required by progress of the Work.

3.02 MAINTENANCE

A. Maintain temporary systems to provide safe, continuous service as required.

B. Properly supervise operation of temporary systems:

1. Enforce compliance with Laws and Regulations.

2. Enforce safe practices.

3. Prevent abuse of services.

4. Prevent nuisances and hazards caused by temporary systems and their use.

5. Prevent damage to finishes.

6. Ensure that temporary systems and equipment do not interrupt continuous progress of construction.

C. At end of each work day, check temporary systems and verify that sufficient consumables are available to maintain operation until work is resumed at the work area. Provide additional consumables if the supply on hand is insufficient.

D. Contractor shall replace broken and burned out lamps, blown fuses, and damaged wiring and appurtenances as required to maintain adequate and safe operating conditions.

E. Contractor shall permit subcontractors and others at a mutually agreed arrangement to use temporary electrical system that meet the following requirements:

1. Equipment are suitable for 120 V, single phase, 60 Hz operation.

2. Operating input does not exceed 1,500 volt-amperes.

3. Single piece of equipment connected to one outlet.

4. Contractor shall restrict use of equipment as required to prevent overloading circuits.

3.03 CLOSEOUT ACTIVITES

A. Completely remove temporary utilities, facilities, equipment, and materials when no longer required. Repair damage caused by temporary systems and their removal and restore the work area to condition required by the Contract Documents; if restoration of damaged areas is not specified, restore to preconstruction condition.

B. Contractor is responsible for and shall return to original condition those portions of permanent electric system used in completing the Work.

C. Where temporary utilities are disconnected from existing utility, provide suitable, watertight or gastight (as applicable) cap or blind flange, as applicable, on service line, in accordance with requirements of utility owner.

D. When permanent utilities and systems that were used for temporary utilities, upon Substantial Completion replace all consumables such as filters and light bulbs and parts used during the Work.

END OF SECTION

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SECTION 01 52 00

CONSTRUCTION FACILITIES

PART 1 – GENERAL

1.01 SUMMARY

A. Contractor shall provide construction facilities for performance of the Work, including the following:

1. Contractor's field office, sheds, and storage containers that shall be erected within 30 days of Notice to Proceed on the Project.

2. Project sign and panel that shall be erected within 21 days of Notice to Proceed on the Project.

1.02 FACILITY DESCRIPTION

A. Contractor's Field Office, Sheds, and Storage:

1. Contractor shall provide and maintain a field office at the Site, including temporary utility services specified.

2. Size and Furnishings: As required by Contractor

3. Features: Exterior Contractor identification sign, night lighting for security, and temporary utilities specified in Section 01 51 00 – Temporary Utilities.

4. Location: At location provided by Contractor for staging and storage

5. Contractor shall provide and maintain one set of Contract Documents, latest approved Shop Drawings, Field Orders, request for interpretations, clarification notices, Work Change Directives, proposal requests, Change Proposals, Change Orders, and other pertinent Project related correspondence.

B. Project Identification Sign:

1. Contractor shall provide a minimum of two signs in accordance to this Section. Each sign shall be staged at the limits of each construction area.

2. In the event that the Owner allows the Contractor to work in more than one area at a time, additional signs may be required.

3. Contractor shall maintain project identification sign for the duration of the Contract.

4. Contractor shall relocate project identification sign as construction progresses through different areas of the project.

5. Contractor shall remove and dispose of project identification sign at the completion of the Project when notified by the Engineer.

6. Contractor shall not receive additional payment for deterioration or replacement of names and other pertinent sign information throughout the duration of the Project.

1.03 SUBMITTALS

A. Action/Informational Submittals: Project identification sign layout, details, and materials of construction.

PART 2 – PRODUCTS

2.01 COMPONENTS

A. Project Identification Sign

1. Sign Panel: 3/4-inch thickness (minimum) marine plywood rabbeted in a 2” x 4” wood frame. Panel shall be fastened to sign supports with six 3/8” dia galvanized bolts, nuts and washers (minimum).

2. Sign Supports: Two, 4” x 4” treated wood posts.

3. Fasteners and Hardware: Galvanized

4. Painting: Supports, trim and back of sign panel shall be painted with two coats (minimum) of same paint for sign face. Paint shall be exterior grade paint, suitable for wood application and in accordance with Section 09 90 00 – Painting.

5. Wording, Colors, and Arrangement: As defined by the Owner during the pre-construction meeting.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 55 00

CONTRACTOR ACCESS AND PARKING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Contractor shall provide and maintain temporary laydown and employee parking areas and appurtenances required during the Project for use by Contractor, other contractors employed on the Project, Owner's, and emergency vehicles.

2. Contractor is responsible for obtaining temporary laydown and employee parking areas. No additional payment will be made for this item.

3. Laydown and employee parking areas shall be designed and maintained by Contractor and shall be fully passable to vehicles in all weather conditions.

1.02 ADMINSTRATIVE REQUIREMENTS

A. Use of existing access roads:

1. Contractor shall prevent interference with traffic on existing roads and parking areas.

2. Except in areas where the Contractor has obtained prior approval from the City of Brownsville or any other agencies having jurisdiction over roadways, Contractor shall keep roads and entrances clear and available to the public. Do not use roads or entrances for parking or storage of materials or equipment.

3. Contractor shall indemnify and hold harmless Owner and Engineer from expenses caused by Contractor's operations over roads and parking areas.

4. Schedule deliveries to minimize use of driveways and entrances.

5. Contractor shall suitably maintain existing access road at Contractor's expense for the duration of the Contract time.

B. Contractor parking areas:

1. Contractor employee parking areas shall be the responsibility of the Contractor. No additional payment shall be made for this item.

2. Any costs associated with procuring or maintaining parking area or any associated costs including, but not limited to, shuttles or similar arrangements shall be the Contractor's responsibility.

C. State/Commonwealth and local regulations:

1. Contractor shall obtain and pay all cost associated with bonds required by authorized entity (i.e. Texas Department of Transportation) for the use of State, City or County maintained roads.

2. Contractors shall obey traffic laws and comply with requirements, rules and regulations of the authorized entity (i.e. Texas Department of Transportation), including local authorities having jurisdiction, to maintain warning signs, lights, barriers, etc. for the protection of traffic on public roadways.

D. Site security:

1. Contractor shall safely guard all the Work, the Project, products, equipment, and property from loss, theft, damage, and vandalism until Substantial Completion. Contractor's duty includes safely guarding Owner's property in vicinity of the Work and Project, and other private property in the vicinity of the Project from injury and loss in connection with performance of the Project.

2. Employ watchmen as required to provide required security and prevent unauthorized entry.

3. Costs for security required under this Section shall be paid by Contractor.

4. Make no claim against Owner for damage resulting from trespass.

5. Pay full compensation for, or repair or replace, damage to property of Owner and others arising from failure to furnish adequate security.

6. Provide temporary fencing in accordance with the Contract Documents.

7. Security requirements specified in the Section shall begin as soon as the contractor delivers materials to the Site and/or begins work, and shall continue until the date of Final Completion.

8. Procedures:

a. Contractor shall conform to Owner's security procedures and access restrictions throughout entire Project.

b. Contractor, including Subcontractors and Suppliers, shall comply with the following:

1) Personnel Identification: All Contractor personnel shall wear at all times a badge bearing Contractor's name, employee's name and, as applicable, employee number.

2) Parking: Do not park outside of parking areas designated by the Contractor. Prepare and maintain parking area as required at no additional cost.

9. Contractor shall provide and maintain temporary security fencing if existing security fencing or barriers are breached or temporarily removed for the Project at no additional cost to the Owner. Temporary security fencing shall be equal to existing, unless otherwise specified, and provided and maintained in a manner satisfactory to the Owner.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 INSTALLATION

A. Contractor shall determine if and where temporary fencing is necessary, unless existing security fencing is damaged, which will be determined by the Owner.

B. Install temporary fencing used for site security in accordance with the fence manufacturer's instructions. Provide temporary fencing for site security as needed.

C. Maintain and replace temporary fencing. Repair damage to temporary fencing and replace fencing when required and when permanent site security fencing is in place and fully functional to maintain security at all times.

END OF SECTION

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SECTION 01 55 26

TRAFFIC CONTROL

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall provide a temporary traffic control plan, signed by a Texas licensed Professional Engineer.

B. The temporary traffic control plan shall be in accordance with the latest version of the Texas Manual on Uniform Traffic Control Devices, Part 6 – Temporary Traffic Control.

C. The temporary traffic control plan shall be reviewed and approved by the City of Brownsville before the start of any construction activities.

D. The traffic control plan shall assume that no more than two adjacent streets or blocks can be shut down at a time.

1.02 STREET SIGNS AND MARKERS AND ROUTE MARKERS

A. The Contractor shall move any existing street signs and markers and route markers out of the construction limits of the project and install the street signs and markers and route markers so that they will be visible to the traveling public if there is sufficient right of way for these signs and markers outside of the construction limits.

B. Near the completion of the project and when so directed by the Engineer, the Contractor shall move the signs and markers and install them in their proper location. Elevations may require adjustment by the Contractor to account for changes in regard to the finished pavement or sidewalk elevations.

C. Any signs or markers which cannot be relocated due to lack of right-of-way, or any signs and markers which will no longer be applicable after the construction of the project, shall be stockpiled at locations directed by the Engineer for removal by others.

D. The Contractor will be responsible to the Owner for any damage to any street signs and markers or route markers during the above described operations.

E. No direct payment will be made for relocating, reinstalling, and/or stockpiling the street signs and markers and route markers as such work will be considered incidental.

PART 2 – MATERIALS (NOT USED)

PART 3 – PAYMENT (NOT USED)

END OF SECTION

SECTION 01 57 00

TEMPORARY CONTROLS

PART 1 – GENERAL

1.01 SUMMARY

A. Contractor shall provide and maintain methods, equipment, and temporary construction as required to control environmental conditions at the Site and adjacent areas.

B. Maintain controls until no longer required.

C. Temporary controls include, but are not limited to, the following:

1. Dust control.

2. Noise controls.

3. Pest and rodent control.

4. Pollution control.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 DUST CONTROL

A. Contractor shall take measures to control dust from Contractor's operations and prevent spillage of excavated materials on public roads.

B. Contractor shall remove spillage of excavated materials, debris and dust from public roads by methods approved by Engineer.

C. Contractor shall provide temporary dust-proof partitions where required to protect unaltered portions of existing structures and facilities and as directed by Engineer or Owner. Temporary partitions shall be provided where demolition Work is required, to protect equipment and material.

D. Contractor shall refer to applicable sections of local and state regulations on dust control for additional guidance.

1. Contractor shall apply water at locations, quantities, and frequencies required by Engineer to control dust for nuisance prevention to Owner, Engineer, and properties in the vicinity of the work areas.

2. Dust control and cleaning measures shall be provided at no additional cost to the Owner.

3.02 NOISE CONTROL

A. Contractor's vehicles and equipment shall minimize noise emissions to greatest degree practicable. Provide mufflers, silencers, and sound barriers when necessary.

B. Noise levels shall comply with Laws and Regulations, including OSHA requirements and local ordinances.

C. Noise emissions shall not interfere with the work of Owner or others.

3.03 PEST AND RODENT CONTROL

A. Provide rodent and pest control as required to prevent infestation of the work and storage areas.

B. Employ methods and use materials that do not adversely affect conditions at the work area or on adjoining properties.

C. In accordance with laws and regulations, promptly and properly dispose of pests and rodents trapped or otherwise controlled.

3.04 POLLUTION CONTROL

A. General:

1. Provide means, methods, and facilities required to prevent contamination of soil, water, and atmosphere caused by discharge of noxious substances from construction operations.

2. Equipment used during construction shall comply with local, state and federal laws and regulations.

B. Spills and Contamination:

1. Provide equipment and personnel to perform emergency measures required to contain spills and to remove contaminated soils and liquids.

2. Excavate contaminated material and properly dispose of off-site, and replace with suitable compacted fill and topsoil.

C. Protection of Surface Waters: Implement special measures to prevent harmful substances from entering surface waters. Prevent disposal of wastes, effluents, chemicals, and other such substances in or adjacent to surface waters and open drainage routes, in sanitary sewers, or in storm sewers.

D. When performing tie-ins into sanitary sewers, Contractor shall be responsible for providing temporary piping to route flow into operating sewers.

E. Atmospheric Pollutants:

1. Provide systems for controlling atmospheric pollutants related to the Work.

2. Prevent toxic concentrations of chemicals and vapors.

3. Prevent harmful dispersal of pollutants into atmosphere.

F. Solid Waste:

1. Contractor shall be responsible for maintaining solid waste facilities in the work areas. This may include:

a. Temporary relocation of solid waste bins and dumpsters to accessible locations during roadway shutdown.

b. Assistance in delivering solid waste bins and dumpsters to locations accessible by collection trucks.

2. Provide systems for controlling and managing solid waste related to the Work.

3. Prevent solid waste from becoming airborne, and from discharging to surface waters and drainage routes.

4. Properly handle and dispose of solid waste.

END OF SECTION

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SECTION 01 57 23

TEMPORARY STORMWATER POLLUTION CONTROL

PART 1 – GENERAL

1.01 WORK INCLUDED

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 requirements. Provide preventive measures to keep sediment and other pollutants from the construction activity from entering any stormwater system, including open channels. Comply with the Texas Commission on Environmental Quality General Permit (TXR150000) for stormwater discharges from construction activities under the Texas Pollutant Discharge Elimination System (TPDES) program.

1.02 QUALITY ASSURANCE

A. Comply with applicable requirements of all governing authorities having jurisdiction.

B. The Contractor shall develop and implement a stormwater pollution prevention plan in accordance with TCEQ General Permit TXR150000 prior to the beginning of construction activity.

C. Stormwater pollution prevention measures shall 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.

D. All land-disturbing activities shall 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.

E. Surface water runoff originating upgrade of an exposed area shall be managed to minimize erosion and sediment loss during the period of exposure.

F. 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 Owner, the Engineer, or the Owner’s representative.

G. 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.

1.03 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 00 SUBMITTALS.

B. Construction Activity Less Than 1 Acre:

1. Projects with a total disturbed area of less than 1 acre are not subject to TCEQ General Permit requirements.

C. Construction Activity From 1 Acre To Less Than 5 Acres:

1. For projects with a total disturbed area equal to or greater than 1 acre and less than 5 acres, submit a copy of the Construction Site Notice to the Operator of any Municipal Separate Storm Sewer System (MS4) receiving construction site discharge at least 2 days prior to beginning construction activity.

2. Post a copy of the Construction Site Notice at the construction 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.

D. Construction Activity For 5 Acres Or Greater:

1. For projects with a total disturbed area of 5 acres greater submit the following to the TCEQ and the Operator of any Municipal Separate Storm Sewer System (MS4) receiving stormwater discharge from the Site:

a. Contractor shall submit Notice of Intent (NOI) at least 7 days prior to beginning construction activity. When submitting an NOI electronically, construction activity may commence immediately upon receipt of confirmation from the TCEQ. Contractor shall be the Primary Operator. Owner shall be the Secondary Operator.

b. Notice of Change (NOC) letter within 14 days after the discovery that incorrect information was submitted in the NOI or if relevant information in the NOI changes during the course of construction activity.

c. Notice of Termination (NOT) within 30 days following a change in operational control or upon final stabilization and completion of the construction project.

2. Post a copy of the NOI and a Construction Site Notice 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.

1.04 JOB CONDITIONS, CODES, AND ORDINANCES

A. TCEQ requires that municipalities provide oversight of construction sites' compliance with the TCEQ General Permit (TXR150000) requirements. These municipalities may require more stringent or additional stormwater pollution prevention measures during construction beyond those required by State and Federal regulations. The Contractor shall provide such additional measures at no additional cost.

PART 2 – PRODUCTS

2.01 MATERIALS

A. All materials used for stormwater pollution prevention shall meet the minimum design and specification requirements identified in Section 31 25 00 EROSION AND SEDIMENT CONTROL for commonly used sediment loss prevention practices.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prepare a stormwater pollution prevention plan (SWPPP) in accordance with applicable permit requirements for construction activity. Develop the SWPPP in conformance with TPDES General Permit (TXR150000) for Stormwater Discharges from Construction Activities and any applicable Local requirements. Prepare and submit all forms for the Owner to assure compliance with TCEQ General Permit TXR150000 rules on behalf of the contractor and the Owner.

   1. SWPPP will be required from municipal separate stormwater sewer system (MS4) operators:

B. Prepare and implement the SWPPP prior to the beginning of construction activity in accordance with Local, State, and Federal requirements.

C. Prior to start of construction, submit schedules to the Owner and Engineer 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.

3.02 INSTALLATION

A. See Section 31 25 00 EROSION AND SEDIMENT CONTROL for installation requirements.

3.03 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 shall apply.

END OF SECTION

SECTION 01 57 40
TEMPORARY PUMPING SYSTEMS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnishing, installing, testing, operating, and maintaining temporary pumping systems.

B. The temporary pumping system contractor must have a service or operations center within 100 miles of the project site to be eligible to perform the work. This requirement will not be waived. The temporary pumping system contractor shall also provide 5 references for projects that have been successfully completed in the last 5 years with firm capacities equal to or greater than that specified herein. The reference information shall include contact information for the Owner and the Contractor that the temporary pumping system contractor provided the services for. The number and size of the pumps; the size and length of the force mains and the duration of the temporary pumping system service shall also be included with the reference contact information. All the reference materials shall be submitted prior to any bypass pumping submittals. Contractors may submit this information prior to bidding if there is any concern of eligibility.

C. Provide all materials, labor, equipment, power, maintenance, associated items and superintendence to implement temporary pumping systems for diverting flow as required to maintain continuous operation of existing facilities during construction. Section 01 14 00 – Coordination with Owner's Operations identifies specified outages that may require temporary pumping. Provide all additional temporary pumping systems needed using Contractor's means and methods at no additional cost to Owner.

1.02 DEFINITIONS

A. Bypass Pumping System: The bypass pumping system shall consist of all equipment, piping, valves, plugs, power supply, instrumentation, controls, and lines and other appurtenances required to divert flows from the facilities being rehabilitated to the discharge location illustrated on the drawings. The bypass pumping system shall be comprised of pumping setups in addition to all bypass piping necessary for bypass pumping. Temporary and bypass pumping systems are terms used to describe the same facilities in this specification. Temporary bypass pumping system contractor and supplier also have the same meaning in this specification.

B. Bypass Pipe: The bypass pipe shall consist of the pipe, valves and other appurtenances including, but not limited to, air relief valves and dewatering connections. The bypass pipe includes both the suction and discharge pipe for each bypass pump setup.

C. Primary Pump(s): The primary pump(s) is/are the main pump(s) located at each setup. The primary pump(s) shall be capable of pumping the peak flow, be connected to the bypass pipe, be isolated with valves, and be complete with power supplies.

D. Backup Pump(s): The backup pump(s) is/are located at each primary setup. The backup pump(s) shall be capable of pumping peak flow, be operational, be connected to the bypass pipe, be isolated with valves, and be complete with power supplies.

E. Standby Pump(s): The standby pump(s) shall be located within 30 minutes of the project site. The standby pump(s) shall be capable of pumping the peak flow and be able to be connected to the bypass pipe at each setup. The standby pump(s) shall have the capacity of the largest pump at each location.

F. Discharge Connection: The discharge connection is where the pumped flow exits the bypass pipe and flows onward into a gravity system or force main.

G. Interruption in Operations: Any activity that will result in a change in the current method of operation of an existing facility being bypassed. Contractor shall request such "interruption of operations" from the Owner in writing no less than three (3) weeks in advance with a subsequent written confirmation of date and time ninety-six (96) hours in advance of the “interruption of operations”. Owner may reject the request if the change will increase project costs or negatively impact the operation of any existing facilities.

H. Partial Utilization, Substantial Completion, and Warranty Period for Items in Continuous Service: Refer to the Contract Documents for definition.

I. The terms "open, close, start, stop, operate, verify, energize, de-energize, transfer, switchover, etc." when used in conjunction with equipment that is in service or about to be placed in service are understood to mean: The Owner's operation or maintenance staff shall perform the operation upon written request from the Contractor.

J. Operational Test: The period of specified duration that the installed system is tested to verify operational integrity of a system prior to placing the system in service. Operational testing requires that representatives of the equipment manufacturers be on site for timely identification and resolution of system issues.

K. Firm Capacity: Shall be the capacity of the bypass pumping system with the largest pump included in the system out of service.

L. Cycling Pump Control: Shall mean the use of starting and stopping of single speed and output pumps to achieve the bypass pumping requirements.

M. Variable Pump Control: Utilizes variable speed and output pumps in the design of the system to try and match the output of the system with the variable flow conditions of the application.

1.03 REFERENCES

A. Publications are referred to in the text by basic designation only.

1. American Society for Testing and Materials (ASTM)

a. D1248 Polyethylene Plastics Extrusion Materials for Wire and Cable

b. D2657 Heat Fusion Joining of Polyolefin Pipe and Fittings

c. D3261 Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

1.04 PERFORMANCE REQUIREMENTS

A. Design the installation and operation of temporary pumping systems in accordance with Federal, State or Commonwealth, and Local Municipality Laws and Regulations, including local noise and light ordinances.

B. The temporary pumping system shall be designed by the Contractor and provide uninterrupted service throughout construction.

C. For all bypass pump arrangements, multiple pumps are necessary.

1. One backup pump for each size pump utilized shall be installed at each bypass pump location, ready for use in the event of primary pump failure.

2. One standby pump shall be required for each system. If the standby pump is placed in operation, an additional standby pump shall be delivered to the bypass pumping site within four hours.

3. The backup pump shall be piped into the suction and discharge headers and shall have the capability of being brought online in the piping system by operating installed isolation valves.

D. The system shall be designed to pump the following flows:

Location	Service	Firm Capacity Required (gpm)	Annual Average Flow (gpm)	Minimum Flow (gpm)	Variable flow or cycling pump controls
ALL LOCATIONS	Sanitary Sewer	400	200	50	Constant Speed with Pump Alternation

E. The temporary pumping system must be monitored continuously (24 hours per day, 7 days per week) during operation by a representative of the Contractor trained and certified by the pump supplier.

F. Install, test, and maintain remote telemetry to monitor operation of the pumps and wet well water levels. The telemetry system shall first notify the Contractor's local representative designated to monitor the pumps, then other individuals so designated by the Contractor and finally up to two individuals so designated by the Owner.

G. Temporary pumping systems shall be equipped with noise reduction features that limit the noise output to 65 db[A] within 50 feet of the equipment, 60 db[A] at the nearest property line, or as required to comply with the City of Brownsville noise limitation requirements, whichever is less. Diesel-driven engines shall be equipped with critical-rated mufflers.

H. Provide pressure and vacuum gauges on the suction and discharge headers.

I. Provide level controls to start and stop the pumps. Each pump shall be equipped with a separate control panel. All pumps provided shall be variable speed and output type pumps such that the system design may operate as continuously as possible and spikes in flow conditions are minimized by the design. Cycling pumps shall not be an acceptable design unless allowed by this specification.

1.05 SUBMITTALS

A. Bypass Pumping Plan: The Contractor shall submit to the Engineer for review and approval detailed drawings and descriptions outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing flows. The plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials, and all other incidental items necessary and/or required to ensure proper protection of the facilities, including protection of the access and bypass pumping locations from damage due to the discharge flows, and compliance with the requirements and permit conditions specified in these Contract Documents. No temporary pumping shall begin until all provisions and requirements have been reviewed and approved by the Engineer.

B. All the descriptive terms used in the presentation of the plan shall be as defined in this specification. No other terms with similar meaning shall be used to prevent miscommunication of the prescribed plan.

C. Submit a specific detailed description of each proposed temporary pumping system at least 30 days prior to intended use. The submittal shall include, but not be limited to, the following:

1. A written description of the plan.

2. Quantity, capacity, dimensions and location of all pumping equipment.

3. Pump performance curves and head capacity curves demonstrating the capability to meet all required flows.

4. Pump net positive suction head required ($NPSH_r$) curves demonstrating the net positive suction head available ($NPSH_a$) exceeds the $NPSH_r$ by an acceptable margin defined by the manufacturer of the supplied pump.

5. Pump power curves demonstrating the temporary power system is adequately sized for pump startup and operation.

6. Pump diesel engine sizing, dimensions, emissions data, and location plan.

7. Diesel engine fuel-consumption curves.

8. Fuel storage tank details, including spill containment.

9. The size, type and routing of all suction and discharge pipe and the means of connecting the system.

10. Calculations of static lift, frictional losses, all pipe velocities, total dynamic head (TDH) requirements, and net positive suction head available ($NPSH_a$).

11. Existing facility plugging or bulkheading plan, including type, location and manufacturer of plugs with emergency release procedures.

12. Thrust and restraint block sizes and locations, if necessary.

13. Any temporary pipe supports, location, and anchoring requirements.

14. Description of controls, monitoring, mode of operation, sequence of starting and stopping pumps, and emergency power source.

15. Method of noise control for each pump and/or generator for all operations.

16. Show force main pipe material and thickness can withstand all normal operating and surge pressures with a safety factor of 2.0.

17. Denote any conditions that will cause pumps to lose suction lift (prime) and describe procedures to rectify.

18. Show that the emergency switchover from primary to secondary pumping will be automatic should equipment fail.

19. Show emergency plan to be used if flooding occurs at work site.

20. Show suction and discharge piping is protected from possible damage from varying flood levels and construction activities.

21. Show any planned shifting of bypass equipment during construction.

22. Complete information on instruments, including calibration certificates.

23. Qualifications of pump supplier on-site operators.

24. Emergency contact telephone numbers.

D. The plan must be signed and sealed by a Professional Engineer registered in the State of Texas.

E. Sequence of Construction Plan: Furnish in accordance with Section 01 33 00 – Submittal Procedures and Section 01 14 00 – Coordination with Owner's Operations.

1. Contractors Sequence of Construction defining work to be performed, including the following items:

a. Definition of the start date, duration, and end date

b. Define activities to be performed by or witnessed by the Owner and date on which these activities are to be performed.

c. Scheduling/timing of manufacturers field services required to train all personnel that will be responsible for the operation of the bypass system and to verify that all system components are installed as recommended by the manufacturer.

1.06 SPECIAL PRECAUTIONS AND LIABILITIES

A. Contractor is responsible for fines levied on Owner by state, federal, and/or other agencies due to spills caused by failure of temporary pumping systems. The Contractor shall also be responsible for repairing any damage to existing facilities including erosion of soils or contamination caused by a spill that is a direct result of the bypass pumping system failure. The cost of all repair and the immediate action required to facilitate the repairs are also the responsibility of the Contractor. This liability is limited to the firm capacity of the bypass pumping system as defined by this specification.

B. The Owner is not responsible for any damage to the bypass pumping system under any circumstance. The bypass pumping system supplier by submitting a design for approval accepts that temporary pumping facilities for collection and treatment facilities have unknown materials and debris in them and that any damage to any of the bypass pumping equipment due to unknown materials are the responsibility of the supplier. It shall be the responsibility of the suppler to take precautions as deemed necessary by the supplier against any and all materials that may be present in the liquid pumped by the system to prevent damage to the equipment and to prevent failures that may cause a spill.

C. Provide lighted barriers/barricades in all locations where temporary pumps, pipe and other accessories are in roadways, driveways, and other vehicle-accessed areas.

D. Provide lighted barriers/barricades and take safety precautions in all locations where temporary pumps, pipe and other accessories are accessible to the general public such as alleys, sidewalks and driveways.

E. When overnight pumping is necessary, provide security fencing for all temporary pumps when not located within a secured area to prevent tampering. Temporary lighting may be required at some or all locations to secure bypass pump system.

PART 2 – PRODUCTS

2.01 PUMPS

A. The pumps and drives shall be rated for continuous duty and shall be capable of pumping the required flow ranges without surging, cavitation, or vibration. Pumps shall not overload drives at any point on the pump operating curve.

B. Pumps shall be suitable for the service specified and the debris contained within it.

C. Pumps shall be self-contained units designed for temporary use.

D. Pumps shall have fully automatic self-priming units that do not require the use of foot-valves, vacuum pumps, or diaphragm pumps in the priming system, or they shall be submersible.

E. All pumps must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of flows.

F. Provide the necessary start/stop/variable speed and level controls for each pump.

G. The primary pumps shall be diesel powered.

1. Contractor shall be responsible for providing and storing a sufficient quantity of diesel fuel on site to continually operate the pumps for the duration of the temporary bypass pumping period. If this is impractical for industry available fuel storage devices, a refueling plan shall be developed and submitted as part of the bypass pumping submittal. There shall be no excuses for not providing fuel to the bypass pumping system including any natural disaster or weather event. Once started the Contractor shall provide fuel until all work is complete and bypass pumping is no longer needed. Diesel-powered pumps shall have adequate fuel storage capacity to operate continuously for 24 hours without refueling.

2. Contractor shall check the pump fuel levels and shall refill the tanks to full capacity at a frequency based on fuel consumption but not less than daily. Fuel deliveries shall only be made during normal daytime working hours.

3. Contractor is responsible for refilling fuel tanks during holidays and weekends. Such activities shall take place during day time only. Owner’s Representative shall

be notified in advance of the proposed holiday and weekend schedule. Refilling fuel tanks shall be taken as approval to perform additional work unless expressly authorized by the Owner's Representative in writing.

4. Each pump and drive shall be rated for continuous duty operation over the specified range of conditions without cavitating or overheating, and without excessive vibration or noise. In addition, each pump and drive shall be rated to operate intermittently at shutoff head against a closed discharge valve for periods of not less than 5 minutes without excessive cavitation, overheating, or vibration.

5. All pumps are to be Godwin Dri-Prime Automatic self-priming pumps as manufactured by Xylem Dewatering Solutions, Inc., or Engineer approved equal.

6. Furnish each pump with the necessary stop/start controls.

7. Contractor will not be permitted to stop or impede the main flows under any circumstances except as otherwise defined under the Sequence of Construction and in Section 01 14 00 – Coordination with Owner's Operations.

2.02 PIPE

A. In order to prevent accidental spillage, all temporary pipe must be constructed of rigid or semi-rigid pipe with positive, leak proof connections. All pipe materials and joints for temporary pipe systems must be High Density Black Polyethylene Pipe - ANSI/ASTM D1248, butt heat fusion type joint fittings shall conform to ASTM D2657 and D3261. Flexible hose of any type shall not be permitted.

B. Pump discharge piping shall be valved and manifolded so that pumped liquid can be conveyed to the dedicated discharge location. Provide check valves for each pump discharge. Air-relief valves shall be provided at high points in the discharge piping as required. Air-relief valves shall expel air upon pipe filling, admit air upon pipe dewatering, and release small amounts of entrained air during operation. Air-relief valves shall be suitable with the specified service.

C. Different pipe diameter sizes can be used, as long as the maximum discharge pipe velocity at the exit does not exceed 10 feet per second.

D. The bypass system pipe shall be rated for at least 3 times the shut off head of the largest pump supplied in the system. The rating of the pipe with supporting calculations and pump curves shall be part of the bypass pumping system submittal.

E. The bypass pumping supplier shall provide a plan for freeze protection of all exposed piping that may be subject to freezing. The method and materials of freeze prevention will be the responsibility of the temporary pumping system supplier. Damage or spills caused by freezing piping shall be the sole responsibility of the bypass pumping system supplier.

2.03 TEMPORARY PLUGS AND BULKHEADS

A. Provide temporary plugs and bulkheads, as required, for successful operation of the temporary pumping systems. Acceptable temporary plugs and bulkheads include inflatable dams specifically designed for such service, brick bulkheads, timer bulkheads, sandbags, and other bulkhead methods suitable for the specified service.

B. Plugs shall be designed for the specific purpose of providing temporary plugging of active pipes. Each plug and temporary bulkhead shall be suitable for the maximum pressure encountered.

C. All plugs shall be firmly attached to a stationary object at ground level by a cable in order to prevent loss of plugs in pipelines.

D. Piping plugs shall be capable of accommodating the maximum allowable surcharge heads within the gravity system that may be experienced during construction. All plugs shall be designed with a minimum factor of safety of 1.5. Where temporary plugs and bulkheads are under pressure or surcharged, provide either two plugs or a plug and a temporary bulkhead.

E. The plugs shall be readily removed from the system during emergency shutdowns and shall be operated pneumatically.

2.04 PIPE SUPPORTS

A. Pipe supports shall be provided for all pipe that is elevated above the ground.

B. The design, construction and dismantling of all temporary pipe supports shall be the responsibility of the Contractor. All pipe supports shall be designed using the required building codes and regulations and accounting for all potential loads including flood water hydrostatic and flotation loads.

C. All piping systems shall be designed to resist all forces associated with liquid pumping. The pipe and supports shall resist all of these forces or the Contractor shall provide supports, thrust blocks or any other facility required to prevent damage to the bypass pumping system.

2.05 ALARM SYSTEMS

A. The minimum acceptable alarm system shall consist of high-water float(s) and automatic dialer with a battery backup. The alarm system design shall be the responsibility of the bypass pumping system supplier. The alarm system must be capable of full operation in the absence of electrical power and must provide redundancy in case of alarm system component failure.

B. The automatic dialer system shall be provided with either cellular or satellite phone as appropriate to provide reliable contact during any failures.

C. The alarm system shall be tested prior to the start of any construction activities requiring bypassing flows.

PART 3 – EXECUTION

3.01 GENERAL

A. Install, operate and maintain temporary pumping systems and appurtenances, including but not limited to, associated pipe, valves, instrumentation, controls and accessories, in accordance with the manufacturer's instructions for each component and as required by the approved bypass pumping submittal.

B. Provide all oil, fuel, grease, lubricants, tools and spare parts required for operation and maintenance of the temporary pumping systems for the duration of use. Spill containment around diesel-powered pumps, including filling operations, shall be provided per applicable regulations.

C. Adequate hoisting equipment for each pump and accessory shall be maintained on Site.

D. Temporary pumping systems shall remain operable until all components of new work requiring temporary pumping systems have successfully completed all required testing and have been accepted by the Owner.

E. The design of the bypass pumping system must allow for prompt dewatering of the system during periods of non-use or if leakage occurs.

F. The sewer system shall be returned to gravity flow during periods when bypass pumping is not necessary for the installation of work.

G. The Contractor will not be permitted to stop or impede the sewer flow under any circumstances without having the primary setups operational.

H. Before placing the system in operation, it shall be tested for at least 8 hours of continuous operation.

I. The Contractor shall be responsible for the provision of temporary fall-protection devices around all removed manhole covers, grating, openings, etc.

J. The Contractor shall assemble a list of 24-hour emergency telephone numbers that shall include the Contractor's project manager, the Contractor's foreman, and a responsible representative from the pump supplier, and submit it to the Engineer for review and approval.

K. In the event of an accidental sewage spill or discharge into the drainage system, the Contractor shall immediately stop the overflow, notify the Owner, and take the necessary action to clean up and disinfect the spillage using an HTH chemical or an equal product.

3.02 SITING OF FACILITIES

A. In all instances, unobstructed roadway access must be maintained as shown on the drawings. All driveways and connections to roadways must be kept clear.

B. The pumps shall be placed in the locations approved by authorized Brownsville Public Utilities Board staff. Locations must be agreed upon prior to placement. All suction piping shall also be in this designated area and shall be placed in the temporary wet well as required to complete the bypass pumping system installation.

C. The corridor for bypass system piping extends 10 feet to either side of the existing sanitary sewer alignment. All piping and supports must be installed within this corridor.

D. At no time shall the Contractor shutdown more than 2 adjacent streets at the same time unless approved in writing by the Owner. Therefore, the temporary bypass system will need to be moved several times during the construction of this project. Such relocation shall be done at no additional cost to the Owner.

E. The discharge of the bypass pumping system shall be placed and designed in such a way to facilitate proper flow momentum on the direction of normal flow in the receiving facility structure. The bypass pumping contractor will be responsible for the design of the discharge piping and ensuring that no spills occur as a direct result of the design of the discharge.

3.03 PREPARATION

A. The Contractor is responsible for locating any existing utilities in the area selected for installation of the bypass pumps and pipelines. The Contractor shall minimize the disturbance to existing utilities and shall obtain approval from the Owner for any relocation of the bypass pipeline. All costs associated with the relocation of utilities and obtaining approvals shall be included in the contract price.

B. During all bypass pumping operations, the Contractor shall protect the bypass pumping facilities and existing collection system from damage inflicted by equipment. The Contractor shall be responsible for all intentional or accidental physical damage to the bypass pumping system caused by human or mechanical failure or interference.

C. During installation of the bypass pumping pipes, the Contractor shall make every effort to minimize the disruption of normal facility flows and pump station operation.

D. The Contractor shall protect all mature vegetation and structures or other obstacles in the path of the pipeline from damage through use of shields and buffering devices. All private property that must be relocated to construct the work must be stored at a location acceptable to the property owner.

E. In instances where fences must be disturbed for the construction of the pipeline, temporary fencing shall be required.

F. The Contractor shall maintain sewer flow around the work area in a manner that will not cause surcharge or damage to tributary sewers and that will protect public and private property from damage.

G. Temporarily burying the bypass piping may be required to provide access over the piping during operations. All fittings and costs associated with this temporary piping location shall be the responsibility of the Contractor. All locations where temporary burying of the pipe will be required shall be included in the bypass pumping system submittal. Rehabilitation and returning the area of temporary burying back to the original condition including paving or seeding or any other item removed to facilitate pipe installation shall also be the responsibility of the Contractor.

3.04 INSTALLATION AND REMOVAL

A. The Contractor shall pipe sections or make connections to the existing piping systems and construct temporary bypass pumping structures only at the access location and as may be required to provide an adequate suction conduit.

B. The temporary bypass pumping system shall be tested before placing the system in operation. Testing periods shall occur only between the hours of 8:30 a.m. and 3:00 p.m., Monday through Thursday. Testing of bypass pumping system shall NOT be allowed Friday through Sunday, on the Owner's scheduled Holidays, or on the day immediately prior to an Owner's scheduled Holiday. In addition, testing of bypass pumping system shall only be performed during the Owner's normally scheduled work days. Testing shall include leakage testing, pressure testing, operational testing, and alarm testing.

C. Leakage and pressure test: Contractor shall perform leakage and pressure testing for a minimum of two (2) hours on the pump duty suction piping and duty discharge piping in accordance with Article 3.05, Paragraph A. Contractor shall then remove the duty piping and shall install the standby suction piping and standby discharge piping and perform the same test for an additional two (2) hours.

D. Operation test: Contractor shall operate the temporary bypass pumping system for as long as necessary, but no less than 8 hours, without failure to demonstrate reliable operation of the entire system, including but not limited to pumps and controls, to the satisfaction of the Owner.

E. Plugging or blocking of flows shall incorporate primary and secondary plugging devices. When plugging or blocking is no longer needed for performance of the work, the plugs are to be removed in a manner that permits the flow to slowly return to normal without surge, surcharging, or causing other major disturbances upstream or downstream.

F. The Contractor shall remove manhole sections or make connections to the existing gravity conveyance system and construct temporary bypass pumping structures only as

the access locations indicated on the Contract Drawings and as may be required to provide adequate suction conduit.

G. The Contractor is responsible for obtaining any approvals for placement of the temporary pipeline within public right of ways.

H. Upon system removal, all wastewater must be discharged into the wastewater collection system and pipes flushed using potable water supplied by the Contractor.

3.05 QUALITY CONTROL AND MAINTENANCE

A. Testing: Contractor shall perform leakage and pressure tests of the bypass pump suction and discharge piping using potable or approved surface water prior to actual operation. Low pressure air test shall be conducted at a test pressure of 15 psi before any liquid is pumped to ensure the system is assembled correctly. The system will pass the low-pressure air test if it holds the test pressure for 2 hours. The Engineer shall be given 24 hours' notice prior to testing. The force main shall be tested to 1.5 times the normal working pressure of the system at the firm capacity specified and will be considered ready for service if the pressure is held for 2 hours. Surface water or potable water shall be supplied and used by the Contractor for this test.

B. Once installation and testing of the temporary pumping systems are complete, a trained representative from the pump supplier shall inspect the installation and verify in writing that the installation is complete in all aspects and ready to run as intended on a continuous basis.

C. Inspection: during operation of the temporary pumping system the Contractor shall inspect all components every two (2) hours to ensure that the system is working correctly and shall keep a written log of the system inspection results. Contractor shall inspect the bypass pumping fuel system a minimum of either one (1) time per day or as often as necessary to ensure full fuel tanks for the bypass pumps.

D. Maintenance service: Contractor shall ensure that the temporary pumping system is properly maintained, and a responsible and competent mechanic/operator shall be on call at all times. The Contractor shall supply all necessary lubrication, fuel, and supplies necessary to maintain the entire installation.

E. Besides the Owner and the Engineer, only employees of the Contractor or the system supplier are allowed on site.

F. Someone with knowledge of the bypass pump system operation must arrive on site within one hour of any bypass pump start-up event. If the system must be operated continuously, then an operator that can troubleshoot failure and make repairs to the system must be on site while the system is in operation. The temporary pumping system must be monitored continuously (24 hours per day, 7 days per week) during operation by a representative of the Contractor trained and certified by the pump supplier.

3.06 SEQUENCE OF CONSTRUCTION

A. Contractor shall propose a Sequence of Construction incorporating all constraints detailed in this Section and shall secure concurrence of Owner prior to starting work. Contractor shall reference Section 01 14 00 – Coordination with Owner's Operations for sequences or constraints that may dictate operations or effect bypass pumping operations.

B. The Contractor shall submit a construction plan and schedule, which details the methods, means, techniques, and sequences to be used to establish a base element of surety against a spill, to the Engineer for review and approval by the Owner as part of the bypass pumping system submittal. One month prior to connections being made to existing structures or pipes, a coordination meeting shall be held between the Contractor, Engineer, and Owner to discuss the construction plan previously submitted by the Contractor. A detailed schedule of all construction activities requiring bypass pumping system operations shall be delivered in the meeting with the intention of discussing all major milestones. No temporary pumping shall take place until after satisfactory completion of the coordination meeting.

C. Schedule of construction, interconnection details, and other revisions necessary for proper interfacing of the Work are to be subsequently modified by Contractor accounting for results of said coordination meeting. The Engineer and Owner are to be notified one week prior to any actual interruptions or connections being made. No work shall be undertaken prior to securing Owner's approval of respective connection plan and work schedule.

END OF SECTION

SECTION 01 61 00

PRODUCT REQUIREMENTS AND OPTIONS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Common requirements for products.

2. Contractor's options for selecting products.

3. Requirements for consideration of "or equal" products.

4. Warranty requirements of products.

1.02 REFERENCES

A. Definitions:

1. "Products" includes materials, equipment, machinery, components, fixtures, systems, and other goods incorporated in the Work. Products do not include machinery and equipment used for preparing, fabricating, conveying, erecting, or installing the Work. Products include Owner-furnished goods incorporated in the Work where use of such goods is specifically required in the Contract Documents.

2. "Special Warranties" includes additions or modifications to standard warranty requirements specified in the Contract Documents.

1.03 SUBMITTALS

A. Warranty Log Book:

1. Submit warranty log book prepared specifically for this Project. Submittal shall include a summary listing of all equipment and material warranties furnished in the Contract, date received, and start/end date of warranty period. Individual warranty documentation shall be provided in the submittal.

2. Submit prior to submittal of final application for payment.

B. Patent Documentation: Submit licensing arrangement and agreement documentation.

1.04 REQUIREMENT

A. Common Products:

1. Provide products that have not been previously incorporated into another project or facility unless otherwise indicated in the Contract Documents.

2. Provide products of the same generic kind from a single manufacturer.

3. Provide products complete with accessories, trim, finish, fasteners, and other items shown, indicated, or required for a complete installation for the indicated use and performance.

4. Standard Products: When available, and unless custom or nonstandard options are specified or indicated, provide standard products of types that have been produced and used successfully in similar situations on other projects.

5. Visual Matching: Where required in the Contract Documents, provide products that match referenced existing construction, approved mock-ups, or approved Sample, as determined by Engineer.

6. Where the Contract Documents include the phrase “as selected” for product color, finish pattern, option, or similar phrase, provide products selected by Engineer as follows:

    a. Standard Range: Where the Contract Documents include the phrase “standard range of colors, patterns, textures” or similar phrase, provide color, pattern, density, or texture selected by Engineer from manufacturer’s product line that does not include premium items.

    b. Full Range: Where the Contract Documents include the phrase “full range of colors, patterns, textures” or similar phrase, Engineer will select color, pattern, density, or texture from manufacturer’s entire product line, including standard and premium items.

B. Product Compatibility:

1. Similar products by the same Supplier shall be compatible with each other, unless otherwise indicated in the Contract Documents.

2. Provide products compatible with products previously selected or installed on the Project.

C. Product Options:

1. For products specified only by reference standard or description, without reference to Supplier, provide products meeting that standard, by a Supplier or from a source that complies with the Contract Documents.

2. For products specified by naming one or more products or Suppliers, provide the named products that comply with the Contract Documents, unless an “or equal” or substitute product is approved by Engineer.

3. For products specified by naming one or more products or Suppliers and the term, “or equal”, when Contractor proposes a product or Supplier as an “or equal”, submit to Engineer a request for approval of an “or equal” product or Supplier.

4. For products specified by naming only one product or manufacturer and followed by words indicating that no substitution is allowed, there is no option and no substitution will be allowed.

D. Concerning Patents:

1. Owner shall be provided a guarantee by Contractor and equipment Supplier that equipment and material furnished in accordance with the Contract Documents is not the subject of patent litigation.

2. Patent litigation or controversy shall include, but not limited to, the following:

a. Actual furnished equipment and material the is subject or could be subject to patent litigation or is known to infringe on a patent.

b. Furnished equipment and material that may result in a process that use of equipment and material in a manner that infringes upon or violates a patent.

3. When patent infringement may occur, Contractor and Supplier shall submit license arrangements among parties, including Contractor, Supplier, and patent owner (controller of patent) at a minimum, which shall permit use of equipment and material as specified in the Contract Documents.

4. Supplier shall indemnify and hold harmless Owner and Engineer against all claims, costs, losses, and damages arising out of or relating to any infringement or patent rights or copyrights incident to the use of equipment and material specified in the Contract Documents and as required in General Conditions and as modified in the Supplemental Conditions.

E. “Or Equal” Products:

1. For proposed products not named in the Contract Documents and considered as an “or equal” as defined in the General Conditions, Contractor shall request in writing Engineer’s approval of the “or equal”. Request for approval of an “or equal” product shall accompany the Shop Drawing or product data submittal for the proposed product and shall include:

a. Contractor’s request that the proposed product be considered as an “or equal” in accordance with the General Conditions, accompanied by Contractor’s certifications required in the General Conditions.

b. Documentation adequate to demonstrate that proposed product does not require revisions to the Contract Documents, that proposed product is

consistent with the Contract Documents, and that proposed product will produce results and performance required in the Contract Documents, and that proposed product is compatible with other portions of the Work.

c. Detailed comparison of significant qualities of proposed product with the products and manufacturers named in the Contract Documents. Significant qualities include attributes such as performance, weight, size, durability, visual effect, performance and specific features and requirements shown or indicated.

d. Evidence that proposed product manufacturer will furnish warranty equal to or better than specified, if any.

e. List of similar installations for completed projects with project names and physical addresses of installation along with the names, telephone numbers, email addresses and physical address of design professionals and owners associated with the referenced installation, if requested.

f. Samples, if requested.

g. Other information requested by Engineer.

1.05 WARRANTY

A. Warranties specified for products shall be in addition to, and run concurrent with, Contractor's general warranty and guarantee and requirements for the required correction period. Disclaimers and limitations in specific product warranties do not limit Contractor's general warranty and guarantee.

1. Product manufacturer's warranty is preprinted written warranty published by product manufacturer and specifically endorsed by product manufacturer to Owner.

2. Equipment and material shall be guaranteed to be free from defects in workmanship, design, and/or materials for a period of one (1) year unless otherwise specified in the individual Specification Section for a Special Warranty.

3. Warranty requirements may be added to or modified in the individual Specification Sections. Special warranty is written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by product manufacturer's warranty or to provide increased rights to Owner.

4. Special warranty information, if any, will be located in the Specification Section for that product.

B. Requirements for Special Warranties: Provide written special warranty document that contains appropriate terms and identification, ready for execution by product manufacturer and Owner. Submit draft warranty with submittals required for product.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed by product manufacturer and other parties as appropriate.

2. Specified Form: When specified forms are included in the Contract Documents, prepare written document, properly executed by product manufacturer and Owner, using appropriate form.

3. Refer to Specifications for content and requirements for submitting special warranties.

C. Submit product manufacturer's warranties and special warranties as submittals in accordance with Schedule of Submittals accepted by Engineer.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 65 00

PRODUCT DELIVERY REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. General requirements for preparing for shipping, delivering, and handling materials and equipment.

2. Contractor shall make all arrangements for transporting, delivering, and handling of materials and equipment required for prosecution and completion of the Work.

1.02 SUBMITTALS

A. Refer to individual Specification Sections for submittal requirements relative to delivery and handling materials and equipment.

1.03 SHIPMENT REQUIREMENTS

A. When practical, factory-assemble materials and equipment. Match mark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with strippable, protective coating.

B. Package materials and equipment to facilitate handling, and protect materials and equipment from damage during shipping, handling, and storage. Mark or tag outside of each package or crate to indicate the associated purchase order number, bill of lading number, contents by name, Owner's contract name and number, Contractor name, equipment number, and approximate weight. Include complete packing lists and bills of materials with each shipment.

C. Protect materials and equipment from exposure to the elements and keep thoroughly dry and dust-free at all times. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Lubricate bearings and other items requiring lubrication in accordance with manufacturer's instructions.

D. Advance Notice of Shipments:

1. Keep Engineer informed of delivery of all materials and equipment to be incorporated in the Work.

E. Do not ship materials and equipment until:

1. Related Shop Drawings, Samples, and other submittals have been approved or accepted (as applicable) by Engineer, including, but not necessarily limited to, Submittals associated with the materials and equipment being delivered.

2. Manufacturer's instructions for handling, storing, and installing the associated materials and equipment have been submitted to and accepted by Engineer in accordance with the Specifications.

3. Results of source quality control testing (factory testing), when required by the Contract Documents for the associated materials or equipment, have been reviewed and accepted by Engineer.

4. Facilities required for handling materials and equipment in accordance with manufacturer's instructions are in place and available.

5. Required storage facilities have been provided.

1.04 DELIVERY REQUIREMENTS

A. Scheduling and Timing of Deliveries:

1. Arrange deliveries of materials and equipment in accordance with the accepted Progress Schedule and in ample time to facilitate inspection prior to installation.

    a. Equipment and material shall not be delivered to the Site prior to 90 days in advance of scheduled installation unless otherwise approved in writing by the Owner prior to delivery.

    b. Partial payment requests will not be processed for materials delivered prior to 90 days before installation or for materials that are improperly stored.

2. Schedule deliveries to minimize space required for and duration of storage of materials and equipment at the Site or delivery location, as applicable.

3. Coordinate deliveries to avoid conflicting with the Work and conditions at Site, and to accommodate the following:

    a. Work of other contractors, utilities or Owner.

    b. Storage space limitations.

    c. Availability of equipment and personnel for handling materials and equipment.

    d. Owner's use of premises.

4. Deliver materials and equipment to the Site during regular working hours.

5. Deliver materials and equipment to avoid delaying the Work and the Project, including work of other contractors, as applicable. Deliver anchor system materials, including anchor bolts to be embedded in concrete or masonry, in ample time to avoid delaying the Work.

B. Deliveries:

1. Shipments shall be delivered with Contractor's name, Subcontractor's name (if applicable), Site name, Project name, and contract designation clearly marked.

2. Site may be listed as the "ship to" or "delivery" address; but Owner shall not be listed as recipient of shipment unless otherwise directed in writing by Engineer.

3. Provide Contractor's telephone number to shipper; do not provide Owner's telephone number.

4. Arrange for deliveries while Contractor's personnel are at the work area. Contractor shall receive and coordinate shipments upon delivery. Shipments delivered to the Site when Contractor is not present will be refused by Owner, and Contractor shall be responsible for the associated delays and additional costs, if incurred.

C. Containers and Marking:

1. Have materials and equipment delivered in manufacturer's original, unopened, labeled containers.

2. Clearly mark partial deliveries of component parts of materials and equipment to identify materials and equipment, to allow easy accumulation of parts, and to facilitate assembly.

D. Inspection of Deliveries:

1. Immediately upon delivery, Contractor shall inspect shipment to verify that:

a. Materials and equipment comply with the Contract Documents and approved or accepted (as applicable) submittals.

b. Quantities are correct.

c. Materials and equipment are undamaged.

d. Containers and packages are intact and labels are legible.

e. Materials and equipment are properly protected.

2. Promptly remove damaged materials and equipment from the Site and expedite delivery of new, undamaged materials and equipment, and remedy incomplete or

lost materials and equipment to furnish materials and equipment in accordance with the Contract Documents, to avoid delaying progress of the Work.

3. Advise Engineer in writing when damaged, incomplete, or defective materials and equipment are delivered, and advise Engineer of the associated impact on the Progress Schedule.

1.05 HANDLING REQUIREMENTS

A. Provide equipment and personnel necessary to handle materials and equipment, including those furnished by Owner, by methods that prevent soiling or damaging materials and equipment and packaging.

B. Provide additional protection during handling as necessary to prevent scraping, marring, and otherwise damaging materials and equipment and surrounding surfaces.

C. Handle materials and equipment by methods that prevent bending and overstressing.

D. Lift heavy components only at designated lifting points.

E. Handle materials and equipment in safe manner and as recommended by the manufacturer to prevent damage. Do not drop, roll, or skid materials and equipment off delivery vehicles or at other times during handling. Hand-carry or use suitable handling equipment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 66 00

PRODUCT STORAGE AND PROTECTION REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. General requirements of storing and protecting equipment and materials.

1.02 STORAGE

A. Store and protect materials and equipment in accordance with manufacturer's recommendations and the Contract Documents.

B. Contractor shall make all arrangements and provisions necessary for, and pay all costs for, storing materials and equipment. Construction equipment, and materials and equipment to be incorporated into the Work shall be placed to avoid injuring the Work and existing facilities and property, and so that free access is maintained at all times to all parts of the Work and to public utility installations in vicinity of the Work. Store materials and equipment neatly and compactly in locations that cause minimum inconvenience to Owner, other contractors, public travel, and owners, tenants, and occupants of adjoining property. Arrange storage in manner to allow easy access for inspection.

C. No areas have been secured by the Owner for storing materials and equipment. Staging and storage areas shall be the responsibility of the Contractor and shall be provided at no additional cost to the Owner.

D. Store materials and equipment to become Owner's property to facilitate their inspection and ensure preservation of quality and fitness of the Work, including proper protection against damage by freezing, moisture, and high ambient temperatures. Store in indoor, climate-controlled storage areas all materials and equipment subject to damage by moisture, humidity, heat, cold, and other elements, unless otherwise acceptable to Owner.

E. Contractor shall be fully responsible for loss or damage (including theft) to stored materials and equipment.

F. Do not open manufacturer's containers until time of installation, unless recommended by the manufacturer, directed by Engineer or otherwise specified in the Contract Documents.

G. Do not store materials or equipment in structures being constructed unless approved by Engineer in writing.

H. Do not use lawns or other private property for storage without written permission of the owner or other person in possession or control of such premises.

I. Contractor shall not store unnecessary equipment and materials in work areas.

J. Contractor shall prevent structures from being loaded with a weight that endanger its security and/or safety of persons.

K. Stored equipment and materials shall not be placed within 10 feet of fire hydrants.

L. Gutters, drainage channels and inlets shall be kept unobstructed at all times.

1.03 PROTECTION

A. Contractor shall provide temporary storage containers/facilities, if required, to protect equipment and materials.

B. Equipment to be incorporated into the Work shall be boxed, crated, or otherwise completely enclosed and protected during shipping, handling, and storage, in accordance with Section 01 65 00 – Product Delivery Requirements.

C. Store all materials and equipment off the ground (or floor) on raised supports such as skids or pallets.

D. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Painted equipment surfaces that are damaged or marred shall be repainted in their entirety in accordance with equipment manufacturer and paint manufacturer requirements, to the satisfaction of Engineer.

1.04 SPECIFIC STORAGE REQUIREMENTS

A. Contractor shall follow manufacturer's storage requirements. If there are conflicts with the requirements listed in this section, Contractor shall follow manufacturer's instructions and notify the Owner and Engineer immediately.

B. Uncovered:

1. The following types of materials may be stored outdoors without cover on supports so there is no contact with the ground:

a. Piping, except polyvinyl chloride (PVC) or chlorinated PVC (CPVC) pipe.

C. Covered:

1. The following materials and equipment may be stored outdoors on supports and completely covered with covering impervious to water:

a. Grout and mortar materials.

b. Rough lumber.

c. PVC and CPVC pipe.

2. Tie down covers with rope, and slope covering to prevent accumulation of water.

D. Fully Protected:

1. All materials and equipment not named as uncovered or covered in this Section, shall be stored on supports in buildings or trailers that have concrete or wooden flooring, roof, and fully closed walls on all sides. Covering with plastic sheeting or similar material in space without floor, roof, and walls is not acceptable. Comply with the following:

a. Provide heated storage for materials and equipment that could be damaged by low temperatures or freezing.

b. Provide air-conditioned storage for materials and equipment that could be damaged by high temperatures.

c. Protect mechanical and electrical equipment from being contaminated by dust, dirt, and moisture.

d. Maintain humidity at levels recommended by manufacturers of electrical and electronic equipment.

e. Energize space heaters for electrical equipment and material.

E. Maintenance of Storage: On scheduled basis, periodically inspect stored materials and equipment to ensure that:

1. Condition and status of storage facilities is adequate to provide required storage conditions.

2. Required environmental conditions are maintained on continuing basis.

3. Materials and equipment exposed to elements are not adversely affected.

1.05 RECORDS

A. Keep up-to-date account of materials and equipment in storage to facilitate preparation of Applications for Payment, if the Contract Documents provide for payment for materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 71 33

PROTECTION OF WORK AND PROPERTY

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Protection of existing utilities and structures.

2. Protection of installed equipment and materials.

3. Protection during inclement weather.

4. Reporting of accidents.

5. Barricades and warning signals.

B. Contractor shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect the Work and all public and private property and facilities from damage, as specified in the General Conditions, Supplementary Conditions, and this Section.

C. To prevent damage, injury, or loss, Contractor's actions shall include the following:

1. Storing apparatus, materials, supplies, and equipment in an orderly, safe manner that does not unduly interfere with progress of the Work or work of other contractors or utility companies.

2. Providing suitable storage facilities for equipment and materials subject to damage or degradation by exposure to weather, theft, breakage, or other cause.

3. Placing upon the Work or any part thereof only loads consistent with the safety and integrity of that portion of the Work and existing construction.

4. Frequently removing and disposing of refuse, rubbish, scrap materials, and debris caused by Contractor's operations so that, at all times, the work area is safe, orderly, and workmanlike in appearance.

5. Provide sufficient barricades, temporary lighting, or any other safety appurtenances to maintain a safe work area for employees and the public.

D. Contractor has full responsibility for preserving public and private property and facilities on and adjacent to the work area. Direct or indirect damage done by, or on account of, any act, omission, neglect, or misconduct by Contractor in executing the Work, shall be

restored by Contractor, at his expense to condition equal to that existing before damage was done.

E. Contractor shall comply with safety regulations required by Owner or authorities having jurisdiction. Contractor shall comply with and correct unsafe conditions created or caused by Contractor's personnel. In the event Contractor fails to comply, Owner receives the right to take necessary measures to correct conditions or practices for reimbursement by Contractor.

1.02 REFERENCES

A. Definitions:

1. "Existing utilities" shall refer to both publicly-owned and privately-owned utilities such as, but are not limited to, electric power and lighting, telephone, water, gas, storm drains, process lines, sanitary sewers and all appurtenant structures.

2. "Surface structures" are existing buildings, structures, and other facilities at or above ground surface, including their foundations or any extension below ground surface. Surface structures include, but are not limited to, buildings, tanks, walls, channels, open drainage, exposed piping and utilities, poles, exposed wires, posts, signs, markers, curbs, walks, fencing, and other facilities visible at or above ground surface.

1.03 SITE CONDITIONS

A. Location of Existing Utilities and Structures:

1. Contractor shall confirm and verify location of existing utilities and structures at the Site prior to commencing the Work.

2. Contractor shall notify and obtain approval from authority having jurisdiction prior to performing the Work in the vicinity of the existing utilities and structures.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 PROTECTION OF EXISTING UTILITIES AND STRUCTURES

A. General:

1. Contractor shall satisfy Engineer that methods and procedures for protection have been approved by authorities having jurisdiction prior to proceeding with the Work.

2. Contractor shall provide temporary support and protection, as required, to existing utilities and structures during the Work, including excavation.

    a. Temporary support and protection of existing utilities shall be provided in accordance with requirements of the authority having jurisdiction.

    b. Temporary support and protection of existing structures shall be provided as directed by the Engineer.

3. Contractor shall be responsible for costs incurred for temporary support or protection provided by a third-party or authority having jurisdiction to ensure safety of the existing utility, Owner, and public and private parties.

4. Contractor shall maintain a minimum 10’ vertical and horizontal clearance from all electric poles, transformer structures and other electrical structures.

5. Contractor shall maintain a minimum 2’ vertical and horizontal clearance from all gas lines.

B. Existing Buried Utilities:

1. Contractor shall perform field investigations to identify conflicts or interferences between existing utilities and utility Work prior to excavation Work.

    a. Investigation of conflicts and interferences shall be performed in all work area locations, elevations, slopes, etc. of the existing utilities determined during the field investigations.

    b. Contractor shall notify Engineer and Owner in writing of identified conflicts or interferences. Contractor shall not proceed with the Work until written authorization is provided by the Engineer.

    c. Identified conflicts and interferences shall be handled in accordance with the Contract Documents. If required, potential modification to the Contract Documents shall be performed in accordance with Section 01 26 00 – Contract Modification Procedures.

2. Contractor shall perform the Work to prevent disruption of existing service and damage to existing utilities.

    a. Temporary connections shall be provided, as required, to provide un-interrupted service of existing utilities.

    b. Contractor shall repair damage to existing utilities as directed by the Engineer or the authority having jurisdiction at Contractor’s own expense.

c. Contractor shall be responsible for damages and repair costs to the authority having jurisdiction if third-party or authority having jurisdiction personnel repair damaged existing utilities.

C. Protection of Existing Structures:

1. Contractor shall sustain existing surface structures in existing place and protect from direct or indirect injury located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure or facility.

2. Contractor shall bear all risks attending the presence or proximity of all surface structures within or adjacent to limits of the Work, in accordance with the Contract Documents.

3. Contractor shall be responsible for damage and expense for direct or indirect injury caused by his Work to structures and facilities.

4. Contractor shall repair immediately damage caused by his Work, to the satisfaction of owner of damaged structure or facility at no cost to the Owner.

5. Contractor shall provide temporary weather protection for existing structures and buildings where exterior walls or roofs are modified or disturbed in the Work. Contractor shall be responsible for damages due to inadequate protection of existing structures and building.

D. Relocation of Surface Structures: Existing surface facilities, including but not limited to guard rails, posts, guard cables, signs, poles, markers, curbs, and fencing, that are temporarily removed to facilitate the Work shall be replaced and restored to their original condition at Contractor's expense.

3.02 PROTECTION OF INSTALLED EQUIPMENT AND MATERIALS

A. Contractor shall protect installed equipment and materials equipment to prevent damage, injury or loss from subsequent operations. Remove protection facilities when no longer needed prior to completion of the Work.

B. Control traffic to prevent damage to equipment, materials, and surfaces.

C. Coverings: Provide coverings to protect materials and equipment from damage.

3.03 PROTECTION DURING INCLEMENT WEATHER

A. Contractor shall not perform Work during inclement or unsuitable weather that will affect the quality of the completed Work.

B. Contractor shall take necessary precautions in the event of impending inclement weather to protect equipment, materials and Work from damage or deterioration due to floods, driving rain, wind, or snow storms.

1. Owner reserves the right to require additional protection measures beyond Contractor's proposed protection measures to protect the Work.

2. Contractor shall not claim additional compensation for additional protection measures required by Owner nor for damages to equipment, material, or Work due to the inclement weather.

C. When directed by Engineer, Contractor shall stop Work and protect new Work by protective covering during rain storms for, but not limited to, the following:

1. Concrete mixing and placement.

2. Paving placement.

3. Masonry installation.

4. Buried piping, valve and appurtenance installation.

5. Additional inclement weather requirements and limitations are specified in individual Specification Sections.

3.04 REPORTING OF ACCIDENTS

A. Contractor shall immediately report, in writing, to Engineer and Owner accidents out of, or in conjunction with, the performance of Work.

1. Accident reporting includes on Site and adjacent to Site, which cause death, personal injury, or property damage.

2. Written report shall provide full details and witness statements.

3. If claim is made against Contractor, Supplier, or Subcontractor due to accident, Contractor shall promptly report facts, in writing, to Engineer and Owner, with full account of the claim.

B. Contractor shall immediately report death, serious injury, or serious damage caused by telephone or messenger to Engineer and Owner.

3.05 BARRICADES AND WARNING SIGNALS

A. General:

1. Where the Work is performed on or adjacent to roadway, access road, right-of-way, or public place:

a. Provide barricades, fences, lights, warning signs, danger signals, watchmen, and take other precautionary measures for protecting persons, property, and the Work.

b. Paint barricades to be visible at night.

c. From sunset to sunrise, furnish and maintain at least one light at each barricade.

d. Erect sufficient barricades to keep vehicles from being driven on or into Work under construction.

e. Furnish watchmen in sufficient numbers to protect the Work.

B. Provide temporary barricades to protect personnel and property for Work not in or adjacent to vehicular travel areas, including indoor work, in accordance with Laws and Regulations.

C. Contractor's responsibility for maintaining temporary barricades, signs, lights, and for providing watchmen shall continue until the Work is accepted in accordance with the Contract Documents.

END OF SECTION

SECTION 01 73 00

DEMOLITION AND EXECUTION OF WORK

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Contractor shall provide labor, materials, tools, equipment, and incidentals shown, specified, and required for execution of the Work as specified in this Section, including the following:

    a. Construction Electronic Documentation

    b. Demolition

    c. Cutting and Coring

    d. Patching

    e. Installation

2. Requirements for demolition, removal and disposal of existing buildings, piping, structures, pavement, curbs, sidewalks and electrical, plumbing, heating and ventilation equipment and materials as indicated in the Contract Documents for demolition.

3. General requirements for installation of equipment and material. Additional installation requirements are included in the individual Specification Sections.

4. General requirements for connections to existing facilities. Requirements for tie-ins and shutdowns necessary to complete the Work are included in Section 01 14 00 – Coordination with Owner's Operations.

    a. To extent possible, materials, equipment, systems, piping, and appurtenances that will be placed into service upon completion of connection to existing facilities shall be checked, successfully tested, and in condition for operation prior to making connections to existing facilities, if valves, gates, or similar watertight and gastight isolation devices are not provided at the connection point.

5. Requirements for cutting and coring, and rough and finish patching of holes and openings in existing construction. Provide cutting, coring, fitting, and patching, including attendant excavation and fill, required to complete the Work, and to:

a. Remove and replace defective Work.

b. Remove samples of installed Work as specified or required for testing.

c. Remove construction required to perform required alterations or additions to existing work.

d. Connect to completed Work not performed in proper sequence.

e. Remove or relocate existing utilities and pipes that obstruct the Work in locations where connections must be made.

f. Make connections or alterations to existing or new facilities.

B. Related Sections:

1. Section 01 14 00 – Coordination with Owner's Operations

2. Section 01 51 00 – Temporary Utilities

3. Section 01 57 00 – Temporary Controls

4. Section 01 61 00 – Product Requirements and Options

5. Section 01 66 00 – Product Storage and Protection Requirements

6. Section 01 74 00 – Cleaning and Waste Management

7. Section 02 41 00 – Site Demolition

1.02 REFERENCES

A. Definitions:

1. "Manufacturer's installation instructions" includes manufacturer's written instructions; drawings; illustrative, wiring, and schematic diagrams; diagrams identifying external connections; and other such information pertaining to installation of equipment and materials. Installation instructions are printed instructions, including those attached to the equipment and materials, all inclusive.

2. "Salvage" items are equipment and materials shown on the Contract Documents for selective removal by the Contractor to furnish to the Owner. Contractor shall be responsible for removal, handling, and depositing of equipment and material to location designated by Owner.

B. Reference Standards:

1. 29 CFR 1910, OSHA.

2. ANSI A10.2, Safety Code for Building Construction

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Review installation procedures under other Sections and coordinate Work that must be performed with or before the Work specified in this Section.

2. Notify other contractors in advance of Work for connections to existing facilities to prevent delay of the Work.

3. Remove and dispose of equipment and materials indicated for demolition on the Contract Documents, unless indicated as salvage items for the Owner. Contractor shall obtain ownership of removed equipment and materials following Engineer and Owner approval. Disposal of equipment and materials shall be in accordance with the Contract Documents

B. Sequencing:

1. Contractor shall remove and demolish equipment and materials in sequence specified in Section 01 14 00 – Coordination with Owner's Operation and following approval by Engineer and Owner.

2. Contractor shall replace equipment and materials removed without proper authorization from Engineer, which are necessary for the operation of the existing facilities. Re-installation of equipment and materials shall be to the satisfaction of the Engineer at no cost to the Owner

C. Title to Equipment and Materials:

1. Equipment and materials indicated for demolition and removal in the Contract Documents, and not designated as Owner's salvaged items, shall become the Contractor's property following removal from the work area. Contractor shall be responsible for legally disposing of the equipment and material.

2. Contractor shall have no right or title to any of the equipment, materials, or other items to be removed until the elements have been removed from the work area.

3. Contractor shall not sell or assign or attempt to sell or assign any interest in the equipment, materials, or other items until removal from work area.

4. Contractor shall have no claim against the Owner because of the absence of equipment, fixtures, and materials.

D. Salvage Equipment and Materials:

1. Contract Documents indicate equipment and materials that shall be retained by Owner. Owner has the right to request any demolished equipment and materials be retained at their discretion.

2. Contractor shall move salvaged equipment and materials to storage areas as instructed by Owner.

3. Architectural equipment and materials may be salvaged for incorporation into the Work when approved by Engineer.

1.04 SUBMITTALS

A. Action/Informational Submittals:

1. Construction electronic documentation as specified in this Section.

2. Demolition Plan: Submit detailed description of methods, equipment, and sequence for demolition Work, including means of ensuring stability of structures during demolition activities.

3. Cutting and Patching Request:

a. Submit written request to Engineer, well in advance of executing cutting or alteration that affects one or more of the following:

1) Design function or intent of Project.

2) Work of Owner or other contractors.

3) Structural value or integrity of an element of the Project.

4) Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.

5) Efficiency, operational life, maintenance, or safety of operational elements.

6) Visual qualities of sight-exposed elements.

b. Request shall include:

1) Identification of Project and contract name and number.

2) Description of affected Work of Contractor and work of others (if any).

3) Necessity for cutting.

4) Effect on work of Owner, other contractors (if any), and on structural or weatherproof integrity of Project.

5) Description of proposed Work, including scope of cutting and patching; trades who will be executing the Work; products proposed to be used; extent of refinishing; schedule of operations; alternatives to cutting and patching, if any.

6) Designation of entity responsible for cost of cutting and patching, when applicable.

7) Written permission of other contractors (if any) whose work will be impacted.

4. Recommendation Regarding Cutting and Patching:

a. Should conditions of work, or schedule, indicate a change of materials or methods, submit written recommendation to Engineer including:

1) Conditions indicating change.

2) Recommendations for alternative materials or methods.

3) Items required with substitution request, in accordance with the substitution request requirements of the Contract Documents and Section 01 61 00 – Product Requirements and Options.

5. Product Data: Submit manufacturer's product data for the protective compound to be applied to core-drilled surfaces and cut concrete surfaces, as well as means of protecting exposed reinforcement or other metal embedments.

6. Informational Submittal: Submit written indication designating the day and time that the construction associated with cutting and patching will be uncovered, to allow observation. Do not begin cutting or patching operations until submittal is accepted by Engineer.

7. Comply with submittal requirements of individual Specification Sections for patching materials.

1.05 WORK AREA CONDITIONS

A. Owner does not assume responsibility for the actual condition of structures and equipment to be demolished and removed.

B. Existing work area conditions shall be maintained to the greatest extent possible by the Owner to the time of Notice to Proceed.

C. Contractor shall perform investigations, explorations, and probes as necessary at the Site prior to initiating demolition Work to ascertain any required protective measures before proceeding with demolition and removal. Contractor shall give particular attention to shoring and bracing requirements to prevent damage to the Work and existing structures.

D. Contractor shall verify measurements, dimensions and other conditions of each existing structure, system, equipment, and material indicated in the Contract Documents for new Work prior to ordering equipment and materials.

PART 2 – PRODUCTS

2.01 MATERIALS

A. General:

1. Provide materials and products in accordance with the individual Specification Sections and the Contract Documents.

2. Provide materials and products that visually match existing adjacent surfaces to fullest extent possible for exposed surfaces.

3. If not indicated in the Contract Documents, provide materials and products that are identical to existing materials and products affected by the Work.

4. If identical materials and products are unavailable, provide materials and products that shall equal or exceed performance requirements of existing materials and products.

B. Protective Coating Applied to Core-Drilled Surfaces and Cut Concrete Surfaces:

1. All concrete surfaces exposed due to cutting or core drilling shall be coated with an epoxy resin coating such as Sikagard 62 by Sika Corporation, Durakote 240 by Tamms Industries or approved equal.

2. Reinforcement or other metal embedment exposed by concrete cutting or core drilling shall be burned back a minimum of ½ inch below surface and resulting void shall be filled with an epoxy resin binder.

PART 3 – EXECUTION

3.01 CONSTRUCTION ELECTRONIC DOCUMENTATION

A. Pre-Construction Documentation

1. Contractor shall take photographic and video documentation of the Site where Work is being performed. Engineer and Owner reserve the right to be present during documentation.

2. Contractor shall provide both photographic and video documentation at grade-level and aerial of the work area prior to commence Work.

3. Contractor shall submit pre-construction documentation to Engineer and Owner for review. Contractor, Engineer, and Owner shall visit work areas to field verify electronic documentation prior to commencing the Work. Site visit verification shall establish existing conditions prior to commencing Work.

B. Construction Progress Documentation

1. Contractor shall document Work progress at locations and construction as directed by Engineer, at a minimum.

2. Contractor shall provide electronic documentation prior to and following any shutdown, switchover, demolition, de-commissioning, cutting, patching, repair, etc. Engineer and Owner reserve the right to be present during documentation.

3. Contractor shall document following exposure of buried utilities, piping, valve, appurtenances, and other underground elements.

4. Engineer reserves the right to provide construction progress documentation to confirm Contractor electronic documentation.

C. Post-Construction Documentation

1. Contractor shall take photographic and video documentation of the areas where Work has been completed and prior to Substantial Completion or partial utilization by Owner. Engineer and Owner reserve the right to be present during documentation.

2. Contractor shall provide both photographic and video documentation at grade-level and aerial of the work area following completion of the Work.

D. Submittal Requirements:

1. Documentation shall be time stamped for verification, including date and time.

2. Documentation shall be organized in a logical manner, such as by structure, building, physical site location, etc. for easy of comparison.

3. Photographic documentation shall be high resolution electronic versions.

4. Documentation shall be submitted to Engineer for review and approval prior to commence Work and at completion of the Work.

3.02 DEMOLITION

A. General:

1. Demolition Work shall comply with the applicable provisions and recommendation of ANSI A10.2, Safety Code for Building Construction, all governing codes, and as specified in this Section.

2. Contractor shall furnish competent and experienced personnel for the various type of demolition and removal Work. Demolition and removal Work shall be performed with regard to the safety of Contractor employees, Owner employees, other individuals at the work area, and the public.

3. Contractor shall confirm absence of embedded utilities prior to cutting, coring, or demolishing existing concrete and facilities. Verification shall be performed by portable x-ray, ground penetrating radar, or other non-invasive methods.

    a. Contractor shall notify Engineer and Owner if embedded utilities are located during the investigation. Contractor shall clearly mark and document location of embedded utilities prior to performing the Work.

    b. Contractor shall be responsible for repair and damages caused by exploration, investigation, and performance of the Work at no additional cost to Owner.

4. Contractor shall remove temporary work, such as enclosures, signs, guards, etc. when such temporary Work is no longer required or when directed at the completion of the Work.

5. Contractor shall perform patching, restoration and Work in accordance with individual Specification Sections and details shown on Contract drawings.

6. Contractor shall be responsible for damage caused by demolition Work to existing structures, equipment and materials indicated for reuse or to remain at no additional cost to Owner.

7. Contractor shall maintain a clean working environment during the demolition Work in accordance with Section 01 74 00 – Cleaning and Waste Management.

8. Contractor shall proceed with the demolition work in a sequence designed to maintain the plant in operation in accordance with Section 01 14 00 – Coordination with Owner's Operations.

9. Excavation caused by demolition shall be backfilled with fill free from rubbish and debris. Select fill or structural fill shall be used where specifically required on Contract Drawings.

10. All debris resulting from the demolition and removal work shall be disposed of by the Contractor at a properly permitted facility as part of the work of this Contract. All regulations covering material handling and disposal shall be followed. Material designated by the Engineer to be salvaged shall be stored as directed by the Owner. All other material shall be disposed of off-site by the Contractor at his expense. Burning of any debris resulting from the demolition will not be permitted at the site.

B. Protection during Demolition:

1. Contractor shall provide, erect, and maintain catch platforms, lights, barriers, weather protection, warning signs and other items as required for proper protection of the public, occupants of the building, personnel engaged in demolition Work, and adjacent construction.

2. Contractor shall provide and maintain weather protection at exterior openings to fully protect the interior premises against damage from the elements until such openings are closed by the Work.

3. Contractor shall provide and maintain temporary protection of the existing structure designated to remain where demolition, removal and Work is being done, connections made, materials handled, or equipment moved. Temporary protection shall be provided in accordance with Section 01 71 33 – Protection of Work and Property.

4. Contractor shall take necessary precautions to prevent dust from rising by wetting demolished masonry, concrete, plaster, and similar debris. Unaltered portions of the existing buildings affected by the operations in the Contract Documents shall be protected by dust proof partitions and other adequate means. Dust control shall be provided in accordance with Section 01 57 00 – Temporary Controls.

5. Contractor shall provide adequate fire protection in accordance with Section 01 51 00 – Temporary Utilities and authorities having jurisdiction.

6. Contractor shall perform the demolition Work with minimum traffic interference. Contractor shall not close or obstruct walkways, passageways, or stairways. Contractor shall not store or place materials in passageways, stairs, or other means of egress.

7. Contractor shall minimize disturbances to exterior walls and roofs to small sections that are readily repaired and patched to maintain watertight conditions in existing structures and buildings.

C. Performance of Demolition:

1. Equipment, piping, valves, and appurtenances:

a. Contractor shall drain equipment, piping, valves, and appurtenances prior to demolition Work. Contractor shall be responsible for collection, transport, and disposal of drained contents at no additional cost to the Owner.

b. Contractor shall provide line stops, plugs, blind flanges, etc. for equipment, piping, valves, and appurtenance required to remain in service during the Project. Contractor shall provide temporary or permanent supports in accordance with the Contract Documents.

c. Supports, pedestals and anchors shall be removed with the equipment and piping unless otherwise noted in the Contract Documents.

d. Concrete bases, anchor bolts and other supports shall be removed to approximately 1 inch below the surrounding finished area and the recesses shall be filled with epoxy resin binder.

e. Wall and roof openings shall be closed, and damaged surfaces shall be patched to match the adjacent areas, in accordance with the Contract Documents and as directed by the Engineer.

f. Wall sleeves, wall pipes, and wall castings shall be plugged or blanked off in accordance with the Contract Documents and as directed by the Engineer.

g. Openings in concrete shall be closed in accordance with the Contract Documents and as directed by the Engineer.

2. Reused and relocated equipment:

a. Contractor shall receive approval from Engineer prior to removal and relocation of equipment and material. Equipment and materials removed by Contractor prior to Engineer's approval that is required for Owner's operation of the facility shall be reinstalled at no cost to the Owner.

b. Prior to removal and relocation Work, equipment and materials indicated for reuse and relocation shall be operated by Owner with Contractor and Engineer present to witness existing functionality and operation.

c. Contractor shall provide personnel responsible for reinstallation of equipment and material for the removal Work.

d. Contractor shall be responsible and provide storage and protection of equipment and materials in accordance with Section 01 66 00 – Product Storage and Protection Requirements until relocation and reinstallation Work is performed.

e. Contractor shall provide replacement equipment and material that is damaged during the removal Work at new cost to the Owner. Contractor

shall be responsible to provide same type, model, electrical components, etc. equipment and material as approved by Engineer and Owner.

3. Structural removal:

    a. Contractor shall provide and install temporary shoring, struts, and bracing required for the demolition Work to ensure stability during entire demolition process.

    b. Contractor shall cut and remove structural material at the interface of demolition Work and the existing structural element. Cutting and removal shall occur in small sections, including masonry units, to prevent instability of structural elements.

    c. Contractor shall patch, repair, and refinish adjacent surfaces that remain following demolition Work.

        1) Adjacent surfaces shall be repaired and refinished to the condition prior to the demolition Work and in accordance with the Contract Documents.

        2) Adjacent surfaces shall be cleaned of dirt, grease, loose paint, etc., prior to refinishing.

    d. Contractor shall limit cutting of existing roof areas designated to remain to the limits required for the proper installation of the Work.

        1) Cut and remove insulation, joists, flashing, membranes, shingles, and metals, etc. in accordance with the Contract Documents and as directed by the Engineer for installation of the Work.

        2) Provide temporary weather tight protection as required until new roofing and flashings are installed.

4. Architectural repairs and removal Work, not specifically shown on the Drawings, may include, but not limited to, the following:

    a. Brickwork: Re-pointing; removing and replacing broken, cracked, disintegrating and missing materials.

    b. Windows: Removing cracked or disintegrating sealant material; replacing missing or broken glass; re-caulking and sealing frames; glazing sealants.

    c. Re-finishing: Removing rust, sealing, or peeling paint from surfaces by scraping, sanding or wire brushing; priming and repainting surfaces.

d. Roofing: Patching and repairing membrane or built-up roofing; metal flashing repair; correcting roof pitch to eliminate ponding; cleaning and/or replacing roof drains.

e. Masonry: Cutting and installing new expansion and control joints.

f. Parapets: Removing and construction of new walls and copings; clean and patching of copings; replacing copings where broken.

g. Concrete surfaces: Patching, cleaning, sealing and resurfacing floors, walls, lintels, sills, and trim. Replace lintels where broken. Patching or replacing broken, spalled, cracked and disintegrating concrete encased steel columns and piers.

h. Openings: Cutting and modifying as required for new Work. Provide new lintels, doors, and frames.

i. Doors: Patching and refinishing doors and frames.

j. Ceilings: Patching, refinishing, and replacing.

k. Guards, handrails, and appurtenances: Cleaning and repainting steel materials. Replacing steel material with new aluminum material.

l. Demolished Exterior Openings: Remove window sash, frame, sill, stool and trim at exterior doors indicated for enclosure and sealing. Provide brick and/or masonry block for closure and sealing.

D. Maintenance during Demolition:

1. Contractor shall maintain the buildings, structures, and public properties free from accumulations of waste, debris and rubbish, generated by the demolition Work.

2. Contractor shall provide cleaning and waste management of demolition equipment and materials in accordance with Section 01 74 00 – Cleaning and Waste Management.

3.03 CUTTING AND CORING

A. General:

1. Contractor shall notify Engineer in writing and receiving Engineer’s approval prior to cutting load bearing walls (concrete or masonry) and structural concrete floors.

2. Perform cutting and coring to limit extent of patching required.

3. Structural Elements: Do not cut or core structural elements in manner that would change structural element’s load-carrying capacity or load deflection ratio.

4. Operating Elements: Do not cut or core operating elements in manner that would reduce capacity to perform as intended. Do not cut or core operating elements or related components in manner that would increase maintenance requirements or decrease operational life or safety.

5. Replace, patch, and repair materials and surfaces cut or damaged during cutting and coring Work. Contractor shall use methods that do not void required or existing warranties.

6. Provide temporary or permanent bypass provisions prior to cutting existing pipe, conduit, ductwork, or other utilities serving facilities scheduled to be removed or relocated in accordance with the Contract Documents.

7. Inspection: Examine and prepare surfaces prior to commencing Work. Contractor shall report unsatisfactory or questionable conditions to Engineer in writing. Contractor shall not proceed with the Work until unsatisfactory conditions are corrected.

8. Preparation:

    a. Provide temporary support required to maintain structural integrity, to protect adjacent Work from damage, and to support the element(s) to be cut or cored.

    b. Protection of Existing Construction During Cutting and Coring:

        1) Protect existing structures, equipment, and materials during cutting and coring to prevent damage.

        2) Provide protection from adverse weather conditions that will be exposed during cutting and coring Work.

        3) Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

9. Restoration:

    a. Clean equipment, materials, piping systems, valves, conduit and appurtenances that were damaged due to the Work prior to applying paint or other finishing materials.

    b. Restore damaged pipe coverings, including insulation, to original condition.

B. Cutting:

1. General:

a. Cut existing structures and appurtenances that provide surfaces for installation or repair of the Work. Cut existing construction using methods to minimize damage and disturbance to retained and adjoining construction elements.

b. Cutting equipment used shall be hand or small power tools suitable for sawing or grinding. Avoid using hammering or chopping equipment for cutting Work.

c. Cut holes and slots as small as possible and to size required for incorporation of the Work and in accordance with the Contract Documents.

d. Cut or drill from exposed or finished side to concealed side to avoid marring finished surfaces.

e. Provide adequate bracing of area to be cut prior to cutting.

f. Provide equipment and material to remove cut spoils.

g. Provide temporary protection for cut openings where and when Work is not being performed.

2. Concrete and Masonry:

a. Cut through concrete and masonry using concrete wall saw with diamond saw blades.

b. Provide control for slurry generated during sawing on both sides of element being cut.

c. After cutting concrete and before installing new Work on or through the opening, coat exposed concrete and steel with protective coating material specified in this Section. Apply protective coating in accordance with manufacturer's instructions.

C. Coring:

1. Core-drill holes through concrete and masonry walls, slabs, or arches, in accordance with the Contract Documents, unless written authorization is furnished by Engineer.

2. Protection: Protect existing structures, equipment, materials, utilities, and adjacent areas from water and other damage by core-drilling Work.

3. Coring:

a. Perform coring with non-impact rotary tool using diamond core-drills.

b. Size holes for pipe, conduit, sleeves, equipment, or mechanical seals, as required, to be installed through the penetration and in accordance with the Contract Documents.

c. After core-drilling and before installing equipment and material through the penetration, coat exposed concrete and steel with protective coating material specified in this Section. Apply protective coating in accordance with manufacturer's instructions.

4. Cleaning: Vacuum or otherwise remove slurry and tailings from the work area following core-drilling.

3.04 PATCHING

A. General:

1. Construction shall be patched by filling, repairing, refinishing, closing-up, and similar methods at completion of the Work.

2. Provide equipment and materials in accordance with the Contract Documents for patching Work. Comply with manufacturer's installation instructions.

3. Provide airtight connections to pipes, sleeves, ducts, conduit, and other penetrations through surfaces when patching the Work. Provide durable patching seams that minimize visual appearance.

4. Patched areas shall be tested to demonstrate integrity of installation as directed by the Engineer. Contractor shall provide testing equipment, material, and services for patch testing.

B. Restoration:

1. Restore exposed finishes of patched areas to minimize evidence of patching and refinishing.

2. Contractor shall extend refinishing and restoration into adjoining areas to blend patched areas with existing adjacent areas.

a. Refinish to nearest intersection for continuous surfaces.

b. Refinish the entire assembly and system for equipment and materials.

c. Repair and rehang existing ceilings to provide an even-plane surface of uniform appearance.

d. Apply plaster and finishes to match adjacent interior walls and partition areas for openings sealed with brick and/or masonry block.

3.05 INSTALLATION

A. Install equipment and materials in accordance with the Contract Documents, approved Shop Drawings, and manufacturer's installation instructions. When manufacturer's installation instructions conflict with the Contract Documents, obtain interpretation or clarification from Engineer before proceeding.

B. Preparation of surfaces shall be performed prior to installation of equipment and material.

1. New floor finishes: Repair and patch with concrete, asphalt latex type emulsion and underlayment as required for existing surfaces or new flooring surfaces.

2. Ceramic tile flooring or bases installed over concrete floors: Grind away cove, if present, for installation of new Work.

C. Concrete surfaces shall achieve compression strength in accordance with the Contract Documents prior to installation of equipment and materials.

1. Anchor bolts and templates shall be provided by Contractor and as specified in the individual Specification Sections.

2. Concrete foundations shall be treated with sealer to prevent oil from seeping into concrete as specified in the individual Specification Sections.

D. Maintain the work area in a broom-clean condition while installing materials and equipment.

E. Contractor shall be responsible for equipment for hoisting, lifting, moving, rigging, etc. for installation of equipment and materials.

1. Contractor shall be responsible for design of temporary installation system used for the installation Work, unless otherwise indicated in the Contract Documents.

2. Contractor shall be responsible for damage to existing structure, equipment, and material caused prior, during, and following installation of the Work with the Contractor furnished temporary installation system at no cost to Owner. Repairs shall be in accordance with the Contract Documents, shall return to condition prior to installation Work, and as directed by the Engineer.

3. Owner's hoists, monorails, bridge cranes, rigging, etc. shall not be used by the Contractor unless written authorization is provided by Owner.

F. Alteration or repair of new equipment and materials shall not be permitted without written authorization from Engineer.

G. Field welding or burning of new equipment and materials shall not be permitted unless indicated in the Contract Documents or without written authorization from Engineer.

H. Contractors shall install temporary shoring and bracing where necessary during installation of the Work where required:

1. System shall be provided in accordance with the Contract Documents and code requirements.

2. Temporary system shall consist of adjustable sound timbers or rolled shapes easily removable following installation of the Work.

3. Contractor shall be responsible for damage to existing structures and new Work during installation, utilization, and removal of the temporary system at new additional cost to the Owner.

I. Manufacturer's Installation Services: Provide competent, qualified manufacturer's representatives of equipment and material for services specified in the individual Specification Sections, including, but not limited to:

1. Supervising installation

2. Checking the completed installation

3. Adjusting and testing of equipment and materials

END OF SECTION

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SECTION 01 74 00

CLEANING AND WASTE MANAGEMENT

PART 1 – GENERAL

1.01 SUMMARY

A. Administrative and procedural requirements for progress and closeout cleaning at the Site.

1. Contractor shall execute cleaning during the Project, at completion of the Work, and as required by the General Conditions and this Section.

2. Maintain in a clean manner the Site, the Work, and areas adjacent to or affected by the Work.

B. Administrative and procedural requirements for disposing of non-hazardous excavation and construction waste.

1. Contractor shall comply with the requirements and procedures for construction waste management and disposal, including developing and implementing a plan for construction waste management and disposal.

2. Extent of required construction waste management and disposal includes within the Project limits, as shown or indicated.

C. Refer to Section 01 51 00 – Temporary Utilities for requirements associated with maintenance of solid waste removal for properties within the work area.

1.02 REFERENCES

A. Definitions:

1. “Waste Management Coordinator” is the person responsible for implementing, monitoring, and reporting the status of the Waste Management Plan. Although available for other assignments, the Waste Management Coordinator shall be present at the Site full time for the duration of the Work.

2. “Construction waste” is building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

3. “Demolition waste” is building and site improvement materials resulting from demolition or selective demolition operations.

4. “Disposal” is removal to an off-Site location of demolition and construction waste and subsequent sale, recycling, reuse, or disposal in a landfill or incinerator conforming to Laws and Regulations and acceptable to authorities having jurisdiction.

B. Reference Standards: NFPA 241, Safeguarding Construction, Alteration, and Demolition Operations

1.03 ADMINSTRATIVE REQUIREMENTS

A. Waste Management Plan:

1. General: Develop preliminary plan consisting of waste identification. Indicate quantities by weight or volume. Use the same units of measure throughout waste management plan.

2. Waste Identification: Indicate anticipated types and quantities of excavation waste generated by the Work.

3. Waste Reduction Work Plan: List each type of waste and whether waste will be disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

    a. Salvaged Materials for Reuse: For materials that will be salvaged and reused in the Work, describe methods for preparing salvaged materials before incorporating them into the Work.

    b. Disposed Materials: Provide information on how and where materials will be disposed. Include name, address, and telephone number of each landfill and incinerator facility that will be used. Contractor to indicate where disposal enclosures to be housed during construction. Placement of enclosures shall be stored to coincide with the traffic control measures and staging of work.

    c. Handling and Transportation Procedures: Provide information on the method(s) that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location at the work area where materials separation will be located.

B. Failure of Contractor to Maintain Clean Work Area and Waste Management Plan:

1. Owner will provide written notification to Contractor for failure to maintain a clean work area and waste management plan.

2. Written notification shall provide five (5) days for Contractor to remedy work area cleaning and waste management to the Engineer’s and Owner’s satisfaction.

3. Following the five (5) day remedy period, Owner shall without prejudice to any other rights provide services to clean the work area to the satisfaction of Owner and Engineer. Contractor shall be responsible for reimbursement of Owner's costs and expenses for the cleaning work.

1.04 SUBMITTALS

A. Action/Informational Submittals:

1. Preliminary Waste Management Plan: Prepare in accordance with this Section and submit within 14 days of the Notice to Proceed and prior to removing waste from the work area.

2. Final Waste Management Plan: Submit within 14 days of receiving Engineer's comments on the preliminary waste management plan.

B. Closeout Submittals:

1. Landfill and Incinerator Disposal Records: Provide copy of receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Submit manifests, weight tickets, receipts, and invoices.

1.05 DELIVERY, STORAGE AND HANDLING

A. Replace loaded containers with empty containers as demand requires.

B. Deposit recyclable materials in containers free from debris.

C. Transport and deposit waste in containers to minimize dust. Close container covers immediately after materials are deposited.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 PROGRESS CLEANING

A. General: Clean the Site, work areas, and other areas occupied by Contractor at least weekly. Dispose of materials in accordance with the General Conditions and the following:

1. Comply with NFPA 241 for removing combustible waste materials and debris.

2. Do not hold non-combustible materials at the work area more than three days if the temperature is expected to rise above 80 degrees F. When temperature is less

than 80 degrees F, dispose of non-combustible materials within seven days of their generation.

3. Provide suitable containers for storage of waste materials and debris.

4. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately.

B. Work Areas:

1. Clean areas where the Work is in progress to level of cleanliness necessary for proper execution of the Work.

2. Remove liquid spills promptly and immediately report spills to Owner, Engineer, and authorities having jurisdiction.

3. Where dust would impair proper execution of the Work, broom-clean or vacuum entire work area, as appropriate.

4. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

C. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of material or equipment installed, using only cleaning agents and methods specifically recommended by material or equipment manufacturer. If manufacturer does not recommend specific cleaning agents or methods, use cleaning agents and methods that are not hazardous to health and property and that will not damage exposed surfaces.

D. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration until Substantial Completion.

E. Cutting and Patching:

1. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

2. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

F. During handling and installation of materials and equipment, clean and protect construction in progress and adjoining materials and equipment already in place. Apply protective covering where required for protection from damage or deterioration, until Substantial Completion.

G. Clean completed construction as frequently as necessary throughout the construction period.

3.02 EXCAVATION WORK NEAR PUBLIC OR PRIVATE PROPERTY

A. Contractor shall provide cleaning and either temporary or permanent restoration where Work is located in or near streets, right of ways, easements, or private property.

B. Contractor shall backfill, compact, grade, and restore excavation or disturbed area to functional condition to permit pedestrian or vehicular traffic and original use of the area as the Work progresses.

C. Temporary storage of excavation spoils, including earth, stones, boulders, and debris, shall be removed from the work area or area of disturbance.

3.03 CLOSEOUT CLEANING

A. Complete the following prior to requesting inspection for Substantial Completion:

1. Clean and remove from the work area rubbish, waste material, debris, and other foreign substances.

2. Sweep paved areas broom-clean. Remove petrochemical spills, stains, and other foreign deposits.

3. Hose-clean sidewalks and loading areas.

4. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

5. Repair pavement, roads, sod, and other areas affected by construction operations and restore to specified condition; if condition is not specified, restore to pre-construction condition.

6. Clean exposed exterior and interior hard-surfaced finishes to dirt-free condition, free of spatter, grease, stains, fingerprints, films, and similar foreign substances.

7. Leave the work area clean, and in neat, orderly condition, satisfactory to Owner and Engineer.

3.04 WASTE MANAGEMENT IMPLEMENTATION

A. General: Implement the waste management plan approved by Engineer. Provide handling, containers, storage, signage, transportation, and other items required to implement the waste management plan during the Project.

B. Training: Train all installers, Subcontractors, and Suppliers as required on proper waste management procedures required for the Work.

1. Distribute the waste management plan as required within three days of Engineer’s approval.

2. Distribute the waste management plan to Contractor's personnel, Subcontractors, and Suppliers prior to these entities starting the Work. Review with installers, Subcontractors, and Suppliers the waste management plan's procedures and locations established for salvage, recycling, and disposal.

C. Work Area Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent facilities. Designate and label specific areas of the work area necessary for separating materials to be disposed.

3.05 WASTE DISPOSAL

A. General: Except for items or materials to be recycled, or otherwise reused, remove waste materials from the Site and properly dispose of waste in facility such as permitted landfill or incinerator or other method acceptable to authorities having jurisdiction.

1. Except as otherwise specified, remove from the Site all waste and debris from the Work as it accumulates. Upon completion of the Work, remove materials, equipment, waste, and debris and leave the Site clean, neat, and orderly. Comply with the Contract Documents regarding cleaning and removal of trash, debris, and waste.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3. Properly dispose of waste materials, surplus materials, debris, and rubbish off the Site.

4. Do not discharge volatile or hazardous substances, such as mineral spirits, oil, or paint thinner, into storm sewers or sanitary sewers.

5. Do not discharge wastes into surface waters or drainage routes.

B. Burying: Do not bury rubbish and waste materials at the Site.

C. Burning: Do not burn waste materials at the Site.

D. Disposal: Transport waste materials to proper location at site other than Owner's property for disposal in accordance with Laws and Regulations. Contractor shall be solely responsible for complying with Laws and Regulations regarding storing, transporting, and disposing of waste.

END OF SECTION

SECTION 01 77 19
CLOSEOUT REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Substantial Completion.

2. Final inspection.

3. Request for final payment.

1.02 REFERENCES

A. Definitions:

1. Substantial completion procedures for requesting and documenting are in the General Conditions, as modified by Supplemental Conditions.

2. Final inspection procedures for requesting and documenting are in the General Conditions, as modified by Supplemental Conditions.

1.03 ADMINSTRATIVE REQUIREMENTS

A. Request for Final Payment:

1. Procedure: Submit request for final payment in accordance with the Agreement and General Conditions, as may be modified by the Supplementary Conditions.

B. Request for final payment shall include:

1. Documents required for progress payments in Section 01 29 76 – Progress Payment Procedures.

2. Documents required in the General Conditions, as may be modified by the Supplementary Conditions.

3. Releases or Waivers of Lien Rights:

a. Provide a final release or waiver by Contractor and each Subcontractor and Supplier that provided Contractor with labor, material, or equipment totaling $10,000 or more.

b. Provide list of Subcontractors and Suppliers for which release or waiver of Lien is required.

c. Each release or waiver of Lien shall be signed by an authorized representative of the entity submitting release or waiver to Contractor, and shall include Subcontractor's or Supplier's corporate seal, when applicable.

d. Release or waiver of Lien may be conditional upon receipt of final payment.

e. Manufacturer's Affidavit of Release of Liens – furnish a separate, completed form from the manufacturer.

4. Consent of Surety Company to Final Payment.

5. Any other requirements identified in Division 0 – Bidding Requirements, Forms of Contract, Bond and Proposal or General Conditions section of the Contract.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Requirements for recording changes to record documents.

2. Requirements for electronic files furnished by Engineer.

B. Contractor shall maintain and submit to Engineer with record documents in accordance with the Specifications, General Conditions, and Supplementary Conditions.

1.02 ADMINSTRATIVE REQUIREMENTS

A. Maintenance of Record Documents:

1. The following record documents shall be maintained in the Contractor's field office:

a. Drawings, Specifications, and Addenda.

b. Shop Drawings, Samples, and other Contractor submittals, including records of test results, approved or accepted as applicable, by Engineer.

c. Change Orders, Work Change Directives, Field Orders, photographic documentation, survey data, and all other documents pertinent to the Work.

2. Update record documents on a monthly basis, minimum.

3. Provide files and racks for proper storage and easy access to record documents.

4. Make record documents available for inspection upon request of Engineer or Owner.

5. Do not use record documents for purpose other than serving as Project record. Do not remove record documents from Contractor's field office without Engineer's approval.

B. Submittal of Record Documents:

1. Submit to Engineer the following record documents: Drawings.

2. Prior to readiness for final payment, submit to Engineer one copy of final record documents. Submit complete record documents; do not make partial submittals.

3. Submit record documents with transmittal letter on contractor letterhead complying with letter of transmittal requirements in Section 01 33 00 – Submittal Procedures.

4. Record documents submittal shall include certification, with original signature of official authorized to execute legal agreements on behalf of Contractor.

C. Electronic Files Furnished by Engineer:

1. CADD files will be furnished by Engineer upon the following conditions:

a. Contractor shall submit to Engineer a letter on Contractor letterhead requesting CADD files and providing specific definition(s) or description(s) of how files will be used, and specific description of benefits to Owner (including credit proposal, if applicable) if the request is granted.

b. Contractor shall execute Engineer's standard agreement for release of electronic files and shall abide by all provisions of the agreement for release of electronic files.

c. Layering system incorporated in CADD files shall be maintained as transmitted by Engineer. CADD files transmitted by Engineer containing cross-referenced files shall not be bound by Contractor. Drawing cross-references and paths shall be maintained. If Contractor alters layers or cross-reference files, Contractor shall restore all layers and cross-references prior to submitting record documents to Engineer.

d. Contractor shall submit record drawings to Engineer in same CADD format that files were furnished to Contractor.

1.03 SUBMITTALS

A. Closeout Submittals: Provide record documentation as specified in this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 GENERAL REQUIREMENTS:

A. At the start of the Project, label each record document to be submitted as, "PROJECT RECORD" using legible, printed letters. Letters on record copy of the Drawings shall be two inches high.

B. Keep record documents current. Make entries on record documents within two working days of receipt of information required to record the change.

C. Do not permanently conceal the Work until required information has been recorded.

D. Accuracy of record documents shall be such that future searches for items shown on the record documents may rely reasonably on information obtained from Engineer-accepted record documents.

E. Marking of Entries:

1. Use erasable, colored pencils (not ink or indelible pencil) for marking changes, revisions, additions, and deletions to record documents.

2. Clearly describe the change by graphic line and make notations as required. Use straight-edge to mark straight lines. Writing shall be legible and sufficiently dark to allow scanning of record documents into legible electronic files.

3. Date all entries on record documents.

4. Call attention to changes by drawing a “cloud” around the change(s) indicated.

5. Mark initial revisions in red. In the event of overlapping changes, use different colors for subsequent changes.

3.02 RECORDING CHANGES TO DRAWINGS:

A. Record changes on copy of the Drawings. Submittal of Contractor-originated or -produced drawings as a substitute for recording changes on the Drawings is unacceptable.

B. Record changes on plans, sections, schematics, and details as required for clarity, making reference dimensions and elevations (to Project datum) for complete record documentation.

C. Record actual construction including:

1. Depths of various elements of foundation relative to Project datum.

2. Field changes of dimensions, arrangements, and details.

3. Changes made in accordance with Change Orders, Work Change Directives, and Field Orders.

4. Changes in details on the Drawings. Submit additional details prepared by Contractor when required to document changes.

3.03 RECORDING CHANGES FOR SCHEMATIC LAYOUTS:

A. In some cases, on the Drawings, arrangements of conduits, circuits, piping, ducts, and similar items are shown schematically and are not intended to portray physical layout.

For such cases, the final physical arrangement shall be determined by Contractor subject to acceptance by Engineer.

B. Record on record documents all revisions to schematics on Drawings, including: piping schematics, ducting schematics, process and instrumentation diagrams, control and circuitry diagrams, electrical one-line diagrams, motor control center layouts, and other schematics when included in the Contract. Record actual locations of equipment, lighting fixtures, in-place grounding system, and other pertinent data.

C. When dimensioned plans and dimensioned sections on the Drawings show the Work schematically, indicate on the record documents, by dimensions accurate to within one inch in the field, centerline location of items of Work such as conduit, piping, ducts, and similar items

1. Clearly identify the Work item by accurate notations such as “cast iron drain”, “rigid electrical conduit”, “copper waterline”, and similar descriptions.

2. Show by symbol or note the vertical location of Work item; for example, “embedded in slab”, “under slab”, “in ceiling plenum”, “exposed”, and similar designations. For piping not embedded, also provide elevation dimension relative to Project datum.

3. Descriptions shall be sufficiently detailed to be related to Specifications.

D. Engineer may furnish written waiver of requirements relative to schematic layouts shown on plans and sections when, in Engineer’s judgment, dimensioned layouts of Work shown schematically will serve no useful purpose. Do not rely on waiver(s) being issued.

3.04 REQUIREMENTS FOR SUPPLEMENTAL DRAWINGS:

A. In some cases, drawings produced during construction by Engineer or Contractor supplement the Drawings and shall be included with record documents submitted by Contractor. Supplemental record drawings shall include drawings provided with Change Orders, Work Change Directives, and Field Orders and that cannot be incorporated into the Drawings due to space limitations.

B. Supplemental drawings provided with record drawings shall be integrated with the Drawings and include necessary cross-references between drawings. Supplemental record drawings shall be on sheets the same size as the Drawings.

C. When supplemental drawings developed by Contractor using computer-aided drafting/design (CADD) software are to be included in record drawings, submit electronic files for such drawings in AutoCAD (latest version) as part of record drawing submittal.

3.05 RECORDING CHANGES TO SPECIFICATIONS AND ADDENDA:

A. Mark each Section to record:

1. Manufacturer, trade name, catalog number, and Supplier of each product and item of equipment actually provided.

2. Changes made by Addendum, Change Orders, Work Change Directives, and Field Orders.

END OF SECTION

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SECTION 01 88 16

WATERTIGHTNESS TESTING OF LIQUID CONTANING STRUCTURES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. All concrete work and sealing work around built-in items and penetrations shall be performed as required to ensure that groundwater, surface water, and water or liquids in tanks, channels, and containers will not intrude into any equipment rooms, pipe galleries, habitable areas, or other generally dry areas.

B. The required watertightness shall be achieved by quality concrete construction and proper sealing of all joints and penetrations.

C. Each unit shall be tested separately, and the leakage tests shall be made prior to backfilling and before equipment is installed. Testing water shall be from any potable, non-potable, or natural moving source such as a river or stream, but not from any still water source such as a lake or pond, and not from any wastewater source.

D. All water holding structures shall be tested for leakage by the Contractor. The Contractor shall provide at his own expense all labor, material, temporary bulkheads, pumps, water measuring devices, etc., necessary to perform the required tests.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 45 23 – Testing Services Furnished by Contractor

B. Section 03 30 00 – Cast-in-Place Concrete

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. ACI 350.1-10 - Specification for Tightness Testing of Environmental Engineering Concrete Structures

1.04 SUBMITTALS

A. Testing procedures shall be submitted for approval prior to the test.

B. Testing Report: Prior to placing the structure in service, submit for review and approval a detailed bound report summarizing the watertightness test data, describing the testing procedure, and showing the calculations confirming the test data.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 TEST PREPARATION

A. The design capability of the structure to withstand testing shall be verified for the pressures to be applied. Another type of test shall not be substituted for hydrostatic tightness testing without approval of the Engineer.

B. The structure shall not be tested before all elements of the structure which resist any portion of the retained liquid pressure are in place and the concrete has attained its specified compressive strength.

C. Unless otherwise specified, coatings shall not be applied until after the hydrostatic tightness testing is complete. Liners that are mechanically locked to the surface during the placement of the concrete shall be installed before the hydrostatic tightness testing. Interior liners shall be visually examined for deficiencies (pinholes, tears, and partially fused splices) and must pass integrity testing. Deficiencies shall be repaired.

D. Clean the exposed concrete surfaces of the structure, including the floor, of all foreign material and debris. Prior to testing, standing water in or outside of the structure that would interfere with the inspection of the exposed concrete surfaces of the structure shall be removed.

E. The concrete surfaces and concrete joints shall be thoroughly inspected for potential leakage points. Areas of potential leakage shall be repaired before filling the containment structure with water.

F. All openings, fittings, and pipe penetrations in the structure shall be inspected at both faces of the concrete, if practical. Defective or cracked concrete shall be repaired prior to testing. All structural penetrations and inlet/outlets shall be securely sealed to prevent the loss of water from the structure during the test. All structural penetrations shall be monitored before and during the test to determine the watertightness of these appurtenances. If the structure will be filled using the inlet/outlet pipe, positive means shall be provided to check that water is not entering or leaving through this pipe once the structure is filled to the test level. Leakage at these inlet/outlets shall be repaired prior to testing. No allowance shall be made in test measurements for uncorrected known points of leakage.

G. The flow from any underdrain system, if a system is provided, shall be monitored during this same period, and any increase in flow shall be recorded and considered for information as a part of the hydrostatic tightness testing.

H. The ground water level shall be brought to a level below the top of the base slab and kept at that elevation or at a lower elevation during the test.

I. No backfill shall be placed against the walls or on the wall footings of the structure to be tested unless otherwise specified.

3.02 PROCEDURE

A. The initial filling of a new structure should not exceed a rate of 4 ft/hour. Filling shall be continued until the water surface is at the design maximum liquid level, or either 1 in. below any fixed overflow level in covered containment structures or 4 in. in open structures, whichever is lower.

B. The exterior surfaces of the structure shall be inspected during the period of filling the structure. If any flow of water is observed from the structure exterior surfaces, including joints or cracks, the defect causing the leakage shall be repaired prior to testing.

C. Watertightness Test - Part 1: Qualitative Criteria

1. The water shall be kept at the test level for at least 3 days prior to Part 2 of the testing.

2. The exterior surfaces of the structure shall be observed in both the early mornings and later afternoons during the 3-day period before Part 2 of the test. If any water is observed on the structure exterior surfaces, including joints, repaired honeycombed areas and cracks, where water droplets can be picked up on a dry hand, the containment structure shall be considered to have failed Part 1 of the test.

3. Wet areas on top of wall footing shall not indicate a failure of Part 1 of the test unless the water can be observed to be flowing.

4. Part 2 of the test may begin prior to completion of repairs for Part 1. However, all defects causing the failure of Part 1 shall be repaired before the structure is accepted. The 3-day period of keeping water at the test level shall be observed again after completion of all repairs and prior to acceptance of structure.

D. Watertightness Test - Part 2: Quantitative Criteria

1. The test measurements shall not be scheduled when the weather forecast predicts a difference of more than 35°F between the ambient temperature readings at the times of the initial and final level measurements of the water surface. The test shall also not be scheduled when the weather forecast indicates the water surface could be frozen before the test is completed.

2. The vertical distance to the water surface shall be measured to within 1/16 in. from a fixed point on the structure above the water surface. Measurements shall be recorded at 24-hour intervals. Measurements taken at the same time of day will reduce the probability of temperature difference.

3. Measurements shall be taken at two locations, 180° apart, to minimize the possible effect of differential settlement. Measurements shall be taken at the same locations to reduce the probability of measurement differences.

4. The test period shall be at least the theoretical time required to lower the water surface 3/8 in. assuming a loss of water at 0.050% of the water volume per 24-hour period. The test period shall not be longer than five days.

5. The water temperature shall be recorded at a depth of 18 in. below the water surface at the start and end of the test.

6. A floating, restrained, partially filled, calibrated, open container for evaporation and precipitation measurement should be positioned in open structures and the water level in the container recorded at 24-hour intervals. Determination of evaporation by a shallow pan-type measuring device is not acceptable due to possible heating of the bottom of the shallow pan resulting in accelerated evaporation.

3.03 EVALUATION

A. The containment structure shall continue to be observed in both the early mornings and late afternoons to verify compliance with Part 1 of the test during Part 2.

B. At the end of the test period, the water surface shall be recorded to within 1/16-in at the location of original measurements. The water temperature and the evaporation and precipitation measurements shall be recorded.

C. The allowable loss of water for tightness tests shall not exceed 0.050% of the test water volume in 24 hours.

D. The change in water volume in the structure shall be calculated and corrected, if necessary, for evaporation, precipitation, and temperature based on the change recorded in the water level from the open container. If the loss exceeds the allowable loss, the structure shall be considered to have failed the test.

E. During Part 2 of the test, observed flow or seepage of water from the exterior surface, including that from cracks and joints, should be considered as a failed test. Excessive wetness resulting in water droplets on dry hand after contact will also be considered a failed test. Slight dampness with only slight wetting of dry hand will not necessarily qualify as a failed test, depending on application, location, and visibility. Dampness or wetness on top of a footing shall not be considered as a failed test.

3.04 RETESTING

A. A restart of the test shall be required when test measurements become unreliable due to unusual precipitation or other external factors.

B. The Contractor shall be permitted to immediately retest when no visible leakage is exhibited. If the structure fails the second test or if the Contractor does not exercise the option of immediately retesting after the first test failure, the interior of the structure shall be inspected by a diver or by other means to determine probable areas of leakage. The structure shall only be retested after the most probable areas of leakage are repaired.

C. If the leakage exceeds the allowable limit, the work shall be corrected by methods approved by the Engineer.

D. Upon completion of the necessary remedial work, the leakage test shall be repeated until it is successfully passed. A minimum of three days shall occur between completion of any repairs with water level remaining at required test level without further issues prior to structure being deemed as satisfying all requirements of testing.

3.05 NOTIFICATION BY ENGINEER

A. If any leaks greater than the specified amount are not remedied by the Contractor within four (4) weeks of notification by the Engineer, regardless of whether the cause of these leaks is or is not determined, the Engineer shall have the authority to have these leaks repaired by others. The cost of repairs, by others, shall be deducted from monies due or to become due to the General Contractor.

END OF SECTION

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SECTION 02 41 00
SITE DEMOLITION

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, materials, and equipment in accordance with the requirements of applicable sections of Divisions 1 and 2.

B. In addition, the Contractor shall demolish and remove all concrete and asphalt paving, curbs, sidewalk, and miscellaneous underground piping, utilities, and structures as required and shown on the Contract Drawings during the construction work.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 14 00 – Coordination with Owner's Operations

B. Section 01 42 00 – References

C. Section 01 73 00 – Demolition and Execution of Work

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. References shall be in accordance with reference standards, codes, and specifications as set forth herein and in Section 31 10 00 – Clearing, Grubbing, and Site Preparation.

1.04 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01 33 00 – Submittal Procedures, the Contractor shall submit the following:

1. Copies of all photographs and other records from the joint existing conditions surveys.

PART 2 – EXECUTION

2.01 DEMOLITION

A. Existing concrete and asphalt paving, curbs, sidewalk and miscellaneous underground piping, utilities, and structures within the areas designated for new construction work shall be completely demolished and all debris removed from the site.

B. Excavation caused by demolition shall be backfilled with fill free from rubbish and debris. Select fill or structural fill shall be used where specifically required on Contract Drawings.

C. Work shall be performed in such manner as not to endanger the safety of the workmen or the public or cause damage to nearby structures.

D. Provide all barriers and precautionary measures in accordance with Owner's requirements and other authorities having jurisdiction.

E. Where parts of existing pavements or structures are to remain in service, demolish the portions to be removed, repair damage, and leave the pavement or structure in proper condition for the intended use. Remove asphalt or concrete pavement, concrete, and masonry to the lines designated by saw-cutting, drilling, chipping, or other suitable methods. Leave the resulting surfaces reasonably true and even, with sharp straight corners that will result in neat joints with new construction and be satisfactory for the purpose intended. Where existing reinforcement extends into new construction, remove the concrete so that the reinforcing is clean and undamaged. Cut off other reinforcing 1/2-inch below the surface and fill with epoxy resin binder flush with the surface.

F. Where street or driveway sawcut locations fall within 3 feet of an existing construction expansion joint, Contractor shall remove concrete to the nearest existing joint.

G. Sidewalks and curbs shall be removed to the nearest joint.

H. Prior to the execution of the work, the Contractor, Owner and Engineer shall jointly survey the condition of the adjoining and/or nearby pavements and structures. Photographs and records shall be made of any prior settlement or cracking of structures, pavements, and the like, that may become the subject of possible damage claims. Contractor shall provide Owner a copy of all records of the joint survey of conditions before demolition activities may begin.

2.02 DISPOSAL OF MATERIAL

A. All debris resulting from the demolition and removal work shall be disposed of by the Contractor at a properly permitted facility as part of the work of this Contract. All regulations covering material handling and disposal shall be followed. Material designated by the Engineer to be salvaged shall be stored on the construction site as directed. All other material shall be disposed of off-site by the Contractor at his expense.

B. Contractor shall dispose of any pipe containing asbestos in accordance with local, state and federal regulatory requirements.

C. Burning of any debris resulting from the demolition will not be permitted.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 02 80 10

ABANDONMENT OF SEWERS

1.01 GENERAL

A. Section includes:

1. Abandonment in place of existing sewers, junction structures, manholes, and force mains.

2. Work consists of furnishing, transporting and placing excavatable “Controlled Low-Strength Material (CLSM)” as flowable backfill to fill trenches for pipe, structures, culverts, utility cuts and other cavity filling uses under pavement or at other locations as designated in the design documents.

1.02 UNIT PRICES

A. Unit Prices

1. Payment for filling and abandonment of existing sewers is on linear foot basis regardless of the sewer pipe diameter being abandoned. Measurement will be along centerline of sewer from centerline to centerline of manholes.

2. Payment for filling and abandonment of sewer manholes or junction structure is by each structure abandoned in conformance with this Section.

3. No separate payment will be made for filling air vents, temporary plugs, excavations, and other incidental fill areas.

4. No separate payment will be made for plugging and abandoning sewer force mains. Include cost of such abandonment in related work.

1.03 DEFINITIONS

A. Abandonment. Sewer abandonment consists of demolition and removal of portion of existing manholes, to a depth specified din the design plans, and the filling of existing sewer lines and manholes with flowable fill as specified in this Section.

B. Flowable Fill. Flowable fill shall be a Controlled Low-Strength Material (CLSM) consisting of fluid mixture of cement, fly ash, aggregate, water and with admixtures as necessary to provide workable properties. Placement of flowable fill may be by grouting techniques in sewer pipes or other restricted areas, or as mass placement by chutes or tremie methods in unrestricted locations with open access.

C. Backgrouting. Secondary stage pressure grouting to ensure that voids have been filled within abandoned sewer. Backgrouting will only be required at critical locations indicated on Drawings or if there is evidence of incomplete flowable fill placements.

1.04 REFERENCE STANDARDS

A. ASTM C 150 - Standard Specification for Portland Cement.

B. ASTM C 494 - Standard Specification for Chemical Admixture for Concrete.

C. ASTM C 618 - Standard Specification for Fly Ash and Raw or Calcinated Natural Pozzolan for use as Mineral Admixture in Portland Cement Concrete.

D. ASTM C 937 - Standard Specification for Grout Fluidifier for Pre—placed Aggregate Concrete.

E. ASTM C 940 - Standard Test Method for Expansion and Bleeding of Freshly Mixed Grout for Replaced Aggregate Concrete in the Laboratory.

F. ASTM C 1017 - Standard Specification for Chemical Admixture for Use in Producing Flowing Concrete.

G. ASTM C 1107 - Specification for Packaged Dry, Hydraulic-Cement Grout (Non—shrink)

1.05 SUBMITTALS

A. Conform to requirements of Section 01 33 00 - Submittal Procedures.

B. Flowable Fill (CLSM) mix design report – The Contractor shall submit to the Engineer a certified mix design with the proportions, names, and sources of material, admixtures, dry cubic yard batch weights and physical property test results. The CLSM mix design submitted for review shall include the following information:

1. Application: Flowable fill type and production method;

2. Sources of Materials;

3. Aggregate Gradation;

4. Absolute volumes, specific gravities, unit weights, and any other values used in the CLSM mix design process;

5. Type and proposed doses of air entraining or accelerating admixtures;

6. Target flow and entrained air content;

7. Set time;

8. Laboratory test data indicating unconfined compressive strengths at specified set time, 7 and 28 days;

9. Wet density;

10. Ambient air temperature and CLSM temperature at time of testing.

C. Technical information for equipment and operational procedures including projected CLSM injection rate, injection pressure, method of controlling injection pressure, bulkhead and vent design, and number of stages of CLSM application.

D. At least 60 days prior to commencing abandonment activities, submit plan for abandonment, describing proposed application sequence, bypass pumping requirements and plugging, if any, and other information pertinent to completion of work.

PART 2 – PRODUCTS

2.01 FLOWABLE FILL

A. Design Mix Criteria. Provide mix design meeting the design criteria and conditions for placement. Present information required by Paragraph 1.05B in mix design report including following:

1. Cement: ASTM C 150 Type I or II. Volume and weight per cubic yard of fill. Provide minimum cement content of 75 pounds per cubic yard.

2. Fly ash: ASTM C 618 Class C or F. Volume and weight per cubic yard of fill. Provide minimum Fly ash content of 250 pounds per cubic yard.

3. Potable water: Volume and weight per cubic yard of fill. Amount of water determined by mix design testing.

4. Aggregate gradation: ASTM C 33. 100 percent passing 3/4-inch sieve and not more than 10 percent passing No. 200 sieve. Fine aggregates shall comprise between 50-percent and 60-percent by volume of the total aggregates. Mix design report shall define gradation based on following sieve sizes 3/4-inch, 3/8-inch, Nos. 4, 8, 16, 100, and 200.

5. Aggregate source material: Screened or crushed aggregate, pit or bank run fine gravels or sand, or crushed concrete. If crushed concrete is used, add at least 30 percent of natural aggregate to provide workability.

6. Admixtures: Use admixtures meeting ASTM C 494 and ASTM C 1017 as needed to improve pumpability, to control time of set, and reduce bleeding.

7. Fluidifier: Use fluidifier meeting ASTM C 937 as necessary to hold solid constituents in suspension. Add shrinkage compensator if necessary.

8. Performance additive: Use flowable fill performance additive, such as Darafill or approved equal, to control fill properties.

B. Design Requirements

1. Wet Unit Weight, in accordance with ASTM D 6023, shall have a minimum 90 pounds per cubic foot (pcf) and a maximum of 120 pcf.

2. Air Content, in accordance with ASTM D 6023, shall have a minimum 15 percent and 25 percent as measured to the nearest 0.1-percent.

3. Hardening (Set) Time, in accordance with ASTM C 403, shall have a minimum penetration number of 650 and a maximum number of 1500 as measured at 3 to 5 hours. If accelerants are used, measurements shall be taken within one-hour.

4. Subsidence & Settlement shall have a maximum of ¼- inch per foot of depth of CLSM placed.

5. Unconfined compressive strength, in accordance with ASTM D 4832, shall meet the following 28-Day compressive strengths:

Application	Excavatable CLSM (psi)	
	Minimum	Maximum
Pipe Backfill and Encasement	30	100
Utility Bedding	50	100
Utility Abandonment (Voids)	15	150

Unconfined compressive strengths are determined based on an average of three tests for same batch placement.

Flowable fill not meeting the specified unconfined compressive strength may be accepted with unit price adjustment of 2.0 percent price deduction for each psi average compressive strength below 75 psi and 1.0 percent price deduction for each psi average compressive strength above 150 psi, as applicable to batch volume represented by the cylinder test series. Flowable fill shrinkage volumes, greater than 5-percent shall be remedied by Contractor according to Paragraph 3.05H without additional compensation. Shrinkage percentage shall be determined by the Engineer.

6. Consistency, measured in accordance to ASTM D 6103, of the fresh mixture shall be that the mixture be placed without segregation. The consistency of the mixture shall produce a circular type spread without segregation between 7-inches and 10-inches. Adjustments of air and water proportions shall be made to achieve proper solid suspension and flowable characteristics.

7. Shrinkage characteristics: non-shrink.

8. Water bleeding for fill to be placed by grouting method in sewers: not to exceed 2 percent according to ASTM C 940.

2.02 PLUGS FOR FORCE MAINS

A. Grout Plugs: Cement-based dry-pack grout conforming to ASTM C 1107, Grade B or C.

B. Manufactured Plug: Commercially available plug or cap specifically designed and manufactured to be used with pipe being abandoned.

PART 3 – EXECUTION

3.01 PREPARATION

A. Have fill mix design reports and other submittals required by Paragraph 1.05 accepted by Engineer prior to start of placement. Notify Owner and Engineer at least 48 hours in advance of grouting with flowable fill.

B. Select fill placement equipment and follow procedures with sufficient safety and care to avoid damage to existing underground utilities and structures. Operate equipment at pressure that will not damage or distort adjacent improvements, new or existing.

C. Contractor shall clean sewer lines and video with closed circuit television to identify connections, locate obstructions, and assess condition of pipe. Locate previously unidentified connections, which have not been redirected and reconnected as part of this project, and report them to Engineer. During placement of fill, compensate for irregularities in sewer pipe, such as obstructions, open joints, or broken pipe to ensure no voids remain unfilled.

D. Perform demolition work prior to starting fill placement. Remove excessive amounts of sludge and other substances that may degrade performance of fill. Do not leave sludge or other debris in place if filling more than 2 percent of placement volume. Dispose of waste sludge and waste material in accordance with Texas Commission on Environmental Quality Chapter 312 -Sludge Use, Disposal and Transportation.

E. Remove free water prior to starting fill placement.

3.02 EQUIPMENT

A. Mix flowable fill in automated batch plant and deliver it to site in ready-mix trucks. Performance additives may be added at placement site if required by mix design.

B. Use concrete or grout pumps capable of continuous delivery at planned placement rate.

3.03 PLACEMENT

A. Consistency of the flowable fill will be tested by filling an open-ended 3-inch diameter, 6-inch high cylinder to the top with the mixture and immediately pulling the cylinder, straight up. The correct consistency of the mixture shall produce the specified diameter circular-type spread with no segregation. The material supplier shall make adjustment

recommendations to the portions of fine aggregate, admixtures or water may be made to achieve proper solid suspension and optimum flowability with the approval of the Engineer.

B. The open ends of the area to be backfilled shall be temporarily plugged or bulk headed to control required placement quantities and resist hydraulic pressure expected from the flowable fill and the void area filled.

3.04 DEMOLITION OF SEWER MANHOLES, PIPELINE STRUCTURES AND FORCE MAINS PRIOR TO ABANDONMENT

A. Remove manhole frames and covers and castings from existing manhole structures.

B. Demolish and remove concrete pad, adjustment rings, cone section, or other manhole structure, to minimum depth of 4 feet below finished grade. Structure may be removed to greater depth, but not to a depth greater than 18-inches above crown of abandoned sewer line, unless sewer line itself is being demolished.

C. When adjacent sewer lines are not to be filled, place temporary plugs in each line connecting to manhole, in preparation for filling manhole.

D. After filling of all sewer lines, manholes and associated excavations shall be backfilled as indicated in the design plans.

E. Excavations for force mains to be abandoned at shown in the design plans o, or as directed by the Owner, shall conform to Section 31 23 23.13 - Excavation and Backfill for Utilities. Cut existing force main, when necessary, to provide an end surface perpendicular to axis of pipe and suitable for plug to be installed. Remove force main piping material remaining outside of segment to be abandoned.

3.05 INSTALLATION

A. Abandon sewer lines by completely filling sewer line with flowable fill. Abandon manholes and other structures by filling with flowable fill, to a depth of 18-inches above the crown of the abandoned sewer pipe.

B. Place flowable fill to fill volume between manholes. Continuously place flowable fill from manhole to manhole with no intermediate pour points, but not exceeding 500 feet in length.

C. Have filling operation performed by experienced crews with equipment to monitor density of flowable fill and to control pressure.

D. Temporarily plug sewer lines which are to remain in operation during pouring/pumping to keep lines free of flowable fill.

E. Pump flowable fill through bulkheads constructed for placement of two 2-inch PVC pipes or use other suitable construction methods to contain flowable fill in lines to be abandoned. These pipes will act as injection points or vents for placement of flowable fill.

F. Place flowable fill under pressure flow conditions into properly vented open system until flowable fill emerges from vent pipes. Pump flowable fill with sufficient pressure to overcome friction and to fill sewer from downstream end, to discharge at upstream end.

G. Inject flowable fill through temporary bulkhead and vents using grouting equipment, allowing fill to rise through bulkhead and vent effectively filling all voids. Alternatively, remove bulkheads during installation and fill with flowable fill.

H. Remediate placement of flowable fill which does not fill voids in sewer, in manhole or other structures, or where voids develop due to excessive shrinkage or bleeding of fill, by using pressure grouting either from inside sewer or from the surface.

I. Force main abandonment

1. Clean inside surface of force main at least 12 inches from ends to achieve firm bond and seal using grout plug or manufactured plug to pipe surface. Similarly, clean and prepare exterior pipe surface if manufactured cap is to be used.

2. When using grout plug, place temporary plug or bulkhead approximately 12 inches inside pipe. Fill pipe end completely with dry-pack grout mixture.

3. When using manufactured plug or cap, install fitting as recommended by manufacturer’s instructions, to form watertight seal.

J. Backfill to surface, above pipe or structures left in place, with flowable fill in restricted areas, compacted bank run sand, in accordance with Section 31 06 20.16 – Utility Backfill Materials, in unrestricted areas to be paved or select fill in unrestricted areas outside of pavement. Place and compact backfill, other than flowable fill, in accordance with Section 31 23 23.13 - Excavation and Backfill for Utilities.

K. Collect and dispose of excess flowable fill material and other debris.

3.06 FIELD QUALITY CONTROL

A. Provide batch plant tickets for each truck delivery of flowable fill. Note on tickets addition of aggregate, water or admixtures at site.

B. Check flow characteristics and workability of fill as placement proceeds.

C. Obtain at least three test cylinders for each placement area for determination of 56- day compressive strength and bleeding. Acceptance of placement will be based on average strength of three tests.

D. Record volume of flowable fill placement for same space to demonstrate that voids have been filled.

END OF SECTION

SECTION 03 11 00
CONCRETE FORMWORK

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Provide materials, labor, and equipment required for the design and construction of all concrete formwork, bracing, shoring and supports in accordance with the provisions of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 21 00 – Reinforcing Steel

B. Section 03 15 00 – Concrete Accessories

C. Section 03 15 16 – Joints in Concrete

D. Section 03 30 00 – Cast-in-Place Concrete

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Building Code for the State or Commonwealth in which the project is located.

2. ACI 318 – Building Code Requirements for Structural Concrete

3. ACI 301 – Specifications for Structural Concrete

4. ACI 347 – Recommended Practice for Concrete Formwork

5. U.S. Product Standard for Concrete Forms, Class I, PS 1

6. ACI 117 – Specification for Tolerances for Concrete Construction and Materials and Commentary

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Manufacturer's data on proposed form release agent

2. Manufacturer's data on proposed formwork system including form ties

1.05 QUALITY ASSURANCE

A. Concrete formwork shall be in accordance with ACI 301, ACI 318, and ACI 347.

PART 2 – PRODUCTS

2.01 FORMS AND FALSEWORK

A. All forms shall be smooth surface forms unless otherwise specified.

B. Wood materials for concrete forms and falsework shall conform to the following requirements:

1. Lumber for bracing, shoring, or supporting forms shall be Douglas Fir or Southern Pine, construction grade or better, in conformance with U.S. Product Standard PS20. All lumber used for forms, shoring or bracing shall be new material.

2. Plywood for concrete formwork shall be new, waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Pine high density overlaid (HDO) plywood manufactured especially for concrete formwork and shall conform to the requirements of PS1 for Concrete Forms, Class I, and shall be edge sealed. Thickness shall be as required to support concrete at the rate it is placed, but not less than 5/8-inch thick.

C. Other form materials such as metal, fiberglass, or other acceptable material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line and grade indicated may be submitted to the Engineer for approval, but only materials that will produce a smooth form finish equal or better than the wood materials specified will be considered.

2.02 FORMWORK ACCESSORIES

A. Form ties shall be provided with a plastic cone or other suitable means for forming a conical hole to ensure that the form tie may be broken off back of the face of the concrete. The maximum diameter of removable cones for rod ties, or of other removable form-tie fasteners having a circular cross-section, shall not exceed 7/8-inch, and all such fasteners shall be such as to leave holes of regular shape for reaming.

B. Form ties for water-retaining structures shall have integral waterstops. Removable taper ties may be used when acceptable to the Engineer. A preformed mechanical EPDM rubber plug shall be used to seal the hole left after the removal of the taper tie. Plug shall be X-Plug by the Sika Corporation or approved equal. Friction fit plugs shall not be used.

C. Form release agent shall be a blend of natural and synthetic chemicals that employs a chemical reaction to provide quick, easy and clean release of concrete from forms. It

shall not stain the concrete and shall leave the concrete with a paintable surface. Formulation of the form release agent shall be such that it would minimize formation of "bug holes" in cast-in-place concrete.

PART 3 – EXECUTION

3.01 FORM DESIGN

A. Forms and falsework shall be designed for total dead load, plus all construction live load as outlined in ACI 347. Design and engineering of formwork and safety considerations during construction shall be the responsibility of the Contractor.

B. Forms shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be 1/240 of the span between structural members.

C. All forms shall be designed for predetermined placing rates per hour, considering expected air temperatures and setting rates.

3.02 CONSTRUCTION

A. The type, size, quality, and strength of all materials from which forms are made shall be subject to the approval of the Engineer. No falsework or forms shall be used which are not clean and suitable. Deformed, broken or defective falsework and forms shall be removed from the work.

B. Forms shall be smooth and free from surface irregularities. Suitable and effective means shall be provided on all forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete. Joints between the forms shall be sealed to eliminate any irregularities. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to a practical minimum.

C. Forms shall be true to line and grade and shall be sufficiently rigid to prevent displacement and sagging between supports. Curved forms shall be used for curved and circular structures. Straight panels joined at angles will not be acceptable for forming curved structures. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly placed concrete. Facing material shall be supported with studs or other backing which shall prevent both visible deflection marks in the concrete and deflections beyond the tolerances specified.

D. Forms shall be mortar tight to prevent the loss of water, cement and fines during placing and vibrating of the concrete. Specifically, the bottom of wall forms that rest on concrete footings or slabs shall be provided with a gasket to prevent loss of fines and paste during

placement and vibration of concrete. Such gasket may be a 1 to 1-1/2-inch diameter polyethylene rod held in position to the underside of the wall form.

E. All vertical surfaces of concrete members shall be formed, and side forms shall be provided for all footings, slab edges and grade beams, except where placement of the concrete against the ground is called for on the Drawings. Not less than 1-inch of concrete shall be added to the thickness of the concrete member as shown where concrete is permitted to be placed against trimmed ground in lieu of forms. Such permission will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed.

F. All forms shall be constructed in such a manner that they can be removed without hammering or prying against the concrete. Wood forms shall be constructed for wall openings to facilitate loosening and to counteract swelling of the forms.

G. Adequate clean-out holes shall be provided at the bottom of each lift of forms. Temporary openings shall be provided at the base of column forms and wall forms and at other points to facilitate cleaning and observation immediately before the concrete is deposited. The size, number and location of such clean-outs shall be as acceptable to the Engineer.

H. Construction joints shall not be permitted at locations other than those shown or specified, except as may be acceptable to the Engineer. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete. For flush surfaces at construction joints exposed to view, the contact surface of the form sheathing over the hardened concrete in the previous placement shall be lapped by not more than 1 inch. Forms shall be held against hardened concrete to prevent offset or loss of mortar at construction joints and to maintain a true surface.

I. The formwork shall be cambered to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and due to construction loads. Set forms and intermediate screed strips for slabs accurately to produce the designated elevations and contours of the finished surface. Ensure that edge forms and screed strips are sufficiently strong to support vibrating screeds or roller pipe screeds if the nature of the finish specified requires the use of such equipment. When formwork is cambered, set screeds to a like camber to maintain the proper concrete thickness.

J. Positive means of adjustment (wedges or jacks) for shores and struts shall be provided and all settlement shall be taken up during concrete placing operation. Shores and struts shall be securely braced against lateral deflections. Wedges shall be fastened firmly in place after final adjustment of forms prior to concrete placement. Formwork shall be anchored to shores or other supporting surfaces or members to prevent upward or lateral movement of any part of the formwork system during concrete placement. If adequate foundation for shores cannot be secured, trussed supports shall be provided.

K. Runways shall be provided for moving equipment with struts or legs. Runways shall be supported directly on the formwork or structural member without resting on the reinforcing steel.

3.03 TOLERANCES

A. Unless otherwise indicated in the Contract Documents, formwork shall be constructed so that the concrete surfaces will conform to the tolerance limits listed in ACI 117.

B. Structural framing of reinforced concrete around elevators and stairways shall be accurately plumbed and located within 1/4 in. tolerance from established dimensions.

C. The Contractor shall establish and maintain in an undisturbed condition and until final completion and acceptance of the project, sufficient control points and benchmarks to be used for reference purposes to check tolerances. Plumb and string lines shall be installed before concrete placement and shall be maintained during placement. Such lines shall be used by Contractor's personnel and by the Engineer and shall be in sufficient number and properly installed. During concrete placement, the Contractor shall continually monitor plumb and string line form positions and immediately correct deficiencies.

D. Regardless of the tolerances specified, no portion of the structure shall extend beyond the legal boundary of the structure.

3.04 FORM ACCESSORIES

A. Suitable moldings shall be placed to bevel or round all exposed corners and edges of beams, columns, walls, slabs, and equipment pads. Chamfers shall be 3/4 inch unless otherwise noted.

B. Form ties shall be so constructed that the ends, or end fasteners, can be removed without causing appreciable spalling at the faces of the concrete. After ends, or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than 2 inches from the formed face of the concrete that is exposed to water or enclosed surfaces above the water surface, and not less than 1 inch from the formed face of all other concrete. Holes left by the removal of form tie cones shall be reamed with suitable toothed reamers to leave the surface of the holes clean and rough before being filled with mortar as specified in Section 03 35 00 – Concrete Finishes. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete member. The use of snap-ties which cause spalling of the concrete upon form stripping or tie removal will not be permitted. No snap ties shall be broken off until the concrete is at least three days old. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste.

3.05 APPLICATION – FORM RELEASE AGENT

A. Forms for concrete surfaces that will not be subsequently waterproofed shall be coated with a form release agent. Form release agent shall be applied on formwork in accordance with manufacturer's recommendations.

3.06 INSERTS AND EMBEDDED ITEMS

A. Sleeves, pipe stubs, inserts, anchors, expansion joint material, waterstops, and other embedded items shall be positioned accurately and supported against displacement prior to concreting. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids.

3.07 FORM CLEANING AND REUSE

A. The inner faces of all forms shall be thoroughly cleaned prior to concreting. Forms may be reused only if in good condition and only if acceptable to the Engineer. Light sanding between uses will be required wherever necessary to obtain uniform surface texture. Unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the Engineer.

3.08 FORM REMOVAL AND SHORING

A. Forms shall not be disturbed until the concrete has attained sufficient strength. Sufficient strength shall be demonstrated by structural analysis considering proposed loads, strength of forming and shoring system, and concrete strength data. Shoring shall not be removed until the supported member has acquired sufficient strength to support its weight and the load upon it. Members subject to additional loads during construction shall be adequately shored to sustain all resulting stresses. Forms shall be removed in such manner as not to impair safety and serviceability of the structure. All concrete to be exposed by form removal shall have sufficient strength not to be damaged thereby.

B. Provided the strength requirements specified above have been met and subject to the Engineer's approval, forms may be removed at the following minimum times. The Contractor shall assume full responsibility for the strength of all such components from which forms are removed prior to the concrete attaining its full design compressive strength. Shoring may be required at the option of the Engineer beyond these periods.

Ambient Temperature (°F.) During Concrete Placement

	Over 95°	**70°-95°**	**60°-70°**	**50°-60°**	**Below 50°**
Edge Forms for Slabs on Grade	1 day	1 day	1 day	1 day	
Walls	5 days	2 days	2 days	3 days	Do not remove until directed by Engineer (7 days minimum)
Columns	7 days	2 days	3 days	4 days	

Ambient Temperature (°F.) During Concrete Placement

	Over 95°	70°-95°	60°-70°	50°-60°	Below 50°
Beam Soffits	10 days	7 days	7 days	7 days	
Elevated Slabs	12 days	7 days	7 days	7 days	

C. When, in the opinion of the Engineer, conditions of the work or weather justify, forms may be required to remain in place for longer periods of time.

D. An accurate record shall be maintained by the Contractor of the dates of concrete placings and the exact location thereof and the dates of removal of forms. These records shall always be available for inspection at the site, and two copies shall be furnished the Engineer upon completion of the concrete work.

3.09 RESHORING

A. When reshoring is permitted or required the operations shall be planned and subjected to approval by the Engineer.

B. Reshores shall be placed after stripping operations are complete but in no case later than the end of the working day on which stripping occurs.

C. Reshoring for the purpose of early form removal shall be performed so that at no time will large areas of new construction be required to support their own weight. While reshoring is under way, no construction or live loads shall be permitted on the new construction. Reshores shall be tightened to carry their required loads but they shall not be overtightened so that the new construction is overstressed. Reshores shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified.

D. For floors supporting shores under newly placed concrete, the original supporting shores shall remain in place or reshores shall be placed. The shoring or reshoring system shall have a capacity sufficient to resist the anticipated loads and, in all cases, shall have a capacity equal to at least one-half of the capacity of the shoring system above. Reshores shall be located directly under a reshore position above unless other locations are permitted.

E. In multi-story buildings, reshoring shall extend over a sufficient number of stories to distribute the weight of newly placed concrete, forms, and construction live loads so the design superimposed loads of the floors supporting shores are not exceeded.

END OF SECTION

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SECTION 03 15 00

CONCRETE ACCESSORIES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnish all materials, labor and equipment required to provide all concrete accessories including waterstops, expansion joint material, joint sealants, expansion joint seals, crack inducing joint inserts, epoxy bonding agent, and neoprene bearing pads.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 – Concrete Formwork

B. Section 03 15 16 – Joints in Concrete

C. Section 03 30 00 – Cast-in-Place Concrete

D. Section 07 90 00 – Joint Fillers, Sealants, and Caulking

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

2. ASTM D412 – Standard Tests for Rubber Properties in Tension

3. ASTM D 624 – Standard Test method for Rubber Property - Tear Resistance

4. ASTM D 638 – Standard Test Method for Tensile Properties of Plastics

5. ASTM D1751 – Standard Specifications for Preformed Expansion Joint fillers for Concrete Paving and Structural Construction (non-extruding and resilient bituminous types)

6. ASTM D 1752 – Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

7. ASTM D 1171 – Standard Test Method for Ozone Resistance at 500 pphm

8. ASTM D 471 – Standard Test Method for Rubber Properties

9. ASTM D 2240 – Standard Test for Rubber Property – Durometer Hardness

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Manufacturer's literature on all products specified herein including material certifications.

2. Proposed system for supporting PVC waterstops in position during concrete placement.

3. Samples of products if requested by the Engineer.

PART 2 – PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) WATERSTOPS

A. PVC waterstops for construction joints shall be flat ribbed type, 6 inches wide with a minimum thickness at any point of 3/8 inches.

B. Waterstops for expansion joints shall be ribbed with a center bulb. They shall be 9 inches wide with a minimum thickness at any point of 3/8 inch unless shown or specified otherwise. The center bulb shall have a minimum outside diameter of 1 inch and a minimum inside diameter of 1/2 inch.

C. The waterstops shall be manufactured from virgin polyvinyl chloride plastic compound and shall not contain any scrap or reclaimed material or pigment whatsoever. The properties of the polyvinyl chloride compound used, as well as the physical properties of the waterstops, shall exceed the requirements of the U.S. Army Corps. of Engineers' Specification CRD-C572. The waterstop material shall have an off-white, milky color.

D. The required minimum physical characteristics for this material are:

1. Tensile strength – 1,750 psi (ASTM D-638).

2. Ultimate elongation – not less than 280% (ASTM D-638).

E. No reclaimed PVC shall be used for the manufacturing of the waterstops. The Contractor shall furnish certification that the proposed waterstops meet the above requirements.

F. PVC waterstops shall be as manufactured by BoMetals, Inc., DuraJoint Concrete Accessories, or Sika Greenstreak.

G. All waterstop intersections, both vertical and horizontal, shall be made from factory fabricated corners and transitions. Only straight butt joint splices shall be made in field.

2.02 RETROFIT WATERSTOPS

A. Retrofit waterstops shall be used where specifically shown on Drawings for sealing joints between existing concrete construction and new construction.

B. Retrofit waterstops shall be PVC waterstops fabricated from material as described in Section 2.01 of this Specification.

C. Retrofit waterstop shall be attached to existing concrete surface as shown on Drawings.

D. Use of split waterstop in lieu of specially fabricated retrofit waterstop will not be acceptable.

E. E. Retrofit Waterstop manufacturer must provide a complete system including all Waterstop, stainless steel anchoring hardware, and epoxy for installation.

F. For construction joints, retrofit waterstop shall be style number 609 by Sika Greenstreak, RF-638 by BoMetals, Inc., or approved equal. For expansion joints, retrofit waterstop shall be style number 667 by Sika Greenstreak, RF-912 by BoMetals, Inc., Type 36RT Retrofit Kit by DuraJoint Concrete Accessories, or approved equal.

2.03 CHEMICAL RESISTANT WATERSTOPS

A. Where specifically noted on Contract Drawings, chemical resistant waterstops shall be used instead of PVC waterstops.

B. Chemical resistant waterstops for construction joints shall be ribbed with a center bulb. They shall be 6 inches wide with a minimum thickness at any point of 3/16 inches.

C. Chemical resistant waterstops for expansion joints shall be ribbed tear web. They shall be 9 inches wide with a tear web designed to accommodate 1 inch of free movement minimum.

D. Chemical resistant retrofit waterstop shall be a minimum of 2½” wide along the ribbed side and a minimum 5” wide along the side attached to the existing concrete surface. Retrofit waterstop shall include a center bulb and shall have a minimum thickness of 3/16”. Retrofit waterstop manufacturer shall provide a complete system including waterstop, stainless steel anchoring hardware and epoxy for installation.

E. Chemical resistant waterstops shall be manufactured from a fully crosslinked thermoplastic vulcanizate rubber.

F. Waterstops shall be TPER by BoMetals, Inc., Earth Shield TPV/TPE-R by JP Specialties, Inc., Westec TPER by Westec Barrier Technologies, or TPE-R by DuraJoint Concrete Accessories.

2.04 WATERPROOF MEMBRANE PATCH (NOT USED)

2.05 HYDROPHILIC WATERSTOPS (NOT USED)

2.06 WATERSTOP ADHESIVE (NOT USED)

2.07 JOINT SEALANTS

A. Joint sealants shall comply with Section 07 90 00 – Joint Fillers, Sealants, and Caulking.

2.08 EXPANSION JOINT MATERIAL

A. Preformed expansion joint material shall be non-extruding, and shall be of the following types:

1. Type I – Sponge rubber, conforming to ASTM D1752, Type I.

2. Type II –Cork, conforming to ASTM D1752, Type II.

3. Type III – Self-expanding cork, conforming to ASTM D1752, Type III.

4. Type IV – Bituminous fiber, conforming to ASTM Designation D1751.

2.09 EXPANSION JOINT SEAL

A. Expansion Joint Seal System shall consist of a preformed neoprene profile, installed using the same dimensions as the joint gap, bonded with a two-component epoxy adhesive, and pressurized during the adhesive cure time.

B. The expansion joint system shall be Hydrozo/Jeene Structural Sealing joint system by Hydrozo/Jeene, Inc.

2.10 CRACK INDUCING JOINT INSERTS (NOT USED)

2.11 EPOXY BONDING AGENT (NOT USED)

2.12 EPOXY RESIN BINDER (NOT USED)

2.13 BEARING PADS (NOT USED)

PART 3 – EXECUTION

3.01 PVC AND CHEMICAL RESISTANT WATERSTOPS (NOT USED)

3.02 WATERPROOF MEMBRANE PATCH AND HYDROPHILIC WATERSTOPS (NOT USED)

3.03 WATERSTOP ADHESIVE (NOT USED)

3.04 INSTALLATION OF EXPANSION JOINT MATERIAL AND SEALANTS

A. Type I, II, or III shall be used in all expansion joints in structures and concrete pavements unless specifically shown otherwise on the Drawings. Type IV shall be used in sidewalk and curbing and other locations specifically shown on the Drawings.

B. All expansion joints exposed in the finish work, exterior and interior, shall be sealed with the specified joint sealant. Expansion joint material and sealants shall be installed in accordance with manufacturer's recommended procedures and as shown on the Drawings.

C. Expansion joint material that will be exposed after removal of forms shall be cut and trimmed to ensure a neat appearance and shall completely fill the joint except for the space required for the sealant. The material shall be held securely in place and no concrete shall be allowed to enter the joint or the space for the sealant and destroy the proper functions of the joint.

D. A bond breaker shall be used between expansion joint material and sealant. The joint shall be thoroughly clean and free from dirt and debris before the primer and the sealant are applied. Where the finished joint will be visible, masking of the adjoining surfaces shall be carried out to avoid their discoloration. The sealant shall be neatly tooled into place and its finished surfaces shall present a clean and even appearance.

E. Type 1 joint sealant shall be used in all expansion and crack inducing joints in concrete, except where other specific types are required as stated below, and wherever else specified or shown on the Drawings. Sealant shall be furnished in pour grade or gun grade depending on installation requirements. Primers shall be used as required by the manufacturer. The sealant shall be furnished in colors as directed by the Engineer.

F. Type 8 joint sealant shall be used in all concrete pavements and floors subject to heavy traffic and wherever else specified or shown on the Drawings.

3.05 EXPANSION JOINT SEAL

A. The expansion joint seal system shall be installed as shown on the Drawings in strict accordance with the manufacturer's recommendations.

3.06 CRACK INDUCING JOINT INSERTS (NOT USED)

3.07 EPOXY BONDING AGENT (NOT USED)

3.08 EPOXY RESIN BINDER (NOT USED)

3.09 BEARING PADS (NOT USED)

END OF SECTION

SECTION 03 15 16

JOINTS IN CONCRETE

PART 1 – GENERAL

1.01 THE REQUIREMENTS

A. Provide all materials, labor and equipment required for the construction of all joints in concrete specified herein and shown on the Drawings.

B. Types of joints in concrete shall be defined as follows:

1. Construction Joints – Intentionally created formed joints between adjacent concrete placements with 100% of reinforcement continuous through joint.

2. Expansion Joints – Formed joints in concrete which separate adjacent sections to allow movement due to dimensional increases and reduction of adjacent sections (temperature and shrinkage). Reinforcement terminates within concrete on each side of joint. Expansion joints may also be considered isolation joints.

3. Contraction Joints – Formed joints in concrete to create interface between concrete placements to allow movement due to dimensional reduction of adjacent sections (shrinkage).

    a. Full Contraction Joints – Formed contraction joints with no bonded reinforcement passing through the joint.

    b. Partial Contraction Joints – Formed contraction joints with no more than 50% of bonded reinforcement passing through the joint.

4. Crack Inducing Joints – Joints formed, tooled, or sawcut in a monolithic placement to create a weakened plane to regulate the location of crack formation due to dimensional reduction of adjacent sections (shrinkage).

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 – Concrete Formwork

B. Section 03 15 00 – Concrete Accessories

C. Section 03 30 00 – Cast-in-Place Concrete

D. Section 07 90 00 – Joint Fillers, Sealants and Caulking

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ACI 301 – Specifications for Structural Concrete for Buildings

2. ACI 318 – Building Code Requirements for Structural Concrete

3. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures

4. ACI 224.3 – Joints in Concrete Construction

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Layout drawings showing location and type of all joints to be placed in each structure.

2. Details of proposed joints in each structure.

3. For sawcut crack-inducing joints, submit documentation indicating the following:

a. Proposed method of sawcutting indicating early entry or conventional sawing.

b. Description of how work is to be performed including equipment to be utilized, size of crew performing the work and curing methods.

c. Description of alternate method in case of time constraint issues or failure of equipment.

PART 2 – MATERIALS

2.01 MATERIALS

A. All materials required for joint construction shall comply with Section 03 15 00 - Concrete Accessories and Section 07 90 00 – Joint Fillers, Sealants and Caulking.

PART 3 – EXECUTION

3.01 CONSTRUCTION JOINTS

A. Place 3/4-inch expansion joints at radius points of curb returns of cross street intersections, wherever concrete placement must be stopped for more than 30 minutes or as located in adjacent pavement but no further than 40 feet apart. Use boards greater than 6 feet in length. When pavement is 24 feet or narrower, use not more than 2 lengths of board. Secure pieces to form a straight joint. Shape board filler accurately to cross section of concrete slab. Use No. 5 smooth dowel, 36 inches long and spaced 18 inches on centers. Seal with joint sealing compound.

B. Other construction joints shall be as shown on the Drawings. Otherwise, Contractor shall submit description of the joint and proposed location to Engineer for approval. All joints shall be construction joints or expansion joints unless otherwise specified on the Drawings or approved by the Engineer on the joint plan submittal.

C. Unless noted otherwise on the Drawings, construction joints shall be located near the middle of the spans of slabs, beams, and girders unless a beam intersects a girder at this point. In this case, the joints in the girders shall be offset a distance equal to twice the width of the beam. Joints in walls and columns shall be at the underside of floors, slabs, beams, or girders and the top of footings or floor slabs unless noted otherwise on Drawings. Beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as slabs. Joints shall be perpendicular to the main reinforcement.

D. Maximum distance between horizontal joints in slabs and vertical joints in walls shall be 50’-0”. For exposed walls with fluid or earth on the opposite side, the spacing between vertical and horizontal joints shall be a maximum of 25’-0”.

E. All corners shall be part of a continuous placement, and should a construction joint be required, the joint shall not be located closer than five feet from a corner.

F. All reinforcing steel and welded wire fabric shall be continued across construction joints. Keys and inclined dowels shall be provided as shown on the Drawings or as directed by the Engineer. Longitudinal keys shall be provided in all joints in walls and between walls and slabs or footings, except as specifically noted otherwise on the Drawings. Size of keys shall be as shown on the Drawings.

G. All joints in water bearing structures shall have a waterstop. All joints below grade in walls or slabs which enclose an accessible area shall have a waterstop.

H. Joint plan of walls and slabs shall consider aspect ratio to create placement of sections as close to square as possible. Aspect ratio is defined as the ratio of plan dimensions for slab sections and length to height placement of wall sections. Aspect ratios shall be between 0.65 and 1.5.

3.02 EXPANSION JOINTS

A. Size and location of expansion joints shall be as shown on the Drawings. All joints shall be construction joints or expansion joints unless otherwise specified on the Drawings or approved by the Engineer on the joint plan submittal.

B. All expansion joints in water-bearing structures shall have a center-bulb type waterstop. All expansion joints below grade in walls or slabs which enclose an accessible area shall have a center-bulb type waterstop. Waterstop shall be as shown on Drawings and specified in Section 03 15 00 – Concrete Accessories.

3.03 CONTRACTION JOINTS

A. Place contraction joints between expansion joints at even spacing, but no further than 10 feet apart. Seal groove with joint sealing compound.

B. Other contraction joints shall be located as shown on the Drawings or otherwise approved by the Engineer on the joint plan submittal. Contractor shall submit proposed locations and details of all contraction joints concurrent or prior to submission of reinforcement drawings. Use of contraction joints at locations not specifically detailed on the Drawings requires Engineer approval and will only be considered if meeting the stipulations herein.

C. Full contraction joints may be considered where the structural behavior of the element allows termination of all reinforcement through joint without compromise of structural integrity of element.

D. Partial contraction joints may be considered where the structural behavior of the element requires partial continuation of reinforcement through joint to ensure structural integrity.

E. Where full contraction joints are allowed, maximum distance between horizontal contraction joints in slab and vertical contraction joints in walls shall be 50’-0”. For exposed walls with fluid or earth on the opposite side, spacing between vertical and horizontal contraction joints shall be a maximum of 25’-0”.

F. Bond breaker shall be provided between sections for all contraction joints.

G. Joint plan of walls and slabs shall consider aspect ratio to create placement of sections as close to square as possible. Aspect ratio is defined as the ratio of plan dimensions for slab sections and length to height placement of wall sections. Aspect ratios shall be between 0.65 and 1.5.

3.04 SAWED JOINTS

A. Use sawed joints as an alternate to contraction and weakened plane joints only in areas approved by the Engineer or those shown on the Drawings. Circular cutter shall be capable of cutting straight line groove minimum of 1/2 inch wide. Depth shall be one

quarter of pavement thickness plus 1/2 inch. Commence sawing as soon as concrete has hardened sufficiently to permit cutting without chipping, spalling or tearing and prior to initiation of cracks. Once sawing has commenced, it shall be continued until completed. Make saw cut with one pass. Complete sawing within 48 hours of concrete placement. Saw joints at required spacing consecutively in sequence of concrete placement.

B. Concrete Saw: Provide sawing equipment adequate in power to complete sawing to required dimensions and within required time. Provide at least one standby saw in good working order. Maintain an ample supply of saw blades at work site at all times during sawing operations. Sawing equipment shall be on job at all times during concrete placement.

3.05 JOINTS FOR CURB, CURB AND GUTTER

A. Place 3/4-inch preformed expansion joints through curb and gutters at locations of expansion and contraction joints in pavement; at end of radius returns at street intersections and driveways; and at curb inlets. Maximum spacing shall be 40-foot centers.

3.06 JOINTS FOR CONCRETE SIDEWALKS

A. Provide 3/4-inch expansion joints conforming to ASTM A 1751 along and across sidewalk at back of curbs, at intersections with driveways, steps, and walls; and across walk at intervals not to exceed 40 feet. Provide expansion joint material conforming to ASTM D 994 for small radius curves and around fire hydrants and utility poles. Extend the expansion joint material for the full depth of the slab.

3.07 JOINTS FOR CONCRETE DRIVEWAYS

A. Provide 3/4-inch expansion joints conforming to ASTM D 1751 across driveway in line with street face of sidewalks, at existing concrete driveways, and along intersections with sidewalks and other structures. For driveways wider than 20-feet, also include an expansion joint at the center point of the driveway perpendicular to the roadway. Extend expansion joint material full depth of slab.

3.08 CRACK INDUCING JOINTS (NOT USED)

3.09 JOINT PREPARATION

A. No concrete shall be allowed to enter the joint or the space for the sealant and destroy the proper functions of the joint.

B. The surface of the concrete at all joints shall be thoroughly cleaned and all laitance removed by wire brushing, air or light sand blasting.

C. The joint shall be thoroughly clean and free from dirt and debris before the primer and the sealant are applied. Where the finished joint will be visible, masking of the adjoining surfaces shall be carried out to avoid their discoloration. The sealant shall be neatly tooled into place and its finished surface shall present a clean and even appearance.

D. Fill joints so that, upon completion, surface of sealer within joint will be within a 1/4 inch of the adjacent concrete surface or at elevation as directed by the Owner.

E. All joints shall be sealed as shown on the Drawings and specified in Section 03 15 00 – Concrete Accessories and Section 07 90 00 – Joint Fillers, Sealants and Caulking.

END OF SECTION

SECTION 03 21 00

REINFORCING STEEL

PART 1 – GENERAL

1.01 THE REQUIREMENTS

A. Provide all concrete reinforcing including all cutting, bending, fastening and any special work necessary to hold the reinforcing steel in place and protect it from injury and corrosion in accordance with the requirements of this section.

B. Provide deformed reinforcing bars to be grouted into reinforced concrete masonry walls.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 – Concrete Formwork

B. Section 03 15 00 – Concrete Accessories

C. Section 03 30 00 – Cast-in-Place Concrete

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Building Code for the State or Commonwealth in which the project is located.

2. CRSI - Concrete Reinforcing Institute Manual of Standard Practice

3. ACI SP66 - ACI Detailing Manual

4. ACI 315 - Details and Detailing of Concrete Reinforcing

5. ACI 318 - Building Code Requirements for Structural Concrete

6. WRI - Manual of Standard Practice for Welded Wire Fabric

7. ASTM A 615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

8. ASTM A 1064 - Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

9. ASTM E 3121 – Standard Test Methods for Field Testing of Anchors in Concrete or Masonry

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Detailed placing and shop fabricating drawings, prepared in accordance with ACI 315 and ACI Detailing Manual - (SP66), shall be furnished for all concrete reinforcing. These drawings shall be made to such a scale as to clearly show joint locations, openings, and the arrangement, spacing and splicing of the bars.

2. Detailed placing and shop fabricating drawings, prepared in accordance with ACI 315 and ACI Detailing Manual - (SP66), shall be furnished for all deformed bar reinforcing used in masonry. These drawings shall be made to such a scale as to clearly show joint locations, openings, and the arrangement, locations, spacing and splicing of the bars.

3. Mill test certificates - 3 copies of each.

4. Description of the reinforcing steel manufacturer's marking pattern.

5. Requests to relocate any bars that cause interferences or that cause placing tolerances to be violated.

6. Proposed supports for each type of reinforcing.

7. Request to use splices not shown on the Drawings.

8. Request to use mechanical couplers along with manufacturer's literature on mechanical couplers with instructions for installation, and certified test reports on the couplers' capacity.

9. Request for placement of column dowels without the use of templates.

10. Request and procedure to field bend or straighten partially embedded reinforcing.

11. International Code Council–Evaluation Services Report (ICC-ES ESR) for dowel adhesives.

12. Certification that all installers of dowel adhesive systems in horizontal to vertically overhead applications are certified as Adhesive Anchor Installers in accordance with the ACI-CRSI Anchor Installer Certification Program.

13. Adhesive dowel testing plan.

1.05 QUALITY ASSURANCE

A. If requested by the Engineer, the Contractor shall provide samples from each load of reinforcing steel delivered in a quantity adequate for testing. Costs of initial tests will be paid by the Owner. Costs of additional tests due to material failing initial tests shall be paid by the Contractor.

B. Provide a list of names of all installers who are trained by the Manufacturer's Field Representative on this jobsite prior to installation of products. Record must include the installer name, date of training, products included in the training and trainer name and contact information.

C. Provide a copy of the current ACI/CRSI "Adhesive Anchor Installer" certification cards, or equivalent, for all installers who will be installing adhesive anchors in the horizontal to vertically overhead orientation.

PART 2 – PRODUCTS

2.01 REINFORCING STEEL

A. Bar reinforcing shall conform to the requirements of ASTM A 615 for Grade 60 deformed billet-steel reinforcing. All reinforcing steel shall be from domestic mills and shall have the manufacturer's mill marking rolled into the bar which shall indicate the producer, size, type, and grade. All reinforcing bars shall be deformed bars. Smooth reinforcing bars shall not be used unless specifically called for on Drawings.

B. Welded wire fabric reinforcing shall conform to the requirements of ASTM A 1064 and the details shown on the Drawings.

C. A certified copy of the mill test on each load of reinforcing steel delivered showing physical and chemical analysis shall be provided, prior to shipment. The Engineer reserves the right to require the Contractor to obtain separate test results from an independent testing laboratory in the event of any questionable steel. When such tests are necessary because of failure to comply with this Specification, such as improper identification, the cost of such tests shall be borne by the Contractor.

D. Field welding of reinforcing steel will not be allowed.

E. Use of coiled reinforcing steel will not be allowed.

2.02 ACCESSORIES

A. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers, and other devices to position reinforcing during concrete placement. Wire bar supports shall be plastic protected (CRSI Class 1).

B. Concrete blocks (dobies), used to support and position bottom reinforcing steel, shall have the same or higher compressive strength as specified for the concrete in which it is located.

2.03 MECHANICAL COUPLERS

A. Mechanical couplers shall develop a tensile strength which exceeds 100 percent of the ultimate tensile strength and 125 percent of the yield strength of the reinforcing bars being spliced. The reinforcing steel and coupler used shall be compatible for obtaining the required strength of the connection.

B. Where the type of coupler used is composed of more than one component, all components required for a complete splice shall be supplied.

C. Hot forged sleeve type couplers shall not be used. Acceptable mechanical couplers are Dayton Superior Dowel Bar Splicer System by Dayton Superior, Dayton, Ohio, or approved equal. Mechanical couplers shall only be used where shown on the Drawings or where specifically approved by the Engineer.

D. Where the threaded rebar to be inserted into the coupler reduces the diameter of the bar, the threaded rebar piece shall be provided by the coupler manufacturer.

2.04 DOWEL ADHESIVE SYSTEM

A. Where shown on the Drawings, reinforcing bars anchored into hardened concrete with a dowel adhesive system shall use a two-component adhesive mix which shall be injected with a static mixing nozzle following manufacturer's instructions.

B. All holes shall be drilled in accordance with the manufacturer’s instructions except that core drilled holes shall not be permitted unless specifically allowed by the Engineer. Cored holes, if allowed by the manufacturer and approved by the Engineer, shall be roughened in accordance with manufacturer’s requirements.

C. Thoroughly clean drill holes of all debris, drill dust, and water in accordance with manufacturer’s instructions prior to installation of adhesive and reinforcing bar.

D. Degree of hole dampness shall be in strict accordance with manufacturer recommendations. Installation conditions shall be dry, or water saturated unless otherwise permitted by the engineer. If water saturated installation is approved, appropriate reduction factors in accordance with manufacturer’s design requirements should be considered. Water filled or submerged holes shall not be permitted unless specifically approved by the Engineer.

E. Injection of adhesive into the hole shall be performed in a manner to minimize the formation of air pockets in accordance with the manufacturer’s instructions.

F. Embedment Depth:

1. The embedment depth of the bar shall be as shown on the Drawings. Although all manufacturers listed below are permitted, the embedment depth shown on the Drawings is based on “Pure 110+” by DeWalt” ESR 3298 issued 7/2020. If the Contractor submits one of the other named dowel adhesives from the list below, the Engineer shall evaluate the required embedment and the Contractor shall provide the required embedment depth stipulated by the Engineer specific to the approved dowel adhesive.

2. Where the embedment depth is not shown on the Drawings, the embedment depth shall be determined to provide the minimum allowable bond strength equal to the tensile strength of the rebar according to the manufacturer’s ICC-ES ESR.

3. The embedment depth shall be determined using design parameters listed below. In no case shall the embedment depth be less than the minimum, or more than the maximum, embedment depths stated in the manufacturer’s ICC-ES ESR.

4. Design of adhesive anchor system shall be based on the following parameters:

    a. Actual compressive strength of concrete.

    b. Cracked concrete state.

    c. Dry or water saturated condition for installation.

    d. Base material temperature between 40- and 104-degrees Fahrenheit.

    e. Installation with either a hammer drill with carbide bit or hollow-drill bit system drilling methods.

    f. Minimum age of concrete 21 days at time of installation.

G. Engineer's approval is required for use of this system in locations other than those shown on the Drawings.

H. The adhesive system shall be IBC compliant for use in both cracked and uncracked concrete in all Seismic Design Categories and shall be "HIT-HY 200 Adhesive Anchoring System" as manufactured by Hilti, Inc. “SET-3G Epoxy Adhesive Anchors” as manufactured by Simpson Strong-Tie Co. or “Pure 110+ Epoxy Adhesive Anchor System” by DeWalt. Fast-set epoxy formulations shall not be acceptable. No or equal products will be considered, unless pre-qualified and approved.

I. All individuals installing dowel adhesive systems in horizontal to vertically overhead applications shall be certified as an Adhesive Anchor Installer in accordance with the ACI-CRSI Anchor Installation Certification Program, or equivalent.

PART 3 – EXECUTION

3.01 FABRICATION

A. Reinforcing steel shall be accurately formed to the dimensions and shapes shown on the Drawings and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318, except as modified by the Drawings.

B. The Contractor shall fabricate reinforcing bars for structures in accordance with the bending diagrams, placing lists and placing Drawings.

C. No fabrication shall commence until approval of Shop Drawings has been obtained. All reinforcing bars shall be shop fabricated unless approved to be bent in the field. Reinforcing bars shall not be straightened or bent in a manner that will injure the material. Heating of bars will not be permitted.

D. Welded wire fabric with longitudinal wire of W9.5 size or smaller shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10 inches. Welded wire fabric with longitudinal wires larger than W9.5 size shall be furnished in flat sheets only.

3.02 DELIVERY, STORAGE AND HANDLING

A. All reinforcing shall be neatly bundled and tagged for placement when delivered to the job site. Bundles shall be properly identified for coordination with mill test reports.

B. Reinforcing steel shall be stored above ground on platforms or other supports and shall always be protected from the weather by suitable covering. Reinforcing steel shall be stored in an orderly manner and plainly marked to facilitate identification.

C. Reinforcing steel shall always be protected from conditions conducive to corrosion until concrete is placed around it.

D. The surfaces of all reinforcing steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where delay in depositing concrete occurs, reinforcing shall be inspected again and if necessary recleaned.

3.03 PLACING

A. Reinforcing steel shall be accurately positioned as shown on the Drawings and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcing steel shall be supported by concrete, plastic or plastic protected (CRSI Class 1) metal supports, spacers or metal hangers which are strong and rigid enough to prevent any displacement of the reinforcing steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be

used in sufficient numbers to support the reinforcing bars without settlement. In no case shall concrete block supports be continuous.

B. The portions of all accessories in contact with the formwork shall be made of plastic or steel coated with a 1/8-inch minimum thickness of plastic which extends at least 1/2 inch from the concrete surface. Plastic shall be gray in color.

C. Tie wires shall be bent away from the forms to provide the specified concrete coverage.

D. Reinforcing bars additional to those shown on the Drawings, which may be found necessary or desirable by the Contractor for the purpose of securing reinforcing in position, shall be provided by the Contractor at no additional cost to the Owner.

E. Reinforcing placing, spacing, and protection tolerances shall be within the limits specified in ACI 318 except where in conflict with the Building Code, unless otherwise specified.

F. Reinforcing bars may be moved within one bar diameter as necessary to avoid interference with other concrete reinforcing, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed placing tolerances, the resulting arrangement of bars shall be as acceptable to the Engineer.

G. Welded wire fabric shall be supported on slab bolsters spaced not less than 30 inches on centers, extending continuously across the entire width of the reinforcing mat and supporting the reinforcing mat in the plane shown on the Drawings.

H. Reinforcing shall not be straightened or bent unless specifically shown on the drawings. Bars with kinks or bends not shown on the Drawings shall not be used. Coiled reinforcement shall not be used.

I. Dowel Adhesive System shall be installed in strict conformance with the manufacturer's recommendations and as required in Article 2.04 above. A representative of the manufacturer must be on site prior to adhesive dowel installation to provide instruction on proper installation procedures for all adhesive dowel installers. Testing of adhesive dowels shall be as indicated below. If the dowels have a hook at the end to be embedded in subsequent work, an approved mechanical coupler shall be provided at a convenient distance from the face of existing concrete to facilitate adhesive dowel testing while maintaining required hook embedment in subsequent work.

J. All adhesive dowel installations in the horizontal or overhead orientation shall be conducted by a certified Adhesive Anchor Installer as certified by ACI/CSRI Adhesive Anchor Installer Certification program, or equivalent, per ACI 318-11 D.9.2.2. Current AAI Certificates must be submitted to the Engineer for approval prior to commencement of any adhesive anchor installations.

3.04 SPLICING

A. Reinforcing bar splices shall only be used at locations shown on the Drawings. When necessary to splice reinforcing at points other than where shown, the splice shall be as acceptable to the Engineer.

B. The length of lap for reinforcing bars, unless otherwise shown on the Drawings shall be in accordance with ACI 318 for a class B splice.

C. Laps of welded wire fabric shall be in accordance with ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.

D. Mechanical splices shall be used only where shown on the drawings or when approved by the Engineer.

E. Couplers which are located at a joint face shall be a type which can be set either flush or recessed from the face as shown on the Drawings. The couplers shall be sealed during concrete placement to eliminate concrete, or cement paste from entering. After the concrete is placed, couplers intended for future connections shall be plugged and sealed to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged with plastic plugs which have an O-ring seal.

3.05 INSPECTION

A. The Contractor shall advise the Engineer of his intentions to place concrete and shall allow him adequate time to inspect all reinforcing steel before concrete is placed.

B. The Contractor shall advise the Engineer of his intentions to place grout in masonry walls and shall allow him adequate time to inspect all reinforcing steel before grout is placed.

3.06 CUTTING OF EMBEDDED REBAR

A. The Contractor shall not cut embedded rebar cast into structural concrete without prior approval.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Provide all labor, equipment, materials, and services necessary for the manufacture, transportation, and placement of all plain and reinforced concrete work, as shown on the Drawings or as required by the Engineer.

B. The requirements in this section shall apply to the following types of concrete:

1. Class A2 Concrete: Normal weight structural concrete in all structures other than environmental concrete structures as described above, and for all sidewalks and pavement.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 – Concrete Formwork

B. Section 03 21 00 – Reinforcing Steel

C. Section 03 15 00 – Concrete Accessories

D. Section 03 15 16 – Joints in Concrete

E. Section 03 35 00 – Concrete Finishes

F. Section 03 39 00 – Concrete Curing

G. Section 03 60 00 – Grout

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the Specifications, all work herein shall conform to or exceed the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. International Building Code

2. ACI 214 – Guide to Evaluation of Strength Test Results of Concrete

3. ACI 301 – Specifications for Structural Concrete

4. ACI 304 – Guide for Measuring, Mixing, Transporting, and Placing Concrete

5. ACI 305 – Specification for Hot Weather Concreting

6. ACI 306 – Standard Specification for Cold Weather Concreting

7. ACI 309R – Guide for Consolidation of Concrete

8. ACI 318 – Building Code Requirements for Structural Concrete and Commentary

9. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures

10. ASTM C 31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field

11. ASTM C 33 – Standard Specification for Concrete Aggregates

12. ASTM C 39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

13. ASTM C42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

14. ASTM C 88 – Standard Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate

15. ASTM C 94 – Standard Specification for Ready-Mixed Concrete

16. ASTM C 114 – Standard Test Method for Chemical Analysis of Hydraulic Cement

17. ASTM C 136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

18. ASTM C 138 – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

19. ASTM C 143 – Standard Test Method for Slump of Hydraulic Cement Concrete

20. ASTM C 150 – Standard Specification for Portland Cement

21. ASTM C 157 - Standard Test Method for Length Change of Hardened Hydraulic Cement, Mortar and Concrete

22. ASTM C 172 – Standard Practice for Sampling Freshly Mixed Concrete

23. ASTM C 192 – Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory

24. ASTM C 231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

25. ASTM C 260 – Standard Specification for Air-Entraining Admixtures for Concrete

26. ASTM C 295 – Standard Guide for Petrographic Examination of Aggregates for Concrete

27. ASTM C 457 – Standard Test Method for Microscopical Determination of the Air-Void System in Hardened Concrete

28. ASTM C 494 – Standard Specification for Chemical Admixtures for Concrete

29. ASTM C 595 – Standard Specification for Blended Hydraulic Cements

30. ASTM C 618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

31. ASTM C 989 – Standard Specification for Slag Cement for Use in Concrete and Mortars

32. ASTM C 1012 – Standard Test Method for Length Change of Hydraulic Cement Mortars Exposed to a Sulfate Solution

33. ASTM C 1077 – Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation

34. ASTM C 1157 – Standard Performance Specification for Hydraulic Cement

35. ASTM C 1260 – Test Method for Potential Alkali Reactivity of Aggregates (Mortar Bar Method)

36. ASTM C 1567 – Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)

37. ASTM C 1579 – Standard Test Method for Evaluating Plastic Shrinkage Cracking of Restrained Fiber Reinforced Concrete (Using a Steel Form Insert)

38. ASTM C 1602 – Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

39. ASTM C 1609 – Standard Test Method for Flexural Performance of Fiber Reinforced Concrete (Using Beam with Third-Point Loading)

40. ASTM C 1778 – Standard Guide for Reducing the Risk of Deleterious Alkali – Aggregate Reaction in Concrete

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Sources of all materials and certifications of compliance with specifications for all materials.

2. Certified current (less than 1 year old) chemical analysis (mill test report) of the Portland Cement or Blended Cement to be used. The chemical analysis must include the equivalent alkali content of the Portland Cement or Blended Cement.

3. Certified current (less than 1 year old) chemical analysis of fly ash or slag cement to be used.

4. Aggregate test results showing compliance with required standards, i.e., sieve analysis, potential reactivity, aggregate soundness tests, petrographic analysis, mortar bar expansion testing, etc.

5. Manufacturer's data on all admixtures stating compliance with required standards.

6. Concrete mix design for each class of concrete specified herein.

7. Field experience records and/or trial mix data for the proposed concrete mixes for each class of concrete specified herein.

8. Drying shrinkage test results from trial concrete mixes.

1.05 QUALITY ASSURANCE

A. Tests on materials used in the production of concrete shall be required as specified in Part 2 – Products. These tests shall be performed by an independent testing laboratory approved by the Engineer at no additional cost to the Owner.

B. Trial concrete mixes shall be tested when required in accordance with Article 3.01 at no additional cost to the Owner.

C. Field quality control tests, as specified in Article 3.11, unless otherwise stated, will be performed by a materials testing consultant employed by the Owner. However, the Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the Specifications. Any individual who samples and tests concrete to determine if the concrete is being produced in accordance with this Specification shall be certified as a Concrete Field-Testing Technician, Grade I, in accordance with ACI CP-2. Testing laboratory shall conform to requirements of ASTM C-1077.

1.06 CONCRETE COORDINATION CONFERENCE (NOT USED)

PART 2 – PRODUCTS (NOT USED)

2.01 NSF/ANSI STANDARD 61 CERTIFIED CONCRETE (NOT USED)

2.02 HYDRAULIC CEMENT

A. Portland Cement

1. Portland Cement shall be Type II conforming to ASTM C 150. Type I cement may be used provided either fly ash or slag cement is also included in the mix in accordance with Articles 2.03 or 2.04, respectively.

2. The proposed Portland Cement shall not contain more than 8% tricalcium aluminate and more than 12% tetracalcium aluminoferrite.

3. Portland Cement shall also meet performance requirements of ASTM C 1157.

B. Blended Cement

1. Blended cements shall be Type IP (Portland Fly Ash Cement), Type IS (Portland Slag Cement), or Type IL (Portland Limestone Cement) conforming to ASTM C 595.

2. Type IP cement shall be an inter-ground blend of Portland Cement and fly ash in which the fly ash constituent is between 15% and 25% of the weight of the total blend.

3. Type IS cement shall be an inter-ground blend of Portland Cement and slag cement in which the slag cement constituent is between 30% and 40% of the weight of the total blend.

4. Type IL cement shall be an inter-ground blend of Portland Cement and limestone in which the limestone constituent is between 5% and 15% of the weight of the total blend.

5. Fly ash, slag cement, and limestone used in the production of blended cements shall meet the requirements of Articles 2.03, 2.04, and 2.05 respectively.

6. Cements meeting ASTM C 1157 shall not be used in manufacture of blended cements.

7. Blended cement shall meet the Physical Requirements of Tables 2 and 3 of ASTM C 595 including the requirements for high sulfate resistance in Table 3 as tested per ASTM C1012.

C. Different types of cement shall not be mixed, nor shall they be used alternately except when authorized in writing by the Engineer. Different brands of cement or the same brand from different mills may be used alternately. A resubmittal will be required if different cements are proposed during the Project.

D. Cement shall be stored in a suitable weather-tight building to prevent deterioration or contamination. Cement which has become caked, partially hydrated, or otherwise damaged will be rejected.

2.03 FLY ASH

A. Fly ash shall meet the requirements of ASTM C 618 for Class F, except that the loss on ignition shall not exceed 4%. Fly ash shall also meet the optional physical requirements for uniformity as shown in Table 3 of ASTM C 618. Fly ash shall be considered as a supplemental cementitious material.

B. For fly ash to be used in the production of Type IP cement, the Pozzolan Activity Index shall be greater than 75% as specified in Table 3 of ASTM C 595.

C. Where reactive aggregates as defined in Article 2.08 are used in the concrete mix, the fly ash constituent shall be as needed to satisfy the concrete alkali loading requirements stipulated in Section 2.06. The percentage of fly ash shall also be set to meet the mean mortar bar expansion requirements in provisions of Article 2.08.G.2. Where fly ash is used, the minimum fly ash content shall be 15%.

D. For Type A1 concrete as required for use in environmental concrete structures, i.e., process structures or fluid containing structures, inclusion of fly ash or slag cement in the concrete mix, is mandatory.

E. Additional fly ash shall not be included in concrete mixed with Type IS or IP cement.

2.04 SLAG CEMENT

A. Slag cement shall meet the requirements of ASTM C 989 including tests for effectiveness of slag in preventing excessive expansion due to alkali-aggregate reactivity as described in Appendix X-3 of ASTM C 989.

B. Where reactive aggregates as defined in Article 2.08 are used in concrete mix, the slag cement constituent shall be as needed to satisfy the concrete alkali loading requirements stipulated in Section 2.06. The percentage of slag cement shall also be set to meet the mean mortar bar expansion requirements in provisions of Article 2.08.G.2. Where Slag Cement is used, the minimum Slag Cement content shall be 30%, and the maximum Slag Cement content shall be 40%.

C. For Type A1 concrete as required for use in environmental concrete structures, i.e., process structures or fluid containing structures, inclusion of fly ash or slag cement in the concrete mix, is mandatory.

D. Additional slag cement shall not be included in concrete mixed with Type IS or IP cement.

2.05 PORTLAND LIMESTONE CEMENT (TYPE IL)

A. Portland Limestone Cement (Type IL) cement shall meet the requirements of ASTM C 595.

B. Limestone used for blended cement Type IL shall be naturally occurring and meet the requirements of ASTM C 33.

C. Fly ash or slag cement shall be used with Type IL cement to meet requirements for durability, ASR resistance, sulfate resistance, and use for environmental structures, as specified herein.

2.06 CONCRETE ALKALI LOADING

A. All concrete mixes containing potentially reactive aggregates shall have a maximum alkali loading of the concrete of 3.0 pounds per cubic yard.

B. The alkali loading of concrete is the Portland Cement equivalent alkali content multiplied by the Portland Cement content of the mix in pounds per cubic yard divided by 100. The Portland Cement equivalent alkali content shall be included in the certified chemical analysis of the Portland Cement.

C. Means of evaluating alkali loading of concrete and proportioning constituents of concrete to minimize alkali loading of content shall also conform to the guidelines of ASTM C1778.

2.07 WATER

A. Water used for mixing concrete shall be clear, potable, and free from deleterious substances such as objectionable quantities of silty organic matter, alkali, salts, and other impurities.

B. Water shall not contain more than 100 PPM chloride.

C. Water shall not contain more than 500 PPM dissolved solids.

D. Water shall have a pH in the range of 4.5 to 8.5.

E. Water shall meet requirements of ASTM C 1602.

2.08 AGGREGATES

A. All aggregates used in normal weight concrete shall conform to ASTM C 33.

B. Fine Aggregate (Sand) in the various concrete mixes shall consist of natural or manufactured siliceous sand, clean and free from deleterious substances, and graded within the limits of ASTM C 33.

C. Coarse aggregates shall consist of hard, clean, durable gravel, crushed gravel, or crushed rock. Coarse aggregate shall be size #57 or #67 as graded within the limits given in ASTM C 33 unless otherwise specified.

D. For Class A4 concrete, coarse aggregate shall be Size #8 in accordance with ASTM C33.

E. Aggregates shall be tested for gradation by sieve analysis tests in conformance with ASTM C 136.

F. Aggregates shall be tested for soundness in accordance with ASTM C 88. The loss resulting after five cycles shall not exceed 10 percent for fine or coarse aggregate when using either magnesium sulfate or sodium sulfate.

G. All aggregates shall be evaluated in accordance with ASTM C 1778 to determine potential reactivity. All aggregates shall be considered reactive unless they meet the requirements below for non-reactive aggregates. Aggregates with a lithology like sources in the same region found to be reactive in service shall be considered reactive regardless of the results of the tests above.

    1. Non-reactive aggregates shall meet the following requirements:

        a. A petrographic analysis in accordance with ASTM C295 shall be performed to identify the constituents of the fine and coarse aggregate. Non-reactive aggregates shall meet the following limitations:

            1) Optically strained, micro-fractured, or microcrystalline quartz, 5.0%, maximum.

            2) Chert or chalcedony, 3.0%, maximum.

            3) Tridymite or cristobalite, 1.0%, maximum.

            4) Opal, 0.5%, maximum.

            5) Natural volcanic glass in volcanic rocks, 3.0%, maximum.

    2. Concrete mixed with reactive aggregates shall meet the following requirements:

        a. If aggregates are deemed potentially reactive as per ASTM C1778 and fly ash or slag cement is included in proposed concrete mix design, proposed concrete mix including proposed aggregates shall be evaluated by ASTM C-1567. Mean mortar bar expansions at 16 days shall be less than 0.08%.

Tests shall be made using exact proportion of all materials proposed for use on the job in design mix submitted.

b. If aggregates are deemed potentially reactive as per ASTM C-1778 and a straight cement mix without fly ash or slag cement is proposed for concrete mix design, aggregates shall be evaluated by ASTM C-1260. Mean mortar bar expansions at 16 days shall be less than 0.08%.

c. If the proposed aggregates are deemed potentially reactive, the concrete mix shall be evaluated and confirmed to meet the requirements for concrete alkali loading as stipulated in Section 2.06.

H. Contractor shall submit a new trial mix to the Engineer for approval whenever a different aggregate or gradation is proposed.

2.09 SYNTHETIC FIBERS (NOT USED)

2.10 ADMIXTURES (NOT USED)

2.11 CONCRETE MIX DESIGN

A. The proportions of cement, aggregates, admixtures, and water used in the concrete mixes shall be based on laboratory trial mixes in conformance with ACI 301. Trial mixes shall also conform to Article 3.01 of this Specification. Trial mix data used as the basis for the proposed concrete mix design shall be submitted to the Engineer along with the proposed mix.

B. Structural concrete shall conform to the following requirements. Cementitious materials refer to the total combined weight of all cement, fly ash, and slag cement contained in the mix.

1. Compressive Strength (28-Day)

Concrete Class A1, A5	4,500 psi (min.), 6500 psi (max.)
Concrete Class A2, A3, A4	4,000 psi (min.), 6000 psi (max.)
Concrete Class B	3,000 psi (min.), 5000 psi (max.)

2. Water/cementitious materials ratio, by weight

	Maximum	**Minimum**
Concrete Class A1, A5	0.42	0.39
Concrete Class A2, A3, A4	0.45	0.39
Concrete Class B	0.50	0.39

3. Slump range

    a. 4" nominal unless high range water reducing admixture is used

    b. 8” max if high range water reducing admixture is used.

4. Air Content

Concrete Class A1, A2, A4, A5	6% ±1.5%
Concrete Class A3, B	3% Max (non-air-entrained)

C. Lightweight concrete (Class C) shall be composed of cement, lightweight aggregate, sand, water, and admixtures, and shall conform to the following requirements:

1. Compressive Strength (28-Day) - 4,000 psi (min.), 6,000 psi (max.)

2. Minimum Cementitious Materials Content - 550 lb/cy

3. Air Content - 6% ±1.5%

4. Maximum Slump - 4"-8” after addition of high range water reducer

5. Maximum Equilibrium Density - 115 PCF

6. Lightweight aggregate shall be presoaked for 48 hours prior to mixing concrete.

PART 3 – EXECUTION

3.01 TRIAL MIXES

A. Trial mixes shall be used to confirm the quality of a proposed concrete mix in accordance with ACI 301. An independent qualified testing laboratory designated and retained by the Contractor shall test a trial batch of each of the preliminary concrete mixes submitted by the Contractor. The trial batches shall be prepared using the aggregates, cement, supplementary cementitious materials, and admixtures proposed for the project. The trial batch materials shall be of a quantity such that the testing laboratory can obtain enough samples to satisfy requirements stated below. Tests on individual materials stated in PRODUCTS should already be performed before any trial mix is done. The cost of laboratory trial batch tests for each specified concrete mix will be borne by the Contractor and the Contractor shall furnish and deliver the materials to the testing laboratory at no cost to the Owner.

B. The independent testing laboratory shall prepare a minimum of fifteen (15) standard test cylinders in accordance with ASTM C 31 in addition to conducting slump (ASTM C 143), air content (C 231) and density (C 138) tests. Compressive strength test on the cylinders shall subsequently be performed by the same laboratory in accordance with ASTM C 39

as follows: Test 3 cylinders at age 7 days; test 3 cylinders at age 21 days; test 3 cylinders at age 28 days and test 3 cylinders at 56 days. The cylinders shall be carefully identified as "Trial Mix, Contract No. “. If the average 28-day compressive strength of the trial mix is less than that specified, or if any single cylinder falls below the required strength by more than 500 psi, the mix shall be corrected, another trial batch prepared, test cylinders taken, and new tests performed as before. Any such additional trial batch testing required shall be performed at no additional cost to the Owner. Adjustments to the mix shall be considered refinements to the mix design and shall not be the basis for extra compensation to the Contractor.

3.02 SHRINKAGE TESTS

A. Concurrent with the trial batch requirements stated in Article 3.01, the testing laboratory shall perform drying shrinkage tests for the trial batches as specified herein. Shrinkage testing is only required for concrete to be used for environmental concrete structures (Class A1).

B. Fabricate, cure, dry, and measure specimens in accordance with ASTM C157 modified as follows.

1. Remove specimens from molds at an age of 23 hours ± 1 hour after trial batching.

2. Place specimens immediately in water at 70 ^{o}F ± 3 ^{o}F for at least 30 minutes.

3. Measure within 30 minutes thereafter to determine original length, then submerge in saturated lime water at 73 ^{o}F ± 3 ^{o}F.

4. At age seven days, measure to determine expansion, expressed as a percentage of original length. This length at age seven days shall be the base length for drying shrinkage calculations (zero days’ drying age).

5. Store specimens immediately in a humidity-controlled room maintained at 73 ^{o}F ± 3 ^{o}F and 50 percent ± 4 percent relative humidity for the remainder of the test.

6. Make and report separately measurements to determine shrinkage expressed as base length percentage for 7, 14, 21, and 28 days of drying after 7 days of moist curing.

C. Compute the drying shrinkage deformation for each specimen as the difference between the base length (at zero days’ drying age) and the length after drying at each test age. Compute the average drying shrinkage deformation for the specimens to the nearest 0.0001 inch at each test age. If the drying shrinkage for any specimen departs from the average test age for that test by more than 0.0004 inch, disregard the results obtained from that specimen. Report results from the shrinkage test to the nearest 0.001 percent of shrinkage. Take compression test specimens in each case from the same concrete

used for preparing drying shrinkage specimens. These tests shall be considered part of the normal compression tests for the project.

D. The maximum concrete shrinkage for specimens cast in the laboratory from the trial batch, as measured at 21-day drying age or at 28-day drying age, shall be 0.036 or 0.042 percent, respectively. Use a mix design for construction that has first met the trial batch shrinkage requirements.

E. If the trial batch specimens do not meet both the strength and shrinkage requirements, revise the mix designs and/or materials and retest.

3.03 PRODUCTION OF CONCRETE

A. All concrete shall be machine mixed. Hand mixing of concrete will not be permitted. The Contractor may supply concrete from a ready-mix concrete plant or from a site mixed plant. In selecting the source for concrete production, the Contractor shall carefully consider its capability for providing quality concrete at a rate commensurate with the requirements of the placements so that well bonded, homogenous concrete, free of cold joints, is assured.

B. Ready-Mixed Concrete

1. At the Contractor's option, ready-mixed concrete may be used meeting the requirements for materials, batching, mixing, transporting, and placing as specified herein and in accordance with ASTM C 94.

2. Truck mixers shall be equipped with electrically actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the resettable, recording type, and shall be mounted in the driver's cab. The counters shall be actuated at the time of starting mixers at mixing speeds.

3. Each batch of concrete shall be mixed in a truck mixer for not less than 100 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolutions of mixing.

4. Truck mixers and their operation shall be such that the concrete throughout the mixed batch, as discharged, is within acceptable limits of uniformity with respect to consistency, mix and grading. If slump tests taken at approximately the 1/4 and 3/4 points of the load during discharge give slumps differing by more than one inch when the specified slump is 3 inches or less, or if they differ by more than 2 inches when the specified slump is more than 3 inches, the mixer shall not be used on the work unless the causing condition is corrected and satisfactory performance is verified by additional slump tests. All mechanical details of the mixer, such as water measuring and discharge apparatus, condition of the blades, speed of

rotation, general mechanical condition of the unit and clearance of the drum, shall be checked before a further attempt to use the unit will be permitted.

5. Ready-mixed concrete shall be delivered to the site for the work and discharge shall be completed within the time requirements stated in Article 3.04 of this Section.

6. Every concrete delivery shall be accompanied by a delivery ticket containing at least the following information:

    a. Date and truck number

    b. Ticket number

    c. Mix designation of concrete

    d. Cubic yards of concrete

    e. Cement brand, type, and weight in pounds

    f. Weight in pounds of fine aggregate (sand)

    g. Weight in pounds of coarse aggregate (stone)

    h. Air entraining agent, brand, and weight in pounds and ounces

    i. Other admixtures, brand, and weight in pounds and ounces

    j. Water, in gallons, stored in attached tank

    k. Water, in gallons, maximum that can be added without exceeding design water/cementitious materials ratio

    l. Water, in gallons, used (by truck driver)

    m. Time of loading

    n. Time of delivery to job (by truck driver)

7. Any truck delivering concrete to the job site, which is not accompanied by a delivery ticket showing the above information will be rejected and such truck shall immediately depart from the job site.

8. The use of non-agitating equipment for transporting ready-mixed concrete will not be permitted. Combination truck and trailer equipment for transporting ready-mixed concrete will not be permitted. The quality and quantity of materials used in ready-mixed concrete and in batch aggregates shall be subject to inspection at the batching plant by the Engineer.

C. Site Mixed Concrete

1. Scales for weighing concrete ingredients shall be accurate when in use within ±0.4 percent of their total capacities. Standard test weights shall be available to permit checking scale accuracy.

2. Operation of batching equipment shall be such that the concrete ingredients are consistently measured within the following tolerances:

a.	Cement, fly ash, or slag cement	± 1 percent
b.	Water	± 1 percent
c.	Aggregates	± 2 percent
d.	Admixtures	± 3 percent

3. Each batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates. Water shall continue for a period which may extend to the end of the first 25 percent of the specified mixing time. Controls shall be provided to prevent batched ingredients from entering the mixer before the previous batch has been completely discharged.

4. The concrete shall be mixed in a batch mixer capable of thoroughly combining the aggregates, cement, and water into a uniform mass within the specified mixing time, and of discharging the concrete without harmful segregation. The mixer shall bear a manufacturer's rating plate indicating the rate capacity and the recommended revolutions per minute and shall be operated in accordance therewith.

5. Mixers with a rated capacity of one cubic yard or larger shall conform to the requirements of the Plant Mixer Manufacturers' Division of the Concrete Plant Manufacturers' Bureau.

6. Except as provided below, batches of one cubic yard or less shall be mixed for not less than one minute. The mixing time shall be increased 15 seconds for each cubic yard or fraction thereof of additional capacity.

7. Shorter mixing time may be permitted provided performance tests made in accordance with of ASTM C 94 indicate that the time is sufficient to produce uniform concrete.

8. Controls shall be provided to ensure that the batch cannot be discharged until the required mixing time has elapsed. At least three-quarters of the required mixing time shall take place after the last of the mixing water has been added.

9. The interior of the mixer shall be free of accumulations that will interfere with mixing action. Mixer blades shall be replaced when they have lost 10 percent of their original height.

10. Air-entraining admixtures and other chemical admixtures shall be charged into the mixer as solutions and shall be measured by means of an approved mechanical dispensing device. The liquid shall be considered a part of the mixing water. Admixtures that cannot be added in solution may be weighed or may be measured by volume if recommended by the manufacturer.

11. If two or more admixtures are used in the concrete, they shall be added separately to avoid possible interaction that might interfere with the efficiency of either admixture or adversely affect the concrete.

12. Addition of retarding admixtures shall be completed within one minute after addition of water to the cement has been completed, or prior to the beginning of the last three-quarters of the required mixing, whichever occurs first. Retarding admixtures shall not be used unless approved by the Engineer.

13. Concrete shall be mixed only in quantities for immediate use and within the time and mixing requirements of ASTM C 94.

3.04 CONCRETE PLACEMENT

A. No concrete shall be placed prior to approval of the concrete mix design. Concrete placement shall conform to the recommendations of ACI 304.

B. Prior to concrete placement, all reinforcement shall be securely and properly fastened in its correct position. Formwork shall be clean, oiled and form ties at construction joints shall be retightened. All bucks, sleeves, castings, hangers, pipe, conduits, bolts, anchors, wire, and any other fixtures required to be embedded therein shall be in place. Forms for openings to be left in the concrete shall be in place and anchored by the Contractor. All loose debris in bottoms of forms or in keyways shall be removed and all debris, water, snow, ice, and foreign matter shall be removed from the space to be occupied by the concrete. The Contractor shall notify the Engineer in advance of placement, allowing sufficient time for a concurrent inspection and for any corrective measures required.

C. On horizontal joints where concrete is to be placed on hardened concrete, flowing concrete containing a high range water reducing admixture or cement grout shall be placed with a slump not less than 8 inches for the initial placement at the base of the wall. Concrete or cement grout shall meet all strength and service requirements specified herein for applicable class of concrete. This concrete shall be worked well into the irregularities of the hard surface.

D. All concrete shall be placed during the daylight hours except with the consent of the Engineer. If special permission is obtained to carry on work during the night, adequate lighting must be provided.

E. When concrete arrives at the project with slump below that suitable for placing, as indicated by the Specifications, water may be added to bring the concrete within the specified slump range provided the design water-cementitious materials ratio is not exceeded. The water shall be incorporated by additional mixing equal to at least half of the total mixing required. Water may be added only to full trucks. On-site tempering shall not relieve the Contractor from furnishing a concrete mix meeting all specified requirements.

F. Concrete shall be conveyed as rapidly as practical to the point of deposit by methods which prevent the separation or loss of the ingredients. The concrete shall be deposited so that additional handling will be unnecessary. Discharge of the concrete to its point of deposit shall be completed within 90 minutes after the addition of the cement to the aggregates unless workability-retaining admixtures are included and approved by the Engineer. In hot weather, or under conditions contributing to quick stiffening of the concrete, the time between the introduction of the cement to the aggregates and discharge shall not exceed the requirements stated in Article 3.10 of this Section.

G. Where concrete is conveyed to position by chutes, a continuous flow in the chute shall be maintained. The angle and discharge arrangement of the chute shall be such to prevent segregation of the concrete ingredients. The delivery end of the chute shall be as close as possible to the point of deposit and in no case shall the free pour from the delivery end of the chute exceed five feet, unless approved otherwise.

H. Special care must be exercised to prevent splashing of forms or reinforcement with concrete, and any such splashes or accumulations of hardened or partially hardened concrete on the forms or reinforcement above the general level of the concrete already in place must be removed before the work proceeds.

I. Placing of concrete shall be regulated so the pressure caused by the wet concrete shall not exceed that used in the design of the forms.

J. All concrete for walls shall be placed through openings in the form spaced at frequent intervals or through tremies (heavy duct canvas, rubber, etc.), equipped with suitable hopper heads. Tremies shall be of variable lengths so the free fall shall not exceed five (5) feet, and enough tremies shall be placed in the form to ensure the concrete remains level.

K. When placing concrete which will be exposed, sufficient illumination shall be provided in the interior of the forms so the concrete, at places of deposit, is visible from deck and runways.

L. Concrete shall be placed to thoroughly embed all reinforcement, inserts, and fixtures.

M. When forms are removed, surfaces shall be even and dense, free from aggregate pockets or honeycomb. Concrete shall be consolidated using mechanical vibration, supplemented by forking and spading by hand in the corners and angle of forms and along form surfaces while the concrete is plastic under the vibratory action. Consolidation shall conform to ACI 309.

N. Mechanical vibration shall be applied directly to the concrete, unless otherwise approved by the Engineer. The bottom of vibrators used on floor slabs must not be permitted to ride the form supporting the slab. Vibration shall be applied at the point of deposit and in freshly placed concrete by a vertical penetration of the vibrator. Vibrators shall not be used to move concrete laterally within the forms.

O. The intensity of vibration shall be sufficient to cause settlement of the concrete into place and to produce monolithic joining with the preceding layer. Vibration shall be of sufficient duration to accomplish thorough compaction and complete embedment of reinforcement and fixtures with a vibrator transmitting not less than 7,500 impulses per minute. Since the duration of vibration per square foot of surface is dependent on the frequency (impulses per minute), size of vibrator, and slump of concrete, the length of time must therefore be determined in the field. Vibration shall not be continued in any one location to the extent that pools of grout are formed.

P. Care shall be taken to prevent cold joints when placing concrete in any portion of the work. The concrete placing rate shall ensure that each layer is placed while the previous layer is soft or plastic, so the two layers can be made monolithic by penetration of the vibrators. Maximum thickness of concrete layers shall be 18 inches. The surface of the concrete shall be level whenever a run of concrete is stopped.

Q. To prevent featheredges, construction joints located at the tops of horizontal lifts near sloping exposed concrete surfaces shall be inclined near the exposed surface, so the angle between such inclined surface and the exposed concrete surface will be not less than 50°.

R. In placing unformed concrete on slopes, the concrete shall be placed ahead of a non-vibrated slip-form screed extending approximately 2-1/2 feet back from its leading edge. The method of placement shall provide a uniform finished surface with the deviation from the straight line less than 1/8 inch in any concrete placement. Concrete ahead of the slip-form screed shall be consolidated by internal vibrators to ensure complete filling under the slip-form. Prior to placement of concrete on sloped walls or slabs, the Contractor shall submit a plan specifically detailing methods and sequence of placements, proposed concrete screed equipment, location of construction joints and water stops, and/or any proposed deviations from the stated requirements to the Engineer for review and approval.

S. Concrete shall not be placed during rains sufficiently heavy or prolonged to prevent washing of mortar from coarse aggregate on the forward slopes of the placement. Once placement of concrete has commenced in a block, placement shall not be interrupted by diverting the placing equipment to other uses.

3.05 PLACING FLOOR SLABS ON GROUND

A. The subgrade for slabs on ground shall be well drained and of adequate and uniform loadbearing nature. The in-place density of the subgrade soils shall be at least the minimum required by the specifications. No foundation, slab, or pavement concrete shall be placed until the depth and character of the foundation soils have been inspected and approved by the materials testing consultant.

B. The subgrade shall be free of frost before concrete placing begins. If the temperature inside a building where concrete is to be placed is below freezing, the temperature shall be raised and maintained above 50° long enough to remove all frost from the subgrade.

C. The subgrade shall be moist at the time of concreting. If necessary, the subgrade shall be dampened with water in advance of concreting, but no free water shall remain standing on the subgrade nor any muddy or soft spots when the concrete is placed.

D. Thirty-pound felt-paper shall be provided between edges of slabs-on-ground and vertical and horizontal concrete surfaces, unless otherwise indicated on the Drawings.

E. Contraction joints shall be provided in slabs-on-ground at locations indicated on the Drawings. Contraction joints shall be installed as per Section 03 15 16 – Joints in Concrete.

F. Floor slabs shall be screeded level or pitched to drain as indicated on the Drawings. Finishes shall conform with requirements of Section 03 35 00 – Concrete Finishes. Interior floor slabs shall be placed with non-air-entrained concrete (Class A3) if a steel troweled or hardened finish is required.

3.06 PLACING CONCRETE UNDERWATER (CLASS A5 CONCRETE)

A. Placing concrete underwater (tremie concrete) will be permitted only when shown on the Drawings. Concrete deposited under water shall be carefully placed in a compacted mass in final position by means of a tremie, a closed bottom dump bucket or other approved method. Care must be exercised to maintain still water at the point of deposit. Concrete shall not be placed in running water. Underwater formwork shall be watertight. The consistency of the concrete shall be regulated to prevent segregation of materials. The method of depositing concrete shall be regulated such that the concrete enters the mass of the previously placed concrete from within, displacing water with a minimum disturbance to the surface of the concrete.

B. Tremie shall consist of a tube having a diameter of not less than 10 inches and constructed in sections having flanged couplings fitted with gaskets. The tremie shall be supported to permit free movement of the discharge and over the entire top surface of the work and shall permit rapid lowering when necessary to choke off or retard the flow. The discharge end shall be sealed, and the tremie tube kept full to the bottom of the hopper. When a batch is dumped into the hopper, the tremie shall be slightly raised, but not out of the concrete at the bottom, until the batch discharges to the bottom of the

hopper. The flow shall then be stopped by lowering the tremie. The flow shall be continuous until the placement has been completed.

3.07 PLACING CONCRETE UNDER PRESSURE

A. Where concrete is conveyed and placed by mechanically applied pressure, the equipment shall have the capacity for the operation. The operation of the pump shall produce a continuous stream of concrete without air pockets. To obtain the least line resistance, the layout of the pipeline system shall contain minimum bends with no change in pipe size. If two sizes of pipe must be used, the smaller diameter should be used at the pump end and the larger at the discharge end. When pumping is completed, the concrete remaining in the pipelines shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients.

B. Priming of the concrete pumping equipment shall be with cement grout only. Use of specialty mix pump primers or pumping aids will not be allowed.

C. No aluminum parts shall be in contact with the concrete during the placing of concrete under pressure.

D. Prior to placing concrete under pressure, the Contractor shall submit the concrete mix design together with test results from a material's testing consultant proving the proposed mix meets all requirements. In addition, an actual pumping test under field conditions is required prior to acceptance of the mix. This test requires a duplication of anticipated site conditions from beginning to end. The batching and truck mixing shall be the same as will be used during construction, and the pipe and pipe layouts will reflect the maximum height and distance contemplated. All submissions shall be subject to approval by the Engineer.

E. If the pumped concrete does not produce satisfactory end results, the Contractor shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

F. The pumping equipment must have two cylinders and be designed to operate with one cylinder only in case the other one is not functioning. In lieu of this requirement, the Contractor may have a standby pump on the site during pumping.

G. The minimum diameter of the hose (conduits) shall be four inches.

H. Pumping equipment and hoses (conduits) that are not functioning properly shall be replaced.

I. Concrete samples for quality control in accordance with Article 3.11 will be taken at the placement (discharge) end of the line.

3.08 ORDER OF PLACING CONCRETE

A. To minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints shown on the Drawings and maximum lengths as indicated on Drawings. Where required on the Drawings and wherever else practical, the placing of such units shall be done in a strip pattern in accordance with ACI 302.1. A minimum of 72 hours shall pass prior to placing concrete directly adjacent to previously placed concrete.

3.09 CONCRETE WORK IN COLD WEATHER

A. Cold weather concreting procedures shall conform to the requirements of ACI 306.1.

B. The Engineer may prohibit the placing of concrete at any time when air temperature is 40°F. or lower. If concrete work is permitted, the concrete shall have a minimum temperature, as placed, of 55°F. for placements less than 12" thick, 50°F. for placements 12" to 36" thick, and 45°F. for placements greater than 36" thick. The temperature of the concrete as placed shall not exceed these minimum values by more than 20°F, unless otherwise approved by the Engineer.

C. All aggregate and water shall be preheated. Precautions shall be taken to avoid the possibility of flash set when aggregate or water are heated to a temperature greater than 100°F. to meet concrete temperature requirements. The addition of admixtures to the concrete to prevent freezing is not permitted. All reinforcement, forms, and concrete accessories shall be defrosted by an approved method. No concrete shall be placed on frozen ground.

3.10 CONCRETE WORK IN HOT WEATHER

A. Hot weather concreting procedures shall conform to the requirements of ACI 305.1.

B. When air temperatures exceed 85°F., or when extremely dry or high wind conditions exist even at lower temperatures, the Contractor and his concrete supplier shall exercise special and precautionary measures in preparing, delivering, placing, finishing, curing, and protecting the concrete mix. The Contractor shall consult with the Engineer regarding such measures prior to each day's placing operation, and the Engineer reserves the right to modify the proposed measures consistent with the requirements herein. All necessary materials and equipment shall be in place prior to each placing operation.

C. Preparatory work at the job site shall include thorough wetting of all forms, reinforcing steel and, in the case of slab pours on ground or subgrade, spraying the ground surface on the preceding evening and again just prior to placing. No standing puddles of water shall be permitted in those areas which are to receive the concrete.

D. The temperature of the concrete mix when placed shall not exceed 95°F. Mixing water and/or aggregates shall be cooled as necessary to maintain a satisfactory placement temperature.

E. Concrete shall not be placed when air temperature exceeds 100°F.

F. Temperature of mixing water and aggregates shall be carefully controlled and monitored at the supplier's plant, with haul distance to the job site being considered. Stockpiled aggregates shall be shaded from the sun and sprinkled intermittently with water. If ice is used in the mixing water for cooling purposes, the ice must be entirely melted prior to addition of the water to the dry mix.

G. Delivery schedules shall be carefully considered in advance to ensure concrete is placed as soon as practical after mixing. For hot weather concrete work (air temperature greater than 85°F), discharge of the concrete to its point of deposit shall be completed within 60 minutes from the time the concrete is batched, unless workability-retaining admixtures are included and approved by the Engineer.

H. The Contractor shall arrange for an ample work force to be on hand to accomplish transporting, vibrating, finishing, and covering of the fresh concrete as rapidly as possible.

3.11 QUALITY CONTROL

A. Field Testing of Concrete

1. The Contractor shall coordinate with the Engineer's project representative the on-site scheduling of the materials testing consultant personnel as required for concrete testing.

2. Concrete for testing shall be supplied by the Contractor at no additional cost to the Owner, and the Contractor shall assist the materials testing consultant in obtaining samples. The Contractor shall dispose of and clean up all excess material.

B. Consistency

1. The consistency of the concrete will be checked by the materials testing consultant by standard slump cone tests. The Contractor shall make any necessary adjustments in the mix as the Engineer and/or the materials testing consultant may direct and shall upon written order suspend all placing operations in the event the consistency does not meet the intent of the specifications. No payment shall be made for any delays, material, or labor costs due to such occurrences.

2. Slump tests shall be made in accordance with ASTM C 143. Slump tests will be performed as deemed necessary by the materials testing consultant and each time compressive strength samples are taken.

3. Concrete with a specified nominal slump shall be placed having a slump within 1” (higher or lower) of the specified slump. Concrete with a specified maximum slump shall be placed having a slump less than the specified slump.

C. Density

1. Samples of freshly mixed concrete shall be tested for density by the materials testing consultant in accordance with ASTM C 138.

2. Density tests will be performed as deemed necessary by the Engineer and each time compressive strength samples are taken.

D. Air Content

1. Samples of freshly mixed concrete will be tested for entrained air content by the materials testing consultant in accordance with ASTM C 231.

2. Air content tests will be performed as deemed necessary by the materials testing consultant and each time compressive strength samples are taken.

3. In the event test results are outside the limits specified, additional testing shall occur. Admixture quantity adjustments shall be made immediately upon discovery of incorrect air entrainment.

E. Compressive Strength

1. Samples of freshly mixed concrete will be taken by the materials testing consultant and tested for compressive strength in accordance with ASTM C 172, C 31, and C 39, except as modified herein.

2. In general, one sampling shall be taken for each placement more than five (5) cubic yards, with a minimum of one (1) sampling for each day of concrete placement operations, or for each one hundred (100) cubic yards of concrete, or for each 5,000 square feet of surface area for slabs or walls, whichever is greater.

3. Each sampling shall consist of at least five (5) 6x12 cylinders or (8) 4x8 cylinders. Each cylinder shall be identified by a tag, which shall be hooked or wired to the side of the container. The materials testing consultant will fill out the required information on the tag, and the Contractor shall satisfy himself that such information shown is correct.

4. The Contractor shall be required to furnish labor to the Owner for assisting in preparing test cylinders. The Contractor shall provide approved curing boxes for storage of cylinders on site. The insulated curing box shall be of sufficient size and strength to contain all the cylinders made in any four consecutive working days and to protect the specimens from falling over, being jarred, or otherwise disturbed during the period of initial curing. The box shall be erected, furnished, and

maintained by the Contractor. Such box shall be equipped to provide the moisture and to regulate the temperature necessary to maintain the proper curing conditions required by ASTM C 31. The curing box shall be placed in an area free from vibration such as pile driving and traffic of all kinds and such that all cylinders are shielded from direct sunlight and/or radiant heating sources. No concrete requiring testing shall be delivered to the site until such storage curing box has been provided. Cylinders shall remain undisturbed in the curing box until ready for delivery to the testing laboratory, but not less than sixteen hours.

5. The Contractor shall be responsible for maintaining the temperatures of the curing box during the initial curing of cylinders with the temperature preserved between 60°F and 80°F as measured by a maximum-minimum thermometer. The Contractor shall maintain a written record of curing box temperatures for each day the curing box contains cylinders. Temperature shall be recorded a minimum of three times a day with one recording at the start of the day and one recording at the end of the day.

6. When transported, the cylinders shall not be thrown, dropped, allowed to roll, or be damaged in any way.

7. Compression tests shall be performed in accordance with ASTM C 39. For 6x12 cylinders, two test cylinders will be tested at seven days and two at 28 days. For 4x8 cylinders, three test cylinders will be tested at seven days, three at 28 days. The remaining cylinders will be held to verify test results, if needed.

F. Evaluation and Acceptance of Concrete

1. Evaluation and acceptance of the compressive strength of concrete shall be according to the requirements of ACI 214, ACI 318, and ACI 350.

2. The strength level of concrete will be considered satisfactory if the following conditions are satisfied.

    a. Every arithmetic average of any three consecutive strength tests equals or exceeds the minimum specified 28-day compressive strength for the mix (see Article 2.11).

    b. No individual compressive strength test result falls below the minimum specified strength by more than 500 psi.

3. If any of the conditions listed above are not met, the mix proportions shall be corrected for the next concrete placing operation.

4. If condition 3.11.F.2.b is not met, additional tests in accordance with Article 3.11, Paragraph H shall be performed.

5. When a ratio between 7-day and 28-day strengths has been established by these tests, the 7-day strengths shall subsequently be taken as a preliminary indication of the 28-day strengths. Should the 7-day test strength from any sampling be more than 10% below the established minimum strength, the Contractor shall:

    a. Immediately provide additional periods of curing in the affected area from which the deficient test cylinders were taken.

    b. Maintain or add temporary structural support as required.

    c. Correct the mix for the next concrete placement operation, if required to remedy the situation.

6. All concrete which fails to meet the ACI requirements, and these specifications is subject to removal and replacement at no additional cost to the Owner.

G. When non-compliant concrete is identified, test reports shall be sent immediately to the Engineer for review.

H. Additional Tests

1. When ordered by the Engineer, additional tests on in-place concrete shall be provided and paid for by the Contractor.

2. If the 28-day test cylinders fail to meet the minimum strength requirements as outlined in Article 3.11, Paragraph F, the Contractor shall have concrete core specimens obtained and tested from the affected area immediately.

    a. Three cores shall be taken for each sample in which the strength requirements were not met.

    b. The drilled cores shall be obtained and tested in conformance with ASTM C 42. The tests shall be conducted by a materials testing consultant approved by the Engineer.

    c. The location from which each core is taken shall be approved by the Engineer. Each core specimen shall be located, when possible, so its axis is perpendicular to the concrete surface and not near formed joints or obvious edges of a unit of deposit.

    d. The core specimens shall be taken, if possible, so no reinforcing steel is within the confines of the core.

    e. The diameter of core specimens should be at least 3 times the maximum nominal size of the coarse aggregate used in the concrete but must be at least 2-inches in diameter.

f. The length of specimen, when capped, shall be at least twice the diameter of the specimen.

g. The core specimens shall be taken to the laboratory and when transported, shall not be thrown, dropped, allowed to roll, or damaged in any way.

h. Two (2) copies of test results shall be mailed directly to the Engineer. The concrete in question will be considered acceptable if the average compressive strength of a minimum of three test core specimens taken from a given area equal or exceed 85% of the specified 28-day strength and if the lowest core strength is greater than 75% of the specified 28-day strength.

3. If the concrete placed by the Contractor is suspected of not having proper air content, the Contractor shall engage a materials testing consultant approved by the Engineer, to obtain and test samples for air content in accordance with ASTM C 457.

3.12 CARE AND REPAIR OF CONCRETE

A. The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Care shall be exercised to avoid jarring forms or placing any strain on the ends of projecting reinforcing bars. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at no additional cost to the Owner.

B. Areas of honeycomb shall be chipped back to sound concrete and repaired as directed.

C. Concrete formwork blowouts or unacceptable deviations in tolerances for formed surfaces due to improperly constructed or misaligned formwork shall be repaired as directed. Bulging or protruding areas, which result from slipping or deflecting forms shall be ground flush or chipped out and redressed as directed.

D. Areas of concrete in which cracking, spalling, or other signs of deterioration develop prior to final acceptance shall be removed and replaced or repaired as directed. This stipulation includes concrete that has experienced cracking due to drying or thermal shrinkage of the concrete. Structural cracks shall be repaired using an approved epoxy injection system. Non-structural cracks shall be repaired using an approved hydrophilic resin pressure injected grout system unless other means of repair are deemed necessary and approved. All repair work shall be performed at no additional cost to the Owner.

E. Concrete which fails to meet the strength requirements as outlined in Article 3.11, Paragraph F, will be analyzed as to its adequacy based upon loading conditions, resultant stresses, and exposure conditions for the area of concrete in question. If the concrete in question is found unacceptable based upon this analysis, that portion of the structure shall be strengthened or replaced by the Contractor at no additional cost to the Owner. The method of strengthening or extent of replacement shall be as directed by the Engineer.

END OF SECTION

SECTION 03 35 00

CONCRETE FINISHES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Furnish all materials, labor, and equipment required to provide finishes of all concrete surfaces specified herein and shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 3 - Concrete

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ACI 301 – Specifications for Structural Concrete for Buildings

2. ACI 318 – Building Code Requirements for Structural Concrete

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittals.

1. Manufacturer's literature on all products specified herein.

PART 2 -- PRODUCTS

2.01 CONCRETE FLOOR SEALER – NOT USED

2.02 CONCRETE LIQUID DENSIFIER AND SEALANT – NOT USED

2.03 NON-METALLIC FLOOR HARDENER – NOT USED

2.04 NON-OXIDIZING HEAVY DUTY METALLIC FLOOR HARDENER – NOT USED

2.05 NON-SLIP FLOORING AGGREGATE – NOT USED

PART 3 -- EXECUTION

3.01 FINISHES ON FORMED CONCRETE SURFACES

A. After removal of forms, the finishes described below shall be applied in accordance with Article 3.05 - Concrete Finish Schedule. Unless the finish schedule specifies otherwise, all surfaces shall receive at least a Type I finish. The City's Project Representative shall be the sole judge of acceptability of all concrete finish work.

1. Type I - Rough: All fins, burrs, offsets, marks and all other projections left by the forms shall be removed. Projections, depressions, etc. below finished grade required to be removed will only be those greater than ¼-inch. All holes left by removal of ends of ties, and all other holes, depressions, bugholes, air/blow holes or voids shall be filled solid with cement grout after first being thoroughly wetted and then struck off flush. The only holes below grade to be filled will be tie holes and any other holes larger than ¼-inch in any dimension. Honeycombs shall be chipped back to solid concrete and repaired as directed by the City's Project Representative. All holes shall be filled with tools, such as sponge floats and trowels, that will permit packing the hole solidly with cement grout. Cement grout shall consist of one part cement to three parts sand, epoxy bonding agent (for tie holes only) and the amount of mixing water shall be as little as consistent with the requirements of handling and placing. Color of cement grout shall match the adjacent wall surface.

2. Type II - Grout Cleaned: Where this finish is required, it shall be applied after completion of Type I finish. After the concrete has been predampened, a slurry consisting of one part cement (including an appropriate quantity of white cement in order to produce a color matching the surrounding concrete) and 1-1/2 parts sand passing the No. 16 sieve, by damp loose volume, shall be spread over the surface with clean burlap pads or sponge rubber floats. Mix proportions shall be submitted to the City's Project Representative after a sample of the work is established and accepted. Any surplus shall be removed by scraping and then rubbing with clean burlap.

3. Type III - Smooth Rubbed: Where this finish is required, it shall be applied after the completion of the Type I finish. No rubbing shall be done before the concrete is thoroughly hardened and the mortar used for patching is firmly set. A smooth, uniform surface shall be obtained by wetting the surface and rubbing it with a carborundum stone to eliminate irregularities. Unless the nature of the irregularities requires it, the general surface of the concrete shall not be cut into. Corners and edges shall be slightly rounded by the use of the carborundum stone. Brush finishing or painting with grout or neat cement will not be permitted. A 100 square foot example shall be established at the beginning of the project to establish acceptability.

3.02 SLAB AND FLOOR FINISHES

A. The finishes described below shall be applied to floors, slabs, flow channels and top of walls in accordance with Article 3.05 - Concrete Finish Schedule. The City's Project Representative shall be the sole judge of acceptability of all such finish work.

1. Type "A" - Screeded: This finish shall be obtained by placing screeds at frequent intervals and striking off to the surface elevation required. When a Type "F" finish

is subsequently to be applied, the surface of the screeded concrete shall be roughened with a concrete rake to 1/2” minimum deep grooves prior to final set.

2. Type "B" - Wood or Magnesium Floated: This finish shall be obtained after completion of a Type "A" finish by working a previously screeded surface with a wood or magnesium float or until the desired texture is reached. Floating shall begin when the water sheen has disappeared and when the concrete has sufficiently hardened so that a person's foot leaves only a slight imprint. If wet spots occur, water shall be removed with a squeegee. Care shall be taken to prevent the formation of laitance and excess water on the finished surface. All edges shall be edged with an 1/8-inch tool as directed by the City’s Project Representative. The finished surface shall be true, even, and free from blemishes and any other irregularities.

3. Type "C" - Cork Floated: This finish shall be similar to Type "B" but slightly smoother than that obtained with a wood float. It shall be obtained by power or band floating with cork floats.

4. Type "D" - Steel Troweled: This finish shall be obtained after completion of a Type "B" finish. When the concrete has hardened sufficiently to prevent excess fine material from working to the surface, the surface shall be compacted and smoothed with not less than two thorough and complete steel troweling operations. In areas which are to receive a floor covering such as tile, resilient flooring, or carpeting, the applicable Specification Sections and Contract Drawings shall be reviewed for the required finishes and degree of flatness. In areas that are intermittently wet such as pump rooms, only one troweling operation is required to provide some trowel marks for slip resistance. All edges shall be edged with an 1/8-inch tool as directed by the City’s Project Representative. The finish shall be brought to a smooth, dense surface, free from defects and blemishes.

5. Type "E" - Broom or Belt: This finish shall provide the surface with a transverse scored texture by drawing a broom or burlap belt across the surface immediately after completion of a Type "B" finish. All edges shall be edged with an 1/8-inch tool as directed by the City’s Project Representative.

6. Type "F" - Swept in Grout Topping: This finish shall be applied after a completion of a Type "A" finish. The concrete surface shall be properly cleaned, washed, and coated with a mixture of water and Portland Cement. Cement grout in accordance with Section 03600 shall then be plowed and swept into neat conformance with the blades or arms of the apparatus by turning or rotating the previously positioned mechanical equipment. Special attention shall be paid to true grades, shapes and tolerances as specified by the manufacturer of the equipment. Before beginning this finish, the Contractor shall notify the City’s Project Representative and the equipment manufacturer of the details of the operation and obtain approval and recommendations.

7. Type “G” Hardened Finish: This finish shall be applied after completion of a Type “B” or Type “C” finish and prior to application of a Type “D” finish. Hardeners shall be applied in strict accordance with the manufacturer’s requirements. Hardeners shall be applied using a mechanical spreader. The hardener shall be applied in

two shakes with the first shake comprising 2/3 of the total amount. Type “D” finish shall be applied following completion of application of the hardener.

a. Non-metallic floor hardener shall be applied where specifically required on the Contract Drawings at the rate of 1.0 pounds/ft.^{2}.

b. Non-oxidizing heavy duty metallic floor hardener shall be applied at the loading docks and where specifically required on the Contract Drawings or specified herein at the rate of 1.5 pounds/ft.^{2}.

8. Type "H" - Non-Slip Finish: This finish shall be provided by applying a non-slip flooring aggregate concurrently with the application of a Type "D" finish. Application procedure shall be in accordance with manufacturer's instructions. Finish shall be applied where specifically required on the Contract Drawings or specified herein.

9. Type "J" - Raked Finish: This finish shall be provided by raking the surface as soon as the condition of the concrete permits by making depressions of ±1/4 inch.

3.03 CONCRETE SEALERS

A. Concrete sealers shall be applied where specifically required on the Contract Drawings or specified herein.

B. Sealers shall be applied after installation of all equipment, piping, etc. and after completion of any other related construction activities. Application of sealers shall be in strict accordance with manufacturer’s requirements.

C. Sealers shall be applied to all floor slabs and equipment pads not painted and not intended to be immersed.

D. Floor slabs subjected to vehicular traffic shall be sealed with the concrete liquid densifier and sealer.

E. All other floor slabs to receive sealer shall be sealed with concrete floor sealer.

3.04 FINISHES ON EQUIPMENT PADS – NOT USED

3.05 CONCRETE FINISH SCHEDULE

Item	Type of Finish
Concrete surfaces indicated to receive textured coating (as noted on Drawings)	I
Inner face of walls of tanks, flow channels, wet wells, perimeter walls, and miscellaneous concrete structures:	
From 1 feet below water surface to bottom of wall	II
From top of wall to 1 feet below water surface	II
Exterior concrete walls below grade	I

Item	Type of Finish
Exterior exposed concrete walls, ceilings, beams, manholes, hand holes, miscellaneous structures and columns (including top of wall) to one foot below grade. All other exposed concrete surfaces not specified elsewhere	II
All interior exposed concrete walls and vertical surfaces	III
Interior exposed ceiling, including beams	III
Floors of process equipment tanks or basins, wetwells, flow channels and slabs to receive roofing material or waterproof membranes	B
All interior finish floors of buildings and structures and walking surfaces which will be continuously or intermittently wet	D
All interior finish floors of buildings and structures which are not continuously or intermittently wet	D
Floors to receive tile, resilient flooring, or carpeting	D
Exterior concrete sidewalks, steps, ramps, decks, slabs on grade and landings exposed to weather	E
Floors of process equipment tanks indicated on Drawings to receive grout topping	F
Garage, storage area floors, and loading docks	G
Precast concrete form panels, hollow core planks, double tees	J

- **END OF SECTION** -

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SECTION 03 39 00

CONCRETE CURING

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Protect all freshly deposited concrete from premature drying and from the weather elements. The concrete shall be maintained with minimal moisture loss at a relatively constant temperature for a period necessary for the hydration of the cement and proper hardening of the concrete in accordance with the requirements specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 – Concrete Formwork

B. Section 03 30 00 – Cast-In-Place Concrete

C. Section 03 35 00 – Concrete Finishes

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ACI 301 – Specifications for Structural Concrete

2. ACI 304 – Guide for Measuring, Mixing, Transporting, and Placing Concrete

3. ACI 305.1 – Specification for Hot Weather Concreting

4. ACI 306.1 – Standard Specification for Cold Weather Concreting

5. ACI 308.1 – Specification for Curing Concrete

6. ASTM C171 – Standard Specifications for Sheet Materials for Curing Concrete

7. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

8. ASTM C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Proposed procedures for protection of concrete under wet weather placement conditions.

2. Proposed normal procedures for protection and curing of concrete.

3. Proposed special procedures for protection and curing of concrete under hot and cold weather conditions.

4. Proposed method of measuring concrete surface temperature changes.

5. Manufacturer's literature and material certification for proposed curing compounds.

PART 2 – PRODUCTS

2.01 LIQUID MEMBRANE-FORMING CURING COMPOUND (NOT USED)

2.02 EVAPORATION REDUCER (NOT USED)

PART 3 – EXECUTION

3.01 PROTECTION AND CURING

A. All freshly placed concrete shall be protected from the elements, flowing water and from defacement of any nature during construction operations.

B. As soon as the concrete has been placed and horizontal top surfaces have received their required finish, provisions shall be made for maintaining the concrete in a moist condition for at least a 7-day period thereafter, except for high early strength concrete, for which the period shall be at least the first three days after placement. Horizontal surfaces shall be kept covered, and intermittent, and localized drying will not be permitted.

C. Walls that will be exposed on one side with either fluid or earth backfill on the opposite side shall be continuously wet cured for a minimum of seven days. Use of a curing compound will not be acceptable for applications of this type.

D. The Contractor shall use one of the following methods to ensure that the concrete remains in a moist condition for the minimum period stated above.

1. Ponding or continuous fogging or sprinkling.

2. Application of mats or fabric kept continuously wet.

3. Continuous application of steam (under 150°F).

4. Application of sheet materials conforming to ASTM C171.

5. If approved by the Engineer, application of a curing compound in accordance with Article 3.04.

E. The Contractor shall keep absorbent wood forms wet until they are removed. After form removal, the concrete shall be cured by one of the methods in paragraph D.

F. Any of the curing procedures used in Paragraph 3.01-D may be replaced by one of the other curing procedures listed in Paragraph 3.01-D after the concrete is one-day old. However, the concrete surface shall not be permitted to become dry at any time.

3.02 CURING CONCRETE UNDER COLD WEATHER CONDITIONS

A. Suitable means shall be provided for a minimum of 72 hours after placing concrete to maintain it at or above the minimum as placed temperatures specified in Section 03 30 00 – Cast-In-Place Concrete, for concrete work in cold weather. During the 72-hour period, the concrete surface shall not be exposed to air more than 20°F above the minimum as placed temperatures.

B. Stripping time for forms and supports shall be increased as necessary to allow for retardation in concrete strength caused by colder temperatures. This retardation is magnified when using concrete made with blended cements or containing fly ash or slag cement. Therefore, curing times and stripping times shall be further increased as necessary when using these types of concrete.

C. The methods of protecting the concrete shall be approved by the Engineer and shall be such as will prevent local drying. Equipment and materials approved for this purpose shall be on the site in sufficient quantity before the work begins. The Contractor shall assist the Engineer by providing holes in the forms and the concrete in which thermometers can be placed to determine the adequacy of heating and protection. All such thermometers shall be furnished by the Contractor in quantity and type which the Engineer directs.

D. Curing procedures during cold weather conditions shall conform to the requirements of ACI 306.

3.03 CURING CONCRETE UNDER HOT WEATHER CONDITIONS

A. When air temperatures exceed 85°F, the Contractor shall take extra care in placing and finishing techniques to avoid formation of cold joints and plastic shrinkage cracking. If ordered by the Engineer, temporary sunshades and/or windbreakers shall be erected to guard against such developments, including generous use of wet burlap coverings and fog sprays to prevent drying out of the exposed concrete surfaces.

B. Immediately after screeding, horizontal surfaces shall receive an application of evaporation reducer. Apply in accordance with manufacturer's instructions. Final finish work shall begin as soon as the mix has stiffened sufficiently to support the workmen.

C. Curing and protection of the concrete shall begin immediately after completion of the finishing operation. Continuous moist-curing consisting of method 1 or 2 listed in paragraph 3.01D is mandatory for at least the first 24 hours. Method 2 may be used only if the finished surface is not marred or blemished during contact with the coverings.

D. At the end of the initial 24-hour period, curing and protection of the concrete shall continue for at least six (6) additional days using one of the methods listed in paragraph 3.01D.

E. Curing procedures during hot weather conditions shall conform to the requirements of ACI 305.

3.04 USE OF CURING COMPOUND

A. Curing compound shall be used only where specifically approved by the Engineer. Curing compound shall never be used for curing exposed walls with fluid or earth backfill on the opposite side. A continuous wet cure for a minimum of seven days is required for these applications. Curing compound shall not be used on surfaces exposed to water in potable water storage tanks and treatment plants unless curing compound is certified in accordance with ANSI/NSF Standard 61.

B. When permitted, the curing compound shall maintain the concrete in a moist condition for the required time, and the subsequent appearance of the concrete surface shall not be affected.

C. The compound shall be applied in strict accordance with the manufacturer's recommendations after water sheen has disappeared from the concrete surface and after finishing operations. Coverage rates for the curing and sealing compound shall be in strict accordance with manufacturer’s requirements for the specific type of finish required. For rough surfaces, apply in two directions at right angles to each other.

END OF SECTION

SECTION 03 60 00

GROUT

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnish all materials, labor, and equipment required to provide all grout used in concrete work and as bearing surfaces for base plates, in accordance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Requirements of related work are included in Division 01 and Division 02 of these Specifications.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. CRD-C 621 – Corps of Engineers Specification for Non-shrink Grout

2. ASTM C 33 – Standard Specification for Concrete Aggregates

3. ASTM C 109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch or 50 mm cube Specimens)

4. ASTM C 531 – Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts and Monolithic Surfacings

5. ASTM C 579 – Test Method for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacings

6. ASTM C 827 – Standard Test Method for Early Volume Change of Cementitious Mixtures

7. ASTM C 1107 – Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink)

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Certified test results verifying the compressive strength and shrinkage and expansion requirements specified herein.

2. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement, and appropriate uses for each type of grout used in the work.

1.05 QUALITY ASSURANCE

A. Field Tests

1. Compression test specimens will be taken during construction from the first placement of each type of grout and at intervals thereafter as selected by the Engineer to ensure continued compliance with these Specifications. The specimens will be made by the Engineer or its representative.

    a. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C 109 at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days, 28 days, and any additional times as appropriate.

    b. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B, at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days and any other time as appropriate.

2. The cost of all laboratory tests on grout will be borne by the Owner, but the Contractor shall assist the Engineer in obtaining specimens for testing. The Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications. The Contractor shall supply all materials necessary for fabricating the test specimens, at no additional cost to the Owner.

3. All grout, already placed, which fails to meet the requirements of these Specifications, is subject to removal and replacement at no additional cost to the Owner.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Cement Grout

1. Cement grout shall be composed of Portland Cement and sand in the proportion specified in the Contract Documents and the minimum amount of water necessary to obtain the desired consistency. If no proportion is indicated, cement grout shall

consist of one-part Portland Cement to three parts sand. Water amount shall be as required to achieve desired consistency without compromising strength requirements. White Portland Cement shall be mixed with the Portland Cement as required to match color of adjacent concrete.

2. The minimum compressive strength at 28 days shall be 4000 psi.

3. For beds thicker than 1-1/2 inch and/or where free passage of grout will not be obstructed by coarse aggregate, 1-1/2 parts of coarse aggregate having a top size of 3/8 inch should be added. This stipulation does not apply for grout being swept in by a mechanism. These applications shall use a plain cement grout without coarse aggregate regardless of bed thickness. Cement grout used for surfaces swept in by a mechanism shall also contain micro-synthetic fibers in accordance with Section 03 30 00.

4. Sand shall conform to the requirements of ASTM C33.

B. Non-Shrink Grout

1. Non-shrink grout shall conform to CRD-C 621 and ASTM C 1107, Grade B or C when tested at a max. fluid consistency of 30 seconds per CDC 611/ASTM C939 at temperature extremes of 45°F and 90°F and an extended working time of 15 minutes. Grout shall have a min. 28-day strength of 7,000 psi. Non-shrink grout shall be, "Euco N-S" by the Euclid Chemical Company, "Sikagrout 212" by Sika Corporation, “Conspec 100 Non-Shrink Non-Metallic Grout” by Conspec, “MasterFlow 928” by Master Builders Solutions.

C. Epoxy Grout

1. Epoxy grout shall be "Sikadur 32 Hi-Mod" by Sika Corporation, "Duralcrete LV" by Tamms Industries, or "Euco #452 Series" by Euclid Chemical, “MasterEmaco ADH 1090 RS” by Master Builders Solutions.

2. Epoxy grout shall be modified as required for each application with aggregate per manufacturer's instructions.

D. Epoxy Base Plate Grout

1. Epoxy base plate grout shall be “Sikadur 42, Grout-Pak” by Sika Corporation, or “MasterFlow 648” by Master Builders Solutions.

2.02 CURING MATERIALS

A. Curing materials shall be as specified in Section 03 39 00 – Concrete Curing for cement grout and as recommended by the manufacturer for prepackaged grouts.

PART 3 – EXECUTION

3.01 GENERAL

A. The different types of grout shall be used for the applications stated below unless noted otherwise in the Contract Documents. Where grout is called for in the Contract Documents which does not fall under any of the applications stated below, non-shrink grout shall be used unless another type is specifically referenced.

1. Cement grout shall be used for grout toppings and for patching of fresh concrete, when approved by the Engineer. Grout toppings swept in by equipment mechanisms shall contain micro-synthetic fibers as specified in Section 03 30 00.

2. Non-shrink grout shall be used for grouting beneath base plates of structural metal framing.

3. Epoxy grout shall be used for bonding new concrete to hardened concrete.

4. Epoxy base plate grout shall be used for precision seating of base plates including base plates for all equipment such as engines, mixers, pumps, vibratory and heavy impact machinery, etc.

B. New concrete surfaces to receive cement grout shall be as specified in Section 03 35 00 – Concrete Finishes, and shall be cleaned of all dirt, grease, and oil-like films. Existing concrete surfaces shall likewise be cleaned of all similar contamination and debris, including chipping, or roughening the surface if a laitance or poor concrete is evident. The finish of the grout surface shall match that of the adjacent concrete. Curing and protection of cement grout shall be as specified in Section 03 39 00 – Concrete Curing.

C. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

D. The Contractor, through the manufacturer of a non-shrink grout and epoxy grout, shall provide on-site technical assistance upon request, at no additional cost to the Owner.

3.02 CONSISTENCY

A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the application. Dry pack consistency is such that the grout is plastic and moldable but will not flow.

3.03 MEASUREMENT OF INGREDIENTS

A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.

B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

3.04 GROUT INSTALLATION

A. Grout shall be placed quickly and continuously, shall completely fill the space to be grouted and be thoroughly compacted and free of air pockets. The grout may be poured in place, pressure grouted by gravity, or pumped. The use of pneumatic pressure or dry-packed grouting requires approval of the Engineer. For grouting beneath base plates, grout shall be placed from one side only and allowed to flow across to the open side to avoid air-entrapment.

END OF SECTION

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SECTION 05 56 00
CASTINGS

PART 1 – GENERAL

1.01 REQUIREMENT

A. Furnish all materials, labor, and equipment required to provide all castings in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 33 05 61 – Utility Structures

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. International Building Code – 2000

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Complete fabrication and erection drawings of all castings specified herein.

PART 2 – PRODUCTS

2.01 METAL MATERIALS (NOT USED)

2.02 METAL FASTENING (NOT USED)

2.03 IRON CASTINGS

A. General - Iron Castings shall include, but not be limited to frames, covers, and grates for trench drains, catch basins, and inlets.

1. Castings shall be of gray iron of uniform quality, free from defects, smooth and well cleaned by shotblasting.

2. Catalog numbers on the Drawings are provided only to show required types and configuration. All covers shall be cast with raised letters as designated on the Drawings.

3. Castings shall be as manufactured by East Jordan Ironworks or approved equal.

B. Covers and Grates

1. Covers and grates shall be provided with matching frames. Cover shall fit flush with the surrounding finished surface. The cover shall not rock or rattle when loading is applied.

2. Round covers and frames shall have machined bearing surfaces.

3. Covers shall have a minimum of four bolts and a gasket designed to seal cover and frame.

4. Manhole frames and covers shall be watertight.

5. Manholes frames and covers shall be Model V-1430A (32-inch cover diameter, 40 3/4-inch base frame diameter and 4 ½-inch height) assembly with “Brownsville Public Utilities Board” and “Sanitary Sewer” engravings.

6. Design loadings:

a. At all locations the design loading shall be a standard AASHTO H-20 truck loading, unless otherwise noted.

C. Watertight gasketing, bolting, locking devices, patterns, lettering, pickholes, vents, or self-sealing features shall be as detailed on the Drawings.

PART 3 – EXECUTION

3.01 FABRICATION

A. All measurements and dimensions shall be based on field conditions and shall be verified by the Contractor prior to fabrication. Such verification shall include coordination with adjoining work.

B. All fabricated work shall be shop fitted together as much as practicable, and delivered to the field, complete and ready for erection. All miscellaneous items such as stiffeners, fillets, connections, brackets, and other details necessary for a complete installation shall be provided.

C. Finished members shall conform to the lines, angles, and curves shown on the Drawings and shall be free from distortions of any kind.

3.02 INSTALLATION

A. Assembly and installation of fabricated system components shall be performed in strict accordance with manufacturer's recommendations.

B. All castings shall be erected square, plumb and true, accurately fitted, adequately anchored in place, and set at proper elevations and positions.

END OF SECTION

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SECTION 07 90 00
JOINT FILLERS, SEALANTS AND CAULKING

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnish labor, materials, equipment and appliances required for the complete execution of Work shown on the Drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 15 00 – Concrete Accessories

B. Section 03 15 16 – Joints in Concrete

C. Section 08 80 00 – Glass and Glazing3

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ASTM C-920 – Elastomeric Joint Sealants

2. ASTM D-1056 – Flexible Cellular Materials – Sponge or Expanded Rubber

3. SWRI – Sealant and Caulking Guide Specification

1.04 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01 33 00 – Submittal Procedures, submit the following:

1. Manufacturers literature and installation instructions. Label each product submitted with Type as indicated in paragraph 2.01 A.

2. Color samples of each type of sealant.

1.05 QUALITY ASSURANCE

A. Applicator shall be a company specializing in the installation of sealants with a minimum of five years of experience.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unopened labeled packages.

B. Store materials in location protected from freezing or damages.

C. Reject and remove from the site materials within broken or damaged packaging.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Sealants

1. Type 1: Multi-component, non-sag, low-modulus polyurethane rubber sealant meeting ASTM C-920, Type M, Grade NS, Class 25, use NT, M, A, and O. Capable of withstanding 25% in extension or compression such as Sikaflex-2C NS/SL, Sika Corporation, or Sonolastic NP-2, Sonneborn, or DynaTrol II by Pecora Corporation.

2. Type 2: Single component polyurethane sealant meeting ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, A, and O. Capable of withstanding 25% in extension or compression such as Sikaflex 1A by Sika Corporation, DynaTrol 1-XL by Pecora Corporation, or Sonolastic NP-1 by Master Builders Solutions.

3. Type 3: Single component, low-modulus moisture curing silicone meeting ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, G, and A. Capable of withstanding 50% extension and compression. Pecora 890 by Pecora Corporation, Sonolastic Omni Seal by Master Builders Solutions.

4. Type 4: Single component, mildew resistant, moisture-curing silicone meeting ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, G, and A. Pecora 898 by Pecora Corporation, Sonolastic Omni Plus by Master Builders Solutions.

5. Type 5: Single component, acrylic latex meeting ASTM C-834. AC-20+ Silicone by Pecora Corporation, Sonneborn Sonolac by Master Builders Solutions.

6. Type 6: High grade butyl sealant meeting Federal Specification TT-S-00-1657. BC-158 by Pecora Corporation or equal.

7. Type 7: Multi-component chemical resistant polysulfide sealant conforming to ASTM C-920, Type M, Grade NS, Class 25 such as Deck-O-Seal by W.R. Meadows, Tammsflex by DuraJoint Concrete Accessories, or Synthacalk GC2+ by Pecora Corporation.

8. Type 8: Nonsag, Multi Component, traffic grade polyurethane sealant meeting ASTM C920, Type M, Grade NS, Class 25, use T, M, A, and O. DynaTread by Pecora Corporation, MasterSeal CR 195 by Master Builders Solutions.

B. Primer: Non-staining primer recommended by sealant manufacturer for the substrates on this project.

C. Backer Rod: Closed cell foam, nonreactive with caulking materials, non-oily, and approved by the sealant manufacturer. Minimum density shall be 2.00 pounds per cubic foot. Use no asphalt or bitumen-impregnated fiber with sealants.

D. Joint Cleaner: Recommended by sealant or caulking compound manufacturer.

E. Bond breaker: Either polyethylene film or plastic tape as recommended by the sealant manufacturer.

F. Board Expansion Joint Material: Filler board of selected stock. Use wood of density and type as follows:

1. Clear, all-heart cypress weighing no more than 40 pounds per cubic foot, after being oven dried to constant weight.

2. Clear, all-heart redwood weighing no more than 30 pounds per cubic foot, after being oven dried to constant weight.

G. Preformed Expansion Joint Material: Bituminous fiber and bituminous mastic composition material conforming to ASTM D 994 and ASTM D 1751.

H. Load Transmission Devices:

1. Smooth, steel dowel bars conforming to ASTM A 615, Grade 60. Encase one end of dowel bar in approved cap having inside diameter 1/16 inch greater than diameter of dowel bar.

2. Deformed steel tie bars conforming to ASTM A 615, Grade 60.

I. Metal Supports for Reinforcing Steel and Joint Assembly: Employ metal supports of approved shape and size that will secure reinforcing steel and joint assembly in correct position during placing and finishing of concrete.

PART 3 – EXECUTION

3.01 QUALITY CONTROL

A. Coordinate work with details shown on approved shop drawings prepared by other trades.

B. Verify conditions in the field.

C. Schedule work to follow closely the installation of other trades.

D. Apply sealants and related items in temperatures and dry conditions recommended by the manufacturers.

E. Do not paint sealant, unless recommended by sealant and paint manufacturer.

3.02 PREPARATION

A. When new work is adjacent to existing concrete, place joints at same location as existing joints in adjacent pavement.

B. If the limit of removal of existing concrete or asphaltic pavement does not fall on existing joint, saw cut existing pavement minimum of 2 inches deep to provide straight, smooth joint surface without chipping, spalling or cracks.

C. Protect finished surfaces adjoining by using masking tape or other suitable materials.

D. Clean and prime joints before starting any caulking or sealing work.

E. Thoroughly clean joints and spaces of mortar and other foreign materials. Cleaning agent shall be Xylol or similar non-contaminating solvent to remove any film from metal surfaces. Masonry or concrete surfaces shall be brushed or air jet cleaned.

F. Joint Requirements

1. All joints and spaces to be sealed in exterior work shall be less than ½-inch deep and not less than 1/4 inch wide. If joints in masonry are less than that specified herein, the mortar shall be cut out to the required width and depth. All joints and spaces to receive sealant shall be completely prepared and thoroughly dry before installation of sealant.

2. Unless otherwise specified, joints and spaces which are open to a depth of 1/2 inch or greater shall be solidly filled with back-up material to within 1/4 inch of the surface. Back-up material shall be packed tightly and made continuous throughout the length of the joints. Bond breaker shall be applied as required. If joints are less than ¼-inch deep, the back-up material may be omitted, a bond breaker substituted and the joint completely filled with sealant. The back-up material shall not project beyond the ¼-inch depth of the open space in any joint. The following width-to-depth ratio table shall be adhered to, unless otherwise recommended by manufacturer.

	Sealant Depth	
Joint Width	**Minimum**	**Maximum**

¼ inch	1/4 inch	1/4 inch
Over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
Over 1/2 inch to 1 inch	1/2 inch	Equal to width
Over 1 inch to 2 inches	1/2 inch	1/2 of width

3.03 APPLICATION

A. Seal joints only when surface and joints are dry, cured and an ambient temperature is above 50 degrees F and less than 85 degrees F, and weather is not foggy or rainy.

B. Exercise care before, during, and after installation so as not to damage any material by tearing or puncturing. All finished work shall be approved before covering with any other material or construction.

C. Apply sealant by an approved type of gun except where the use of a gun is not practicable, suitable hand tools shall be used. Avoid applying the compound to any surface outside of the joints or spaces to be sealed. Mask areas where required to prevent overlapping of sealant.

D. All joints shall be waterproof and weathertight.

E. Point sealed joints to make a slightly concave joint, the edges of which are flush with the surrounding surfaces. Exposed joints in the interior side of the door and other frames shall be neatly pointed flush or to match adjacent jointing work.

F. Adjacent materials which have been soiled shall be cleaned immediately and the work left in neat and clean condition.

G. Comply with sealant manufacturer's written instructions except where more stringent requirements are shown or specified and except where manufacturer's technical representative directs otherwise.

3.04 ADJUSTMENT AND CLEANING

A. Remove misplaced sealant compounds promptly using methods and materials recommended by the manufacturer, as the work progresses.

B. Allow sealants to cure and remove protective edging, of doors, louvers, saddles windows etc. as directed by the Engineer.

3.05 SCHEDULE

Schedule of Sealants

Application	Sealant	Color
Vertical and horizontal expansion and construction joints in concrete structures unless noted otherwise herein or on Drawings.	Type 1	To closely match adjacent surfaces or mortar and as selected by the Owner.
Vertical and horizontal joints bordered on both sides by masonry, precast concrete, natural stone or other porous building material, unless noted otherwise herein or on Drawings.	Type 2	To closely match adjacent surfaces or mortar and as selected by the Owner.
Vertical and horizontal joints bordered on both sides by painted metals, anodized aluminum, mill finished aluminum, PVC, glass or other non-porous building material.	Type 3	To closely match adjacent surfaces and as selected by the Owner.
Masonry expansion and control joints less than 1¼" wide.	Type 2	To closely match adjacent surfaces and as selected by the Owner.
Masonry expansion and control joints equal or greater than 1¼ inches wide and not to exceed 2".	Type 1	To closely match adjacent surfaces and as selected by the Owner.
Interior – wood trim and finish joints.	Type 5	Color to be selected by Owner
Sanitary areas, joints in ceramic tile, around plumbing fixtures, countertops, and back splashes.[1]	Type 4	To closely match adjacent surfaces and as selected by the Owner.
Perimeter sealing of doors, windows, louvers, piping, ducts, and electrical conduit.[2]	Type 2 OR Type 3	To closely match adjacent surfaces and as selected by the Owner.
Below thresholds.	Type 6	Manufacturer's standard
Submerged in liquids.[3,4]	Type 1	Manufacturer's standard
Submerged in liquids with high concentration of chlorine (> 2 ppm) or wastewater.	Type 7	Manufacturer's standard
Horizontal Joints exposed to vehicular or pedestrian traffic.	Type 8	To closely match adjacent surfaces.
Other joints indicated on the drawings or customarily sealed but not listed.	Type recommended by manufacturer	To closely match adjacent surfaces and as selected by the Owner.

[1] Sealant for Laboratory Countertop shall be as recommended by countertop manufacturer.
[2] Provide UL approved sealants for penetrations thru fire-rated walls and as specified in Section 07 84 00 - Firestopping.
[3] Sealants which will come in contact with potable water shall meet the requirements of NSF 61.
[4] Where sealant will be immersed in liquid chemicals verify compatibility prior to installation of sealant.

END OF SECTION

SECTION 31 00 01

EARTHWORK

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, equipment, and materials required to complete all work associated with excavation (including off-site borrow excavation), fill and backfill placement and compaction, coordination for testing of soil materials and compaction, constructing embankments, dewatering, construction of drainage layers, installing foundation and backfill aggregate, placing filter and separation fabrics, stockpiling topsoil and any excess suitable material, designing, installing, maintaining and removing excavation support systems, disposing of all excess and unsuitable materials, providing erosion and sedimentation control, encasing utility conduits, site grading, preparation of pavement and structure subgrades, and other related and incidental work as required to complete the work shown on the Drawings and as specified herein.

B. Materials testing associated with Earthwork shall be paid for by Owner. However, Contractor will be required to cover costs associated with re-testing or excessive mobilization (testing done more than once per day).

C. All excavations shall be in conformity with the lines, grades, and cross sections shown on the Drawings or established by the Engineer.

D. It is the intent of this Specification that the Contractor conduct the construction activities in such a manner that erosion of disturbed areas and off-site sedimentation be absolutely minimized.

E. Earthwork performed under this Contract shall be done in conformance with these specifications. Items and activities not addressed herein shall be subject to the limitations of the latest editions of the Texas Department of Transportation Standard Specifications for Roads and Structures. If there is a conflict between this specification and the Standard Specifications for Roads and Structures, the more conservative of the two shall take precedent.

F. Erosion and Sediment Control shall be performed in accordance with Section 31 25 00 of these specifications.

G. All fill materials (soil, aggregate, topsoil, etc.) imported to the site and onsite materials to be reused as fill, backfill, or embankment shall be subjected to the testing requirements contained in Part 3.0 of this Section. The Contractor shall retain a Materials Testing Consultant who shall perform all testing. The test results shall be used to determine if a material meets the requirements included herein. The Contractor shall furnish all necessary samples for laboratory testing and shall provide assistance and cooperation

during field tests. The Contractor shall plan their operations to allow adequate time for laboratory tests and to permit taking of field density tests during compaction.

H. Any costs for re-testing required as a result of failure to meet compaction requirements shall be borne solely by the Contractor.

I. Contractor shall indemnify and hold harmless the Owner, Engineer and their employees and agents, from any and all damages, costs (including, without limitation, legal fees, court costs, and the cost of investigation), judgements or claims by anyone for injury or death of persons resulting from the collapse or failure of trenches constructed under this Contract.

J. Contractor acknowledges and agrees that this indemnity provision provides indemnity for the Owner and Engineer in case the Owner or Engineer are negligent either by act or omission in providing for trench safety, including, but not limited to safety program and design reviews, inspections, failures to issue stop work orders, and the hiring of the Contractor.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Requirements of related work are included in Divisions 01, 02, 31, and 32 of these Specifications.

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the Specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced Specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. American Society for Testing and Materials (ASTM):

    a. ASTM C127 – Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.

    b. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

    c. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3 (600 kN-m/m^3))

    d. ASTM D1140 – Standard Test Method for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing

    e. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by Sand Cone Method.

f. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/lb^3 (2,700 kN-m/m^3)).

g. ASTM D1883 – Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils.

h. ASTM D2216 – Test for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

i. ASTM D2487 – Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

j. ASTM D4253 – Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

k. ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

l. ASTM D5268-22 - Standard Specification for Topsoil Used for Landscaping and Construction Purposes

m. ASTM D6913 - Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

n. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil Aggregate by Nuclear Methods (Shallow Depth).

1.04 SUBSURFACE CONDITIONS

A. Information on subsurface conditions is referenced under Division 01, General Requirements.

B. Attention is directed to the possible location of water pipes, sanitary pipes, storm drains, and other utilities located in the area of proposed excavation. In the event excavation activities disrupt service, the Contractor shall perform all repairs at no additional cost to the Owner. The Contractor shall contact www.Texas811.com or dial 811 to request underground utility location mark-out at least three (3) working days, not including the day the request is called in, but no more than ten (10) working days prior to the beginning of excavation. The Contractor shall also contact and request utility location mark-out from buried utility owners with utilities on the project site that are not participants of www.Texas811.com.

1.05 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01 33 00 – Submittal Procedures, the Contractor shall submit the following:

1. Evidence the Contractor has a minimum of five (5) years of experience performing excavation and backfill in flood embankments similar in size to the work for this project.

2. Name and location of all material suppliers.

3. Certificate of compliance with the standards specified herein for each source of each material.

4. List of disposal sites for waste and unsuitable materials and all required permits for use of those sites.

5. Plans and cross sections of open cut excavations showing side slopes and limits of the excavation at grade.

6. Procedures for dewatering proposed by the Contractor shall be submitted to the Engineer for review and approval prior to any earthwork operations.

7. Samples of synthetic filter fabric and reinforced plastic membrane with manufacturer's certificates or catalog cuts stating the mechanical and physical properties. Samples shall be at least one (1) foot wide and four (4) feet long taken across the roll with the warp direction appropriately marked.

8. Construction drawings and structural calculations for any types of excavation support required. Drawings and calculations shall be sealed by a currently registered Professional Engineer in the State in which the project is located.

9. Monitoring plan and pre-construction condition inspection and documentation of all adjacent structures, utilities, and roadways near proposed installation of excavation support systems and near areas where dewatering is required to facilitate construction.

10. A representative sample of the on-site or off-site source of each class of fill material weighing approximately 50 lbs. The sample shall be delivered to a location designated by the Engineer.

11. The Contractor shall be required to submit plans of open cut excavation for review by the Engineer before approval is given to proceed.

12. Submit excavation support installer qualifications with installation history.

13. Drawings and calculations on proposed excavation support systems sealed by a Professional Engineer currently registered in the in the State in which the project is located.

14. Contractor shall also submit a monitoring plan developed by the excavation support design engineer.

15. Earthwork contractor qualifications.

16. All required permits and a list of disposal sites for unsuitable materials within thirty (30) consecutive days after Notice to Proceed. If the disposal site is located on private property, the submittal shall also include written permission from the owner of record.

17. Except where borrow is to be obtained from a commercial source, a borrow source development, use, and reclamation plan jointly developed by the Contractor and the property owner prior to engaging in any land disturbing activity on the proposed source (other than material sampling that may be necessary). The Contractor's plan shall address the following:

    a. Drainage: The source shall be graded to drain such that no water will collect or stand, and a functioning drainage system shall be provided. If drainage is not practical, and the source is to serve as a pond, the minimum average depth below the water table shall be 4 feet or the source graded so as to create wetlands as appropriate, or as agreed to with the property owner

    b. Slopes: The source shall be dressed and shaped in a continuous manner to contours which are comparable to and blend in with the adjacent topography, but in no case will slopes steeper than 3:1 be permitted.

    c. Erosion Control: Except where borrow is to be obtained from a commercial source, the Contractor and the property owner shall jointly submit a Borrow Source Development, Use, and Erosion Control Plan to the appropriate State or Local permitting authority for approval and provide evidence of such to the Engineer for their approval prior to engaging in any land disturbing activity on the proposed source other than material sampling that may be necessary.

1.06 PRODUCT HANDLING

A. Soil and rock material shall be excavated, transported, placed, and stored in a manner so as to prevent contamination, segregation and excessive wetting. Materials which have become contaminated or segregated will not be permitted in the performance of the work and shall be removed from the site.

1.07 USE OF EXPLOSIVES **(NOT USED)**

PART 2 – PRODUCTS

2.01 FILL MATERIALS

A. The contractor shall be responsible for providing fill materials meeting the gradation requirements specified in Section 31 06 20.16 – Utility Backfill Materials.

B. All fill materials shall be free of organic material, environmental contaminants, snow, ice, frozen soil, or other unsuitable material.

C. Contractor may stockpile excavated material for a limited amount of time only if approved in writing by the Owner. Soil materials may be stockpiled as necessary to sort, segregate, test, and transfer the materials. Excess material shall be removed from the site for off-site disposal as directed by the Owner. No stockpiling of excavated material is allowed in a manner or location that would permit erosion and its subsequent sedimentation in wetlands or other natural areas.

2.02 SELECT FILL

A. Select fill shall be used at all locations.

B. Select fill shall not include particles or lumps larger than 3 inches.

C. Select fill used as backfill against walls shall not contain any rock larger than 1½ -inches.

D. Select fill shall consist of non-plastic materials classifying as GW, GW-GM, GP, SW, SW-SM, SP-SM, or SP per ASTM D-2487. Select fill shall be free of organic material, environmental contaminants, snow, ice, frozen soil, or other unsuitable material.

E. Open-graded and dense-graded aggregates meeting the gradation requirements above may be used as Select Fill.

F. Select Fill shall be compacted to not less than 95 percent of the maximum dry density obtainable by ASTM D 698 and does not contain unsuitable material.

G. Select Fill shall be compacted at a moisture content within 20 percent of the optimum moisture content of the fill material in accordance with the ASTM D 698, Standard Proctor.

H. All materials used as Select Fill are subject to approval by the Engineer.

2.03 SAND BEDDING

A. Sand bedding shall meet the requirements of Bank Run Sand and shall be classified as SP, SW, or SM according to ASTM D 2487.

B. Durable bank run sand shall have less than 15 percent passing the number 200 sieve when tested in accordance with ASTM D 1140. The amount of clay lumps shall not exceed 2 percent.

C. Durable bank run sand passing the number 40 sieve shall have a liquid limit not exceeding 25 percent and a plasticity index not exceeding 7 when tested in accordance with ASTM D 4318.

2.04 COMMON FILL

A. Common Fill shall be used where shown on the Contract Drawings.

B. Common Fill shall consist of non-organic on-site soils classifying as CH, MH, CL, ML, SC, SM, SP, SW, GC, GM, GP, or GW according to ASTM D 2487.

C. Common Fill shall be placed in 8-inch-thick loose lifts.

D. Common Fill shall be compacted to not less than 95 percent of the maximum dry density obtainable by ASTM D 698 and does not contain unsuitable material.

E. Common Fill shall be compacted at a moisture content within 20 percent of the optimum moisture content of the fill material in accordance with the ASTM D 698, Standard Proctor.

F. All material used as common fill is subject to approval by the Engineer. If there is insufficient suitable material onsite, import whatever additional material is required which conforms to the specifications, at no additional cost to the Owner.

G. Select Fill may be used as Common Fill, subject to approval by the Engineer. Select fill may be used as Common Fill at no change in the Contract Price.

2.05 TOPSOIL

A. Topsoil shall be friable and loamy (loam, sandy loam, silt loam, sandy clay loam, clay loam). It shall be free of debris, trash, stumps, rocks, roots, and noxious weeds, and shall give evidence of being able to support healthy vegetation. It shall contain no substance potentially toxic to plant growth.

B. All topsoil shall be tested before use on site by a recognized laboratory for the following criteria according to local standards (or at a minimum according to ASTM D5268-22, Table 1): Organic matter content shall not be less than 3% by weight. pH range shall be from 5.5 -7.5. If pH is less than 5.5, lime shall be added in accordance with test results or in accordance with the recommendations of the vegetative establishment practice being used. Soluble salts shall not exceed 2.5 mmhos/cm ppm. If additional topsoil is needed, it must meet the standards stated above.

C. Soils falling within the ranges of ASTM D5268-22, Table 1 shall form a suitable topsoil. Soils being used as a topsoil with organic content matter contents between 10% and 90% may need to be amended prior to use. If soils proposed for use as topsoil do not meet the criteria of Table 1, an engineered soil amendment may be added to meet the requirements. When using an engineered soil amendment, the organic matter values need to be greater than 75%.

2.06 GEOTEXTILES

A. The Contractor shall provide geotextiles as indicated on the Contract Drawings and specified herein. The materials and placement shall be as indicated under Section 31 05 19 - Geotextiles.

PART 3 – EXECUTION

3.01 STRIPPING OF TOPSOIL (NOT USED)

3.02 EXCAVATION

A. All material excavated, regardless of its nature or composition, shall be classified as UNCLASSIFIED EXCAVATION. Excavation shall include the removal of all soil, rock, weathered rock, rocks of all types, boulders, conduits, pipe, all other obstacles encountered, and all other obstacles shown to be removed within the limits of excavation shown on the Contract Drawings or specified herein. The cost of excavation shall be included in the Lump Sum Bid Price and no additional payment will be made for the removal of obstacles encountered within the excavation limits shown on the Drawings and specified herein.

B. All suitable material removed in the excavation shall be used as far as practicable in the formation of embankments, subgrades, and shoulders, and at such other places as may be indicated on the Drawings or indicated by the Engineer. No excavation shall be wasted except as may be permitted by the Engineer. Refer to the drawings for specific location and placement of suitable excavated materials in the formation of embankments, backfill, and structural and roadway foundations. THE ENGINEER AND/OR MATERIALS TESTING CONSULTANT WILL DESIGNATE MATERIALS THAT ARE UNSUITABLE. The Contractor shall furnish off-site disposal areas for the unsuitable material. Where suitable materials containing excessive moisture are encountered above grade in cuts, the Contractor shall construct above grade ditch drains prior to the excavation of the cut material when in the opinion of the Engineer and/or materials testing consultant such measures are necessary to provide proper construction.

C. All excavations shall be made in the dry and in such a manner and to such widths as will give ample room for properly constructing and inspecting the structures and/or piping they are to contain and for such excavation support, pumping and drainage as may be required. Excavation shall be made in accordance with the grades and details shown on the Drawings and as specified herein.

D. It is the intent of these Specifications that all structures shall bear on an aggregate base, crushed stone or screened gravel bedding placed to the thickness shown on the Drawings, specified in these Specifications, or not less than 6-inches. Bedding for process piping shall be as specified in Section 40 05 00 – Basic Mechanical Requirements, or as shown on the Drawings.

E. The bottom of all excavations for structures and pipes shall be examined by the Engineer and/or materials testing consultant for bearing value and the presence of unsuitable material. If, in the opinion of the Engineer and/or materials testing consultant, additional excavation is required due to the low bearing value of the subgrade material, or if the in place soils are soft, yielding, pumping or wet, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted select fill, and/or crushed stone or screened gravel as indicated by the Engineer. Payment for such additional work ordered by the Engineer shall be made as an extra by a Change Order in accordance with the General Conditions and Division 01. No payment will be made for subgrade disturbance caused by inadequate dewatering or improper construction methods.

F. All cuts shall be brought to the grade and cross section shown on the Drawings, or established by the Engineer, prior to final inspection and acceptance by the Engineer.

G. Slides and over-breaks which occur due to negligence, carelessness or improper construction techniques on the part of the Contractor shall be removed and disposed of by the Contractor as indicated by the Engineer at no additional cost to the Owner. If grading operations are suspended for any reason whatsoever, partially completed cut and fill slopes shall be brought to the required slope and the work of seeding and mulching or other required erosion and sedimentation control operations shall be performed.

H. Where the excavation exposes sludge, sludge contaminated soil or other odorous materials, the Contractor shall cover such material at the end of each workday with a minimum of 6 inches and a maximum of 24-inches of Common fill. The work shall be an odor abatement measure and the material shall be placed to the depth deemed satisfactory by the Engineer for this purpose.

3.03 EXCAVATION SUPPORT

A. The Contractor shall furnish, place, and maintain such excavation support which may be required to provide safe working conditions and support sides of excavation or to protect structures, pipes, and utilities from possible. The Contractor shall be exclusively responsible for maintaining safe working conditions and structure integrity without overstressing or damaging existing structures, pipes, and utilities resulting from the Contractor temporarily placing, moving, or removing loads on or adjacent to existing structures, pipes, and utilities. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, the Engineer may order additional supports put in at the expense of the Contractor. The Contractor shall be responsible for the adequacy of all supports used and for all damage resulting from failure of support system or from placing, maintaining and removing the support system.

B. The selection of and design of any proposed excavation support systems is exclusively the responsibility of the Contractor. Contractor shall submit drawings and calculations to the Engineer on the proposed systems sealed by a Professional Engineer currently registered in the in the State in which the project is located.

C. The excavation support system shall be installed by a specialized contactor with a minimum of five (5) years' experience installing the type of excavation support system proposed.

D. The Contractor shall exercise caution in the installation and removal of supports to ensure no excessive or unusual loadings or vibrations are transmitted to any new or existing structure. The Contractor shall promptly repair at their expense any and all damage that can be reasonably attributed to installation or removal of excavation support system.

E. Contractor shall monitor movement and vibration in the excavation support systems as well as movement and vibration at adjacent structures, utilities and roadways near excavation supports. Contractor shall submit a monitoring plan developed by the excavation support design engineer. All pre-construction condition assessment and documentation of adjacent structures on-site and off-site shall be performed by the Contractor. If any sign of distress such as cracking or movement occurs in any adjacent structure, utility or roadway during installation of supports, subsequent excavation, service period of supports, subsequent backfill and construction, or removal of supports, Engineer shall be notified immediately. The Contractor shall be exclusively responsible for repair of any damage to any roadway, structure, utility, pipes, etc. both on-site and off-site, as a result of their operations.

F. All excavation supports shall be removed upon completion of the work except as indicated herein. The Engineer may permit supports to be left in place at the request and expense of the Contractor. The Engineer may order certain supports left permanently in place in addition to that required by the Contract. The cost of the materials so ordered left in place, less a reasonable amount for the eliminated expense of the removal work omitted, will be paid as an extra by a Change Order in accordance with the General Conditions and Division 01. Vibrations of new and existing structures shall be considered when the Contractor decides whether to remove excavation supports or leave them in place. Any excavation supports left in place shall be cut off at least two (2) feet below the finished ground surface or as directed by the Engineer.

3.04 PROTECTION OF SUBGRADE

A. To minimize the disturbance of bearing materials and provide a firm foundation, the Contractor shall comply with the following requirements:

1. Use of heavy rubber tired construction equipment shall not be permitted on the final subgrade unless it can be demonstrated that drawdown of groundwater throughout the entire area of the structure is at least 3 feet below the bottom of the excavation (subgrade). Even then, the use of such equipment shall be prohibited should subgrade disturbance result from concentrated wheel loads.

2. Subgrade soils disturbed through the operations of the Contractor shall be excavated and replaced with compacted select fill or crushed stone at the Contractor's expense as indicated by the Engineer.

3. The Contractor shall provide positive protection against penetration of frost into materials below the bearing level during work in winter months. This protection can consist of a temporary blanket of straw or salt hay covered with a plastic membrane or other acceptable means.

3.05 PROOF-ROLLING (NOT USED)

A. The subgrade of all structures and all areas that will support pavements or select fill shall be proof-rolled. After stripping of topsoil, excavation to subgrade and prior to placement of fills, the exposed subgrade shall be carefully inspected by probing and testing as needed. Any topsoil or other organic material still in place, frozen, wet, soft, or loose soil, and other undesirable materials shall be removed. The exposed subgrade shall be proof-rolled with a heavily loaded tandem-wheeled dump truck to check for pockets of soft material hidden beneath a thin crust of better soil. Any unsuitable materials thus exposed shall be removed and replaced with an approved compacted material, as directed by the Materials Consultant.

3.06 DEWATERING

A. The Contractor shall do all dewatering as required for the completion of the work. Procedures for dewatering proposed by the Contractor shall be submitted to the Engineer for review prior to any earthwork operations.

B. The dewatering system shall be of sufficient size and capacity as required to control groundwater or seepage to permit proper excavation operations, embankment construction and reconstruction, subgrade preparation, and to allow concrete to be placed in a dry condition. The system shall include a sump system or other equipment, appurtenances and other related earthwork necessary for the required control of water. The Contractor shall drawdown groundwater to at least 2 feet below the bottom of excavations (subgrade), over the entire tempo, at all times in order to maintain a dry and undisturbed condition.

C. The Contractor shall control, by acceptable means, all water regardless of source. Water shall be controlled, and its disposal provided for at each berm, structure, etc. The entire periphery of the excavation areas shall be ditched and diked to prevent water from entering the excavation. The Contractor shall be fully responsible for disposal of the water and shall provide all necessary means at no additional expense to the Owner. The Contractor shall be solely responsible for proper design, installation, proper operation, maintenance, and any failure of any component of the system.

D. The Contractor shall be responsible for and shall repair without cost to the Owner, any damage to work in place and the excavation, including damage to the bottom due to heave and including removal of material and pumping out of the excavated area. The Contractor shall be responsible for damages to any other area or structure caused by their failure to maintain and operate the dewatering system proposed and installed by the Contractor.

E. The Contractor shall be responsible for and shall repair, without cost to the Owner, any damage to work in place and nearby structures, roadways, and utilities which can be reasonably attributed to dewatering operations. This includes settlement of structures, roadways, and utilities due to dewatering of soils supporting the structures, roadways, and utilities.

F. The Contractor shall take all the steps that they consider necessary to familiarize himself with the surface and subsurface site conditions, and shall obtain the data that is required to analyze the water and soil environment at the site and to assure that the materials used for the dewatering systems will not erode, deteriorate, or clog to the extent that the dewatering systems will not perform properly during the period of dewatering. Copies of logs of borings and laboratory test results are available to the Contractor. This data is furnished for information only, and it is expressly understood that the Owner and Engineer will not be held responsible for any interpretations or conclusions drawn therefrom by the Contractor.

G. Prior to the execution of the work, the Contractor, Owner and Engineer shall jointly survey the condition of adjoining structures. Photographs and records shall be made of any prior settlement or cracking of structures, pavements, and the like, that may become the subject of possible damage claims.

H. Refer to Section 31 23 19 – Dewatering for additional details and requirements.

3.07 FILL OR EMBANKMENTS (NOT USED)

3.08 BACKFILLING

A. All structures and pipes shall be backfilled with the type of materials shown on the Drawings and specified herein. Fill placed as structure or utility backfill shall be deposited in successive, uniform, approximately horizontal lifts. The thickness of each lift shall not exceed the requirements of Paragraph 3.09, COMPACTION.

B. Each lift of fill placed backfill shall be thoroughly compacted to the density specified for each type of fill included in Paragraph 3.09, COMPACTION.

C. Where excavation support is used, the Contractor shall take all reasonable measures to prevent loss of support beneath and adjacent to pipes and existing structures when supports are removed. If significant volumes of soil cannot be prevented from clinging to the extracted supports, the voids shall be continuously backfilled as rapidly as possible. The Contractor shall thereafter limit the depth below subgrade that supports will be installed in similar soil conditions or employ other appropriate means to prevent loss of support.

D. Backfill against concrete or masonry structure shall not be performed until the Work has been reviewed and backfilling permitted. Backfill against walls shall also be deferred until the structural slab for floors above the top fill line have been placed and attained design strength or earlier at the discretion of the Engineer. Partial backfilling against

adequately braced wall may be considered by the Engineer on an individual situation basis. Where walls are to be waterproofed, all Work shall be completed and membrane materials dried or cured according to the manufacturer's instructions before backfilling.

E. Backfill against tanks and other structures which are to retain liquids shall not be performed until leakage tests are completed and accepted by the Engineer in accordance with the Section entitled "Water Tightness Testing".

3.09 COMPACTION

A. The Contractor shall compact embankments, backfill, crushed stone, aggregate base, and in place subgrade in accordance with the requirements of this Section. The densities specified herein refer to percentages of maximum density as determined by the noted test methods. Compaction of materials on the project shall be in accordance with the following schedule:

	Density % Standard Proctor (D 698)	Density % Mod. Proctor (D 1557)	Max. Lift Thickness as Compacted Inches
Embankments Beneath Structures, Roadways, and Sidewalks*	98	92	8
Common Fill Areas	95	90	8
Backfill Around Structures	95	90	8
Backfill in Pipe Trenches	95	90	8
Crushed Stone Beneath Structures	**	**	12
Select Sand	98	92	8
Aggregate Base Course (ABC) Beneath Structures, Roadways, and Sidewalks	**	**	8
Crushed Stone Backfill	**	**	12
Crushed Stone Pipe Bedding	**	**	12
In Place Subgrade Beneath Structures, Roadways, and Sidewalks	98	92	Top 12-inches

* Embankments beneath structures shall be considered to include a zone 10 feet out from the foundation of the structure extending down to the natural ground on a 45° slope.
** The aggregate shall be compacted to a degree acceptable to the Engineer by use of a vibratory compactor and/or crawler tractor.

B. Compaction Near Existing Structures

1. Vibratory equipment shall not be used with 25 feet of any existing structure.

2. Within 25 feet of any existing structure, non-vibratory compaction equipment such as a drum roller with a maximum weight of 4 tons should be used. Within 5 feet of any existing structure, a walk behind vibratory sled or roller shall be used.

C. Field density tests will be made by the Materials Testing Consultant to determine if the specified densities have been achieved, and these tests shall be the basis for accepting or rejecting the compaction. In-place density tests will be performed in accordance with ASTM D 1556, ASTM D 1557, or ASTM D 6938. The Engineer, in conjunction with the Materials Testing Consultant, will be the judge as to which test method will be the most appropriate. Failure to achieve the specified densities shall require the Contractor to recompact the material or remove it as required. The Contractor shall, if necessary, increase the compactive effort by increasing the number of passes, using heavier or more suitable compaction equipment, or by reducing the thickness of the layers. The Contractor shall adjust the moisture contents of the soils to bring them within the optimum range by drying them or adding water as required.

D. Testing will be performed as frequently as deemed necessary by the Engineer and/or Materials Testing Consultant. As a minimum, one in place density test shall be performed for each 1000 cubic yards of embankment placed and 500 cubic yards of backfill placed or one test performed each day for either or as directed by the Engineer or recommended by Material Testing Consultant.

3.10 VIBRATION MONITORING (NOT USED)

3.11 REMOVAL OF EXCESS AND UNSUITABLE MATERIALS

A. All excess and unsuitable materials shall be disposed of in locations and under conditions that comply with federal, state and local laws and regulations.

B. All excess and unsuitable materials shall be hauled in trucks of sufficient capacity and tight construction to prevent spillage. Trucks shall be covered to prevent the propagation of dust.

C. When all excess and unsuitable material disposal operations are completed, the Contractor shall leave the disposal sites in a condition acceptable to the Owner and Owner(s) of the disposal site(s).

3.12 BORROW EXCAVATION (NOT USED)

END OF SECTION

SECTION 31 05 19

GEOTEXTILES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install all Geotextiles, including all necessary and incidental items, as detailed or required for the Contractor to complete the installation in accordance with the Drawings and these Specifications.

B. For the location of each type of Geotextile see the Drawings.

1.02 REFERENCES

A. ASTM Standards

1. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles

2. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

3. ASTM D5261 - Standard Test Method for Measuring Mass per Unit Area of Geotextiles

4. ASTM D6241 - Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe

B. AASHTO Standards

1. AASHTO M 288-06 (2011) Geotextile Specification for Highway Applications

1.03 SUBMITTALS

A. Prior to shipping to the site, the Contractor shall submit to the Engineer two copies of a mill certificate or affidavit signed by a legally authorized official of the Manufacturer for each type of Geotextile. The Supplier shall also submit three Geotextile samples of each product, 1 yard square each, seamed and unseamed as appropriate, with the mill certificate for each Geotextile type supplied. The mill certificate or affidavit shall attest that the Geotextile meets the chemical, physical and manufacturing requirements stated in the specifications. The samples shall be labeled with the manufacturer's lot number, machine direction, date of sampling, project number, specifications, manufacturer and product name.

B. The Engineer shall be furnished copies of the delivery tickets or other acceptable receipts as evidence for materials received that will be incorporated into construction.

PART 2 – MATERIALS

2.01 MATERIALS

A. Filter Geotextile shall be a minimum 6-ounce per square yard (nominal) nonwoven needle punched synthetic fabric consisting of staple or continuous filament polyester or polypropylene manufactured in a manner accepted by the Engineer and the Owner. The Geotextiles shall be inert and unaffected by long-term exposure to chemicals or liquids with a pH range from 3 to 10. The Geotextiles shall have a minimum threshold water head of 0.25-inches in the "as received" condition.

1. Filter Geotextile shall have a Survivability Class of Class 1 or 2 in accordance with AASHTO M288, unless otherwise specified herein.

B. Cushion Geotextile shall be a minimum 16-ounce per square yard nonwoven needle punched synthetic fabric consisting of continuous filament or staple polyester or polypropylene manufactured in a manner accepted by the Engineer and the Owner. The Geotextiles shall be inert and unaffected by long-term exposure to chemicals or liquids with a pH range from 3 to 10.

1. Cushion Geotextile shall have a Survivability Class of Class 1 in accordance with AASHTO M288.

C. Type I Separator Geotextile shall be a minimum 8-ounce per square yard (nominal) nonwoven needle punched synthetic fabric consisting of staple or continuous filament polyester or polypropylene manufactured in a manner accepted by the Engineer and the Owner. The Geotextiles shall be inert and unaffected by long term exposure to chemicals or liquids with a pH range from 3 to 10.

1. Type I Separator Geotextile shall have a Survivability Class of Class 1 or 2 in accordance with AASHTO M288, unless otherwise specified herein.

D. Type II Separator Geotextile shall be a woven slit film or monofilament synthetic fabric consisting of polyester or polypropylene in a manner approved by the Engineer. Geotextile shall be treated to resist degradation due to exposure to ultraviolet light.

1. Type II Separator Geotextile shall have a Survivability Class of Class 1 in accordance with AASHTO M288, unless otherwise specified herein.

E. All Geotextiles shall conform to the properties listed using the test methods listed in Table 1. The Contractor shall be responsible for timely submittals of all confirmation test data for Geotextiles.

PART 3 – EXECUTION

3.01 SHIPPING, HANDLING AND STORAGE

A. During all periods of shipment and storage, all Geotextiles shall be protected from direct sunlight, temperature greater than 140°F water, mud, dirt, dust, and debris.

B. To the extent possible, the Geotextile shall be maintained wrapped in heavy-duty protective covering until use. Geotextile delivered to the project site without protective covering shall be rejected. After the protective covering has been removed, the Geotextile shall not be left uncovered for longer than fourteen (14) days, under any circumstances.

C. The Owner shall approve the shipping and delivery schedule prior to shipment. The Owner shall designate the on-site storage area for the Geotextiles. Unloading and storage of Geotextiles shall be the responsibility of the Contractor.

D. Geotextiles that are damaged during shipping or storage shall be rejected and replaced at Contractor expense.

3.02 QUALITY ASSURANCE CONFORMANCE TESTING

A. At the option of the Engineer representative samples of Geotextiles shall be obtained and tested by the Engineer to assure that the material properties conform to these Specifications. Conformance testing shall be conducted by the Engineer and paid for by the Owner.

B. Conformance testing shall be completed at a minimum frequency of one sample per 100,000 square feet of Geotextile delivered to the project site. Sampling and testing shall be as directed by the Engineer.

C. Conformance testing of the Geotextiles shall include but not be limited to the following properties:

1. Mass Per Unit Area (ASTM D5261)

2. Grab Tensile Strength (ASTM D4632)

3. Trapezoidal Tear (ASTM D4533)

4. Puncture Resistance (ASTM D6241)

D. The Engineer may add to, remove or revise the test methods used for determination of conformance properties to allow for use of improved methods.

E. All Geotextile conformance test data shall meet or exceed requirements outlined in Table 1 of these Specifications for the particular category of Geotextile prior to

installation. Any materials that do not conform to these requirements shall be retested or rejected at the direction of the Engineer.

F. Each roll of Geotextile will be visually inspected by the Engineer or his representative. The Engineer reserves the right to sample and test at any time and reject, if necessary, any material based on visual inspection or verification tests.

G. A Geotextile that is rejected shall be removed from the project site and replaced at the Contractor's expense. Sampling and conformance testing of the Geotextile supplied as replacement for rejected material shall be performed by the Engineer at Contractor's expense.

3.03 INSTALLATION

A. Geotextiles shall be placed to the lines and grades shown on the Drawings. At the time of installation, the Geotextile shall be rejected by the Owner's representative if it has defects, rips, holes, flaws, evidence of deterioration, or other damage.

B. It is the intent of these Specifications that Geotextiles used to protect natural drainage media be placed the same day as the drainage media to prevent soil, sediment or windblown soils to make contact with the drainage media.

C. The Geotextiles shall be placed smooth and free of excessive wrinkles. Geotextiles shall conform to and be in contact with the approved subgrade.

D. When the Geotextiles are placed on slopes, the upslope fabric portion shall be lapped such that it is the upper or exposed Geotextile.

E. Geotextiles shall be temporarily secured in a manner accepted by the Owner's representative prior to placement of overlying materials.

F. In the absence of specific requirements shown on the Drawings, the following shall be used for overlaps of adjacent rolls of Geotextile:

Geotextile Type / Application	Overlap of Adjacent Rolls(1) (Inches)	Transverse End Overlap (Inches)
Filter Geotextile	6 min	12 min
Cushion Geotextile	12 min	12 min
Separator - Roadway Applications	12 min	24 min
Separator - Slope Protection	18 min	24 min
Separator Geotextile	12 min	18 min

(1) Overlaps may be reduced if adjacent panels are sewn or heat bonded where approved by the Engineer.

G. Any Geotextile that is torn or punctured shall be repaired or replaced as directed by the Owner's representative by the Contractor at no additional cost to the Owner. The repair shall consist of a patch of the same type of Geotextile placed over the failed areas and shall overlap the existing Geotextile a minimum of 12-inches from any point of the rupture.

H. Any Geotextile that is subjected to excessive sediment buildup on its surface during construction shall be replaced by the Contractor prior to placement of overlying material.

Table 1: Minimum Required Geotextile Properties*

Geotextile Property	Filter Geotextile	Cushion Geotextile	Type I Separator Geotextile	Type II Separator Geotextile
Geotextile Construction	Nonwoven Needle punched	Nonwoven Needle punched	Nonwoven Needle punched	Woven
Ultraviolet Resistance, (500 hrs.) ASTM D7238, Average % Strength Retention	70	70	70	70
Grab Tensile Strength (lbs.), ASTM D4632	120	340	160	315
Grab Tensile elongation (%) ASTM D4632	50	50	50	15
Trapezoid Tear Strength (lbs) ASTM D4533	50	155	60	120
Apparent Opening Size (AOS), (mm), ASTM D4751	0.212	N/A	0.212	0.425
Permittivity at 50 mm constant head (sec^{-1}), ASTM D4491	0.5	N/A	1.5	0.1
CBR Puncture Strength, ASTM D6241 (lb)	340	1100	410	900

* MINIMUM AVERAGE ROLL VALUE (MARV)

END OF SECTION

SECTION 31 06 20.16

UTILITY BACKFILL MATERIALS

PART 1 – GENERAL

1.01 Section includes:

A. Material Classifications.

B. Utility Backfill Materials:

1. Concrete sand

2. Gem sand

3. Pea gravel

4. Crushed Aggregate: Crushed stone

5. Crushed Aggregate: Crushed concrete

6. Bank run sand

7. Select backfill

8. Random backfill

C. Material Handling and Quality Control Requirements.

1.02 DEFINITIONS

A. Unsuitable Material: Unsuitable soil materials are the following:

1. Materials that are classified as ML, CL-ML, MH, PT, OH, and OL according to ASTM D 2487.

2. Materials that cannot be compacted to the required density because of either gradation, plasticity, or moisture content.

3. Materials that contain large clods, aggregate, and stones greater than 4 inches in any dimension; debris, vegetation, and waste; or any other deleterious materials.

4. Materials that are contaminated with hydrocarbons or other chemical contaminants.

B. Suitable Material: Suitable soil materials are the following:

1. Those meeting this specification requirements.

2. Unsuitable soils meeting specification requirements for suitable soils after treatment with lime or cement.

C. Foundation Backfill Materials: Natural soil or manufactured aggregate meeting Class I requirements and geotextile filter fabrics as required, to control drainage and material separation. Foundation backfill material is placed and compacted as backfill where needed to provide stable support for the structure foundation base. Foundation backfill materials may include concrete fill and seal slabs.

D. Foundation Base: Crushed stone aggregate with filter fabric as required, cement stabilized sand, or concrete seal slab. The foundation base provides a smooth, level working surface for the construction of the concrete foundation.

E. Backfill Material: Classified soil material meeting specified quality requirements for the designated application as embedment or trench zone backfill.

F. Embedment Material: Soil material placed under controlled conditions within the embedment zone extending vertically upward from top of foundation to an elevation 12 inches above top of pipe, and including pipe bedding, haunching, and initial backfill.

G. Trench Zone Backfill: Classified soil material meeting specified quality requirements and placed under controlled conditions in the trench zone from top of embedment zone to base coarse in paved areas or to the surface grading material in unpaved areas.

H. Foundation: Either suitable soil of the trench bottom, or material placed as backfill of over-excavation for removal and replacement of unsuitable or otherwise unstable soils.

I. Source: A source selected by the Contractor for supply of embedment or trench zone backfill material. A selected source may be the project excavation, off-site borrow pits, commercial borrow pits, or sand and aggregate production or manufacturing plants.

J. Refer to Section 31 23 16.16 - Excavation and Backfill for Utilities for other definitions regarding utility installation by trench construction.

1.03 REFERENCES

A. ASTM C 33 - Specification for Concrete Aggregate.

B. ASTM C 40 - Test Method for Organic Impurities in Fine Aggregates for Concrete.

C. ASTM C 123 - Test Method for Lightweight Pieces in Aggregate.

D. ASTM C 131 - Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

E. ASTM C 136 - Test Method for Sieve Analysis of Fine and Coarse Aggregates.

F. ASTM C 142 - Test Method for Clay Lumps and Friable Particles in Aggregates.

G. ASTM D 1140 - Test Method for Amount of Materials in Soils Finer Than No. 200 Sieve.

H. ASTM D 2487 - Classification of Soils for Engineering Purposes (Unified Soil Classification System).

I. ASTM D 2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).

J. ASTM D 4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

K. ASTM D 4643 - Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method.

L. TxDOT Tex-101-E - Preparation of Soil and Flexible Base Materials for Testing.

M. TxDOT Tex-104-E - Test Method for Determination of Liquid Limit of Soils (Part 1)

N. TxDOT Tex-106-E - Test Method - Methods of Calculating Plasticity Index of Soils.

O. TxDOT Tex-110-E - Determination of Particle Size Analysis of Soils.

1.04 SUBMITTALS

A. Conform to requirements of Section 01 33 00 - Submittal Procedures.

B. Submit a description of source, material classification and product description, production method, and application of backfill materials.

C. Submit test results for samples of off-site backfill materials to comply with Paragraph 2.3, Materials Testing.

D. Before stockpiling materials, submit a copy of temporary easement or approval from landowner for stockpiling backfill material on private property.

E. For each delivery of material, provide a delivery ticket which includes source location.

1.05 TESTS

A. Perform tests of sources for backfill material in accordance with Paragraph 2.3.

B. Verification tests of backfill materials may be performed by the Owner in accordance with Section 01 45 29 - Testing Laboratory Services and in accordance with Paragraph 3.3.

C. Random fill obtained from the project excavation as source is exempt from pre-qualification requirements by Contractor but must be inspected by the testing lab for unacceptable materials based on ASTM D 2488.

PART 2 – PRODUCTS

2.01 MATERIAL CLASSIFICATIONS

A. Materials for backfill shall be classified for the purpose of quality control in accordance with the Unified Soil Classification Symbols as defined in ASTM D 2487. Material use and application is defined in utility installation specifications and Drawings either by class, as described in Paragraph 2.1B, or by product descriptions, as given in Paragraph 2.2.

B. Class Designations Based on Laboratory Testing:

1. Class I: Well-graded gravels and sands, gravel-sand mixtures, crushed well-graded rock, little or no fines (GW, SW):

    a. Plasticity index: nonplastic.

    b. Gradation: D60/D10 - greater than 4 percent; amount passing No. 200 sieve - less than or equal to 5 percent.

2. Class II: Poorly graded gravels and sands, silty gravels and sands, little to moderate fines:

    a. Plasticity index: nonplastic to 4.

    b. Gradations:

        1) Gradation (GP, SP): amount passing No. 200 sieve - less than 5 percent.

        2) Gradation (GM, SM): amount passing No. 200 sieve - between 12 percent and 50 percent.

        3) Borderline gradations with dual classifications (e.g., SP-SM): amount passing No. 200 sieve - between 5 percent and 12 percent.

3. Class III: Clayey gravels and sands, poorly graded mixtures of gravel, sand, silt, and clay (GC, SC, and dual classifications, e.g., SP-SC):

    a. Plasticity index: greater than 7.

    b. Gradation: amount passing No. 200 sieve - between 12 percent and 50 percent.

4. Class IVA: Lean clays (CL).

    a. Plasticity Indexes:

        1) Plasticity index: greater than 7, and above A line.

        2) Borderline plasticity with dual classifications (CL-ML): PI between 4 and 7.

    b. Liquid limit: less than 50.

    c. Gradation: amount passing No. 200 sieve - greater than 50 percent.

    d. Inorganic.

5. Class IVB: Fat clays (CH)

    a. Plasticity index: above A line.

    b. Liquid limit: 50 or greater.

    c. Gradation: amount passing No. 200 sieve - greater than 50 percent.

    d. Inorganic.

6. Use soils with dual class designation according to ASTM D 2487, and which are not defined above, according to the more restrictive class.

2.02 PRODUCT DESCRIPTIONS

A. Soils classified as silt (ML), elastic silt (MH), organic clay and organic silt (OL, OH), and organic matter (PT) are not acceptable as backfill materials. These soils may be used for site grading and restoration in unimproved areas as approved by the Owner. Soils in Class IVB, fat clay (CH) may be used as backfill materials where allowed by the applicable backfill installation specification.

B. Provide backfill material that is free of stones greater than 4 inches, free of roots, waste, debris, trash, organic material, unstable material, non-soil matter, hydrocarbon or other contamination, conforming to the following limits for deleterious materials:

1. Clay lumps: Less than 0.5 percent for Class I, and less than 2.0 percent for Class II, when tested in accordance with ASTM C 142.

2. Lightweight pieces: Less than 5 percent when tested in accordance with ASTM C 123.

3. Organic impurities: No color darker than standard color when tested in accordance with ASTM C 40.

C. Manufactured materials, such as crushed concrete, may be substituted for natural soil or rock products where indicated in the product specification, and approved by the Engineer, provided that the physical property criteria are determined to be satisfactory by testing.

D. Bank Run Sand: Durable bank run sand classified as SP, SW, or SM by the Unified Soil Classification System (ASTM D 2487) meeting the following requirements:

1. Less than 15 percent passing the number 200 sieve when tested in accordance with ASTM D 1140. The amount of clay lumps or balls not exceeding 2 percent.

2. Material passing the number 40 sieve shall meet the following requirements when tested in accordance with ASTM D 4318:

a. Liquid limit: not exceeding 25 percent.

b. Plasticity index: not exceeding 7.

Concrete Sand: Natural sand, manufactured sand, or a combination of natural and manufactured sand conforming to the requirements of ASTM C 33 and graded within the following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
3/8”	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

E. Gem Sand: Sand conforming to the requirements of ASTM C 33 for coarse aggregates specified for number 8 size and graded within the following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
3/8”	95 to 100
No. 4	60 to 80
No. 8	15 to 40

F. Pea Gravel: Durable particles composed of small, smooth, rounded stones or pebbles and graded within the following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
1/2”	100
3/8”	85 to 100
No. 4	10 to 30
No. 8	0 to 10

No. 16	0 to 5

G. Crushed Aggregates: Crushed aggregates consist of durable particles obtained from an approved source and meeting the following requirements:

1. Materials of one product delivered for the same construction activity from a single source.

2. Non-plastic fines.

3. Los Angeles abrasion test not exceeding 45 percent when tested in accordance with ASTM C 131.

4. Crushed aggregate shall have a minimum of 90 percent of the particles retained on the No. 4 sieve with 2 or more crushed faces as determined by Test Method Tex-460-A, Part I.

5. Crushed stone: Produced from oversize plant processed stone or gravel, sized by crushing to predominantly angular particles from a naturally occurring single source. Uncrushed gravel is not acceptable material for embedment where crushed stone is shown on the applicable utility embedment drawing details.

6. Crushed Concrete: Crushed concrete is an acceptable substitute for crushed stone as utility backfill. Gradation and quality control test requirements are the same as crushed stone. Provide crushed concrete produced from normal weight concrete of uniform quality; containing particles of aggregate and cement material, free from other substances such as asphalt, reinforcing steel fragments, soil, waste gypsum (calcium sulfate), or debris.

7. Gradations, as determined in accordance with Tex-110-E.

Sieve	Percent Passing by Weight for Pipe Embedment by Ranges of Nominal Pipes Sizes		
	>15”	15” – 8”	<8”
1”	95 - 100	100	-
3/4”	60 - 90	90 -100	100
1/2”	25 - 60	-	90 - 100
3/8”	-	20 - 55	40 - 70
No. 4	0 - 5	0 - 10	0 - 15
No. 8	-	0 - 5	0 - 5

H. Select Backfill: Class III clayey gravel or sand or Class IV lean clay with a plasticity index between 7 and 20 or clayey soils treated with lime in accordance with Section 32 01 00 - Pavement Repair and Resurfacing, to meet plasticity criteria. Structural Select Backfill shall need the requirements described in the design plans or as directed by the Engineer.

I. Cement Stabilized Sand: Conform to requirements of Section 31 32 13.16 - Cement Stabilized Sand.

J. Concrete Backfill: Conform to Class B concrete as specified in Section 33 05 16 - Concrete for Utility Construction.

2.03 MATERIAL TESTING

A. Ensure that material selected, produced and delivered to the project meets applicable specifications and is of sufficient uniform properties to allow practical construction and quality control.

B. Source or Supplier Qualification. Perform testing, or obtain representative tests by suppliers, for selection of material sources and products. Provide test results for a minimum of three samples for each source and material type. Test samples of processed materials from current production representing material to be delivered. Tests shall verify that the materials meet specification requirements. Repeat qualification test procedures each time the source characteristic changes or there is a planned change in source location or supplier. Qualification tests shall include, as applicable:

1. Gradation. Complete sieve analyses shall be reported regardless of the specified control sieves. The range of sieves shall be from the largest particle through the No. 200 sieve.

2. Plasticity of material passing the No. 40 sieve.

3. Los Angeles abrasion test of material retained on the No. 4 sieve.

4. Clay lumps.

5. Lightweight pieces

6. Organic impurities

PART 3 – EXECUTION

3.01 SOURCES

A. Use of material encountered in the trench excavations is acceptable, provided applicable specification requirements are satisfied. If excavation material is not acceptable, provide from other approved source.

B. Identify off-site sources for backfill materials at least 14 days ahead of intended use so that the Owner or Lab may obtain samples for verification testing.

C. Obtain approval for each material source by the Owner before delivery is started. If sources previously approved do not produce uniform and satisfactory products, furnish materials from other approved sources. Materials may be subjected to inspection or additional verification testing after delivery. Materials which do not meet the specifications will be rejected. Do not use material which, after approval, has become unsuitable for use due to segregation, mixing with other materials, or by contamination. Once a material is approved by the Owner, expense for sampling and testing required to change to a different material will be credited to the Owner through a change order.

D. Bank run sand, select backfill, and random backfill, if available in the project excavation, may be obtained by selective excavation and acceptance testing. Obtain additional quantities of these materials and other materials required to complete the work from off-site sources.

E. The Owner or any provided geotechnical reference information does not represent or guarantee that any soil found in the excavation work will be suitable and acceptable as backfill material.

3.02 MATERIAL HANDLING

A. When backfill material is obtained from either a commercial or non-commercial borrow pit, open the pit to expose the vertical faces of the various strata for identification and selection of approved material to be used. Excavate the selected material by vertical cuts extending through the exposed strata to achieve uniformity in the product.

B. Establish temporary stockpile locations for practical material handling and control, and verification testing by the Owner in advance of final placement. Obtain approval from landowner for storage of backfill material on adjacent private property.

C. When stockpiling backfill material near the project site, use appropriate covers to eliminate blowing of materials into adjacent areas and prevent runoff containing sediments from entering the drainage system.

D. Place stockpiles in layers to avoid segregation of processed materials. Load material by making successive vertical cuts through entire depth of stockpile.

3.03 FIELD QUALITY CONTROL

A. Quality Control

1. The Owner or Engineer may sample, and test backfill at:

a. Sources including borrow pits, production plants and Contractor's designated off-site stockpiles.

b. On-site stockpiles.

c. Materials placed in the Work.

2. The Owner or Engineer may resample material at any stage of work or location if changes in characteristics are apparent.

B. Production Verification Testing: The Owner's testing laboratory will provide verification testing on backfill materials, as directed by the Engineer. Samples may be taken at the source or at the production plant, as applicable.

END OF SECTION

SECTION 31 10 00

CLEARING, GRUBBING, AND SITE PREPARATION

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Includes all labor, material, equipment and appliances required for the complete execution of any additions, modifications, or alterations to existing building(s) and new construction work as shown on the Drawings and specified herein.

B. Principal items of work include:

1. Notifying all authorities owning utility lines running to or on the property. Protecting and maintaining all utility lines to remain and capping those that are not required in accordance with instructions of the Utility Companies, and all other authorities having jurisdiction.

2. Clearing the site within the Contract Limit Lines, including removal of grass, brush, shrubs, trees, loose debris and other encumbrances except for trees marked to remain.

3. Boxing and protecting all trees, shrubs, lawns and the like within areas to be preserved. Relocating trees and shrubs, so indicated on the Drawings, to designated areas.

4. Repairing all injury to trees, shrubs, and other plants caused by site preparation operations shall be repaired immediately. Work shall be done by qualified personnel in accordance with standard horticultural practice and as approved by the Engineer.

5. Removing topsoil to its full depth from designated areas and stockpiling on site where directed by the Engineer for future use.

6. Disposing from the site all debris resulting from work under this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 31 00 01 – Earthwork

B. Section 31 25 00 – Erosion and Sedimentation Control

1.03 STREET AND ROAD BLOCKAGE

A. Closing of streets and roads during progress of the work shall be in compliance with the requirements of the Owner and other authorities having jurisdiction. Access shall be provided to all facilities remaining in operation.

1.04 PROTECTION OF PERSONS AND PROPERTY

A. All work shall be performed in such a manner to protect all personnel, workmen, pedestrians and adjacent property and structures from possible injury and damage.

B. All conduits, wires, cables and appurtenances above or below ground shall be protected from damage.

C. Provide warning and barrier fence where shown on the Drawings and as specified herein.

PART 2 – EXECUTION

2.01 CLEARING OF SITE

A. Before removal of topsoil, and start of excavation and grading operations, the areas within the clearing limits shall be cleared and grubbed.

B. Clearing shall consist of cutting, removal, and satisfactory disposal of all trees, fallen timber, brush, bushes, rubbish, sanitary landfill material, fencing, and other perishable and objectionable material within the areas to be excavated or other designated areas. Prior to the start of construction, the Contractor shall survey the entire Contract site and shall prepare a plan which defines the areas to be cleared and grubbed, trees to be pruned, extent of tree pruning, and/or areas which are to be cleared but not grubbed. This plan shall be submitted to the Engineer for approval. Should it become necessary to remove a tree, bush, brush or other plants adjacent to the area to be excavated, the Contractor shall do so only after permission has been granted by the Engineer.

C. Excavation resulting from the removal of trees, roots and the like shall be filled with suitable material, as approved by the Engineer, and thoroughly compacted per the requirements contained in Section 31 00 01 – Earthwork.

D. Unless otherwise shown or specified, the Contractor shall clear and grub a strip at least 15-ft. wide along all permanent fence lines installed under this Contract.

E. In temporary construction easement locations, only those trees and shrubs shall be removed which are in actual interference with excavation or grading work under this Contract, and removal shall be subject to approval by the Engineer. However, the Engineer reserves the right to order additional trees and shrubs removed at no additional cost to the Owner, if such, in his opinion, are too close to the work to be maintained or have become damaged due to the Contractor's operations.

2.02 STRIPPING AND STOCKPILING EXISTING TOPSOIL

A. Erosion and sedimentation control measures shall be installed as per the Federal, State or Locally approved Erosion and Sedimentation Control Plan for the project and Specification Section 31 25 00 – Erosion and Sedimentation Control before any stripping and stockpiling of topsoil can occur.

B. Existing topsoil and sod on the site within areas designated on the Drawings shall be stripped to whatever depth it may occur and stored in locations directed by the Engineer.

C. The topsoil shall be free of stones, roots, brush, rubbish, or other unsuitable materials before stockpiling the topsoil.

D. Care shall be taken not to contaminate the stockpiled topsoil with any unsuitable materials.

2.03 GRUBBING

A. Grubbing shall consist of the removal and disposal of all stumps, roots, logs, sticks and other perishable materials to a depth of at least 6-inches below ground surfaces.

B. Large stumps located in areas to be excavated may be removed during grading operations, subject to the approval of the Engineer.

2.04 DISPOSAL OF MATERIAL

A. All debris resulting from the clearing and grubbing work shall be disposed of by the Contractor as part of the work of this Contract. Material designated by the Engineer to be salvaged shall be stored on the construction site as directed by the Engineer for reuse in this Project or removal by others.

B. Burning of any debris resulting from the clearing and grubbing work will not be permitted at the site.

2.05 WARNING AND BARRIER FENCE

A. The fence shall be made of a visible, lightweight, flexible, high strength polyethylene material. The fence shall be Guardian Visual Barrier as manufactured by TEMAX, or equal.

B. Physical Properties

Fence	
Color	International Orange
Roll Size	4' x 100'

Roll weight	9 lbs.
Mesh opening	1-3/4" x 1-3/4"
Posts	
ASTM Designation:	ASTM 702
Length:	6 feet long (T-Type)
Weight:	1.25 #/Foot (min)
Area of Anchor Plate:	14 Sq. In.

C. Drive posts 18 inches into ground every 8'. Wrap fence material around first terminal post allowing overlap of one material opening. Use metal tie wire or plastic tie wrap to fasten material to itself at top, middle and bottom. At final post, cut with utility knife or scissors at a point halfway across an opening. Wrap around and tie at final post in the same way as the first post.

D. Use tie wire or tie wrap at intermediate posts and splices as well. Thread ties around a vertical member of the fence material and the post and bind tightly against the post. For the most secure fastening, tie at top, middle and bottom. Overlap splices a minimum of four fence openings, tie as above, fastening both edges of the fence material splice overlap.

END OF SECTION

SECTION 31 23 19
DEWATERING

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, and equipment, perform all work necessary to lower and control the groundwater levels and hydrostatic pressures to permit all excavations and construction to be performed in dry conditions. The work shall include the following:

1. Testing, operation, maintenance, supervision, rewatering, and final dismantling and removal from the site of the dewatering system.

2. The cost of any replacement or rehabilitation of the subgrade or structures damaged due to dewatering system failures or Contractor negligence.

3. Compliance with all regulations relating to this work.

4. The diversion, collection, and removal of all ice, snow and surface runoff from the work areas, and removal of groundwater from new excavations to permit construction in the dry.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Requirements of related work are included in Division 01 and Division 02 of these Specifications.

1.03 REFERENCE SPECIFICATIONS CODES AND STANDARDS

A. Without limiting the generality of other requirements of these Specifications, all work herein shall conform to or exceed the applicable requirements of the following documents to the extent that the provisions therein are not in conflict with the requirements of this Section.

1. ASTM D1556 – Density of soil in place by the Sand Cone Method.

2. ASTM D2167 – Density of soil in place by the Rubber Balloon Method.

3. Bureau of Reclamation – Groundwater Manual Sediment Test by Imhoff Cone

4. Federal Regulations 29 CFR Part 1926

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures:

1. Name of dewatering subcontractor, if applicable.

2. Shop Drawings indicating the following:

    a. Plans showing the methods and location of dewatering and discharge including a sufficient number of detailed sections to clearly illustrate the scope of work.

    b. Relationship of the dewatering system, observation wells, and discharge line to existing buildings, other structures, utilities, streets and new construction.

    c. Utility locations.

    d. Drawings shall bear the seal and signature of the qualified Registered Professional Engineer licensed in the state of Texas in charge of preparing the drawings.

    e. List of materials and equipment to be used.

    f. A sample of all well record forms to be maintained during construction.

3. Detailed description of the sequence of dewatering operations

4. Dewatering well installation records indicating an identification number, location, dimensions, and installation procedures and materials.

5. Observation well installation records indicating an identification number, location, dimensions, and installation procedures and materials.

6. Emergency observation plan to be put into operation during failure of the dewatering system

7. Monthly Dewatering System Monitoring Reports containing the following data on approved forms:

    a. For observation wells, daily piezometric levels shall be identified by date, time, well number and system (subsystem if multiple pumps are used) pumping rate. Piezometric levels shall be noted in feet of drawdown and groundwater elevation.

    b. For dewatering wells, suspended material test results shall be identified by date, time, well number, well pumping rate (if monitored) and system (subsystem if multiple pumps are used) pumping rate.

    c. Installation records for new wells.

8. Schedule and records of all maintenance tests for primary and standby dewatering systems including the following:

a. Maintenance tests and water quality tests for suspended matter at the discharge point including date, time of day, elapsed times of tests procedures, components tested, suspended particles, resultant observations and well readings.

b. Daily discharge rates.

c. Installation and removal of wells.

d. General observations of the system such as equipment running times, and failures.

9. Dewatering well removal records

10. Observation well removal records

1.05 QUALITY ASSURANCE

A. The Contractor shall conduct subsurface investigations to identify groundwater conditions and to provide parameters for design, installation, and operation of groundwater control systems.

B. The groundwater control system shall be compatible with requirements of Federal Regulations 29 CFR Part 1926 and shall produce the following results:

1. Effectively reduce the hydrostatic pressure affecting:

a. Excavations.

b. Tunnel excavation, face stability or seepage into tunnels.

2. Develop a substantially dry and stable subgrade for subsequent construction operations.

3. Preclude damage to adjacent properties, buildings, structures, utilities, installed facilities, and other work.

4. Prevent the loss of fines, seepage, boils, quick condition, or softening of the foundation strata.

5. Maintain stability of sides and bottom of excavations.

C. The Contractor shall be solely responsible for the arrangement, location, and depths of the dewatering system necessary to accomplish the work described herein.

D. Dewatering shall prevent the loss of fines, seepage, boils, quick conditions or softening of the foundation strata while maintaining stability of the sides and bottom of the excavation and providing dry conditions for construction operations.

E. Provide drainage of seepage water and surface water, as well as water from any other source entering the excavation. Excavation drainage may include placement of drainage materials, such as crushed stone and filter fabric, together with sump pumping.

F. Provide ditches, berms, pumps and other methods necessary to divert and drain surface water from excavation and other work areas.

G. Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.

H. The Contractor shall assume sole responsibility for ground water control systems and for any loss or damage resulting from partial or complete failure of protective measures and any settlement or resultant damage caused by the ground water control operations. The Contractor shall modify ground water control systems or operations if they cause or threaten to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells, or affect potentially contaminated areas. The Contractor shall repair damage caused by ground water control systems or resulting from failure of the system to protect property as required.

I. The Contractor shall Provide an adequate number of piezometers installed at the proper locations and depths as required to provide meaningful observations of the conditions affecting the excavation, adjacent structures, and water wells.

J. The Contractor shall provide environmental monitoring wells installed at the proper locations and depths as required to provide adequate observations of hydrostatic conditions and possible contaminant transport from contamination sources into the work area or into the ground water control system.

K. Decommission piezometers and monitoring wells installed during design phase studies and left for Contractors monitoring and use.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Comply with requirements of agencies having jurisdiction.

B. Comply with Texas Natural Resource Conservation Commission regulations and Texas Water Well Drillers Association for development, drilling, and abandonment of wells used in dewatering system.

C. Obtain permit from EPA under the National Pollutant Discharge Elimination System (NPDES), for storm water discharge from construction sites. Refer to Section 31 25 00 – Erosion & Sedimentation Controls TPDES Permit Requirements.

D. Obtain all necessary permits from agencies with control over the use of groundwater and matters affecting well installation, water discharge, and use of existing storm drains and natural water sources. Because the review and permitting process may be lengthy, take early action to pursue and submit for the required approvals.

E. Monitor ground water discharge for contamination while performing pumping in the vicinity of potentially contaminated sites.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Materials, especially the well screen, shall be carefully chosen to be compatible with the environment to prevent erosion, deterioration, and clogging.

B. Surging of the natural formation to form a "gravel pack" is strictly prohibited.

PART 3 – EXECUTION

3.01 EXAMINATION OF THE SITE

A. Become familiar with the surface and subsurface site conditions.

B. Obtain the data required to analyze the water and soil environment at the site in order to assure that the materials used for the dewatering systems will not erode, deteriorate, clog or otherwise hinder the system's performance during the period of the dewatering.

C. Perform a subsurface investigation by borings as necessary to identify water bearing layers, piezometric pressures, and soil parameters for design and installation of ground water control systems. Perform pump tests, if necessary, to determine the drawdown characteristics of the water bearing layers. The results shall be presented as part of the Dewatering submittal.

D. Prior to the execution of the work, the Contractor, Owner and Engineer shall jointly survey the condition of adjoining structures. Photographs and records shall be made of any prior settlement or cracking of structures, pavements, and the like, that may become the subject of possible damage claims.

3.02 DESIGN

A. The dewatering system shall be capable of relieving all hydrostatic pressure against the height of the excavation walls and of lowering the hydrostatic level below the bottom of the pipe invert elevation a minimum of four (4) feet in the work areas both prior to excavation, and during excavation and construction.

B. The dewatering system shall be segmented so that if the operation of any one segment is disrupted, the remaining segment plus activated redundant components are capable of maintaining the groundwater at the stated levels.

C. Provide, operate and maintain all ditches, berms, site grading, sumps and pumping facilities to divert, collect and remove all surface water from work areas. All collected water shall be discharged into the outfall pipe.

D. Provide pipe and pumps of sufficient size and quantity to be able to flood the excavation within 12 hours in an emergency situation. Restoration of the working area shall be carried out by the Contractor at no additional cost to the Owner.

E. Carry the dewatering system discharge through pipes out of the area of the excavation into the outfall junction manhole shown on the Drawings. Provide meters to measure the discharge flow.

F. Place a portion of the header and discharge system underground to provide vehicle crossings or access to existing structure as required.

G. Provide a standby dewatering system that meets the following requirements:

1. Provide 100 percent standby power.

2. Provide a 15 percent minimum increase in the number of wells and related equipment required to operate the dewatering system installed and ready to operate.

3. Provide a minimum of three separate power units for the standby power system and one installed auxiliary unit for each individually powered pump.

4. Provide separate discharge lines from each well or common lines with valves such that any well or wells that malfunction or are damaged can be isolated form the others.

5. The systems shall be laid out and designed in such a way that portions of the system may be isolated for routine maintenance or repair in case of accidental damage without affecting the normal operation of the system.

H. Provide sufficient fuel to maintain a five day supply on site for fuel power systems.

I. Provide observation wells to determine compliance with dewatering requirements as indicated on the Drawings, Shop Drawings, and the Engineer.

J. Designate certain observation wells as emergency observation wells.

3.03 INSPECTION

A. All tests and inspections require the witnessing and written approval of the Owner and Engineer.

B. Provide safe access for the Owner and Engineer to perform testing and inspection.

C. The Owner and Engineer will provide oral and written notice to the Contractor for all tests and inspections that do not meet approval.

3.04 INSTALLATION AND TESTING

A. Install the dewatering system from the existing ground surface or from the bottom of an excavation which is located above the natural groundwater level.

B. Pump each well individually at its maximum or design flow and take a water sample using the following procedures:

1. Obtain samples from stopcocks located along the discharge lines at points of high turbulence or between 4 and 8 o'clock on the perimeter of straight sections of pipe.

2. Flush the stopcock for a few seconds before taking a sample.

3. Take a 1 liter sample with the stopcock fully open.

C. Test the sample following the Sediment Test by Imhoff Cone for two to three minutes and measure the volume of settled materials to the nearest 0.01 milliliters (0.01 milliliters = 10 ppm).

D. All wells shall be evaluated as follows:

1. Wells producing 10 ppm or less shall be accepted.

2. Wells producing between 10 and 20 ppm may be accepted by the Engineer based on the evaluation of average ppm for all wells, ppm of adjacent wells, and total quantity of water which is actually pumped to dewater the excavation.

3. Well producing more than 20 ppm shall be abandoned and backfilled.

E. Observation wells shall consist of a standpipe or riser of minimum 1.0-inch inside diameter and a minimum three (3) foot long well-point screen or slotted PVC section at the bottom. Observation wells shall be installed as follows:

1. Employ the jetting method for all observation wells except those within ten feet of existing structures, piping or utilities.

2. Employ Case Boring Techniques for all observation wells within ten feet of existing structures, piping, or utilities and backfill the annulus between the well point or riser and the natural soil with a free flowing granular material similar to Ottawa Sand.

F. Test observation wells by adding or removing water from the riser to demonstrate their proper functioning.

3.05 DEWATERING PROCEDURE

A. Following dewatering system installation and testing and prior to excavation, place the dewatering system into operation and lower the water level.

B. Schedule the dewatering work to coordinate with all the other related work such as excavation support systems, excavation, placing of concrete walls and slabs, and any other operations by other Contractors that might be affected by this work.

C. Test the standby dewatering system with the following procedures:

1. Shut off the primary power source and demonstrate that the standby power can be activated prior to the groundwater level rising to within one (1) foot of the bottom of base slab elevation and that the standby power source is adequate to draw the groundwater level back down to the Contractor's design depth or to the minimum required depths.

2. Shut off one segment of the system and show that redundant components can be activated prior to the groundwater level rising to within one (1) foot of the bottom of base slab elevation and that the system is adequate to draw the groundwater level back down to the Contractor's design depth or to the minimum required depths.

3. If the dewatering system fails to meet either performance requirement, the Contractor shall draw the groundwater level to a greater depth, add wells, or modify the system such that it will be in conformance with these requirements when retested.

D. Operate the dewatering system continuously twenty-four (24) hours per day, seven (7) days per week until all structures have been satisfactorily constructed, including placement of fill materials, and no longer require dewatering.

3.06 REQUIREMENTS FOR EDUCTOR, WELL POINTS, OR DEEP WELLS

A. For aboveground piping in ground water control system, include a 12-inch minimum length of clear, transparent piping between every eductor well or well point and discharge header so that discharge from each installation can be visually monitored.

B. Install sufficient piezometers or monitoring wells to show that all trench or shaft excavations in water bearing materials are pre-drain prior to excavation. Provide separate piezometers for monitoring of dewatering and for monitoring of depressurization. Install piezometers and monitoring wells for tunneling as appropriate for Contractor's selected method of work.

C. Install piezometers or monitoring wells not less than one week in advance of beginning the associated excavation.

D. Dewatering may be omitted for portions of underdrains or other excavations, but only where auger borings and piezometers or monitoring wells show that soil is pre-drained by an existing system such that the criteria of the ground water control plan are satisfied.

E. Replace installations that produce noticeable amounts of sediments after development.

F. Provide additional ground water control installations, or change the methods, in the event that the installations according to the ground water control plan does not provide satisfactory results based on the performance criteria defined by the plan and by the specification. Submit a revised plan according to Paragraph 1.06B.

3.07 EXCAVATION DRAINAGE

A. Contractor may use excavation drainage methods if necessary, to achieve well-drained conditions. The excavation drainage may consist of a layer of crushed stone and filter fabric, and sump pumping in combination with sufficient wells for ground water control to maintain stable excavation and backfill conditions.

3.08 MONITORING

A. Measure the piezometric water levels to the nearest one-tenth foot in all observation wells and submit the readings daily.

B. Measure the concentration of suspended material in the discharge water of each well once every two days. Wells which exceed the acceptable level of solids concentration shall be replaced.

C. Test the performance of the standby system and all components by demonstrating that the system is operational at least every two weeks.

D. Test the observation wells every two weeks by adding and removing water from the risers to demonstrate their proper functioning.

E. Observation wells that become inoperable shall be immediately replaced while construction is halted if the Engineer determines that the observation well is critical.

F. Remove and add riser pipe of each observation well located within the excavation as construction progresses until the well conflicts with the structure. When the conflict occurs, abandon the observation well, fill it with grout, and cut the riser off at grade.

G. In the event of a dewatering system failure, take the following steps:

1. Conduct in situ density tests conforming to ASTM D1556 or ASTM D2167 immediately above an at the structure founding grades.

2. Remove all soils that show unacceptable density and replace them with compacted fill as indicated in Section 31 00 01 – Earthwork.

3. Test the repaired soils as required by the Owner and Engineer to verify that they have been returned to their original in situ state or better.

4. Repair or replace damaged structures.

3.09 REWATERING AND REMOVAL OF DEWATERING SYSTEM

A. Obtain written approval from the Owner and Engineer to being rewatering operations.

B. Provide an adequate weight of fill to prevent buoyancy.

C. Pump water into the excavation such that the water level inside the excavation is always at a higher level than the rising groundwater on the outside until the groundwater level has reached its static level.

D. During backfilling, dewatering may be reduced to maintain water level a minimum of 5 feet below prevailing level of backfill. However, do not allow that water level to result in uplift pressures in excess of 80 percent of downward pressure produced by weight of structure or backfill in place. Do not allow water levels to rise into cement stabilized sand until at least 48 hours after placement.

E. Remove all dewatering wells, buried and surface piping, cables, pump foundations, structural supports and all other support facilities.

F. Backfill as specified in Section 31 00 01 – Earthwork, all trenches and excavations below final grades or in fill areas.

G. Grout abandoned well and piezometer holes. Fill piping that is not removed with cement-bentonite grout or cement-sand grout.

H. Provide documentation of dewatering and observation well removal including the date of removal, well number, location, procedures, and materials used.

END OF SECTION

SECTION 31 23 24

FLOWABLE FILL

PART 1 – GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish all labor, equipment, materials and services, including pumping equipment and application, necessary for the manufacture, transportation and placement of all cementitious flowable fill as shown on the Contract Drawings or as ordered by the Engineer, except for the work specifically included under other items.

1.02 RELATED WORK

A. Division 03 - Concrete

1.03 SUBMISSIONS

A. In accordance with the procedures and requirements set forth in the General Conditions and Division 01, the Contractor shall submit the following:

1. Shop Drawings
2. Certifications of specification compliance for all sources of each material
3. Manufacturer’s data on all admixtures
4. Mix design and trial mix test results
5. Aggregate gradation

1.04 QUALITY CONTROL

A. The Owner will engage the services of a testing laboratory to perform material evaluation tests for flowable fill. The Contractor shall provide coordination and a trial mix sample to verify the flowable fill mix design. The trial mix shall also report slump, air content, yield, cement content, and dry unit weight per ASTM C143 and ASTM D6023.

PART 2 – MATERIALS

2.01 CEMENTITIOUS FLOWABLE FILL

A. Flowable fill (controlled low strength material) shall be a uniform mixture of sand, Type II Portland cement, fly ash, admixtures and water. The mix design shall produce a flowable material with little or no bleed water, which produces a minimum compressive strength of 50 psi and maximum compressive strength of 100 psi at 56 days. The cured material

shall be excavatable and have a maximum dry weight of 100 pounds per cubic foot. Slump of mix at the point of application shall be 7-inches to 10-inches.

B. Admixtures specifically designed for flowable fill shall be used to improve flowability, reduce unit weight, control strength development, reduce settlement and reduce bleed water. Admixtures shall be Mastercell 25 by BASF Construction Chemicals; Darafill by Grace Construction Products; or approved equal. Cement and all other materials shall be as specified in Section 03 30 00 - Cast-in-Place Concrete.

C. Fine Aggregate (Sand) shall consist of natural or manufactured siliceous sand, clean and free from deleterious substances, and graded within the following limits:

Sieve Size	Percent Passing by Weight
3/8"	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100*	2 to 10

*For manufactured sand, the percent passing the No. 100 Sieve may be increased up to 20%.

PART 3 – EXECUTION

3.01 PLACEMENT OF FLOWABLE FILL

A. Flowable fill shall be batched and premixed by an approved producer, dispensed from ready-mix trucks, and placed by approved methods and equipment.

B. Flowable fill shall be placed as needed to completely fill the space to receive it with no trapped air pockets or other voids. Positive means of allowing the air to escape shall be provided where necessary and after approval of the Engineer. Where placed against, around and inside existing structures, lift heights shall be limited so as not to overload the structure. The Engineer shall approve lift heights and procedures. Specific procedures and methods shall be included in the Contractor’s shop drawing submittals.

C. Where flowable fill is placed around piping and other elements subject to floating within the fill space, positive means shall be taken to provide temporary balancing loads to prevent uplift or fill lift heights shall be limited to prevent uplift.

D. Application of loads or placement of other fill materials or concrete on top of flowable fill shall not occur until the flowable fill surface is determined to be suitable for loading per ASTM D6024 subject to the approval of the Engineer.

END OF SECTION

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SECTION 31 25 00

EROSION AND SEDIMENTATION CONTROL

PART 1 – GENERAL

1.01 THE REQUIREMENTS

A. The Contractor is responsible for implementing a Stormwater Pollution Prevention Plan (SWPPP), including all Stormwater Control Measures (SCMs) to prevent and minimize erosion and resultant sedimentation in all cleared and grubbed areas during and after construction.

B. This item covers the work necessary for the installation of structures and measures for the prevention of soil erosion and control of sedimentation. The Contractor shall furnish all material, labor and equipment necessary for the proper installation, maintenance, inspection, monitoring, reporting, and removal (where applicable) of erosion prevention and sediment control measures and, if applicable, to cause compliance with all local permits.

C. Any land disturbance as the result of modifications to a site's drainage features or topography requires protection from erosion and sedimentation.

D. All excavations shall be in conformity with the lines, grades, and cross sections shown on the Contract Drawings or established by the Engineer.

E. It is the intent of this Specification that the Contractor conducts the construction activities in such a manner that erosion of disturbed areas and off-site sedimentation be absolutely minimized.

F. The Contractor is responsible for preparing and obtaining approval for the following submittals:

1. Stormwater Pollution Prevention Plan (SWPPP)

2. TCEQ Notice of Intent for Stormwater Discharges Associated with Construction Activity under the TPDES General Permit

3. Construction Site Notice

4. TCEQ Notice of Termination for Stormwater Discharges Associated with Construction Activity under the TPDES General Permit

5. Any applicable Notice of Change

G. Due to the nature of the work required by this Contract, it is anticipated that the location and nature of the erosion and sediment control devices will be adjusted on several occasions to reflect the current phase of construction. The construction schedule

adopted by the Contractor will impact the placement and need for specific devices required for the control of erosion. The Contractor shall develop and implement such additional techniques as may be required to minimize erosion and off-site sedimentation. The location and extent of erosion and sedimentation control devices shall be revised at each phase of construction that results in a change in either the quantity or direction of surface runoff from constructed areas. All deviations from the erosion and sedimentation control provisions detailed in the approved SWPPP shall have the prior acceptance of the Engineer and shall be completed at no additional cost to the Owner.

H. Erosion and sedimentation controls applicable to this project shall be as specified herein, as indicated by the Engineer and as detailed in the TCEQ TPDES General Permit TXR150000.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 33 00 – Submittal Procedures

B. Section 31 10 00 – Clearing, Grubbing, and Site Preparation

C. Section 31 23 19 – Dewatering

D. Section 31 00 10 – Earthwork

E. Section 31 05 19 – Geotextiles

F. Section 32 11 00 – Surface Restoration

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of other requirements of these specifications, all work hereunder shall conform to the applicable requirements of the referenced portions of the following documents, to the extent that the requirements therein are not in conflict with the provisions of this Section.

1. TCEQ TPDES General Permit TXR150000 (latest revision)

2. Texas Department of Transportation Departmental Materials Specification 6230 – Temporary Sediment Control Fence Fabric, latest edition

1.04 REGULATORY COMPLIANCE

A. Land disturbance activities are not authorized to begin until after all required erosion and sediment control permits are obtained.

B. During the period beginning on the effective date of the permit and lasting until expiration, discharges shall be controlled, limited and monitored as specified below.

1. Deviation from the approved plan is allowed only to correct emergency situations of sediment discharge offsite or when minor modifications are made to improve performance of the measures and the approval authority has been notified. Note approved deviations on the plan maintained on the site.

2. Manage onsite activities such that no adverse impacts to water quality occur from site activities or allowed discharges. The following activities, and others on a site-specific basis, require oversight throughout the construction and development process to assure that all water quality standards are protected.

    a. Equipment Operation and Maintenance: Equipment utilized during the construction activity on a site must be operated and maintained in such a manner as to prevent the potential or actual pollution of the surface or ground waters of the State. Fuels, lubricants, coolants, and hydraulic fluids, or any other petroleum products, shall not be discharged onto the ground or into surface waters. Spent fluids shall be disposed of in a manner so as not to enter the waters, surface or ground, of the State and in accordance with applicable state and federal disposal regulations. Any spilled fluids shall be cleaned up to the extent practicable and disposed of in a manner so as not to allow their entry into the waters, surface or ground, of the State.

    b. Material Handling: Herbicide, pesticide, and fertilizer usage during the construction activity shall be consistent with the Federal Insecticide, Fungicide, and Rodenticide Act and shall be in accordance with label restrictions.

    c. Building Material Waste Handling: All wastes composed of building materials shall be disposed of in accordance with local regulatory requirements. At a minimum, Contractor shall observe the following practices:

        1) No paint or liquid wastes in streams or storm drains.

        2) Dedicated area for demolition, construction, and other wastes must be located a minimum of 50’ from storm drains and streams unless no reasonable alternatives are available.

        3) Earthen-material stockpiles must be located a minimum of 50’ from storm drains and streams unless no reasonable alternatives are available.

        4) Concrete materials onsite, including excess concrete, must be controlled to avoid contact with surface waters, wetlands, or buffers. (Note discharges from onsite concrete plants may require coverage under a separate NPDES permit).

    d. Litter and Sanitary Waste: The Permittee shall control the management and disposal of litter and sanitary waste from the site.

C. Violations and Fines

1. Contractor shall be responsible for reimbursing the Owner for any fines incurred as a result of violations to the TCEQ TPDES General Permit.

2. If violations result in the issuance of a Notice of Violation, the Contractor shall comply with the requirements of the Notice within the specified time period for compliance. Failure to comply could result in the assessment of a penalty for each day of the continuing violation, beginning with the date of the violation.

3. Violations may result in civil and/or criminal penalties which include fines and imprisonment.

1.05 GUARANTEE

A. All restoration and re-vegetation work shall be subject to the one-year guarantee period of the Contract as specified in the General Conditions.

PART 2 – MATERIALS

2.01 MATERIALS

A. All erosion and sediment control bid prices shall include all excavation, grading, maintenance, legal sediment disposal, permits and all other work and appurtenances necessary to design, install and maintain the sediment and erosion control measures as detailed herein and in accordance with the TCEQ TPDES General Permit TXR150000.

2.02 SILT FENCE

A. Silt (or sediment) fence shall be constructed along all active construction areas, at locations indicated by the Engineer, as specified herein, as required by the TPDES General Permit TXR150000, and required by the approved SWPPP.

B. Silt fence shall meet the requirements of TxDOT DMS-6230 – Temporary Sediment Control Fence Fabric. Silt fences shall be installed below small disturbed areas that are less than ¼ acre disturbed per 100-feet of fence when slopes are less than 2%. Silt fence shall not be installed across streams, ditches, or waterways or other areas of concentrated flows.

C. Silt fence shall be a woven geotextile filter fabric made specifically for sediment control. Filter fabric shall not rot when buried and shall resist attack from soil chemicals, alkalines and acids in the pH range from 2 to 13, and shall resist damage due to prolonged ultraviolet exposure.

D. The cost of silt fence shall include the materials, excavation, backfill, aggregate, periodic sediment removal, etc. and all maintenance and restoration activities required.

E. Silt fence shall be stable for the 10-year peak storm runoff.

F. The posts for silt fences shall be 1.33 lb/linear feet steel with a minimum length of 5 feet; posts shall have projections to facilitate fastening of the fabric.

G. For reinforcement of standard strength filter fabric use wire fence with a minimum 14 gauge and a maximum mesh spacing of 6 inches.

H. Provide staples with a crown at least 3/4 inch wide and legs 1/2 inch long.

2.03 STONE FOR EROSION CONTROL

A. The stone for erosion control shall consist of field stone or rough un-hewn quarry stone. The stone shall be sound, tough, dense, and resistant to the action of air and water. The stone for erosion control shall be 3-6 inch aggregate for Types 1, 2 and 4 rock filter dams and 4-8 inch aggregate for Type 3 rock filter dams. , and underlain by a Type II Geotextile, as specified in Section 31 05 19 – Geotextiles.

B. The cost for stone for erosion control shall include furnishing, weighing, stockpiling, re-handling, placing and maintaining stone; disposal of any stone not incorporated into the project if directed by the Engineer; and any other incidentals necessary to complete the work.

2.04 RIP RAP

A. The stone for rip rap shall consist of field stone or rough un-hewn quarry stone. The rip rap shall be sound, tough, dense, and resistant to the action of air and water. Neither the width nor thickness of individual stones shall be less than one third their length. The rip rap shall be underlain by a Type II Separator Geotextile, as specified in Section 31 05 19 – Geotextiles.

B. The cost for rip rap shall include furnishing, weighing, stockpiling, rehandling, placing, and maintaining rip rap; disposal of any rip rap not incorporated into the project if directed by the Engineer; geotextile material and installation, and all other incidentals necessary to complete the work.

2.05 TEMPORARY DIVERSIONS

A. Temporary diversions shall be constructed as locations indicated by the Engineer, as specified herein, or as required by the SWPPP. Temporary diversions shall be constructed adjacent to disturbed areas to collect surface runoff from disturbed areas and direct the runoff to sediment basins or to divert non-sediment laden runoff away from undisturbed areas and/or sediment basins. All temporary diversions transporting sediment-laden runoff shall terminate in a sediment trapping device. All temporary diversions shall be stabilized with vegetation or other means within 7 days of installation.

B. Temporary diversions shall be designed, installed and maintained in accordance with Part 3.0 of this Section and as required by the SWPPP , to the satisfaction of the Engineer, until the site has been stabilized.

C. The cost of temporary diversions shall include the excavation, grading, materials, etc. and all maintenance and restoration activities required.

2.06 TEMPORARY SLOPE DRAINS

A. Temporary slope drains shall be constructed at locations indicated by the Engineer, as specified herein, or as required by the SWPPP . Temporary slope drains are used to convey concentrated runoff down the face of a slope without causing erosion and are generally used in conjunction with temporary diversions.

B. The pipe diameter for temporary slope drains shall be selected according to the SWPPP. The pipe shall be heavy-duty flexible material such as non-perforated, corrugated plastic pipe or specially designed flexible tubing.

C. Temporary slope drains shall be designed, installed and maintained in accordance with the SWPPP, to the satisfaction of the Engineer, until the site has been stabilized.

D. The cost of the temporary slope drains shall include the piping, earthwork, stone for erosion control, and all maintenance activities required. Temporary slopes drains shall be removed from site and the materials disposed of in an approved manner once final stabilization has been achieved.

2.07 TEMPORARY GRAVEL CONSTRUCTION ENTRANCES/EXITS

A. Temporary gravel construction entrances/exits shall be located at points where vehicles enter and leave a construction site, at locations indicated by the Engineer, as specified herein, or as required by the SWPPP.

B. Temporary gravel construction entrances/exits shall be constructed with a minimum 12-inch layer of 3-5 inch washed stone placed over a stable foundation. Geotextile fabric shall be used under stone.

C. Temporary gravel construction entrances/exits shall be designed, installed and maintained to the satisfaction of the Engineer, until the site has been stabilized. The cost of temporary gravel construction entrances/exits shall include the materials, including the application of additional stone, tire washing, and other maintenance as may be necessary. Temporary gavel construction entrances/exists shall be removed from site and the materials disposed of in an approved manner once final stabilization has been achieved.

2.08 INLET EROSION CONTROL MEASURES

A. Yard, Curb and other Inlet Erosion Control Measures shall be constructed at all inlets impacted by construction activities, at other locations indicated by the Engineer, as

specified herein or as required by the SWPPP. Inlet erosion control measures shall be used to prevent or limit the introduction of sediment to storm drain systems and allow early use of the of the storm drainage system. Maximum drainage areas for inlet erosion control measures vary from 1 acre for excavated drop inlet protection, hardware & cloth gravel inlet protection, and block and gravel inlet protection to more than 5 acres for rock pipe inlet protection.

B. Materials for Inlet Erosion Control Measures consist of silt fence, riprap, stone (gravel), hardware wire, sod, concrete blocks, and sediment logs. Riprap and stone for erosion control shall be as specified herein.

C. The cost of inlet erosion control measures shall include all excavation, grading, materials, and all maintenance activities required. Inlet Control Measures shall be removed from site and the materials disposed of in an approved manner once final stabilization has been achieved.

2.09 FIBER FILTRATION TUBES (FFTS)

A. FFTs shall be installed at the locations indicated by the Engineer, as specified herein, or as required by the SWPPP.

B. FFTs shall consist of straw, wood, or coconut fibers, with or without performance-enhancing polymers, encased with cylindrical tubes composed of a heavy-duty, loose-weave, biodegradable natural-fiber netting made of burlap, jute, or coir. The netting shall be oriented in a diamond or hexagonal pattern and shall move freely at all fiber intersections (Leno weave, or equal).

C. FFTs shall be designed, installed, and maintained as specified herein. If Manufacturer's recommendations are more stringent, they shall supersede. The cost of FFTs shall include all excavation, grading, materials, and all maintenance activities required. FFT's shall be removed from site and the materials disposed of in an approved manner once final stabilization has been achieved.

2.10 TEMPORARY SEDIMENT TRAPS, SEDIMENT BASINS, AND SKIMMER SEDIMENT BASINS

A. Temporary sediment traps shall be constructed at the termination of all temporary diversions diverting sediment laden runoff, at other locations indicated by the Engineer, as specified herein, or as required by the SWPPP. These temporary measures shall not be constructed within an intermittent or perennial stream and shall be installed prior to any land disturbance activities within the drainage area. Temporary sediment traps shall be constructed by excavating the appropriate size rectangular basin and constructing a rock-fill dam on the discharge end. Contractor shall maintain basins at the depths shown below working grades.

B. Sediment basins and skimmer sediment basins shall be installed at locations indicated by the Engineer, as specified herein, or as required by the SWPPP. Sediment basins

and skimmer sediment basins shall be used where drainage areas are too large for temporary sediment traps. Outlet structures must withdraw from basin surface unless drainage area is less than 1 acre. They shall retain sediment on the site and prevent off site sediment in waterways, and they shall not be located in intermittent or perennial streams. Sediment basins and skimmer sediment basins shall be installed prior to any land disturbance activities within the drainage area.

C. Porous baffles shall be installed in temporary sediment traps, sediment basins, and skimmer sediment basins at locations indicated by the Engineer, as specified herein, or as required by the SWPPP. Porous baffles are used to reduce the velocity and turbulence of the water flowing through the structure and to facilitate the settling of sediment in the water before discharge. They effectively spread the flow across the entire width of a structure.

D. Materials for porous baffles include silt fence, coir erosion blanket, coir mesh, and tree protection fence. Other materials may be used as approved by the Engineer.

E. The structure life for temporary sediment traps shall be limited to 2 years. Temporary sediment traps shall be spaced to limit the maximum tributary drainage area to 5 acres. The basin life of sediment basins and skimmer sediment basins shall be limited to 3 years unless they are designed as permanent structures. The drainage area for sediment basins and skimmer sediment basins shall be limited to 100 acres.

F. The principal spillway for sediment basins shall consist of a riser and barrel. Ensure that the pipe is capable of withstanding the maximum expected load without yielding, buckling, or cracking. The basin should be provided with a skimmer or flashboard riser to dewater the basin from the water surface. The emergency spillway shall be constructed in undisturbed soil. The principal spillway outlet and emergency spillway shall be stabilized.

G. The principal spillway for skimmer sediment basins shall consist of a skimmer which dewaters the basin from the top of the water surface at a controlled rate. A dewatering rate of 24 to 72 hours is required. The skimmer outlet pipe shall be capable of withstanding the maximum expected load without yielding, buckling, or cracking. The emergency spillway shall be constructed in undisturbed soil whenever possible and shall be lined with impermeable geotextile fabric in accordance with Section 31 05 19 – Geotextiles. The principal spillway outlet and emergency spillway shall be stabilized.

H. The cost of the temporary sediment traps, sediment basins, and porous baffles shall include the excavation, grading, fill, baffles, stone for erosion control, washed stone, geotextile, etc. and all maintenance activities required.

2.11 OUTLET STABILIZATION STRUCTURE

A. Outlet stabilization structures shall be constructed at locations indicated by the Engineer, as specified herein, or as required by the SWPPP. These structures shall be used where

the discharge velocity of the upstream water conveyance structure exceeds the permissible velocity of the receiving channel or disposal area.

B. Structures shall be sized for a capacity equivalent to a 10-year, peak runoff or design discharge of the water conveyance structure, whichever is greater. Riprap materials shall be as specified herein. Filter fabric shall be Type II Separator Geotextile, as specified in Section 31 05 19 – Geotextiles.

C. The cost of outlet stabilization structures shall include all excavation, grading, materials, and all maintenance activities required.

2.12 TREE PROTECTION FENCE

A. Tree protection fence shall be installed at locations indicated by the Engineer, as specified herein, or as required by the SWPPP .

B. Tree protection fence shall be used to protect trees and their root zones during construction. Tree protection fence shall be brightly-colored, UV-resistant poly barricade fabric. Signs designating the area as protected shall be installed on all sides of the fence. Wording and spacing of the signage shall be as requested by the Owner.

C. The cost of tree protection fence shall include all materials as well as all maintenance activities required.

2.13 SAND BAGS

A. Provide sandbag material of polypropylene, polyethylene or polyamide woven fabric with a minimum unit weight of 4 ounces per square yard, a Mullen burststrength exceeding 300 psi, and an ultraviolet stability exceeding 70 percent.

B. Use natural coarse sand or manufactured sand meeting the gradation as shown in the table below to fill sandbags.

C. Filled sandbags must be 24 to 30 inches long, 16 to 18 inches wide, and 6 to 8 inches thick.

Sieve No.	Maximum Retained (% by Weight)
4	3%
100	80%
200	95%

PART 3 – EXECUTION

3.01 INSTALLATION AND MAINTENANCE

A. Develop and implement the project's Storm Water Pollution Prevention Plan (SWPPP) in accordance with the TPDES Construction General Permit TXR150000 requirements. Prevent water pollution from storm water runoff by using and maintaining appropriate structural and nonstructural BMPs to reduce pollutants discharges to the MS4 from the construction site.

B. All installation and maintenance shall be conducted in accordance with this specification and the approved SWPPP. In the event of a discrepancy, the more stringent requirements shall take precedence.

C. If applicable, all requirements of the NPDES Permit shall be followed. In the event of a discrepancy between this specification and the NPDES Permit requirements, the more stringent requirements shall take precedence.

D. If possible, erosion and sedimentation control devices shall be established prior to clearing operations in a given area. Where such practice is not feasible, the erosion and sedimentation control device(s) shall be established concurrent with the clearing operations or immediately following completion of the clearing operations.

E. The Contractor shall furnish the labor, materials and equipment required for routine maintenance of all erosion and sedimentation control devices. At a minimum, maintenance shall be scheduled as required for a particular device to maintain the removal efficiency and intent of the device.

F. Maintenance shall include but not be limited to:

    1. Removal and satisfactory, legal disposal of accumulated sediment from traps or silt barriers

    2. Replacement of filter fabrics used for silt fences and stone impaired by sediment in stone filters, gravel construction entrances, etc.

G. Maintenance as noted in items 1 and 2 above shall be performed as required, and at least once every 3 months for the duration of construction activities. Sediment removed from erosion and sedimentation control devices shall be disposed of in locations that will not result in off-site sedimentation as acceptable to the Engineer, at no additional cost to the Owner. If no suitable on-site locations are available, all such sediment will be legally disposed of off site, at no additional cost to the Owner.

3.02 SILT FENCE

A. Silt fence shall be erected and maintained to the satisfaction of the Engineer until a vegetative ground cover has been established. Replacement of the filter fabric and its associated appurtenances, if required by the Engineer, will be at the Contractor's expense.

B. Silt fence shall not be installed across streams, ditches, waterways or other areas of concentrated flow. Silt fence shall be placed at least 6 feet beyond the toe of slope of any embankment or stockpile area to allow space for ponding and maintenance access.

C. Dig a trench approximately 8 inches deep and 4 inches wide and place the fabric in the bottom of the excavated ditch or use the slicing method to insert the fabric into a cut sliced in the ground with a disc. Ensure that the height of the sediment fence does not exceed 24 inches above the ground surface.

D. Install posts 4 feet apart in critical areas and 6 feet apart on standard applications when extra strength filter fabric is used. When wire mesh support is used, posts shall be installed a maximum of 8 feet apart. Install posts 2 feet deep on the downstream side of the silt fence, as close as possible to the fabric.

E. Joints should be avoided along the fencing. When joints are necessary, securely fasten the filter cloth only at a support post with 4 feet minimum overlap to the next post.

F. Compaction is vitally important for effective results. Compact the soil immediately next to the silt fence fabric with the front wheel of the tractor, skid steer or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of 4 trips.

G. Stabilized outlets for silt fence shall be provided. The outlet section shall have a maximum width of 4 feet. The height of silt fence at the outlet shall be a maximum of 1 foot. A 5 foot x 5 foot (minimum) apron of #57 washed stone shall be provided on the downstream side of the silt fence outlet.

H. Silt fence shall be erected around all catch basins which are located downstream from any construction work unless other inlet protection is specified. Should any catch basins be indicated to be relocated or modified, silt fence shall be utilized until work is completed on the catch basins. Upon completion of the modification, the area shall be rough graded, until the end of the project, at which time final grading shall occur.

I. Inspect silt fence at least once a week and after each rainfall event. Make any required repairs immediately.

J. Should the fabric of any silt fence collapse, tear, decompose or become ineffective, replace it promptly. All fabric shall be replaced after the first 6 months of construction activity and every 6 months thereafter until construction activities are complete, unless otherwise directed by the Engineer.

K. Remove sediment deposits as necessary to provide adequate storage volume for the next rain and to reduce pressure on the fence. Take care to avoid undermining the fence during cleanout.

L. Remove all fencing materials and unstable sediment deposits and bring the area to grade and stabilize it after the contributing drainage area has been properly stabilized. Removal of any silt fence shall be permitted only with the prior approval of the Engineer or the local governing agency.

3.03 STONE FOR EROSION CONTROL

A. Stone for erosion control shall be dumped and placed in such manner that the larger rock fragments are uniformly distributed throughout the rock mass and the smaller fragments fill the voids between the larger fragments. Rearranging of individual stones by equipment or by hand shall only be required to the extent necessary to secure the results specified above, to protect structures from damage when rock material is placed against the structures, or to protect the underlying Separator Geotextile from damage during installation.

B. Inspect at least weekly and within 24 hours after any storm event of greater than 1 inch of rain per 24-hour period. Remove accumulated sediment and replace stone impaired by sediment as necessary.

3.04 RIPRAP

A. Riprap shall be graded so that the smaller stones are uniformly distributed through the mass. The Contractor may place the stone by mechanical methods, augmented by hand placing where necessary or ordered by the Engineer. The placed riprap shall form a properly graded, dense, neat layer of stone. The placed riprap shall have a minimum depth of 24 inches unless otherwise specified by the Engineer. Type II Separator Geotextile, as specified in Section 31 05 19 – Geotextiles, shall be used under all riprap unless otherwise noted.

B. Inspect periodically for scour or dislodged stones. Control of weed and brush growth may be needed.

3.05 TEMPORARY DIVERSIONS

A. Remove and properly dispose of all trees, debris, etc. Fill and compact all ditches, swales, etc. that will be crossed to natural ground level or above.

B. Excavate, shape and stabilize diversions as described herein. Unless otherwise noted, provide vegetative stabilization immediately after installation of permanent diversions. Temporary diversions that are to serve longer than 7 working days shall be seeded and mulched as soon as they are constructed to preserve dike height and reduce maintenance. Seed and mulch disturbed areas draining into the diversions within 14 calendar days of completing any phase of grading.

C. For temporary diversions, ensure that the top of the dike is not lower at any point than the design elevation plus the specified settlement. Provide sufficient room around temporary diversions to permit machine re-grading and cleanout. Vegetate the ridge of temporary diversions immediately after construction unless they will remain in place less than 7 working days.

D. Provide outlet protection adequate to accept flow from diversion plus any other contributing runoff. Sediment-laden runoff shall be routed through a sediment-trapping device.

E. Inspect temporary diversions once a week and after every rainfall event. Immediately remove sediment from the flow area and repair the diversion ridge. Carefully check outlets and make timely repairs as needed. When the area protected is permanently stabilized, remove the ridge and the channel to blend with the natural ground level and appropriately stabilize it. Inspect permanent diversions weekly and after every rainfall event during construction operations until permanent vegetation is established. After vegetation is established, inspect after major storms. Immediately remove any debris and make repairs as needed in a timely manner. Maintain healthy vegetation at all times.

3.06 TEMPORARY SLOPE DRAINS

A. Place slope drains on undisturbed soil or well compacted fill. Slightly slope the section of pipe under the dike toward its outlet. Hand-tamp the soil under and around the entrance section in lifts not to exceed 6 inches.

B. Ensure that all slope drain connections are watertight. Ensure that all fill material is well-compacted. Securely fasten the exposed section of the drain with grommets or stakes spaced no more than 10 feet apart. Extend the drain beyond the toe of the slope and provide outlet protection.

C. Immediately stabilize all disturbed areas following construction.

D. Inspect the temporary slope drain, inlet and outlet protection, and supporting diversions weekly and after every rainfall event and promptly make any necessary repairs. When the protected area has been permanently stabilized, temporary measures may be removed, materials disposed of properly, and all disturbed areas stabilized appropriately.

3.07 TEMPORARY GRAVEL CONSTRUCTION ENTRANCES/EXITS

A. Maintain the gravel pad in a condition to prevent mud or sediment from leaving the construction site. This may require periodic topdressing with 2 – 3 inch stone. Inspect each construction entrance at least weekly and after each rainfall event and replace stone impaired by sediment as necessary. Immediately remove all objectionable materials spilled, washed, or tracked onto public roadways.

B. If, despite the use of a gravel construction entrance/exit, most of the mud and sediment are not removed from vehicle tires, tire washing may be necessary as detailed in Section

6.06 of the NC ESCPDM. If necessary, this shall be done at no additional cost to the Owner.

3.08 INLET EROSION CONTROL MEASURES

A. Excavated drop inlet protection shall be installed and maintained. Drainage area is limited to 1 acre. The minimum volume of excavated area around the drop inlet is 1800 ft3/acre disturbed. Minimum depth of the excavated area shall be 1 foot and maximum depth shall be 2 feet as measured from the crest of the inlet structure. Weep holes shall be protected by gravel. Inspect the excavated basin at least weekly and after every storm event until the contributing drainage area has been permanently stabilized. Remove sediment when the storage volume has been reduced by one-half.

B. Block and gravel inlet protection shall be installed and. Drainage area shall be limited to 1 acre unless site conditions allow for frequent removal of accumulated sediment. The height of the block barrier shall be no more than 12 inches and no less than 24 inches. On the bottom row, place some of the blocks on their side to allow for dewatering. Place wire mesh over all block openings to hold gravel in place. Lateral support may be provided by placement of 2 x 4 wood studs through block openings. Place gravel 2 inches below the top of the block barrier. The top elevation of the structure must be at least 6 inches below the ground elevation downslope from the inlet to ensure that all stormwater flows over the structure and enters the storm drain instead of bypassing the structure. Block and gravel inlet protection shall not be used near the edge of fill material and shall not divert water away from the storm drain. Inspect at least weekly and after every storm event until the contributing drainage area has been permanently stabilized. Remove sediment as necessary to provide adequate storage volume for subsequent rains. Replace stone as needed.

C. Rock pipe inlet protection shall be installed and maintained. Rock pipe inlet protection may be used at pipes with a maximum diameter of 36 inches. It shall not be installed in intermittent or perennial streams. The minimum crest width of the riprap berm shall be 3 feet, with a minimum bottom width of 11 feet and minimum height of 2 feet. The top of the riprap shall be 1 foot lower than the shoulder of the embankment or diversions. The outside face of the riprap should be covered with a 12-inch thick layer of #5 or #57 washed stone. The sediment storage area should be excavated upstream of the rock pipe inlet protection, with a minimum depth of 18 inches below grade. The rock pipe inlet protection shall be inspected at least weekly and after any storm event of greater than 1 inch of rain per 24-hour period. Repairs shall be made immediately. Remove sediment when the volume of the sediment storage area has been decreased by one-half and replace the contaminated part of the gravel facing.

3.09 FIBER FILTRATION TUBES (FFTS) AND SEDIMENT LOGS

A. FFTs and sediment logs shall be installed to maintain contact with the soil surface. Install prior to seeding. May be installed before or after installation of RECMs.

B. Anchor the upstream/upslope side of the FFTs using wire staples or approved devices at 1-foot intervals. Drive wooden stakes through downstream/downslope side of the FFTs at 2-foot intervals. Take care not to compress the FFTs. Backfill and compact loose soil against the upstream/upslope side. Overlap adjacent FFT ends by a minimum of 1 foot.

C. For channel installation, construct anchor trench 3 inches deep by FFT diameter and place loose soil against upstream side of FFT. For channel gradients of 2%, install trenches on 25-foot intervals. Decrease interval distance with steeper channel gradients or more highly erosive soils.

D. Any sediment accumulation at the base of the FFT must be removed when it reaches one-third of the height of the tube. FFT may need to be removed if fully loaded with captured sediment for maximum product performance. FFTs are to be left in place or removed from the site as directed by the Engineer.

E. Sediment logs do not require installation trenches. Wood stakes shall be placed at least every 2 feet along the length of the sediment log. Stakes shall only penetrate the netting around the log. They shall not be driven through the center of the log. Sediment logs are to be left in place or removed from the site as directed by the Engineer.

F. The FFTs and sediment logs shall be inspected at least weekly and within 24 hours after any storm event of greater than 1 inch of rain per 24-hour period. Look for signs of flow undercutting the logs. Re-anchor and replace as necessary.

3.10 TEMPORARY SEDIMENT TRAPS, SEDIMENT BASINS, AND SKIMMER SEDIMENT BASINS

A. Care shall be taken to ensure that proper site preparation operations are conducted prior to trap or basin construction. Clear, grub and strip embankment location.

B. A cut-off trench shall be excavated along the center line of the earth fill embankment for sediment basins and skimmer sediment basins. Keep the trench dry during backfilling and compaction operations.

C. Fill material shall be free of roots, woody vegetation, rocks, and other objectionable materials. Fill shall be placed in 6 to 8-inch layers and compacted. Construct the embankment to an elevation 10 percent (minimum of 6 inches) higher than the design height to allow for settling.

D. Inlets to the sediment traps and basins shall be constructed so as to prevent erosion. Use diversions to divert sediment-laden water to the upper end of the basin.

E. Shape the sediment trap or basin to the specified dimensions.

F. Following construction of the embankment, clear the sediment trap or basin area below the crest elevation of the spillway to facilitate sediment cleanout. Provide access for cleanout of accumulated sediment.

G. Spillway/outlet configuration shall be constructed as specified below.

H. Temporary sediment trap

1. Construct riprap outlet in embankment. Use filter fabric or a keyway cutoff trench between the riprap and the soil to protect it from piping. The outlet weir must be level and constructed to grade to assure design capacity. Ensure that the stone spillway outlet extends downstream past the toe of the embankment until the outlet velocity is acceptable for the receiving stream.

2. Provide emergency bypass in natural, stable areas, located so that flow will not damage the embankment.

I. Sediment basin

1. Securely attach the riser to the barrel or barrel stub to make a watertight structural connection. Secure all barrel connections with approved watertight assemblies. Install anti-seep collar(s). Ensure that the pipe stays in firm contact with its foundation when compacting fill around the pipe. Do not use pervious material as backfill around the pipe. Anchor the riser to prevent floatation. Install trash guard to prevent the riser and barrel from becoming clogged.

2. Install basin dewatering mechanism.

3. Install outlet protection as specified at principal spillway outlet. Install the emergency spillway in undisturbed soil and provide stabilization as specified.

J. Skimmer sediment basin

1. Excavate a shallow pit under the skimmer or provide a low support of stone or timber under the skimmer to prevent the skimming device from settling into the mud.

2. Place the barrel on a firm, smooth foundation of impervious soil. Do not use pervious material to backfill around the pipe. Ensure that the barrel stays in firm contact with its foundation when compacting fill around the pipe.

3. Assemble the skimmer following the Manufacturer’s instructions, or as designed.

4. Lay the assembled skimmer on the bottom of the basin with the flexible joint at the inlet of the barrel pipe. Attach the flexible joint to the barrel pipe and position the skimmer over the excavated pit or support. Attach a rope to the skimmer and anchor it to the side of the basin so that the skimmer may be pulled to the side for maintenance.

5. Install the spillway in undisturbed soil to the greatest extent possible and line with laminated plastic or impermeable geotextile fabric. Anchor the edges of the fabric

in a trench with staples or pins. Install outlet protection as specified at the principal spillway outlet.

K. Install porous baffles in temporary sediment traps, sediment basins, and skimmer sediment basins as specified herein or as required in the SWPPP.

1. Care shall be taken when installing porous baffles so they perform as designed. Baffle material shall be secured at the bottom and sides of sediment trap or basin. Fabric shall not be spliced but a continuous piece shall be used across the trap or basin.

2. Install at least three rows of baffles between the inlet and outlet discharge point. Sediment traps and basins less than 20 feet in length may use 2 baffles.

3. Posts or sawhorses shall be installed across the width of the sediment trap or basin unless an alternate baffle configuration is detailed in the approved SWPPP. Steel posts shall be driven to a depth of 24 inches, spaced a maximum of 4 feet apart. Baffle weirs shall be installed at locations and according to details on the approved SWPPP. Except in locations of baffle weirs, the top of the fabric shall be 6 inches higher than the invert of the spillway and 2 inches lower than the top of the berms.

L. Sediment traps and basins shall be constructed so that the area disturbed and resulting erosion is minimized. The emergency spillway, embankment, and all other disturbed areas above the crest of the principal spillway are to be stabilized immediately after construction.

M. Sediment traps and basins may attract children and should be considered dangerous. Steep side slopes should be avoided and fences with warning signs may be necessary if trespassing is likely.

N. Inspect temporary sediment traps, sediment basins, and skimmer sediment basins once a week and within 24 hours after any storm event of greater than ½ inch of rain per 24-hour period. Repairs shall be made immediately.

1. Sediment, limbs and other debris shall be cleared and the trap or basin shall be restored to its original dimensions when it accumulates to one-half the design depth or more frequently as directed by the Engineer. Sediment material removed from traps and basins shall be disposed of by the Contractor in locations that will not result in off-site sedimentation as acceptable to the Engineer, at no additional cost to the Owner. If no suitable on-site locations are available, all such sediment will be legally disposed of off site, at no additional cost to the Owner.

2. The embankment, spillways and outlet shall be checked for erosion damage and the embankment shall be checked for piping and settlement. Immediately fill any settlement of the embankment to slightly above design grade. Any riprap displaced from the spillway must be replaced immediately. Replace contaminated gravel

facing of riprap outlets as necessary. Inspect vegetation. Reseed and re-mulch as necessary.

3. Baffles, fabric and skimmer shall be inspected for damage. Repairs shall be made immediately. Re-anchor baffles if water is flowing under or around them.

4. Debris shall be removed from the skimmer to prevent clogging. Special precautions shall be taken in winter to prevent the skimmer from plugging with ice.

3.11 OUTLET STABILIZATION STRUCTURE

A. The Contractor shall ensure the subgrade, riprap and gravel filter conforms to the grading limits shown on the plans.

B. Riprap shall be installed in accordance with the specifications contained herein, with filter fabric placed under the riprap.

C. The apron shall be constructed on zero grade with no overfill. Ensure the apron is properly aligned with the receiving stream.

D. All disturbed areas shall be stabilized with vegetation immediately after construction.

E. Outlet stabilization structures shall be inspected at least weekly and within 24 hours after any storm event of greater than ½ inch of rain per 24-hour period to see if any erosion around or below the riprap has taken place or if stones have been dislodged. Repairs shall be made immediately.

3.12 TREE PROTECTION FENCE

A. Install tree protection fence around all designated tree protection areas prior to clearing, deliveries, and other construction activities onsite. Post signs designating area as protected on all sides of the fencing.

B. Inspect tree protection fence weekly. Repair and replace as needed.

3.13 DEWATERING SUMP

A. Excavate for pit installation. Pit dimensions are variable, with the minimum diameter being trice the diameter of the standpipe.

B. A base of filter material consisting of clean gravel or #57 stone (1.5 inch max diameter) is to be placed in the pit to a depth of six (6) inches.

C. The standpipe shall be wrapped with hardware cloth and approved non-woven geotextile fabric and placed in pit on clean gravel.

D. After installing the standpipe, the pit surrounding the standpipe should then be backfilled with #57 stone to an elevation that is six (6) inches minimum above the anticipated highwater level.

E. The standpipe shall extend twelve (12) inches minimum above the anticipated standing water level.

F. Insert pumping mechanism. Connect to separate filter bag if required by the SWPPP.

3.14 ADDITIONAL REQUIREMENTS

A. All storm sewer piping shall be blocked at the end of every working day until the inlet is constructed above grade.

B. All streets around the construction area shall be scraped as necessary to prevent accumulation of dirt and debris.

C. The Contractor shall provide adequate means to prevent any sediment from entering any storm drains, curb inlets (curb inlet filter box), ditches, streams, or bodies of water downstream of any area disturbed by construction. Excavation materials shall be placed upstream of any trench or other excavation to prevent sedimentation of offsite areas. Silt fence will be provided, at no additional cost to the Owner, around excavation materials if deemed necessary by the Engineer. In areas where a natural buffer area exists between the work area and the closest stream or water course, this area shall not be disturbed.

D. The Engineer may direct the Contractor to place any additional sediment and erosion control devices at locations not shown on the Drawings.

3.15 INSPECTIONS AND MAINTENANCE

A. The Contractor shall designate an Authorized Representative to perform inspections and maintenance as described herein. Contractor shall perform regular inspections and maintain records as follows:

1. Inspections shall be performed, at a minimum, once every seven calendar days and within 24 hours after any storm event of greater than 1 inch of rain per 24-hour period.

2. A rain gauge shall be maintained in good working order on the site and all rainfall amounts recorded throughout the duration of construction activities.

3. Inspection reports must be available on-site during business hours unless a site-specific exemption is approved.

4. Inspection records must be kept for 3 years following completion of construction and be available upon request.

5. Electronically-available records may be substituted under certain conditions.

B. During inspections, the following will be observed and appropriate maintenance activities shall be performed:

1. The conformance to specifications and current condition of all erosion and sediment control structures.

2. The effectiveness and operational success of all erosion and sediment control measures.

3. The presence of sediments or other pollutants in storm water runoff at all runoff discharge points.

4. The presence of sediments or other pollutants in receiving waters.

5. Evidence of off-site tracking at all locations where vehicles enter or exit the site.

6. Evidence of impacts to water quality due to site activities pertaining to equipment operation and maintenance, material handling, and material storage and construction laydown areas exposed to precipitation.

C. Immediate action shall be taken to repair/maintain erosion and sediment control measures that are not performing as designed. The State/Commonwealth reserves the right to stop all construction activities not related to these measures until such deficiencies are repaired.

D. In areas that have undergone final stabilization, inspections and, if necessary, maintenance by Contractor will occur at least once per month for the duration of the contract or project, whichever is longer.

3.16 MONITORING AND REPORTING

A. Monitoring: The Contractor shall be responsible for the implementation of the Inspections and Maintenance Procedures as included in the approved SWPPP . The implementation must comply with guidelines of any local regulatory authorities. Minimum monitoring requirements are as follows:

1. A rain gauge shall be maintained in good working order on the site.

2. A written record of the daily rainfall amounts shall be retained. (Note: if no rainfall occurred the Contractor must record “zero”).

3. The control measures shall be inspected to ensure that they are operating correctly. Inspection records must be maintained for each inspection event and for each measure. All erosion and sedimentation control measures must be inspected by the Contractor at least once every seven calendar days and within 24 hours after any storm event of greater than 1 inch of rain per 24-hour period unless otherwise noted herein. Some measures require inspection following each rainfall event.

4. Once land disturbance has begun on the site, stormwater runoff discharge outfalls shall be inspected by observation for erosion, sedimentation and other stormwater discharge characteristics such as clarity, floating solids, and oil sheens. Inspections of the outfalls shall be made at least once every seven calendar days and within 24 hours after any storm event of greater than 1 inch of rain per 24-hour period. Inspection records must be maintained for each inspection event and for each discharge location.

5. If any visible sedimentation is leaving the site or entering waters of the State, corrective action shall be taken immediately to control the discharge of sediments. Where visible deposition of sediment has occurred in surface waters or wetlands, the Contractor must verbally contact the Owner and TCEQ within 24 hours of becoming aware of the deposition. Written notification shall be made to the Owner and TCEQ within 5 days of becoming aware of the deposition.

B. Reporting: The Contractor must keep a record of inspections onsite with a copy of the approved erosion and sediment control plan. Inspection records shall be made available to TCEQ or its authorized agent upon request. Copies of inspection records shall be sent to the Owner on a monthly basis. The records must provide the details of each inspection including observations and corrective actions taken as described below.

1. Control Measure Inspections: Inspection records must include at a minimum: 1) identification of the measures inspected, 2) date and time of the inspection, 3) name of the person performing the inspection, 4) indication of whether the measures were operating properly, 5) description of maintenance needs for the measure, 6) corrective actions taken and 7) date of actions taken.

2. Stormwater Discharge Inspections: Inspection records must include at a minimum: 1) identification of the discharge outfall inspected, 2) date and time of the inspection, 3) name of the person performing the inspection, 4) evidence of indicators of stormwater pollution such as oil sheen, floating or suspended solids or discoloration, 5) indication of visible sediment leaving the site, 6) actions taken to correct/prevent sedimentation and 7) date of actions taken.

3. Visible Sedimentation Found Outside the Site Limits: Inspection records must include 1) an explanation as to the actions taken to control future releases, 2) actions taken to clean up or stabilize the sediment that has left the site limits and 3) the date of actions taken.

4. Visible Sedimentation Found in Streams or Wetlands: All inspections should include evaluation of streams or wetlands onsite or offsite (where accessible) to determine if visible sedimentation has occurred.

5. Visible Stream Turbidity: If the discharge from a site results in visible stream turbidity, inspection records must record that evidence and actions taken to reduce sediment contributions.

C. TCEQ reserves the right to use its own resources to duplicate monitoring and verify the work required by the Contractor in this Section.

1. The Sedimentation Pollution Control Act requires persons responsible for land-disturbing activities to inspect a project after each phase of the project to make sure that the approved erosion and sedimentation control plan is being followed.

2. The self-inspection program is separate from the weekly self-monitoring program of the NPDES Stormwater Permit for Construction Activities. The focus of the self-inspection report is the installation and maintenance of erosion and sedimentation control measures according to the approved plan. The inspections should be conducted after each phase of the project and continued until permanent ground cover is established.

3.17 REMOVAL OF TEMPORARY SEDIMENT CONTROL STRUCTURES

A. At such time that temporary erosion and sediment control structures are no longer required under this item, the Contractor shall notify the Owner of its intent and schedule for the removal of the temporary structures. The Contractor shall obtain the Owner's approval in writing prior to removal. Once the Contractor has received such written approval from the Owner, the Contractor shall remove, as approved, the temporary structures and all sediments accumulated at the removed structure shall be returned upgrade and stabilized so they do not re-erode. In areas where temporary control structures are removed, the site shall be left in a condition that will restore original drainage. Such areas shall be evenly graded and seeded to match existing conditions.

END OF SECTION

SECTION 31 32 13.16

CEMENT STABILIZED SAND

PART I – GENERAL

1.1 WORK INCLUDED

A. The Contractor shall furnish all labor, equipment, materials and services, including pumping equipment and application, necessary for the manufacture, transportation and placement of all cementitious stabilized sand as shown on the Contract Drawings or as ordered by the Engineer, except for the work specifically included under other items.

1.2 REFERENCES

A. ASTM C33 – Standard Specification for Concrete Aggregates (Fine Aggregate).

B. ASTM C40 – Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.

C. ASTM C42 – Standard Test Methods for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

D. ASTM C94 – Standard Specification for Ready-Mixed Concrete.

E. ASTM C123 – Standard Test Method for Lightweight Particles in Aggregate.

F. ASTM C142 – Standard Test Method for Clay Lumps and Friable Particles in Aggregates.

G. ASTM C150 – Specification for Portland Cement.

H. ASTM D558 – Standard Test Method for Moisture-Density (Unit Weight) Relations of Soil Cement-Mixtures.

I. ASTM D1632 – Standard Practice for Making and Curing Soil- Cement Compression and Flexure Test Specimens in the Laboratory.

J. ASTM D1633 – Standard Test Method for Compressive Strength of Molded Soil-Cement Cylinders.

K. ASTM D2487 – Standard Test Method for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

L. ASTM D3665 – Standard Practice for Random Sampling of

M. Construction Materials.

N. ASTM D4318 – Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

O. ASTM D6938 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Conform to requirements of Section 01 33 00 – Submittal Procedures.

B. Submit proposed target cement content and production data for sand- cement mixture in accordance with requirements of Paragraph 2.3, Materials Qualifications.

1.4 DESIGN REQUIREMENTS

A. Use sand-cement mixture producing minimum unconfined compressive strength of one hundred (100 psi) in forty-eight hours (48 Hrs.).

1. Design will be based on strength specimens molded in accordance with ASTM D558 at moisture content within three percent (3%) above or below of optimum moisture content and within four hours (4 Hrs.) of batching.

2. Determine minimum cement content from production data and statistical history. Provide no less than one and one tenth (1.1) sacks of cement per ton of dry sand.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Cement: Type I Portland cement conforming to ASTM C150.

B. Sand: Clean, durable sand meeting grading requirements for fine aggregates of ASTM C33 or requirements for bank run sand of Section 02140 – Utility Backfill Materials and the following requirements:

1. Classified as SW, SP, SW-SM, SP-SM or SM by Unified Soil Classification System of ASTM D2487.

2. Deleterious materials:

a. Clay lumps, ASTM C142 – less than one-half percent (1/2%).

b. Lightweight pieces, ASTM C123; less than five percent (5%).

c. Organic impurities, ASTM C40, color no darker than standard color.

3. Plasticity index of four (4) or less when tested in accordance with ASTM D4318.

C. Water: Potable water, free of oils, acids, alkalies, organic matter or other deleterious substances, meeting requirements of ASTM C94.

2.2 MIXING MATERIALS

A. Add required amount of water and mix thoroughly in pugmill-type mixer.

B. Stamp batch ticket at plant with time of loading. Reject material not placed and compacted within four hours (4 Hrs.) after mixing.

2.3 MATERIAL QUALIFICATION

A. Determine target cement content of material as follows:

1. Obtain samples of sand-cement mixtures at production facility representing range of cement content consisting of at least three

2. (3) points.

3. Complete molding of samples within four hours (4 Hrs.) after addition of water.

4. Perform strength tests [average of two (2) specimens] at forty- eight hours (48 Hrs.) and seven days (7 D).

5. Perform cement content tests on each sample.

6. Perform moisture content tests on each sample.

7. Plot average forty-eight hour (48 Hrs.) strength vs. cement content.

8. Record scale calibration date, sample date, sample time, molding time, cement feed dial settings and silo pressure (if applicable).

B. Test raw sand for following properties at point of entry into pug-mill:

1. Gradation.

2. Plasticity index.

3. Organic impurities.

4. Clay lumps and friable particles.

5. Lightweight pieces.

6. Moisture content.

7. Classification.

C. Present data obtained in format similar to that provided in sample data form attached to this Section.

PART 3 – EXECUTION

3.1 PLACING

A. Place sand-cement mixture in maximum twelve inch (12 in) thick loose lifts and compact to ninety-five percent (95%) of maximum density as determined in accordance with ASTM D558, unless otherwise specified. Target moisture content during compaction is plus or minus three percent (±3%) of optimum moisture content. Perform and complete compaction of sand-cement mixture within four hours (4 Hrs.) after addition of water to mix at plant.

B. Do not place or compact sand-cement mixture in standing or free water.

3.2 FIELD QUALITY CONTROL

A. Testing shall be performed under the provisions of Sections 01470 – Testing Laboratory Services and 01475 – Quality Control Testing Procedures.

B. One (1) sample of cement-stabilized sand shall be obtained for each one hundred fifty tons (150 Tn) of material placed per day with no less than one (1) sample per day of production. Random samples of delivered cement-stabilized sand shall be taken in the field at point of delivery in accordance with ASTM D3665. Obtain three (3) individual samples of approximately twelve pounds (12 Lbs.) to fifteen pounds (15 Lbs.) each from the first (1st), middle and last third (3rd) of the truck and composite them into one sample for test purpose.

C. Prepare and mold four (4) specimens (for each sample obtained) in accordance with ASTM D558, Method A, without adjusting moisture content. Samples shall be molded at approximately same time material is being used, but no later than four hours (4 Hrs.) after water is added to mix.

D. After molding, specimens shall be removed from molds and cured in accordance with ASTM D1632.

E. Specimens shall be tested for compressive strength in accordance with ASTM D1633, Method A. Two (2) specimens shall be tested at forty- eight hours (48 Hrs.) plus or minus two hours (±2 Hrs.) and two (2) specimens shall be tested at seven days (7 D) plus or minus four hours (±4 Hrs.).

F. A strength test shall be the average of strengths of two (2) specimens molded from the same sample of material and tested at the same age. The average daily strength shall be the average of strengths of all specimens molded during one day's (1 D) production and tested at same the age.

G. Precision and Bias: Test results shall meet recommended guideline for precision in ASTM D1633 Section 9.

H. Reporting: Test reports shall contain, as a minimum, as specified in TABLE 4.1 – CEMENT-STABILIZED SAND REPORT in this section, the following information:

1. Supplier and plant number.
2. Time material was batched.
3. Time material was sampled.
4. Test age (exact hours).
5. Average forty-eight hour (48 Hrs.) strength.
6. Average seven-day (7 D) strength.
7. Technical Specification section number.
8. Indication of compliance / non-compliance.
9. Mixture identification.
10. Truck and ticket numbers.
11. The time of molding.
12. Moisture content at time of molding.
13. Required strength.
14. Test method designations.
15. Compressive strength data as required by ASTM D1633.
16. Supplier mixture identification.
17. Specimen diameter and height, in.
18. Specimen cross-sectional area, sq.in.

3.3 ACCEPTANCE

C. Strength level of material shall be considered satisfactory if:

1. The average forty-eight hour (48 Hr) strength is greater than one hundred pounds per square inch (100 psi) with no individual strength test below seventy pounds per square inch (70 psi).

2. All seven-day (7 D) individual strength tests [average of two (2) specimens] are greater than or equal to one hundred pounds per square inch (100 psi).

D. The material shall be considered unacceptable and subject to removal and replacement at the Contractor's expense when individual strength test [average of two (2) specimens) has seven-day (7 D) strength] less than one hundred pounds per square inch (100 psi).

E. When the moving average of three (3) daily forty-eight hour (48 Hrs.) averages falls below one hundred pounds per square inch (100 psi), discontinue shipment to project until plant is capable of producing material, which exceeds one hundred pounds per square inch (100 psi) at forty hours (48 Hrs.). Five (5) – forty-eight hour (48 Hrs.) strength tests shall be made in this determination with no individual strength tests less than one hundred one hundred pounds per square inch (100 psi).

F. If any strength test of laboratory cured specimens falls below the specified strength, the Contractor may, at his own expense, request testing of cores drilled from the area(s) in question in accordance with ASTM C42. In such cases, three (3) cores shall be taken for each strength test that falls below the values given in paragraph 3.3.A.

G. Cement-stabilized sand in an area represented by core tests shall be considered satisfactory if the average of three (3) cores is equal to at least one hundred pounds per square inch (100 psi). Additional testing of cores extracted from locations represented by erratic core strength results shall be permitted.

END OF SECTION

SECTION 32 10 00
PAVING AND SURFACING

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, equipment and materials and perform all operations in connection with the construction of asphalt concrete pavement, asphalt concrete overlay, reinforced concrete pavement, gravel roads, concrete curb and gutter, repair and reconstruction of existing asphalt concrete pavement, repair of existing gravel roads, and pavement markings complete as specified herein and as detailed on the Drawings.

B. All new roads including the replacement of portions of the existing roads shall be to the limits, grades, thicknesses and types as shown on the Drawings. Patches for pipe crossings and areas damaged during the construction work shall be asphalt and/or gravel, depending upon the material encountered, unless otherwise indicated.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Requirements of related work are included in Division 01, Division 02 and Division 03 of these Specifications.

1.03 RELATED SECTIONS

A. Section 31 00 01 – Earthwork

B. Section 03 30 00 – Cast-in-Place Concrete

1.04 REFERENCES

A. TxDOT Tex-126-E - Molding, Testing, and Evaluating Bituminous Black Base Material.

B. TxDOT Tex-200-F - Sieve Analysis of Fine and Course Aggregates.

C. TxDOT Tex-203-F - Sand Equivalent Test.

D. TxDOT Tex-204-F - Design of Bituminous Mixtures.

E. TxDOT Tex 206-F - Compacting Test Specimens of Bituminous Mixtures.

F. TxDOT Tex-207-F - Determining Density of Compacted Bituminous Mixtures.

G. TxDOT Tex-208-F - Test for Stabilometer Value of Bituminous Mixtures.

H. TxDOT Tex-217-F - Determining Deleterious Material and Decantation Test for Coarse Aggregates.

I. TxDOT Tex-227-F - Theoretical Maximum Specific Gravity of Bituminous Mixtures.

J. TxDOT Tex-530-C - Effect of Water on Bituminous Paving Mixtures.

K. TxDOT Tex-531-C - Prediction of Moisture Induced Damage to Bituminous Paving Materials Using Molded Specimens.

1.05 STANDARD SPECIFICATIONS

A. Except as otherwise provided in the Specifications or on the plans, all work shall be in accordance with the latest version of the Texas Department of Transportation Standard Specifications for Roads and Structures except that any reference to "TxDOT", "Department" or "Unit" shall mean the "Owner".

B. Except with the approval of the Engineer, the placing of concrete or asphalt concrete surface paving shall be subject to the Seasonal and Weather Restrictions set forth in TxDOT Specifications.

PART 2 – MATERIALS

2.01 SELECT FILL

A. The Contractor shall place select fill as necessary to complete the embankments, shoulders, subgrade foundation and replacement for removed unsuitable material in accordance with TxDOT 100 Items – Earthwork and Landscape, and Section 31 00 01 – Earthwork.

2.02 GRAVEL

A. All work, including materials, associated with gravel shall be in accordance with TxDOT Item 247 – Flexible Based and Item 302 – Aggregates for Surface Treatment.

2.03 AGGREGATE BASE COURSE (ABC)

A. All work, including materials, associated with Aggregate Base Course shall be in accordance with TxDOT Item 247 – Flexible Base. Type shall be as shown on the drawings.

B. Base shall be Type A Grade 1-2.

2.04 ASPHALT BINDER FOR PLANT MIX

A. All work, including materials, associated with asphalt binder shall be in accordance with Item 292 – Asphalt Treatment.

2.05 ASPHALT PAVEMENTS

A. All work, including materials, associated with asphalt pavement shall be in accordance with Item 292 – Asphalt Treatment of the TxDOT Specifications. Surface Course shall be as shown on the drawings. Asphalt pavement mix designs shall be in accordance with Item 340 – Dense Graded Hot Mix Asphalt.

B. The job mix formulas shall be delivered to the Engineer at least two (2) weeks prior to beginning paving operations.

C. Asphalt mixture shall have a retained stability of no less than 70 percent when tested in accordance with ASTM D 1075.

2.06 RIGID PORTLAND CEMENT CONCRETE PAVEMENT

A. All work, including materials associated with rigid concrete pavement shall be in accordance with Section 03 30 00 – Cast-in-Place Concrete. Class B concrete shall be used. Placement shall be in accordance with Section 03 30 00 – Cast-in-Place Concrete and TxDOT Item 360 – Concrete Pavement.

2.07 RIGID CONCRETE PAVEMENT REINFORCING (NOT USED)

2.08 CONCRETE CURB AND GUTTERS

A. Concrete shall be Class B in accordance with the requirements of Section 03 30 00 – Cast-in-Place Concrete, except that concrete shall be air-entrained to provide an air content of 6% ± 1.5%.

B. Premolded expansion joint filler for expansion joints shall conform to ASTM D 1751 and shall be 1/2-inch thick, minimum.

2.09 ASPHALT TACK COAT

A. All work, including materials, associated with asphalt tack coat shall be in accordance with Item 292 – Asphalt Treatment and Item 300 – Asphalts, Oils, and Emulsions.

2.10 ASPHALT PRIME COAT

A. All work, including materials, associated with asphalt prime coat shall be in accordance with Item 310 – Prime Coat.

2.11 POLYCYCLIC AROMATIC HYDROCARBON (PAH)

A. The EPA has classified seven PAHs as probable human carcinogens, and 16 PAHs as Priority Pollutants. Materials containing concentrations of Polycyclic aromatic hydrocarbon (PAH), such as Coal Tar Based Sealcoat, higher than allowed by OSHA limits shall not be allowed for use on the project.

2.12 PAVEMENT MARKINGS

A. Type I Marking Materials shall be furnished in accordance with the most recent version of the Texas Department of Transportation (TxDOT), DMS-8220, “Hot Applied Thermoplastic.”

B. Type II Marking Materials shall be furnish in accordance with TxDOT DMS-8200, “Traffic Paint.” (Contains chlorinated rubber, do not use water-based material).

C. Glass Traffic Beads shall be furnished in accordance with TxDOT DMS-8290, “Glass Traffic Beads.”

1. Type I Markings: Furnish Type III drop-on glass beads.

2. Furnish Type II or double-drop of Type II and Type III drop-on glass beads where each type bead is applied separately in equal portions (by weight), only when specified in the plans.

3. When furnishing a double-drop system, apply the Type III beads before applying the Type II beads.

4. Type II Markings. Furnish Type III drop-on glass beads or other beads specified on the plans. 2.4 Labeling.

5. Use clearly marked containers that indicate color, mass, material type, manufacturer, and batch number.

PART 3 – EXECUTION

3.01 EMBANKMENT (NOT USED)

3.02 SUBGRADE

A. The subgrade, where shown on the Drawings, shall be aggregate stabilized by the addition and mixing of coarse aggregate with the top 3-inches of subgrade in accordance with Item 292 – Asphalt Treatment.

3.03 BASE COURSE

A. The finished base course of all paving shall be ABC and shall be of the thickness shown on the Drawings, formed true to crown and grade. Gravel roads, including repair to existing gravel roads shall be ABC and shall be of the thicknesses shown on the Drawings, formed true to crown and grade. No fill material except new ABC shall be placed on top of existing gravel.

3.04 ASPHALT CONCRETE SURFACE COURSE

A. Prior to placement of the asphalt concrete surface course, the base course shall be inspected for damage or defects and repaired to the satisfaction of the Engineer. The surface of the base/intermediate course shall be approved by the Engineer.

B. The asphalt tack coat shall be applied to the surface of the approved base/binder course as described in TxDOT Item 340 – Dense Graded Hot Mix Asphalt. Equipment for applying the tack coat shall be power oriented pressure spraying or distributing equipment suitable for the materials to be applied and approved by the Engineer.

C. The Asphalt Concrete Surface Course shall meet the thicknesses shall be as shown on the Drawings.

3.05 ASPHALT CONCRETE PAVEMENT COMPACTION

A. Asphalt concrete pavement compaction shall be performed as described in TxDOT Item 340 – Dense Graded Hot Mix Asphalt.

B. Contractor shall provide Quality Control (QC) for proper asphalt concrete pavement placement and compaction using equipment in good working order which has been properly calibrated at the start of each round of testing. Quality Assurance (QA) of paving operations will be performed by an independent third-party representative hired by Owner.

C. Immediately after the asphalt mixture has been spread, struck off and surface and edge irregularities adjusted, thoroughly and uniformly compact the pavement. Compact the mix to the required degree of compaction for the type of mixture being placed.

3.07 ASPHALT CONCRETE DENSITY ACCEPTANCE

A. The Engineer will evaluate the asphalt pavement for density acceptance after the asphalt mix has been placed and compacted using the Contractor's QC test results, the Owner’s QA test results (including verification samples) and by observation of the Contractor's density QC process conducted in accordance with TxDOT Item 340 – Dense Graded Hot Mix Asphalt.

B. Minimum density requirements for all mixes will be as specified in TxDOT Item 340 – Dense Graded Hot Mix Asphalt. Density acceptance will be as provided herein. Core sample shall be obtained and tested by the Owner’s representative at the same frequency and location as the Contractor’s QC testing, if possible.

C. A failing lot for density acceptance purposes is defined as a lot for which the average of all test sections, and portions thereof, fails to meet the minimum specification requirement. A lot will consist of one day’s production of a given JMF, for each layer of asphalt concrete placed. If additional density sampling and testing, beyond the minimum requirement, is performed and additional test sections are thereby created, then all test results shall be included in the lot average.

D. Any lot or portion of a lot deemed obviously unacceptable by the Owner or Engineer will be rejected for use in the work. If the Engineer determines that a given lot of mix does not meet the minimum specification requirements, but the work is reasonably acceptable, the lot will be accepted at a reduced pay factor in accordance with the following formula. The reduced pay factor will apply only to the contractor's schedule of values.

$$\text{Reduced Pay Factor} = 100 + \frac{(\text{Actual Density} - \text{Specified Density}) \times 30}{2}$$

Where: Actual Density = the lot average density, not to exceed 2.0% of the specified density

Specified Density = the density in Table 3-1 or as specified in the contract

3.08 ASPHALT CONRETE PAVEMENT PHASING

A. Contractor shall be responsible for phasing the placement of asphalt concrete pavement sections and courses to account for individual construction activities, the construction traffic volume, and vehicle loading expected throughout construction activities. The placement of asphalt concrete pavement shall also be phased so the aggregate base course, once installed, is not exposed to freeze/thaw cycles.

3.09 RIGID PORTLAND CEMENT CONCRETE

A. The subgrade and base course beneath portland cement concrete pavement shall be prepared in accordance with the applicable Sections of these Specifications and referenced Standard Specifications, except that the Contractor shall use an approved automatically controlled fine grading machine to produce final subgrade and base surfaces meeting the lines, grades, and cross sections (thicknesses) shown on the Drawings or established by the Engineer.

B. The surface of the base shall be damp at the time the concrete is placed. The Contractor shall sprinkle the base when necessary to provide a damp surface. The Contractor shall satisfactorily correct all soft areas in the subgrade or base prior to placing concrete.

C. Hauling over the base course shall not be allowed except where specifically permitted by and in writing by the Engineer. The Engineer may allow equipment dumping concrete to operate on the base to the extent and under the conditions the Engineer deems necessary to facilitate placing and spreading the concrete.

D. Installation of the rigid concrete pavement shall be in accordance with the details shown on the Drawings and Division 03 - Concrete. The rigid concrete pavement shall cure a minimum of ten (10) calendar days and until the concrete has attained a minimum flexural strength of 550 psi as indicated by flexural strength testing. The Contractor shall coordinate and pay for all flexural strength testing with a minimum of four (4) 6inch by 6inch by 20inch beams for every fifty (50) cubic yards of pavement concrete installed.

E. Transverse and longitudinal joints shall be spaced at intervals as shown on the Drawings and installed as per the requirements of TxDOT Item 360 – Concrete Pavement. Transverse contraction joints shall be formed by an approved joint insert. Longitudinal joints shall be formed by allowing the paver to deposit the mixture adjacent to the joint to such depth that maximum compaction can be obtained along the joint. Pinch the joint by rolling immediately behind the paver. Expansion joints shall be placed when the pavement abuts a structure using 1 inch expansion joint material (filler) and sealant as specified herein.

3.10 CONCRETE CURB AND GUTTER AND SIDEWALK

A. The expansion joint filler for concrete curb and gutters shall be cut to conform with the cross section of the curb. Expansion joints shall be spaced at intervals of not more than 50 feet. Formed control joints shall be installed at intervals not exceeding 10 feet. (Expansion joints can placed at intervals of 45 feet and control joints at 15 feet if curb and gutter is machine placed.) Depth of joint shall be 1/3 the thickness. Curved forms shall be used where radii are indicated; straight segments shall not be permitted. Upon removal of the forms, exposed curb faces shall be immediately rubbed down to a smooth and uniform surface. No plastering shall be permitted.

B. Concrete sidewalks shall include contraction joints between each panel of sidewalk and when sidewalk width exceeds 6-feet, longitudinal contractions joints shall be placed as required. Additionally, ½" expansion joints and sealer shall be placed at a maximum spacing of 50-feet of sidewalk. ½" expansion joint material and sealer shall also be where sidewalks abut and rigid structure or curb and gutter.

3.11 UNDERGROUND UTILITY LINES

A. Where an underground utility line is beneath the new roadway, the backfilling shall be carried out with special care, and the final consolidation shall be accomplished by a vibratory roller. Construction of the roadway over the trench shall be deferred as long as practicable.

3.12 JUNCTION WITH OTHER PAVING

A. Where new asphalt concrete pavement abuts existing asphalt concrete pavement, the existing pavement shall be cut back to insure obtaining the specified compaction of the new pavement courses and interlocking adjoining courses. Existing subbase courses shall be cut back from the subgrade level of the new pavement on a one-on-one slope into the existing pavement, and the asphalt courses of the existing pavement shall be removed for an additional 6-inches back from the slope. The edge of the existing asphalt courses shall be saw cut straight and true. The faces between new and existing asphalt courses shall receive an application of tack coat.

B. Where new rigid concrete pavement abuts existing rigid concrete or asphalt concrete paving, the existing paving shall be saw cut straight and true. An expansion joint of a

1/2-inch minimum thickness with filler material and sealant shall be placed between the new concrete pavement and the existing rigid concrete or asphalt concrete paving.

3.13 ASPHALT CONCRETE OVERLAY

A. Where asphalt concrete is proposed to be placed over an existing asphalt or rigid concrete surface, the surfaces shall be thoroughly cleaned by power brooming and a tack coat shall be applied in accordance with TxDOT Item 347 – Thin Overlay Mixtures, prior to installing the overlay. The overlay shall be applied in accordance with TxDOT Item 347 – Thin Overlay Mixtures and Standard Details shown on the Drawings.

3.14 PAVEMENT MARKINGS

A. Place markings before opening to traffic unless short-term or work zone markings are allowed.

B. Obtain approval for the sequence of work and estimated daily production.

C. On roadways already open to traffic, place markings with minimal interference to the operations of that roadway.

D. Use approved traffic control methods as per TMUTCD.

E. Protect all markings placed under open-traffic conditions from traffic damage and disfigurement.

F. Establish guides to mark the lateral location of pavement markings as directed and have guide locations verified.

G. Use material for guides that will not leave a permanent mark on the roadway.

H. Apply markings on pavement that is completely dry and passes the following tests:

1. Type I Marking Application—Place a sample of Type I marking material on a piece of tarpaper placed on the pavement. Allow the material to cool to ambient temperature, and then inspect the underside of the tarpaper in contact with the pavement. Pavement will be considered dry if there is no condensation on the tarpaper.

2. Type II Marking Application—Place a 1-sq. ft. piece of clear plastic on the pavement, and weight down the edges. The pavement is considered dry if, when inspected after 15 min., no condensation has occurred on the underside of the plastic.

I. Apply markings that meet the requirements of Tex-828-B, 2. using widths and colors matching the existing conditions.

J. Marking shall:

1. Be in proper alignment with the guides without deviating from the alignment more than 1 in. per 200 ft. of roadway or more than 2 in. maximum.

2. Be applied without abrupt deviations.

3. Be free of blisters and with no more than 5% by area of holes or voids.

4. Have uniform cross section and thickness.

5. Have clean and reasonably square ends.

6. Be are reflectorized

7. Be applied using personnel skilled and experienced with installation of pavement markings.

K. Contractor shall remove all applied markings that are not in alignment or sequence as stated in the plans or as stated in the specifications at the Contractor's expense in accordance with the most recent version of the Texas Department of Transportation "Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges", Item 677, "Eliminating Existing Pavement Markings and Markers," except for measurement and payment. Surface Preparation. Unless otherwise shown on the plans, prepare surfaces in accordance with this section.

L. Apply markings during good weather unless otherwise directed. If markings are placed at Contractor option when inclement weather is impending and the markings are damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the markings if required.

1. Apply Type I markings with a minimum thickness of:

   a. 0.100 in. (100 mils) for new markings and retracing water-based markings on surface treatments involving the Texas Department of Transportation "Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges", Item 316, "Surface Treatments," or Item 318, "Hot Asphalt-Rubber Surface Treatments."

   b. 0.060 in. (60 mils) for retracing on thermoplastic pavement markings.

   c. 0.090 in. (90 mils) for all other Type I markings. The maximum thickness for Type I markings is 0.180 in. (180 mils). Measure thickness for markings in accordance with Tex-854-B using the tape method.

2. Type II Markings. Apply on surfaces with a minimum surface temperature of 50°F. Apply at least 20 gal. per mile on concrete and asphalt surfaces and at least 22 gal. per mile on surface treatments for a solid 4-in. line. Adjust application rates proportionally for other widths. When Type II markings are used as a sealer for Type I markings, apply at least 15 gal. per mile using Type II drop-on beads.

3. Bead Coverage. For Type I and Type II markings, provide a uniform distribution of beads across the surface of the stripe, with 40 to 60% bead embedment.

M. Performance Period. All markings and replacement markings must meet the requirements of Tex828-B for at least 30 calendar days after installation. Unless otherwise directed, remove pavement markings that fail to meet requirements, and replace at the Contractor's expense. Replace failing markings within 30 days of notification.

END OF SECTION

SECTION 33 01 30.23

PIPE BURSTING

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The work shall include furnishing all labor, tools, and equipment required to replace existing pipes by using the pipe bursting method at the locations indicated on the Contract Drawings, including any service and manhole connections.

B. Pipe bursting for this project has been classified as Class B difficulty in accordance with the guidelines published by the International Pipe Bursting Association.

1.02 REFERENCED SECTIONS

A. Section 01 33 00 Submittal Procedures

B. Section 33 05 33.23 High Density Polyethylene (HDPE) Pipe

C. Section 33 01 30.11 Television Inspection of Sewers

1.03 REFERENCED CODES AND STANDARDS

A. None

1.04 QUALIFICATIONS

A. The Contractor shall provide proof of training by the particular pipe bursting system manufacturer that the company is a fully trained user of the pipe bursting system and has installed a minimum of 5,000 LF of pipe using the aforementioned system. A list of prior contracts stating the owner, location, and footage installed by the pipe bursting method is required as proof.

B. Polyethylene pipe joining shall be performed by personnel trained and certified in the use of butt-fusion equipment and recommended methods for new pipe connections. Personnel directly involved with installing the new pipe shall receive training in the proper methods for handling and installing the polyethylene pipe. Training shall be performed by qualified representative(s).

1.05 SUBMITTALS

A. Conform to the requirements of Section 01 33 00 – Submittal Procedures.

B. Submit the following:

1. Shop drawings, catalog data, and manufacturer's technical data showing complete information on material composition, physical properties, and dimensions of new pipe and fittings. Include manufacturer's recommendations for handling, storage, and repair of pipe and fittings damaged.

2. Work plan outlining the method of mainline replacement and restoration of existing service connections as applicable. This shall include detail drawings and written descriptions of the entire construction procedure to install pipe, bypass sewage flow, and reconnect sewer service connections including:

    a. Static or pneumatic unit

    b. Information about bursting unit including pulling capacity

    c. Lubrication MSDS (if used)

    d. Pipe splitters and cutting wheels (if used for static pipe bursting methods only)

    e. Location of machine and pipe insertion pits

    f. Storage and equipment setup areas

    g. Construction sequencing

    h. Traffic control plan

    i. Existing utility protection and contingency plan

    j. Modifications to existing facilities

    k. Safety plan particularly related to confined space entries and excavation near existing gas lines, as applicable

    l. Manufacturer’s data for the pipe including material, dimensions, safe pull ratings, physical properties, compliance with standards and recommendations for handling, storage, and repair. Contractor to confirm proposed pipe material is appropriate for use with proposed pipe bursting method.

    m. Design calculations resulting in wall thickness for appropriate-sized DR for each installation utilizing the following parameters and assumptions:

        1) Use soil depth at deepest manhole in installation.

        2) Assume ground water table height of four feet below grade unless ground water monitoring data indicates different height.

3) List values of key parameters used in calculations, including but not limited to:

a) Density of soil

b) Depth of burial

c) Live loads

d) Safety factors

e) Pipe modulus of elasticity

f) Soil modulus

g) Total calculated pressure on the pipe

4) Documentation of source of equations and methodologies used in calculations.

5) Allowable tensile stress during pulling of pipe.

6) Calculated pipe deflection versus allowable pipe deflection for selected pipe.

7) Critical buckling pressure.

8) Slip trench or entry pit dimensions for pipe insertion (as applicable).

n. Pulling log to include Allowable Tensile Load (ATL) and duration of pull of the replacement pipe.

o. Field testing results.

p. Sample door hangers. These shall include basic information about the work being conducted, including noise, interruption of service, and contact information (phone number) of the Contractor.

q. Manufacturer's product data for the following:

1) Water stopping material used to reconstruct manhole connections and benches.

2) Cementitious patching material used to reconstruct manhole connections and benches.

3) Lateral connection assemblies.

3. Contractor and personnel experience and certifications described in Article 1.04 herein.

4. Television inspection reports and videotapes made after pipe bursting.

5. Packing list, invoice, or delivery ticket with every shipment, to contain Contract number, type and class of pipe, length, and other pertinent information.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Transport, handle, and store pipe and fittings as recommended by manufacturer. Deliver, store and handle materials as required to prevent damage.

B. If new pipe and fittings become damaged before or during installation, they shall be repaired as recommended by the manufacturer or replaced as required by the Engineer at the Contractor's expense, before proceeding further.

1.07 SAFETY

A. The contractor shall carry out operations in strict accordance with all applicable OSHA Standards. Particular attention is drawn to those safety requirements involving work entry into confined spaces. It shall be the contractor's responsibility to familiarize its employees with OSHA Standards and regulations pertaining to all aspects of the work.

B. All excavations shall be properly shored in accordance with relevant specifications for trench safety systems. Any damage resulting from improperly shored excavations shall be corrected to the satisfaction of the Engineer with no compensation due to the Contractor.

C. All open excavations shall be kept secure at all times by the use of barricades with appropriate lights and signs, construction tape, covering with steel plates, etc., or as directed by the Engineer.

1.08 QUALITY ASSURANCE

A. The Contractor is solely responsible for quality assurance during the length of the project. The Contractor is responsible for any costs associated with corrective measures required to replace or repair items not meeting the quality standards of these Specifications at no additional cost to the Owner.

B. Product Manufacturers shall provide the Engineer with written certification indicating products furnished comply with all applicable provisions of these specifications.

C. If ordered by the Engineer, each pipe manufacturer shall furnish the services of a competent and certified factory representative to supervise and/or inspect the installation of the pipe. This service shall be furnished at no additional cost to the Owner.

PART 2 – PRODUCTS

2.01 BURSTING EQUIPMENT

A. Pipe bursting tool shall be the pneumatic or static type.

1. Bursting rods shall be pushed from a pit through the existing pipe to a pipe pit where the bursting appurtenances and pipe are connected and pulled back through the existing pipe. No cable, chain, or threaded rod systems will be permitted for static type pipe bursting.

B. The bursting action of the tool shall increase the external dimensions sufficiently, causing breakage of the pipe at the same time expanding the surrounding ground. This action shall not only break the pipe, but also create the void into which the expander head can be pulled which enables forward progress to be made. Simultaneously, the new pipe either directly attached to the expander or connected via a ductile iron pipe pulling head of similar joint design, shall also move forward.

C. The static pulling frame shall be telescopic in design to allow the cutting head to release at the termination of the pull. This also provides minimal trench length by telescopic adjustment.

D. Quick lock bursting rods are required to guarantee snap lock connections. Quick Lock rods also stabilize cutting wheels at a 90º plane to invert pipe. Threaded bursting rods are not allowed. This insures the same cutting location eliminating threaded rod failures and turning of rods which effect cutting ability of blades.

E. The unit must maintain automatic thrust and pull back.

F. The unit is capable of pipe bursting in two directions from the same excavation.

2.02 PIPE

A. Butt-fused High Density Polyethylene (HDPE) pipe per Specification Section 33 05 33.23. Pipe shall be a minimum of DR 17. Contractor shall submit proposed pipe based on pull length. Submittal shall include calculations to substantiate pipe selection.

2.03 BURSTING LUBRICANTS

A. Bursting lubricants can be used at the request of the pipe bursting contractor or shall be used at the discretion of the Owner and/or their Representative.

B. If used, lubricants shall be compatible for long term use with the pipe being installed.

2.04 PIPE PULL HEADS / EXPANDERS

A. Pipe pull heads that employ a positive through-bolt design assuring a smooth wall against the pipe cross-section shall be used at all times.

B. Pipe pull heads shall be specifically designed for use with new pipe material and shall be as recommended by the pipe supplier.

2.05 PIPE ROLLERS

A. Pipe rollers, if required, shall be of sufficient size to fully support the weight of the pipe during handling and pullback operations.

B. Rollers (type and quantity) shall be used per the pipe supplier's guidelines to assure adequate support and resist excessive sagging of the product pipe.

2.06 PIPE JOINING FOR TERMINAL SECTIONS OF HDPE PIPE

A. Terminal sections may also be joined by:

1. Electrofuse Couplings by Central Plastic Company, Friatec, or Engineer approved equal.

2. Full Circle Repair Clamps by Smith Blair, JCM, or Engineer approved equal.

2.07 SEWER SERVICE CONNECTIONS

A. Saddles for sewer service connections shall be made of a material compatible with that of the pipe. Sewer service connections shall be connected to the new pipe by Electrofusion saddles as manufactured by Central Plastics, Friatec, or Engineer approved equal.

2.08 MANHOLE CONNECTIONS

A. A cementitious patching material shall be used in the manholes to reconstruct a proper flow channel around the end of the cured liner. Patching material shall be made by the Strong Company, Quadex or Engineer approved equal.

B. A water stop shall be used around the HDPE pipe at the manholes to create a watertight seal at the manhole interface. Material shall be hydrophobic that expands when in contact with water by a minimum of 2x its original volume. Material shall be Adeka P-201, Hydrotite by Sika, or Engineer approved equal.

PART 3 – EXECUTION

3.01 GENERAL

A. Prior to beginning pipe bursting work, submit a schedule to the Engineer. Once the schedule is approved by the Engineer, it will become part of the scope of work. It is the responsibility of the Contractor to maintain this schedule. If circumstances arise affecting the project schedule, the Contractor shall notify the Engineer in writing and request approval from the Engineer for a schedule change.

B. It is the responsibility of the Contractor to notify all residents potentially affected by the Pipe Bursting activities. This notification shall consist of written information and verbal communication outlining the Pipe Bursting process and timing of the project. The written information shall be delivered to each home/business at least one week prior to the start of the project, and at a minimum shall describe the work, schedule, how it affects the home/business, and local telephone numbers for the Contractor and Engineer. The written notification shall be approved by the Engineer before distribution. At the request of the Owner, the Contractor shall participate in public meetings regarding the Project.

C. Provide sewer flow control in accordance with Specification Section 01 57 40 – Temporary Pumping Systems. If sewage backup and overflow occurs, the Contractor shall be responsible for clean-up, repair, property damage cost, and claims.

1. Contractor shall be responsible for maintaining service and coordination of any loss of sewer service with property owners.

2. At no time shall water and sewer service be interrupted by the pipe bursting operations.

3. The Contractor shall locate all wastewater service lines, plug, and pump prior to pipe bursting and continuously pump until the services are reconnected.

4. Schedule and perform the Work in a manner that does not cause or contribute to incidence of overflows or spills of sewage from sewer system.

5. In the event Contractor's work activities contribute to overflows or spills, take appropriate action to contain and stop overflow, clean up spillage, disinfect area affected by spill and notify Owner as soon as possible.

D. Contractor shall obtain approval in writing from the Owner regarding work outside of normal work hours .

E. Contractor shall take the necessary steps for the protection of existing utilities. This may require potholing and exposure at crossing points, or the use of a different bursting method, etc. Contractor shall be responsible for all damage caused to existing utilities and structures because of pipe bursting.

F. Provide water from tanker trucks or approved hydrants for cleaning, installation, and other process related work items requiring water. Comply with Owner's connection and use requirements.

3.02 PREPARATION

A. All sewer mains to be burst shall be cleaned and inspected. Cleaning and CCTV inspections should be in accordance with NASSCO standards for quality and industry standards.

B. All service connections shall be located prior to pipe bursting using the CCTV inspection.

C. If the pre-construction CCTV inspection reveals obstructions or pipe materials that will prevent the existing pipe from being pipe burst properly and cannot be removed by conventional cleaning equipment, a point repair will be made by the Contractor, with approval from the Owner/Engineer. Separate payment for this work will be made and it is not considered incidental to the pipe bursting process.

D. If the pre-construction CCTV inspection reveals a sag or hump, Contractor shall notify the Owner so they can determine whether Contractor should proceed. Separate payment for this work will be made and it is not considered incidental to the pipe bursting process.

E. Sub-surface and Surface Conditions:

1. Before any excavation, it will be the responsibility of the contractor to follow local regulations related to Texas 811 notification and to check with the various utility companies and determine the location of existing utilities in the vicinity of the work area. The contractor at no cost to the City, if required, will arrange temporary construction easement and/or right-of-way areas to avoid impacting existing utilities.

2. Locate and mark existing utilities in areas where excavation is to be performed prior to beginning excavation.

3. Any known pre-existing concrete encasements shall be excavated and broken out prior to the bursting operation to allow the steady and free passage of the pipe bursting head.

4. Examine surface and subsurface path of proposed line segment and notify Engineer if conditions exist that could cause problems with pipe bursting method. This could include utilities and nearby services that could be damaged by the operations, existing slabs that could be damaged, expansive soils, or less than acceptable depth of cover.

5. Where the existing utilities may be damaged by the expander head pushing soil against them, the Contractor shall pothole and verify existing utility locations and provide an ability to relieve soil stresses without applying additional stresses to the existing utilities. Contractor is responsible for all damage to adjacent utilities as a result of pipe bursting operations.

F. Disconnect laterals from host sewer main following approved submittals.

G. Manhole Preparation

1. Enlarge manhole openings as necessary to accommodate to the bursting head to pass through without damaging the manhole.

2. Remove manhole drop connections that interfere with bursting process.

3.03 INSERTION / RECEIVING PIT EXCAVATIONS

A. One or more receiving pits shall be excavated at the end(s) of the sewer pipe to be replaced or at appropriate points within the length of the existing pipe. Pit shall be centered over the existing pipe.

B. The location and number of insertion and receiving pit excavations shall be planned by the contractor and submitted in writing for approval by the Engineer 21 days prior to excavation. If it is determined that the construction site access is limited or restrictions on street and lane blockage is restricted or prohibited, consideration should be given to using sectional pipe installed using the “cartridge” method.

C. The number of pits for machine and pipe insertion shall be the minimum necessary to accomplish the work most efficiently. The contractor shall consider the use of excavation required for other purposes such as for sanitary sewer service reconnections and manhole replacement.

D. Where manholes are used as machine pits or new pipe insertion pits, the contractor shall identify such manholes and replace them at no additional cost to the City if damaged. Any manhole modification or replacement required shall be considered incidental to the installation of the new pipe.

E. Insertion pits shall be of sufficient length to allow the bursting head and new HDPE pipe to enter the host pipe at an angle that will maintain the grade of the existing sanitary sewer.

3.04 PIPE INSTALLATION

A. The pipe shall be assembled and joined at the site using the butt-fusion method to provide a leak proof joint. Threaded or solvent-cement joints and connections are not permitted. All equipment and procedures shall comply with the manufacturer’s recommendations. Fusing shall be accomplished by personnel certified as fusion technicians by a manufacturer of HDPE pipe and/or fusing equipment.

B. The butt-fused joint shall be in true alignment and shall have uniform rollback beads resulting from the use of proper temperature and pressure. The joint shall be allowed adequate cooling time before removal of pressure. The fused joint shall be watertight and shall have tensile strength equal to that of the pipe. All defective joints shall be cut out and replaced at the expense of the Contractor.

C. The new pipe shall be inserted immediately behind the bursting head in accordance with the manufacturer’s recommended procedures. The bursting tool shall be specifically designed and manufactured for the type of insertion process being used. It shall be utilized to guide and assist the bursting head during the operation. A pushing machine may be utilized to aid pipe insertion from the rear.

D. Do not exceed approved submittal insertion rate or force at any time. Maintain logs verifying rate and force did not exceed submitted calculations.

E. Use approved lubricant to ease installation friction. Match lubricants to soil and insertion conditions.

F. If concrete encasements are encountered, a point repair shall be performed to excavate and break out concrete prior to the bursting operation to allow the steady and free passage of the pipe bursting head, with approval from the Owner/Engineer. Separate payment for this work will be made and it is not considered incidental to the pipe bursting process.

G. New pipe shall extend a minimum of 8 inches into each manhole. At the manhole interfaces, the pipe shall be completely wrapped with water stop material and then completely encased in the hydraulic cementitious patching material to form a smooth, solid, watertight connection to the manhole.

H. Installations of electrofusion couplings shall be done in accordance with the manufacturers' recommended procedures.

I. An appropriate relaxation period shall be allowed prior to making service connections and connecting to manholes. The relaxation period shall be appropriate for and dependent upon site conditions, as determined by Contractor.

J. Service connections to the HDPE pipe shall be made with materials submitted and approved in accordance with Article 2.02 herein.

K. The inverts and flow channel shall be reconstructed using approved cementitious patching material. Flow channel shall not leave any voids which will become clogged with debris.

3.05 LATERAL REPLACEMENT

A. Replace laterals by pipe bursting as specified herein including all preparatory and post-installation cleaning, inspection, and flow control requirements.

1. Burst laterals 20 feet long and shorter by sectional bursting.

2. Burst laterals longer than 20 feet by either sectional or standard bursting.

3. Modify services as necessary to ensure each lateral has its own connection to the main. Do not allow services to join to each other prior to mainline connection.

4. Discuss any of the following conditions with the Engineer:

a. Laterals with issues that prevent bursting.

b. Connections with less than 2 percent slope.

5. Provide elevations and logs showing confirmation of lateral grade.

6. Do not replace laterals that have already been replaced with PVC pipe and have an existing cleanout. Only reconnect to mainline after pipe bursting of mainline is complete.

3.06 RECONSTRUCTION AND RESTORATION AT EXCAVATION PITS

A. Contractor shall fill and restore excavation pits related to pipe bursting in accordance with the appropriate project specifications and Contract Drawings.

B. Contractor shall install any open-cut pipe or manholes related to pipe bursting in accordance with the appropriate project specifications.

3.07 TESTING AND ACCEPTANCE

A. After the existing sewer is completely replaced, the Contractor shall perform a post-installation television inspection. Copies of the inspection video tape shall be provided to the Owner for review and approval prior to final acceptance.

B. The finished pipe will be continuous over the entire length of the sewer between two manholes, unless the Engineer has approved a non-fused joint at a particular location, and to be free from visual defects. Defects which may affect the integrity or strength of the pipe in the opinion of the Engineer will be repaired or the pipe replaced at the Contractor's expense.

END OF SECTION

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SECTION 33 05 16

CONCRETE FOR UTILITY CONSTRUCTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Cast-in-place concrete work for utility construction or rehabilitation, such as slabs on grade, small vaults, site-cast bases for precast units, and in-place liners for manhole rehabilitation.

1.02 REFERENECES

A. ACI 117 - Standard Tolerances for Concrete Construction and Materials.

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.

C. ACI 302.1R - Guide for Concrete Floor and Slab Construction.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

E. ACI 308 - Standard Practice for Curing Concrete.

F. ACI 309R - Guide for Consolidation of Concrete.

G. ACI 311 - Batch Plant Inspection and Field Testing of Ready Mixed Concrete.

H. ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures.

I. ACI 318 - Building Code Requirements for Reinforced Concrete.

J. ACI 544 - Guide for Specifying, Mixing, Placing, and Finishing Steel Fiber Reinforced Concrete.

K. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

L. ASTM A 185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

M. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

N. ASTM A 767 - Standard Specifications for Zinc-coated (Galvanized) Bars for Concrete Reinforcement.

O. ASTM A 775 - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

P. ASTM A 820 - Steel Fibers for Fiber Reinforced Concrete.

Q. ASTM A 884 - Specification for Epoxy-coated Steel Wire and Welded Wire Fabric for Reinforcement.

R. ASTM C 31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

S. ASTM C 33 - Standard Specification for Concrete Aggregates.

T. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

U. ASTM C 42 - Standard Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

V. ASTM C 94 - Standard Specification for Ready-Mixed Concrete.

W. ASTM C 138 - Standard Test Method for Unit Weight Yield and Air Content (Gravimetric) of Concrete.

X. ASTM C 143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

Y. ASTM C 150 - Standard Specification for Portland Cement.

Z. ASTM C 172 - Standard Practice for Sampling Freshly Mixed Concrete.

AA. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by Volumetric method.

BB. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure method.

CC. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete.

DD. ASTM C 309 - Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.

EE. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete.

FF. ASTM C 595 - Standard Specification for Blended Hydraulic Cements.

GG. ASTM C 685 - Standard Specification for Concrete Made by Volumetric Batching and Continuous mixing.

HH. ASTM C 1017 - Chemical Admixtures for Use in Producing Flowing Concrete.

II. ASTM C 1064 - Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.

JJ. ASTM C 1077 - Standard Practice for Laboratory Testing of Concrete and Concrete Aggregate for Use in Construction and Criteria for Laboratory Evaluation.

KK. ASTM D 638 - Test Method for Tensile Properties of Plastics.

LL. ASTM D 746 - Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.

MM. ASTM D 747 - Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever beam.

NN. CRSI MSP-1 - Manual of Standard Practice.

OO. CRSI - Placing Reinforcing Bars.

PP. Federal Specification SS-S-210A - Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe joints.

QQ. NRMCA - Concrete Plant Standards.

1.03 SUBMITTALS

A. Conform to Section 01 33 00 - Submittal Procedures.

B. Submit proposed mix design and test data for each type and strength of concrete in the Work.

C. Submit laboratory reports prepared by an independent testing laboratory stating that materials used comply with requirements of this Section.

D. Submit manufacturer's mill certificates for reinforcing steel. Provide specimens for testing when required by the Engineer.

E. Submit certification from concrete supplier that materials and equipment used to produce and deliver concrete comply with this Specification.

F. When required on Drawings, submit shop drawings showing reinforcement type, quantity, size, length, location, spacing, bending, splicing, support, fabrication details, and other pertinent information.

G. For waterstops, submit product information sufficient to indicate compliance with this Section, including manufacturer's descriptive literature and specifications.

1.04 HANDLING AND STORAGE

A. Cement: Store cement off the ground in a well-ventilated, weatherproof building.

B. Aggregate: Prevent mixture of foreign materials with aggregate and preserve gradation of aggregate.

C. Reinforcing Steel: Store reinforcing steel to protect it from mechanical injury and formation of rust. Protect epoxy-coated steel from damage to the coating.

PART 2 – PRODUCTS

2.01 CONCRETE MEATERIALS

A. Cementitious Material:

1. Portland Cement: ASTM C 150, Type II.

2. When aggregates are potentially reactive with alkalis in cement, use cement not exceeding 0.6 percent alkali content in the form of Na2O + 0.658K20.

B. Water: Clean, free from harmful amounts of oils, acids, alkalis, or other deleterious substances, and meeting requirements of ASTM C 94.

C. Aggregate:

1. Coarse Aggregate: ASTM C 33. Unless otherwise indicated, use the following ASTM standard sizes: No. 357 or No. 467; No. 57 or No. 67, No. 7. Maximum size: Not larger than 1/5 of the narrowest dimension between sides of forms, nor larger than 3/4 of minimum clear spacing between reinforcing bars.

2. Fine Aggregate: ASTM C 33.

3. Determine the potential reactivity of fine and coarse aggregate in accordance with the Appendix to ASTM C 33.

D. Air Entraining Admixtures: ASTM C 260.

E. Chemical Admixtures:

1. Water Reducers: ASTM C 494, Type A.

2. Water Reducing Retarders: ASTM 494, Type D.

3. High Range Water Reducers (Superplasticizers): ASTM C 494, Types F and G.

F. Prohibited Admixtures: Admixtures containing calcium chloride, thiocyanate, or materials that contribute free chloride ions in excess of 0.1 percent by weight of cement.

G. Reinforcing Steel:

1. Use new billet steel bars conforming to ASTM A 615, ASTM A 767, or ASTM A 775, grade 40 or grade 60, as shown on Drawings. Use deformed bars except where smooth bars are specified. When placed in work, keep steel free of dirt, scale, loose or flaky rust, paint, oil or other harmful materials.

2. Where shown, use welded wire fabric with wire conforming to ASTM A 185 or ASTM A 884. Supply the gauge and spacing shown, with longitudinal and transverse wires electrically welded together at points of intersection with welds strong enough not to be broken during handling or placing.

3. Wire: ASTM A 82. Use 16-1/2 gauge minimum for tie wire, unless otherwise indicated.

H. Fiber:

1. Fibrillated Polypropylene Fiber:

a. Addition Rate: 1.5 pounds of fiber per cubic yard of concrete.

b. Physical Properties:

1) Material: Polypropylene.

2) Length: 1/2 inch or graded

3) Specific Gravity: 0.9l.

c. Acceptable Manufacturer: W. R. Grace Company, Fibermesh, or approved equal.

2. Steel Fiber: Comply with applicable provisions of ACI 544 and ASTM A 820.

a. Ratio: 50 to 200 pounds of fiber per cubic yard of concrete.

b. Physical Properties

1) Material: Steel.

2) Aspect Ratio (for fiber lengths of 0.5 to 2.5-inch, length divided by diameter or equivalent diameter): 30:1 to 100:1.

3) Specific Gravity: 7.8.

4) Tensile Strength: 40-400 ksi.

5) Young's Modulus: 29,000 ksi.

6) Minimum Average Tensile Strength: 50,000 psi.

7) Bending Requirements: Withstand bending around 0.125-inch diameter mandrel to an angle of 90 degrees, at temperatures not less than 60 degrees F, without breaking.

I. Curing Compounds: Type 2 white-pigmented liquid membrane-forming compounds conforming to ASTM C 309.

2.02 FORMWORK MATERIALS

A. Lumber and Plywood: Seasoned and of good quality, free from loose or unsound knots, knot holes, twists, shakes, decay and other imperfections which would affect strength or impair the finished surface of concrete. Use S4S lumber for facing or sheathing. Forms for bottoms of caps: At least 2-inch (nominal) lumber, or 3/4-inch form plywood backed adequately to prevent misalignment. For general use, provide lumber of 1-inch nominal thickness or form plywood of approved thickness.

B. Formwork for Exposed Concrete Indicated to Receive Rubbed Finish: Form or form-lining surfaces free of irregularities; plywood of 1/4-inch minimum thickness, preferably oiled at the mill.

C. Chamfer Strips and Similar Moldings: Redwood, cypress, or pine that will not split when nailed and which can be maintained to true line. Use mill-cut molding dressed on all faces.

D. Form Ties: Metal or fiberglass of approved type with tie holes not larger than 7/8 inch in diameter. Do not use wire ties or snap ties.

E. Metal Forms: Clean and in good condition, free from dents and rust, grease, or other foreign materials that tend to disfigure or discolor concrete in a gauge and condition capable of supporting concrete and construction loads without significant distortion. Countersink bolt and rivet heads on facing sides. Use only metal forms which present a smooth surface, and which line up properly.

2.03 PRODUCTION METHODS

A. Use either ready-mixed concrete conforming to requirements of ASTM C 94, or concrete produced by volumetric batching and continuous mixing in accordance with ASTM C 685.

2.04 MEASUREMENT OF MATERIALS

A. Measure dry materials by weight, except volumetric proportioning may be used when concrete is batched and mixed in accordance with ASTM C 685.

B. Measure water and liquid admixtures by volume.

2.05 DESIGN MIX

A. Use design mixes prepared by a certified testing laboratory in accordance with ASTM C 1077 and conforming to requirements of this section.

B. Proportion concrete materials based on ACI 211.1 to comply with durability and strength requirements of ACI 318, Chapters 4 and 5, and this specification. Prepare mix design of Class A concrete so minimum cementitious content is 564 pounds per cubic yard. Submit concrete mix designs to the Engineer for review.

C. Proportioning on the basis of field experience or trial mixtures in accordance with requirements at Section 5.3 of ACI 318 may be used, if approved by the Engineer.

D. Classification:

Class	Application	Minimum Compressive Strength (lbs/sq. in.)		Maximum W/C (Percent)	Air Content (Percent)	Consistency range in slump (inches)
		7-day	28-day			
A	Structural	3200	4000	0.45	4+1	2 to 4*
B	Pipe Block Fill, Thrust Block	-------	2,500	-------	4+1	5 to 7

*When ASTM C 494, Type F or Type G admixture is used to increase workability, this range may be 6 to 9.

E. Add steel or polypropylene fibers only when called for on the Drawings or in another section of these Specifications.

F. Determine air content in accordance with ASTM C 138, ASTM C 173 or ASTM C 231.

G. Use of Concrete Classes: Use classes of concrete as indicated on the Drawings and other Specifications. Use Class B for unreinforced concrete used for plugging pipes, seal slabs, thrust blocks, trench dams, and concrete fill unless indicated otherwise. Use Class A for all other applications.

2.06 PVC WATERSTOPS

A. Extrude from virgin polyvinyl chloride elastomer. Use no reclaimed or scrap material. Submit waterstop manufacturer's current test reports and manufacturer's written certification that the material furnished meets or exceeds Corps of Engineers Specification CRD-C572 and other specified requirements.

B. Flat Strip and Center-Bulb Waterstops:

1. Thickness: not less than 3/8 inch

2. Acceptable Manufacturers:

a. Kirkhill Rubber Co., Brea, California

b. Water Seals, Inc., Chicago, Illinois

c. Progress Unlimited, Inc., New York, New York

d. Greenstreak Plastic Products Co., St. Louis, Missouri

e. Approved equal.

2.07 RESILIENT WATERSTOP

A. Resilient Waterstop: Where shown on the Drawings; either a bentonite- or adhesive-type material.

B. Bentonite Waterstop:

1. Material: 75 percent bentonite, mixed with butyl rubber-hydrocarbon containing less than 1.0 percent volatile matter, and free of asbestos fibers or asphaltic.

2. Manufacturer's rated temperature ranges: For application, 5 to 125 degrees F; in service, -40 to 212 degrees F.

3. Cross-sectional dimensions, unexpanded waterstop: 1 inch by 3/4 inch.

4. Provide with adhesive backing capable of producing excellent adhesion to concrete surfaces.

C. Adhesive Waterstop:

1. Preformed plastic adhesive waterstop at least 2 inches in diameter.

2. Meets or exceeds requirements of Federal Specification SS-S-210A.

3. Supplied wrapped completely by a 2-part protective paper.

4. Submit independent laboratory tests verifying that the material seals joints in concrete against leakage when subjected to a minimum of 30 psi water pressure for at least 72 hours.

5. Provide primer, to be used on hardened concrete surfaces, from the same manufacturer who supplies the waterstop material.

6. Acceptable Manufacturer: Synko-Flex Preformed Plastic Adhesive Waterstop, Synko-Flex Products, Inc.; or approved equal.

PART 3 – EXECUTION

3.01 FORMS AND SHORING

A. Provide mortar-tight forms sufficient in strength to prevent bulging between supports. Set and maintain forms to lines designated such that finished dimensions of structures are within the tolerances specified in ACI 117. Construct forms to permit removal without damage to concrete. Forms may be given slight draft to permit ease of removal. Provide adequate cleanout openings. Before placing concrete, remove extraneous matter from within forms.

B. Install rigid shoring having no excessive settlement or deformation. Use sound timber in shoring centering. Shim to adjust and tighten shoring with hardwood timber wedges.

C. Design Loads for Horizontal Surfaces of Forms and Shoring: Minimum fluid pressure, 175 pounds per cubic foot; live load, 50 pounds per square foot. Maximum unit stresses: 125 percent of allowable stresses used for form materials and for design of support structures.

D. Back formwork with a sufficient number of studs and wales to prevent deflection.

E. Re-oil or lacquer the liner on the job before using. Facing may be constructed of 3/4-inch plywood made with waterproof adhesive backed by adequate studs and wales. In such cases, form lining will not be required.

F. Unless otherwise indicated, form outside corners and edges with triangular 3/4-inch chamfer strips (measured on sides).

G. Remove metal form ties to depth of at least 3/4 inch from surface of concrete. Do not burn off ties. Do not use pipe spreaders. Remove spreaders which are separate from forms as concrete is being placed.

H. Treat facing of forms with approved form coating before concrete is placed. When directed by Engineer, treat both sides of face forms with coating. Apply coating before reinforcement is placed. Immediately before the concrete is placed, wet surface of forms which will come in contact with concrete.

3.02 PLACING REINFORCEMENT

A. Place reinforcing steel accurately in accordance with approved Drawings. Secure steel adequately in position in forms to prevent misalignment. Maintain reinforcing steel in place using approved concrete and hot-dip galvanized metal chairs and spacers. Place reinforcing steel in accordance with CRSI Publication "Placing Reinforcing Bars." Request inspection of reinforcing steel by the Engineer and obtain acceptance before concrete is placed.

B. Minimum spacing center-to-center of parallel bars: 2-1/2 times nominal bar diameter. Minimum cover measured from surface of concrete to face of reinforcing bar unless shown otherwise on the Drawings: 3 inches for surfaces cast against soil or subgrade, 2 inches for other surfaces.

C. Detail bars in accordance with ACI 315. Fabricate reinforcing steel in accordance with CRSI Publication MSP-1, "Manual of Standard Practice." Bend reinforcing steel to required shape while steel is cold. Excessive irregularities in bending will be cause for rejection.

D. Do not splice bars without written approval of the Engineer. Approved bar bending schedules or placing drawings constitute written approval. Splice and development length of bars shall conform to ACI 318, Chapters 7 and 12, and as shown on Drawings. Stagger splices or locate at points of low tensile stress.

3.03 EMBEDDED ITEMS

A. Install conduit and piping as shown on Drawings. Accurately locate and securely fasten conduit, piping, and other embedded items in forms.

B. Install waterstops as specified in other sections and according to manufacturer's instructions. Securely position waterstops at joints as indicated on Drawings. Protect waterstops from damage or displacement during concrete placing operations.

3.04 BATCHING, MIXING AND DELIVERY OF CONCRETE

A. Measure, batch, mix, and deliver ready-mixed concrete in accordance with ASTM C 94, Sections 8 through 11. Produce ready-mixed concrete using an automatic batching system as described in NRMCA Concrete Plant Standards, Part 2 - Plant Control Systems.

B. Measure, mix and deliver concrete produced by volumetric batching and continuous mixing in accordance with ASTM C 685, Sections 6 through 8.

C. Maintain concrete workability without segregation of material and excessive bleeding. Obtain approval of the Engineer before adjustment and change of mix proportions.

D. Ready-mixed concrete delivered to the site shall be accompanied by batch tickets providing the information required by ASTM C 94, Section 16. Concrete produced by continuous mixing shall be accompanied by batch tickets providing the information required by ASTM C 685, Section 14.

E. When high temperatures are expected, prepare ingredients, place, cure and protect in accordance with ACI 301, ACI 305.1, and as follows:

1. When high air temperatures are expected that would affect quality of concrete, postpone concrete placement. Do not mix concrete when air temperature is at or above 95 degrees F and rising.

2. Maintain concrete temperature below 90 degrees F at the time of placement, furnish test data or other proof that admixtures and mix ingredients for not produce flash set plastic shrinkage, or cracking as a result of heat of hydration and the ambient air temperatures. Cool ingredients before mixing to maintain fresh concrete temperatures as specified or less.

3. Provide windbreaks, shading, fog spraying, sprinkling, wet cover or other means as necessary to maintain at or below specified temperature.

F. When adverse weather conditions affect quality of concrete, postpone concrete placement. Do not mix concrete when air temperature is at or below 40 degrees F and falling. Concrete may be mixed when temperature is 35 degrees F and rising. Take temperature readings in the shade, away from artificial heat. Protect concrete from temperatures below 32 degrees F until the concrete has cured for a minimum of 3 days at 70 degrees F or 5 days at 50 degrees F.

G. Clean, maintain and operate equipment so that it thoroughly mixes material as required.

H. Hand-mix only when approved by the Engineer.

3.05 PLACING CONCRETE

A. Give sufficient advance notice to the Engineer (at least 24 hours prior to commencement of operations) to permit inspection of forms, reinforcing steel, embedded items and other preparations for placing concrete. Place no concrete prior to the Engineer's approval.

B. Schedule concrete placing to permit completion of finishing operations in daylight hours. However, if necessary, to continue after daylight hours, light the site as required. If rainfall occurs after placing operations are started, provide covering to protect the work.

C. Use troughs, pipes and chutes lined with approved metal or synthetic material in placing concrete so that concrete ingredients are not separated. Keep chutes, troughs and pipes clean and free from coatings of hardened concrete. Allow no aluminum material to be in contact with concrete.

D. Limit free fall of concrete to 4 feet. Do not deposit large quantities of concrete at one location so that running or working concrete along forms is required. Do not jar forms after concrete has taken an initial set; do not place any strain on projecting reinforcement or anchor bolts.

E. Use tremies for placing concrete in walls and similar narrow or restricted locations. Use tremies made in sections, or provide in several lengths, so that outlet may be adjusted to proper height during placing operations.

F. Compact each layer of concrete with concrete spading implements and mechanical vibrators of approved type and adequate number for the size of placement. When immersion vibrators cannot be used, use form vibrators. Apply vibrators to concrete immediately after depositing. Move the vibrator vertically through the layer of concrete just placed and several inches into plastic layer below. Do not penetrate or disturb layers previously placed which have partially set. Do not use vibrators to aid lateral flow concrete. Closely supervise consolidation to ensure uniform insertion and duration of immersion.

G. Handling and Placing Concrete: Conform to ACI 302.1R, ACI 304R and ACI 309R.

3.06 CONSTRUCTION JOINTS

A. Definitions:

1. Construction joint: Contact surface between plastic (fresh) concrete and concrete that has attained initial set.

2. Monolithic: Manner of concrete placement to reduce or eliminate construction joints; joints other than those indicated on Drawings will not be permitted without written approval of Engineer. Where so approved, make additional construction joints with details equivalent to those indicated for joints in similar locations.

3. Preparation for Construction Joints: Roughen surface of concrete previously placed, leaving some aggregate particles exposed. Remove laitance and loose materials by sandblasting or high-pressure water blasting. Keep surface wet for several hours prior to placing of plastic concrete.

3.07 CURING

A. Comply with ACI 308. Cure by preventing loss of moisture, rapid temperature change and mechanical injury for a period of 7 curing days when Type II or IP cement has been used and for 3 curing days when Type III cement has been used. Start curing as soon as free water has disappeared from the concrete surface after placing and finishing. A curing day is any calendar day in which the temperature is above 50 degrees F for at least 19 hours. Colder days may be counted if air temperature adjacent to concrete is maintained above 50 degrees F. In continued cold weather, when artificial heat is not provided, removal of forms and shoring may be permitted at the end of calendar days equal to twice the required number of curing days. However, leave soffit forms and shores in place until concrete has reached the specified 28-day strength, unless directed otherwise by the Engineer.

B. Cure formed surfaces not requiring rubbed-finished surface by leaving forms in place for the full curing period. Keep wood forms wet during the curing period. Add water as needed for other types of forms. Or, at Contractor's option, forms may be removed after 2 days and curing compound applied.

C. Finishes:

1. Broom Finish:

a. After completion of straightedge operation, make first pass of traverse broom as soon as construction operations permit and before water sheen has disappeared from surface. Follow with as many passes as required to produce desired textured depth. Permit no unnecessary delays between passes. Keep drag wet, clean and free from encrusted mortar during use.

2. Rubbed Finish:

a. At formed surfaces requiring rubbed finish, remove forms as soon as practicable without damaging the surface and immediately apply rub completely within 4 hours.

b. After rubbed-finish operations are complete, continue curing formed surfaces by using either approved curing/sealing compounds or moist cotton mats until normal curing period is complete.

D. Unformed Surfaces: Cure by membrane curing compound method.

1. After concrete has received a final finish and surplus water sheen has disappeared, immediately seal surface with a uniform coating of approved curing compound, applied at the rate of coverage recommended by manufacturer or as directed by the Engineer. Do not apply less than 1 gallon per 180 square feet of area. Provide satisfactory means to properly control and check rate of application of the compound.

2. Thoroughly agitate the compound during use and apply by means of approved mechanical power pressure sprayers equipped with atomizing nozzles. For application on small miscellaneous items, hand-powered spray equipment may be used. Prevent loss of compound between nozzle and concrete surface during spraying operations.

3. Do not apply compound to a dry surface. If concrete surface has become dry, thoroughly moisten surface immediately prior to application. At locations where coating shows discontinuities, pinholes or other defects, or if rain falls on a newly coated surface before film has dried sufficiently to resist damage, apply an additional coat of compound at the specified rate of coverage.

3.08 REMOVAL OF FORMS AND SHORING

A. Remove forms from surfaces requiring rubbing only as rapidly as rubbing operation progresses. Remove forms from vertical surfaces not requiring rubbed-finish when concrete has aged for the required number of curing days. When curing compound is used, do not remove forms before 2 days after concrete placement.

B. Leave soffit forms and shores in place until concrete has reached the specified 28-day strength, unless directed otherwise by the Engineer.

3.09 DEFECTIVE WORK

A. Immediately repair any defective work discovered after forms have been removed. If concrete surface is bulged, uneven, or shows excess honeycombing or form marks which cannot be repaired satisfactorily through patching, remove and replace the entire section.

3.10 FINISHING

A. Patch honeycomb, minor defects and form tie holes in concrete surfaces with carr-bond and verticoat or approved equal. Repair defects by cutting out unsatisfactory material and replacing with new concrete, securely keyed and bonded to existing concrete. Finish to make junctures between patches and existing concrete as inconspicuous as possible. Use a stiff mixture and thoroughly tamp into place. After each patch has stiffened sufficiently to allow for greatest portion of shrinkage, strike off mortar flush with the surface.

B. Apply a rubbed finish to exposed surfaces of formed concrete structures as noted on Drawings. After pointing has set sufficiently, wet the surface with a brush and perform first surface rubbing with No. 16 carborundum stone, or approved equal. Rub sufficiently to bring surface to paste, to remove form marks and projections, and to produce a smooth, dense surface. Add cement to form surface paste as necessary. Spread or brush material, which has been ground to paste, uniformly over surface and allow to reset. In preparation for final acceptance, clean surfaces and perform final finish rubbing with No. 30 carborundum stone or approved equal. After rubbing, allow paste on the surface to reset; then wash surface with clean water. Leave structure with a clean, neat and uniform-appearing finish.

C. Apply a wood float finish to concrete slabs.

3.11 FIELD QUALITY CONTROL

A. Testing shall be performed under provisions of Section 01 45 29 - Testing Laboratory Services.

B. Unless otherwise directed by Engineer, the following minimum testing of concrete is required. Testing shall be performed by qualified individuals employed by an approved independent testing agency and conform to the requirements of ASTM C 1077.

1. Take concrete samples in accordance with ASTM C 172.

2. Make one set of four compression test specimens, or as directed by the Engineer, for each mix design at least once per day and for each 150 cubic yards or fraction

thereof. Make, cure and test the specimens in accordance with ASTM C 31 and ASTM C 39.

3. When taking compression test specimens, test each sample for slump according to ASTM C 143, for temperature according to ASTM C 1064, for air content according to ASTM C 231, and for unit weight according to ASTM C 138.

4. Inspect, sample and test concrete in accordance with ASTM C 94, Section 13, 14, and 15, and ACI 311-5R.

C. Test Cores: Conform to ASTM C 42.

D. Testing High Early Strength Concrete: When Type III cement is used in concrete, the specified 7-day and 28-day compressive strengths shall be applicable at 3 and 7 days, respectively. For Early Strength Concrete, a set of 5 specimen cylinders shall be required.

E. If 7-day or 3-day test strengths (as applicable for type of cement being used) fail to meet established strength requirements, extended curing or resumed curing on those portions of structure represented by test specimens may be required. If additional curing fails to produce the required strength, strengthening or replacement of portions of structure which fail to develop required strength may be required by the Engineer, at no additional cost to the Owner.

3.12 PROTECTION

A. Protect concrete against damage until final acceptance by the Owner.

B. Protect fresh concrete from damage due to rain, hail, sleet, or snow. Provide such protection while the concrete is still plastic, and whenever such precipitation is imminent or occurring.

C. Do not backfill around concrete structures or subject them to design loadings until components of the structure needed to resist the loading are complete and have reached the specified 28-day compressive strength, except as authorized otherwise by the Engineer.

END OF SECTION

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SECTION 33 05 39.23

REINFORCED CONCRETE PIPE

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnish all labor, equipment and materials in connection with the installation of exterior underground reinforced concrete pipe for sewer, low-head pressure piping, and concrete culverts and storm drains as shown on the Contract Drawings and specified herein.

B. Special care shall be exercised during delivery, distribution and storage of the pipe and fittings to prevent damage. Damaged pipe will be rejected and shall be replaced at the Contractor's expense. Storage of pipe and fittings, prior to use, shall be in such a manner as to keep the materials clean and dry.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 11 00 – Summary of Work

B. Section 31 00 01 – Earthwork

C. Section 33 05 61 – Utility Structures

D. Section 40 05 00 – Basic Mechanical Requirements.

1.03 REFERENCES

A. ASTM C 76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

B. ASTM C 150 - Standard Specification for Portland Cement

C. ASTM C 361 - Standard Specification for Reinforced Concrete Low-Head Pressure Pipe

D. ASTM C 443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets

E. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3))

F. ASTM C 990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

G. ASTM C 1479 - Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations

H. ASTM C 1628 - Standard Specification for Joints for Concrete Gravity Flow Sewer Pipe, Using Rubber Gaskets

I. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

J. ASTM D 4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table

K. ASTM D 4254 - Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

L. AASHTO M 43 - Standard Specification for Sizes of Aggregate for Road and Bridge Construction

1.04 SUBMITTALS

A. Furnish and submit shop drawings and certificates for the piping work as outlined in the General Conditions and Division 1.

B. Product Data – Contractor shall submit complete reinforced concrete pipe product data showing conformance to the Contract Drawings and these specifications, including, but not limited to materials used and conformance to the noted standards and specifications.

PART 2 – PRODUCTS

2.01 REINFORCED CONCRETE SEWER PIPE (NOT USED)

2.02 REINFORCED CONCRETE LOW-HEAD PRESSURE PIPE (RCP-ASTM C361) (NOT USED)

2.03 REINFORCED CONCRETE CULVERT AND STORM DRAIN PIPE

A. All reinforced concrete culvert and drain pipe shall be manufactured in accordance with ASTM C76, Wall Type B or C, and shall be of the class that equals or exceeds the pipe class as specified herein or as shown on the Contract Drawings. Minimum pipe laying lengths shall be four (4) feet.

B. Joints for the reinforced concrete culvert and storm drain pipe shall have bell and spigot ends with preformed flexible joint sealants meeting the requirements of ASTM C 990.

C. All pipe shall be aged at the manufacturing plant for at least fourteen (14) days before delivery to the job site.

2.04 BACKFILL MATERIAL

A. The material obtained from excavation of the pipe trench or elsewhere on site with a particle size not greater than 3 inches shall be used for pipe backfill if they conform with the soil classes given in Table 1. Imported materials meeting the criteria of Table 1 may also be used.

Table 1: Acceptable Backfill Material and Compaction Requirements

Soil Classifications				
Description	**ASTM D 1479**	**ASTM D 2487**	**AASHTO M 43**	**Minimum Standard Proctor Density %**
Graded or crushed, crushed stone, gravel	Class I	--	5 56	Dumped
Well-graded sand, gravels and gravel/sand mixtures, poorly graded sand, gravels and gravel/sand mixtures; little or no fines	Class II	GW GP SW SP	57 6	95%
Silty or clayey gravels, gravel/sand/silt or gravel and clay mixtures; silty or clayey sands, sand/clay or sand/silt mixtures	Class III	GM GC SM SC	Gravel and Sand (<10% fines)	95%

PART 3 – EXECUTION

3.01 INSPECTION

A. Each length of pipe and fittings delivered to the property shall be inspected by the Contractor, in the presence of the Engineer, for flaws, cracks, dimensional tolerances and compliance with the referenced Standards. The Contractor shall provide the Engineer with suitable templates or calipers for checking pipe dimensions. Only lengths of pipe and fittings accepted by the Engineer and so marked may be installed in the work.

3.02 INSTALLATION

A. The laying of reinforced concrete pipe shall conform to the applicable sections of the Concrete Pipe Handbook as published by the American Concrete Pipe Association.

B. Trenching, bedding and backfilling shall be as specified in Section 31 00 01 – Earthwork of these Specifications and Paragraph 2.04 - Backfill Material of this Specification. Under no condition shall pipe be laid in water or when trench conditions or weather are unsuitable for such work.

C. All pipes and fittings shall be handled carefully in loading and unloading. They shall be lifted by hoists or lowered on skidways in such a manner as to avoid shock. Derricks, ropes or other suitable equipment shall be used for lowering the pipe into the trench. Pipe and fittings shall not be dropped or dumped.

D. Each pipe and fitting shall be inspected before it is lowered into the trench. The interior of the pipe and all joint surfaces shall be thoroughly cleaned and shall thereafter be maintained clean. The open ends of pipe shall be securely plugged whenever pipe laying is not in progress.

E. Pipe and fittings shall be selected so that there will be as small a deviation as possible at the joints and so that inverts present a smooth surface. All joints shall be installed, made up and inspected in accordance with approved printed instructions of the manufacturer. Pipe and fittings which do not fit together to form a tight joint will be rejected.

F. Cutting of reinforced concrete pipe will be permitted only at connections to structures and be accomplished by abrasive saws. Cutting of other pipe materials shall be done only with mechanical cutters and in accordance with the manufacturer's recommendations.

G. Pipe shall be laid accurately to the lines and grades shown on the drawings or as directed by the Engineer.

H. If an adequate foundation for the pipe is not available at the desired depth, additional excavation shall be required, and the foundation brought to desired grade with suitable granular material.

I. Rock outcroppings, very soft soils such as muck, and other similar materials not providing proper foundation support shall be removed/replaced with suitable granular material.

J. Bedding material directly under the pipe invert shall be left in native condition and not compacted. Pipe shall be placed on the bedding, then backfilled under the pipe haunches before further backfill is placed.

K. Class I materials may be dumped around pipe. Voids shall be eliminated by knifing under and around the pipe or by other approved technique.

L. Inorganic silts, and gravelly, sandy, or silty clays, and other Class IV materials (not shown in Table 1) shall not be used for pipe backfill.

M. Any section of the pipe that is found defective in material, alignment, grade, joints, or otherwise, shall be satisfactorily corrected by the Contractor at no additional cost to the Owner.

3.03 COMPACTION

A. General

1. Place and assure backfill and fill materials achieve an equal or higher degree of compaction than undisturbed materials adjacent to the work.

2. In no case shall degree of compaction below “Minimum Compactions” specified be accepted.

B. Compaction Requirements: Unless noted otherwise on the Drawings or more stringently by other Sections of these Specifications, comply with following trench compaction criteria:

Table 2: Minimum Compactions

Location	Soil Type	Density
Compacted Select Backfill		
All applicable areas	Cohesive soil	95 percent of maximum dry density by ASTM D698
	Cohesionless soils	75 percent of maximum relative density by ASTM D4253 and ASTM D4254
Common Trench Backfill		
Under pavements roadways surfaces, D698 within highway rights-of-way, adjacent to retaining walls	Cohesive soils	95 percent of maximum dry density by ASTM D698
	Cohesionless soils	75 percent of maximum relative density by ASTM D4253 and ASTM D4254
Under turfed, sodded plant seeded, non-traffic areas	Cohesive soils	95 percent of maximum dry density by ASTM D698
	Cohesionless soils	75 percent of maximum relative density by ASTM D4253 and ASTM D4254

C. Ensure backfill materials have moisture content within three (3) percent of optimum moisture content at the time of placement.

3.04 INSPECTION AND TESTING

A. General

1. The Contractor shall provide at his own expense, all labor, material, video and measuring devices, water, plugs, or other equipment necessary to perform the required tests on installed reinforced concrete pipe. All tests shall be performed in the presence of the Engineer. Disposal of water shall be in accordance with Section 01 11 00 – Summary of Work.

B. Field Test - Visual Inspection

1. Examine structures and pipes for:

    a. Physical damage.

    b. Indication of displacement of pipes or structures, reinforcement, forms, or bedding.

    c. Porous areas or voids.

    d. Proper placement of seals, gaskets, and embedments.

    e. Visible infiltration.

2. Verify structures and pipes are set to proper line, grade as per the Contract Drawings, and are plumb.

3. Verify structure and pipe dimensions and thickness match Contract Drawings.

4. The Contractor shall be responsible to provide video recording of all installed storm sewer systems at least 30 days after completion of backfill and one month before Owner or Engineer gives final acceptance for the two-year warranty. The recording shall be made using a color camera, self-propelled or other, having sufficient light to show detail of problem areas and joints. Camera speed shall not exceed 3 feet per second. If problems or concerns are seen by the operator, then the camera shall be reversed and an extended look at the area will be recorded. All recordings will have time, date, and footage displayed. Supplement the video recording with a written log or orally recorded tape log noting observations, findings, and deficiencies shown on the video tape.

    a. The video recording inspection shall be performed by an outside independent testing agency acceptable to the Owner or Engineer.

    b. The video tape and log will be given to the Engineer for review. If the Engineer finds any problems with the storm sewer, the Contractor will repair the problem and re-camera the repaired area before final acceptance will be given, at no added cost to the Owner.

    c. Video recording of storm sewer may be waived if pipe diameter is sufficient for human access, as determined by the Engineer. A log shall be developed for such inspection.

    d. One copy of the video tape and log will become permanent property of the Engineer and Owner as record.

C. Repair

1. Repair or replace any damage pipe or work found unacceptable by the Engineer at no additional cost to the Owner.

2. Repair all visible leaks.

3. Remove any concrete webs or protrusions.

4. Remove form ties and repair tie holes.

END OF SECTION

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SECTION 33 05 61
UTILITY STRUCTURES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnish all materials, labor, equipment, and tools required for the design, fabrication, delivery and installment of utility structures and appurtenances in accordance with the Drawings and as specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 21 00 – Reinforcing Steel

B. Section 05 56 00 – Castings

C. Section 31 00 01 – Earthwork

D. Section 40 05 00 – Basic Mechanical Requirements

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ASTM C32 - Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)

2. ASTM C139 - Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes

3. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets

4. ASTM C478 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections

5. ASTM C857 – Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

6. ASTM C858 – Standard Specification for Underground Precast Utility Structures

7. ASTM C890 – Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures

8. ASTM C913 – Standard Specification for Precast Water and Wastewater Structures

9. ASTM C923 – Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals

10. ASTM C990 – Standard Specifications for Joints in Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

11. ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill

12. ASTM C1478 - Standard Specification for Storm Drain Resilient Connectors Between Reinforced Concrete Storm Sewer Structures, Pipes, and Laterals

13. ASTM C1802 - Standard Specification for Design, Testing, Manufacture, Selection, and Installation of Horizontal Fabricated Metal Access Hatches for Utility, Water, and Wastewater Structures

14. ASTM F2510 – Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Corrugated Dual- and Triple-Wall Polyethylene and Polypropylene Pipes

1.04 SUBMITTALS

A. Submit samples and/or Shop Drawings in accordance with Section 01 33 00 – Submittal Procedures.

B. Shop Drawings shall include, but not be limited to:

1. Shop drawings for all precast concrete items showing all dimensions, locations, and type of lifting inserts, and details of reinforcement and joints.

2. Complete layout and installation Drawings and schedules with clearly marked dimensions.

3. Material certificates on all piping materials.

4. A list of the design criteria used by the manufacturer for all manufactured, precast items.

5. Structural design calculations sealed by a Professional Engineer registered in the State or Commonwealth in which the project is located. Design calculations for precast manholes and vaults shall include confirmation structures adequately

resist flotation when they are totally empty and subjected to groundwater full height of structure.

6. Certified reports for all lifting inserts, indicating allowable design loads.

7. Information on lifting and erection procedures.

8. Results of leakage test

PART 2 – PRODUCTS

2.01 PRECAST MANHOLES AND UTILITY STRUCTURES

A. Design requirements vary for manholes, for utility structures exposed to internal liquid, and for utility structures not exposed to internal liquid, as follows:

1. All precast manholes shall conform to the following requirements (regardless of exposure to internal liquid):

a. Precast manholes shall conform to the requirements of ASTM C478 and shall be designed for loads in accordance with ASTM C890.

b. Precast manholes shall be watertight for infiltration and exfiltration. Joints between manhole riser sections and at base slabs shall conform to the requirements of ASTM C443.

c. Manhole section shall have an internal diameter of 4'-0", unless noted otherwise. Clear lid openings shall be minimum of 24-inch diameter.

2. Precast utility structures exposed to internal liquid (other than manholes) shall include but not be limited to water and wastewater distribution boxes, yard inlets, and catch basins. These structures shall conform to the following requirements:

a. Precast utility structures exposed to internal liquid (other than manholes) shall conform to the requirements of ASTM C913 and shall be designed for loads in accordance with ASTM C890.

b. Precast utility structures exposed to internal liquid shall be watertight for infiltration and exfiltration. Joints between riser sections and at base slabs shall conform to the requirements of ASTM C443.

3. Precast utility structures not exposed to internal liquid (other than manholes) shall include but not be limited to vaults and meter boxes for piping, and utility structures for electric, gas, or communication lines. These structures shall conform to the following requirements:

a. Precast utility structures not exposed to internal liquid (other than manholes) shall conform to the requirements of ASTM C858 and shall be designed for loads in accordance with ASTM C857.

b. Precast utility structures not exposed to internal liquid shall be soil-tight and shall be watertight for infiltration when below groundwater. Joints between riser sections and at base slabs shall conform to the requirements of either ASTM C443 or ASTM C990.

B. In addition to the requirements above, the following requirements are typical for all precast manholes and utility structures:

1. Precast manholes and utility structures shall be furnished with sleeves and openings as noted on the Drawings, conforming accurately to the sizes and elevations of the adjoining pipes or conduits.

2. Precast manholes and utility structures shall include ballast concrete and/or other means necessary to ensure they resist flotation when empty and subjected to groundwater full height of structure.

3. Precast manholes and utility structures shall be as manufactured by Oldcastle, Tindall Corporation, or equal.

4. The date and name of manufacturer shall be marked inside each precast section.

5. No more than two lift holes may be cast or drilled in each section.

6. Dimensions shall be as shown on the Drawings.

7. Covers and frames shall be as specified in Paragraph 2.11.

8. Mechanical Details such as piping, electrical, and other details shall be as shown on the Drawings.

2.02 BRICK (NOT USED)

2.03 MORTAR (NOT USED)

2.04 CONCRETE

A. Concrete shall conform to Section 03 30 00 – Cast-in-Place Concrete.

2.05 REINFORCING

A. Reinforcing shall conform to Section 03 21 00 – Reinforcing Steel.

2.06 CONCRETE BLOCK (NOT USED)

2.07 CASTINGS

A. Castings shall conform to Section 05 56 00 – Castings. Casting shall be of the type and size indicated on the Drawings.

2.08 STEPS

A. Steps shall be constructed of Grade 60 steel reinforcing rod (min. 1/2-inch) and completely encapsulated with a wear resistant and chemical resistant rubber.

B. Each step shall have a minimum vertical load resistance of 800 pounds and a minimum pull-out resistance of 400 pounds.

C. The steps shall have 11-inch minimum tread width and shall be placed at 16-inches on center, as shown on the Drawings.

D. Steps shall be cast in place with the concrete.

E. Steps shall only be installed as shown on the Drawings or required in the Specifications.

2.09 JOINT SEALANTS AND GASKETS

A. For precast utility structure joints required to conform to ASTM C990, joint sealant shall be a preformed flexible sealant conforming to the requirements of ASTM C990, paragraph 6.2, Butyl Rubber Sealant. Joint sealant shall be Pro-Stik Butyl Sealant by Press-Seal Corporation, Butyl-Nek Join Sealant by Henry Company, CS-102 Butyl Rubber Sealant for all Precast Structures by ConSeal Concrete Sealants, Inc., or equal.

B. For precast utility structure joints required to conform to ASTM C443, gaskets shall be rubber gaskets conforming to the requirements of ASTM C443.

2.10 PIPE TO MANHOLE CONNECTIONS

A. The spring set type shall have a stainless-steel interior power sleeve or expander and shall be the PSX assembly by Press-Seal Gasket Corporation, the Kor-N-Seal® | 106-406 Series assembly by National Pollution Control Systems, or QUIK-LOK Boot Connector by A-LOK Products, Inc, or equal.

B. The cast-in-place type shall conform to ASTM C923-18 for sanitary sewer connections between reinforced concrete manhole structures, pipes, and laterals, ASTM C1478-19 for storm drain connections between pipes, and laterals, and ASTM F2510 for storm drain connections between reinforced concrete manhole structures, and dual and triple-wall polyethylene and polypropylene pipes. Sleeves shall include stainless steel take up clamps.

C. Flexible seal assemblies shall permit at least an eight (8) degree deflection from the center line of the opening in any direction while maintaining a watertight connection.

2.11 COVERS AND FRAMES

A. Covers and frames shall comply with Section 05 56 00 – Castings and shall be provided by the utility structure manufacturer.

B. Manhole covers and frames shall meet the following requirements:

1. Locate so that there is ready access to the manhole steps

2. Clear opening shall be a minimum of 22 inches, unless otherwise indicated on the Drawings.

3. Watertight manhole frames and covers shall be suitable for 20 psi internal pressure and shall be Neenah Model R-1915, Type E or equal, cast in place.

4. Non-watertight manhole covers shall be perforated and shall be Neenah Model R-1668, or equal.

5. Storm drain grated inlet frames and grates shall be Neenah R-1878-B7L, East Jordan Iron Works V-4873, or equal.

6. Curb inlet frames and grates shall be Neenah R-3067, East Jordan Iron Works EJ 7030, or equal, and shall include frame, grate, and hood.

C. The Load Level capacity of fabricated metal access hatches as noted on the Contract Drawings shall be in conformance with the requirements of ASTM C1802.

D. Frames and covers shall be identical throughout the Contract.

2.12 GRATES

A. Grates shall comply with Section 05 56 00 – Castings.

2.13 CONCRETE BALLAST (NOT USED)

2.14 EPOXY BONDING AGENT (NOT USED)

PART 3 – EXECUTION

3.01 DESIGN CRITERIA

A. Minimum structural design loading for underground precast concrete manholes and utility structures shall be in accordance with the applicable document of ASTM C890 or

ASTM C857 specified in Article 2.01, unless otherwise noted herein. Precast items subjected to vehicular traffic shall be designed for HS-20 traffic loading. Other precast items shall be designed for a vertical live load of 300 psf.

B. Walls of precast items shall be designed for a vertical surcharge resulting in a 100 psf horizontal load.

C. Precast manholes and vaults shall be designed to resist flotation when totally empty and subjected to groundwater full height of the manhole/vault.

3.02 FABRICATION AND CASTING

A. Fabrication and casting of precast manholes and utility structures shall conform to the applicable ASTM documents specified in Article 2.01.

B. All base sections designated to receive concrete ballast and all electrical manholes shall extend monolithically a minimum of 6 inches beyond the outside face of the wall for the entire periphery. All other utility structures shall have a standard base.

C. Utility structures built around existing pipe shall have a cast-in-place base slab.

3.03 HANDLING, TRANSPORTING, AND STORING

A. Precast members shall not be transported away from the casting yard until the concrete has reached the minimum required 28-day compressive strength and a period of at least 5 days has elapsed since casting, unless otherwise permitted by the Engineer.

B. No precast member shall be transported from the plant to the job site prior to approval of that member by the plant inspector. This approval will be stamped on the member by the plant inspector.

C. During handling, transporting, and storing, precast concrete members shall be lifted and supported only at the lifting or supporting points as indicated on the shop drawings.

D. All precast members shall be stored on solid, unyielding, storage blocks in a manner to prevent torsion, objectionable bending, and contact with the ground.

E. Precast concrete members shall not be used as storage areas for other materials or equipment.

F. Precast members damaged while being handled or transported will be rejected or shall be repaired in a manner approved by the Engineer.

3.04 INSTALLATION

A. Installation of precast manholes and utility structures shall conform with the manufacturer's recommendations.

B. Frames and covers or grates shall be set so that tops are at elevations indicated on the Drawings or flush with finished grade where no elevation is indicated.

C. Joints between riser sections shall be sealed with joint sealant or gaskets as specified herein.

D. All openings in utility structures shall have flexible rubber sleeves sized to fit the connecting pipe and installed to provide watertight joints in accordance with the manufacturer's recommendations. The interior of the sleeve shall be filled with Class B concrete.

E. Openings that are too large for flexible rubber sleeves shall utilize rubber bladder seals which are expanded by water injected using a pressure pump.

F. All units shall be installed plumb and level.

G. All lift holes and joints shall be filled with non-shrink grout conforming to Section 03 60 00 – Grout, grout inside and out.

H. The manhole frames shall be set to their required elevations either with grade rings or with two or three courses of brick masonry laid around the top of the upper wall section. Such brick work shall be given a 1-inch mortar coat on the inside and out.

I. Concrete ballast shall be placed so that it bears directly on the utility structure base against the outer wall monolithically encircling the structure for the full height indicated on the Drawings. Additional ballast may be required where the depth or elevation of the structure varies from the Drawings.

J. Brick or Concrete Block

    1. Brick or concrete blocks shall be laid with broken joints and all horizontal and vertical joints filled with cement-sand mortar. The outside of walls shall be plastered with a minimum 1-inch-thick coat of cement-sand mortar troweled smooth.

K. Connection to Existing Pipe

    1. Verify the diameter and invert elevation of existing pipe to be connected to new utility structures prior to beginning work on the structures.

    2. Provide adequate protection to prevent damage to the existing pipe.

    3. Provide adequate means for plugging and/or transferring the existing flow in the pipe to allow for the construction of inverts and grouting.

    4. Cut off the existing pipe sufficiently for connection to the new structure and remove.

5. Thoroughly clean all foreign matter and coat the pipe surface with epoxy adhesive where the pipe joins the new structure.

6. Install a flexible joint sealer around the pipe.

7. Grout inside and outside of wall penetration with non-shrink grout.

L. Backfill structures in accordance with Section 31 00 01 – Earthwork.

M. Clean all structures of any accumulation of silt, debris, or foreign matter and keep clean until final acceptance of the work.

N. Excavation shall conform to Section 31 00 01 – Earthwork.

O. Structure bases shall bear on a minimum of 8-inches of compacted stone unless otherwise indicated on the Drawings.

P. Channel Inverts

1. Inverts shall be placed using Class B concrete with forms sufficient to provide a smooth half-round shape as shown on the Drawings. Manhole bases employing full depth precast inverts are acceptable.

2. Where the slope of the line does not change through a manhole, a constant slope shall be maintained in the invert. Where slope changes occur within a given manhole, the transition shall be smooth and shall occur at the approximate center of the manhole.

3. Inverts shown on the Drawings are taken at the center of the manhole unless otherwise noted.

3.05 ADJUSTMENTS TO EXISTING UTILITY STRUCTURES

A. Contractor shall be responsible for adjusting rim elevations of all utility structures, including those that are existing with the goal of eliminating any severe changes in elevation with respect to new pavement.

B. Adjust structures using concrete or cast-iron adjustment rings by approved methods.

C. Clean covers and inlet castings of all foreign material.

3.06 ADJUSTING COLLARS AND FINAL ADJUSTMENTS

A. Adjusting collars shall be as shown on the Drawings, or as necessary meet final grade. Final adjustments shall be made so that the manhole ring and cover will be smooth and flush with the finished grade of the adjacent surface, or as otherwise indicated on the Drawings for manholes shown above grade.

3.07 LEAKAGE TESTING FOR MANHOLES (NOT USED)

3.08 FLUSHING AND TESTING OF SEWERS

A. After backfilling, all sewers shall be inspected for obstructions and shall be flushed with water. Flushing shall be a minimum velocity of 2.5 feet per second for a duration acceptable to the Engineer. Flushing shall remove all dirt, stones, pieces of wood and other debris which accumulated in the sewer during construction. The Contractor shall provide a means acceptable to the Engineer for removal of debris flushed from each section of sewer. If after flushing, any obstructions remain, they shall be removed at the Contractor's expense.

B. Visual Inspection – Sewer lines shall be visually inspected from every manhole by use of mirrors, television cameras, or other devices for visual inspection, and the lines shall all exhibit a fully circular pattern when viewed from one manhole to the next. Lines which do not exhibit a true line and grade or have structural defects shall be corrected to meet these qualifications. Any visual water infiltration of water into the manhole shall be repaired using hydraulic cement or other approved materials.

C. Leakage – Sewers shall be tested for leakage. The program of testing shall fit the conditions as mutually determined by the Engineer and the Contractor. The Contractor shall take all necessary precautions to prevent any joints from drawing while the sewers or their appurtenances are being tested. The Contractor shall, at his own expense, correct any excess leakage and repair any damage to the pipe and their appurtenances, or to any structures resulting from or caused by these tests.

D. Leakage Test Procedure – Each section of sewer shall be tested by closing the lower end of the sewer to be tested and the inlet sewer of the upper manhole with stoppers and filling the pipe and manhole with water to a point 6 feet above the crown of the open sewer in the upper manhole, or, if ground water is present, 6 feet above the sections average adjacent ground water level as indicated by a monitor well installed adjacent to each manhole. The line shall be filled with water prior to testing and allowed to stand until the pipe has reached its maximum absorption, but not less than two (2) hours. After maximum absorption has been reached, the head shall be reestablished and tested for at least six (6) hours maintaining the head specified above by measured additions of water. The sum of these additions shall be the leakage for the test period.

    1. If ground water is present to a height of at least 6 feet above the crown of the sewer at the upper end of the pipe section to be tested, the leakage test may be made by measuring the rate of infiltration using a suitable weir or other measuring device approved by the Engineer. Whether the test is made by infiltration or exfiltration, the allowable leakage shall not exceed 100 gallons per day per inch of diameter per mile of sewer being tested.

    2. Where the actual leakage exceeds the allowable, the Contractor shall discover the cause and correct it before the sewer will be accepted. A section of sewer is

defined as that length of sewer between successive manholes or special structures or stub-outs for future connections.

E. Low Pressure Compressed Air Test – If the leakage cannot be located by infiltration or exfiltration testing, this type test may be used. The pipeline shall be considered acceptable, when tested at an average pressure of 3.0 psi greater than the average back pressure of any groundwater that may submerge the pipe if the section under test does not lose air at a rate greater than 0.0030 cfm per sq. ft. of internal pipe surface.

F. Deflection Test – No sooner than thirty (30) days after final backfill installation, each section of PVC pipe shall be checked for vertical deflection using an electronic deflectometer or a rigid "GoNoGo" device. Vertical deflection shall not exceed five (5) percent of the inside pipe diameter for PVC pipe.

1. Where the actual deflection exceeds the allowable, the Contractor shall discover the cause and correct before the pipe will be acceptable. A section of sewer is defined as that length of sewer between successive manholes or special structures or stubouts for future connections.

G. Cost of Testing and Repairs – Any and all work necessary to bring the line into conformance with the infiltration and deflection specifications shall be performed by the Contractor at no extra cost to the Owner. All apparent sources of infiltration and excessive deflection shall be repaired by the Contractor.

1. The Contractor shall provide all water, plugs, hoses, pumps, equipment, etc. necessary for the proper flushing and testing of the sewers.

END OF SECTION

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SECTION 33 14 13

WATERLINE PIPE WORK

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section shall cover the furnishing, laying, jointing and testing of all water pipe, including water appurtenances, both in open cut and in tunnels, as shown on the drawings, or as directed by the Engineer.

PART 2 – PRODUCTS

2.01 MATERIAL

A. Refer to Section 40 05 31 – PVC Pipe for material requirements.

B. All fittings shall be wrapped in a plastic protector in conformance with AWWA Standard C-105 and ANSI A21.5 (2.5 to 3 percent carbon black content, low or high density) "Polyethylene Encasement for Gray and Ductile Cast-Iron piping for Water and Other Liquids" and conforming to ASTM D 1248. Fitting wrapping shall be installed in such a manner as to curtail or prevent corrosion of the metallic fittings. Any fittings found defective, not meeting the specifications, or improperly installed, shall be rejected and so marked, and shall be replaced by fittings approved by the Owner, at no additional cost to the Owner.

C. Service Connections - Water service connections shall be installed with rubber gasket double strap bronze saddles. "Modified" double strap saddles will not be acceptable substitutes. Ball corporation valve shall be installed at the service saddle and within the meter box, as per the design detail. The service lines and casings shall be of the following classifications.

1. Copper tubing for water service lines shall be type "K" and shall conform to ASTM Standard "Seamless Copper Water Tube" B-88, latest revisions.

2. Cross-linked polyethylene (PEX) water service line shall confirm to AWWA C904.

    a. Polyvinyl chloride casing for water service lines shall be Schedule 40 PVC and shall conform to ASTM Standard "Polyvinyl Chloride (PVC) Plastic Pipe" D-1785, latest revision.

D. Any material found defective, not meeting the specifications, or improperly installed, shall be rejected and so marked and shall be replaced with material approved by the Owner's Engineer at no additional cost to the Owner. Service line tubing crossings

under traveled roadways shall be installed as specified on the plans with a minimum cover of 30" below roadway surface.

E. Gate Valves shall conform the requirements of Section 40 05 61 – Gate Valves.

F. Fire Hydrants - Unless otherwise specified, fire hydrants shall conform to AWWA Standard "Dry- Barrel Fire Hydrants" C502, latest revision. Hydrants shall be cast iron, fully bronze mounted and have a working pressure of 150 psi. Fire hydrants shall have a minimum valve opening of 5-1/4 inch.

PART 3 – EXECUTION

3.01 CONSTRUCTION METHODS

A. Pipe laying

1. All water mains shall be installed as specified in plans with a minimum cover of 48 inches from the top of pipe to an established grade. Where pipe is installed beneath State Highways, there shall be a minimum vertical distance of 4 feet from top of pipe to the lowest pavement elevation on the highway, or as per the Highway Department's permit requirements. In special locations, Highway Department may require additional cover. Construction clearance and other requirements to cross under State Highways shall be obtained by Owner. Where pipe is installed beneath drainage or irrigation ditches, there shall be a minimum vertical distance of 3 feet from top of pipe to the flowline of the ditch, or as shown in the design plans or by permit requirements.

2. For all pipe, the Contractor shall familiarize himself with the TCEQ Chapter 290 Separation Distance Requirements and verify that all proposed work conforms to these regulations. The Contractor shall immediately notify Owner and the Engineer once the Contractor discovers that field conditions cannot meet the TCEQ Chapter 290 Separation Distance Requirements.

3. Procedure - After the trench is excavated to grade as specified, it shall be backfilled in accordance with the details shown in the design plans. Bedding material shall provide a smooth and uniform pipe bed for the entire length of the water pipe barrel. Trenching and pipe laying shall be uniformly in a straight line and to uniform elevation unless otherwise specified on plans. Pipe, fittings and valves shall be carefully handled to avoid damage. Before placing pipe into the trench, the outside of the spigot and the inside of the bell shall be wiped clean and dry, free from oil and grease. Every precaution shall be taken to prevent foreign material from entering the pipe. During layout operation, no debris, tools, clothing or other material shall be placed into the pipe. After placing a length of pipe in the trench, the spigot end shall be centered in the bell; the pipe forced home, brought to the correct alignment and covered with an approved backfill material.

4. Detectable warning metallic tape with “Waterline Below” shall be buried above pipe at a depth of 18 inches below finished grade for surface locating purposes. The minimum width of the metallic tape shall be 3-inches wide or as specified by the manufacturer. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other approved means. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

B. PIPE JOINTING - In laying the water pipe to line and grade, the pipe shall be jointed in accordance with one of the following approved jointing methods. Owner reserves the right, before construction, or while construction is in progress, to change the type of joints if Owner's Engineer so directs.

1. Asbestos Cement Pipe Jointing - The Contractor shall furnish and install asbestos cement pipe in accordance with AWWA Standard "Installation of Asbestos Cement Pressure Pipe" C603-78, latest revision. The machined ends of the pipe to be jointed, coupling grooves and rubber rings shall be cleaned immediately before assembly. Care should be taken not to roll, pinch or reverse the gasket when placed in the bell. Each pipe joint shall be sealed with a coupling consisting of an asbestos cement sleeve and two rubber rings or an equivalent coupling or joint of equivalent strength and performance, as determined by Engineer. The pipe joint shall not be deflected either vertically or horizontally beyond the limits recommended by the manufacturer.

2. Polyvinyl Chloride (PVC) Pipe Jointing - The Contractor shall make certain before jointing polyvinyl chloride pipe that the ring groove in the bell of the pipe is clean, with no dirt or foreign material that could interfere with proper seating of the ring. Make sure pipe end is clean. Wipe with a clean dry cloth around the entire circumference from the end to one inch beyond the reference mark. Lubricate the spigot end of the pipe, using only the lubricant supplied by the manufacturer. Be sure the entire circumference is covered. The coating should be the equivalent of a brush coat of enamel paint. It can be applied by hand, cloth, pad, sponge or glove. Do not lubricate the ring groove in the bell to avoid lubrication causing ring displacement. The level end is then inserted into the bell so that it is in contact with the ring. Brace the bell, while the level end is pushed in under the ring, so that previously completed joints in the line will not be closed. The spigot end is pushed until the reference mark on the spigot end is flush with the end of the bell. If undue resistance to inserting of the level end is encountered or the reference mark does not reach the flush position, disassemble the joint and check the position of the ring. If it is twisted or pushed out of its seat, clean the ring, bell and level end and repeat the assembly steps.

C. WET CONNECTIONS - Schedules of existing fittings and proposed new fittings needed to make wet connections to existing waterlines as shown on the plans are estimates only. It is to be recognized that after existing lines and fittings are uncovered, that some discrepancies may occur. Where discrepancies occur, the Contractor shall request a

decision by the Owner as to how the connection in question shall be made. Additional fittings shall be included in the costs associated with applicable bid items. Contractor shall plan his work concerning wet connections in such a way that a minimum of inconvenience shall occur to existing water customers due to water service interruptions. Before water service interruptions are made to any customer, Contractor shall notify designated official and cooperate with operating personnel in every way to minimize service interruptions due to wet conditions. In certain locations, other utility lines or conduits will be obstructing the normal path of proposed waterlines. In such instances, gravity lines of all kinds hold priority as to grade over water pressure lines, gas lines, electric conduits, or other obstruction conduits or combinations of conduits, which may be encountered. Contractor shall analyze conditions carefully, while considering TCEQ Chapter 290 separation distance requirements, and then use best judgment in determining proper method of proceeding through obstructed area with waterline construction, and shall notify the Owner forty-eight (48) hours in advance of making such connection after obtaining approval from the Owner's Engineer.

D. APPURTENANCES - Appurtenances to the waterline shall be provided and laid in accordance with the drawings and in the manner as specified herein.

1. Valves. Valves shall be installed at the locations indicated on, and with concrete thrust blocks as specified in the construction drawings. All valves shall be wrapped in a plastic protector in conformance with AWWA Standard C-105 and ANSI A21.5 "Polyethylene Encasement for Gray and Ductile Cast-Iron piping for Water and Other Liquids." Valve wrapping shall be installed in such a manner as to curtail or prevent corrosion of the metallic valves.

2. Fire Hydrants. All fire hydrants shall be located as shown in the plans, and in a manner to provide complete accessibility, and to minimize the possibility of damage from vehicles or injury to pedestrians. All hydrants shall stand plumb with the pumper nozzle facing the curb (or as shown in the design plans) and the bury line of the hydrant at the finished grade. The barrel of the fire hydrant shall be set so that no portion of the pumper nozzle or hose nozzle will be less than 12 inches from the curb, walkway, or bike path or more than 20 feet from the face of the curb. The preferred location for the fire hydrant shall be 2 feet clear of the right-of-way line. All fire hydrants shall be placed in accordance with any City or County ordinances. Fire hydrants installed near State Highways shall be in accordance with State Department of Highways and Public Transportation requirements. All fire hydrants shall be connected to the main in the manner shown in the design plans.

3.02 TESTING AND STERILIZATION

A. TESTING. All newly laid sections of pipe shall be hydrostatically tested at a gauge pressure of 150 psi. Contractor has the option of running hydrostatic test before or after trench has been completely backfilled. Trenches must be at least partially backfilled

before hydrostatic testing to prevent pipe shift. Hydrostatic tests shall be in accordance with AWWA Standard C600 Section 4 "Hydrostatic Testing" latest revision.

1. Hydrostatic Test Procedure - The Contractor shall provide all necessary equipment and shall perform all Work required in connection with the tests. All pressure pipe, fittings and valves shall be subjected to a hydrostatic pressure of 150 psi. Air pressure testing will not be allowed. The line under test shall be slowly filled with water to the specified test pressure. The lowest elevation point of the section being tested shall be determined and any corrections necessary shall be corrected to the elevation of the test gauge by means of a hand pump, gasoline or electrically driven test pump connected to the pipe. A blow off or fire hydrant shall be installed at the end of the line under test. Before applying the specified test pressure, all air shall be expelled from the test section including service connections. If hydrants or blow offs are not available at high places, tap at points of highest elevation shall be made before the test is made and brass plugs inserted after the test has been completed. The required test pressure shall be applied for not less than two (2) hours and longer if ordered by the Owner. Leakage tests shall be conducted concurrently with pressure tests. Owner will inspect all pipe, fittings, valves and joints under tests. Any faults found to be due to improper workmanship shall be corrected by the Contractor at no expense to Owner.

B. STERILIZATION. Pipeline construction shall be in accordance with Section 4 of AWWA Standard C601-01, latest revision. Upon or during completion of the hydrostatic test, the new section of pipe shall be sterilized in accordance with AWWA Standard "Disinfecting Water Mains" C601, latest revision; and the State of Texas Health Standards. Chlorine may be applied by the following methods: Continuous Feed Method and Chlorine Tablet Method. Contractor shall provide all equipment and chemicals necessary for sterilization.

1. Continuous Feed Method - This method is suitable for general application. Water from the existing distribution system or other approved sources of supply shall be made to flow at a constant, measured rate into the newly laid pipeline. The water shall receive a dose of chlorine, also fed at a constant, measured rate. The two rates shall be proportioned so that the chlorine concentration in the water in the pipe is maintained at a minimum of 50 mg/l available chlorine. During the application of the chlorine, valves shall be manipulated to prevent the treatment dosage from flowing back into the line supplying the water. Chlorine application shall not cease until the entire main to be tested is filled with the chlorine solution. The chlorine water shall be retained in the main for at least 24 hours during which time all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. At the end of this 24-hour period, the treated water shall contain no less than 25 mg/l chlorine throughout the length of the main.

2. Chlorine Tablet Method - Tablet disinfection is best suited to short extensions (up to 2,500 feet) and smaller diameter mains (up to 12 inches). Because the

preliminary flushing step must be eliminated, this method shall be used only when scrupulous cleanliness has been exercised. It shall not be used if trench water or foreign material has entered the main or if the water is below 5`C (41`F). Calcium hypochlorite tablets are placed in each section of pipe and in hydrants, hydrant branches and other appurtenances. They shall be attached by an adhesive, except for the tablets placed in hydrants and in the joints between the pipe sections. All the tablets within the main must be at the top of the main. If the tablets are fastened before the pipe section is placed in the trench, their position should be marked on the section to assure that there will be no rotation. In placing tablets in joints, either crushed or placed on the inside annular space or, if the type of assembly does not permit, they are rubbed like chalk on the butt ends of the sections to coat them with calcium hypochlorite. The adhesive may be Permatex No. 1 or any alternative approved by the Owner. There shall be no adhesive on the tablet except on the broad side next to the surface to which the tablet is attached. If desired, the calcium hypochlorite may be placed in the pipe in granular form at a rate of one (1) cup (4 fl. oz.) per each pipe. When installation has been completed, the main shall be filled with water at a velocity of less than 1-ft./sec. This water shall remain in the pipe for at least 24 hours. Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water.

3. Final Flushing - After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system, or less than 1 mg/1. Chlorine residual determination shall be made to ascertain that the heavily chlorinated water has been removed from the pipeline.

4. Bacteriologic Tests - After final flushing, and before the water main is placed in service, a sample or samples shall be collected from the end of the line and tested for bacteriologic quality and shall show the absence of coliform organisms. If the number and frequency or samples is not prescribed by the public health authority having jurisdiction, at least one sample shall be collected from chlorinated supplies when the chlorine residual is maintained throughout the new main. From unchlorinated supplies, at least two samples shall be collected at least 24 hours apart. In the case of extremely long mains, it is desirable that samples be collected the length of the line as well as at its end. Samples for bacteriologic analysis shall be collected in sterile bottles treated with sodium thiosulfate. No hose or fire hydrant shall be used in collection of samples. A suggested sampling tap consists of a standard corporation cock installed in the main with a copper tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use.

5. Repetition of Procedure. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory samples have been obtained. The tablet method cannot be used in these subsequent disinfections. When the samples are satisfactory, the main may be placed in service.

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SECTION 33 31 11

SANITARY SEWER PIPE WORK

PART 1 – GENERAL

1.01 DESCRIPTION

A. Under this section is included the furnishing, laying, jointing and testing of all sewer pipe, including sewer pipe and sewer appurtenances, both in open cut and in tunnels, as shown on the drawings or as directed by the Engineer.

PART 2 – PRODUCTS

2.01 MATERIAL

A. Gravity Sewer Pipe

1. Gravity sewer pipe may be of any of the following classifications. Any pipe found defective, not meeting the specifications, or improperly installed shall be rejected and so marked and shall be replaced by pipe approved by the Engineer at no additional cost to Utility Owner.

    a. Pipe and fittings shall be manufactured in conformance with the materials and methods described in ASTM Specification D-3034. Joint seals shall be compression type rubber gaskets in compliance with the requirements of ASTM Specification D-1869.

    b. Pipe and fittings shall be manufactured in conformance with the materials and methods described in ASTM Specification F-789 and UNI-B-10. Gaskets shall comply with the requirements of ASTM Specification F-477.

2. Manholes

    a. Manholes shall be constructed of glass fiber-reinforced isophalic polyester resin containing chemically enhanced sand for use in sanitary sewer applications. They shall be a one-piece unit of one class, fabricated in a composite laminate. Walls shall be of uniform thickness and shall be free from thin spots and voids. Exterior surface shall be free of ridges and sharp protrusions and reinforcement. Interior surface shall also be smooth and free of ridges to allow for self-cleaning. The exterior surface shall be covered with graded sand to facilitate bonding to the concrete base pad, cement stabilized sand backfill and cement grout used to seal around all incoming lines. Manholes shall conform to the following design criteria:

1) ASTM D-3753 "Standard Specification of Glass-Fiber reinforced Polyester Manholes."

2) ASTM C-581 "Practice for determining chemical resistance of chemical thermosetting resins used in glass-fiber reinforced structures intended for liquid Service."

3) ASTM D-2412 "Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel Plate Loading."

4) ASTM D-695 "Test Methods for Compressive Properties of Rigid Plastics."

5) ASTM D-2584 "Test Method for Ignition Loss of Cured Reinforced Resins."

6) AASHO H-20 Axial Loading Nominal inside diameter of the manhole shall be 48". Thickness of the manhole shall be 0.50" nominal. Height shall be selected in accordance with project plans.

b. Dimensions: The manhole shall be a circular cylinder, reduced at the top to a circular manway not smaller than 30” inside diameter. Manholes shall be produced in half-foot increments in length +/- 2”. Nominal inside diameters shall be 48”, 60”, and 72“as shown in the design details. Tolerance on the inside diameter shall be +/- 1%.

c. Configuration: The manway reducing cone section shall be centered on the manhole barrel and must provide a bearing surface on which a standard ring and cover may be supported and adjusted to grade. The reducer shall be joined to the barrel section at the factory with resin and glass fiber reinforcement, thus providing required monolithic design to prevent infiltration and/or exfiltration through the manhole.

d. Loading: The manhole shall be manufactured in one class of load rating. This class shall be H-20 wheel load (minimum 16,000 pounds dynamic wheel load).

e. Manufacturer and Certification: The manholes shall be Containment Solutions, Inc. Flowtite Fiberglass Manholes or approved equal that conforms to ASTM D. 3753-81, Standard Specifications for Fiberglass Reinforced Polyester Manholes and all noted applicable documents. The manufacturer shall submit written certification that their product meets the requirements of ASTM D. 3753-81 with test results of specified manholes included.

B. Service Connections

1. Property service connections shall be installed using crosslinked polyethylene (PEX) conforming to AWWA C-904 and C-800. The pipe type shall be specified in the service line detail shown in the Drawings.

C. Concrete Surface Coatings

1. All interior manhole concrete surfaces shall be coated with 8mils of Raven 155 epoxy primer and 125 mils of Raven 405 – 100% solids, solvent-free ultra-high build epoxy system manufactured by Raven Lining Systems, Broken Arrow, Oklahoma or Engineer approved equal.

PART 3 – EXECUTION

3.01 CONSTRUCTION METHODS

A. For all pipe, the Contractor shall familiarize himself with the TCEQ Chapter 217 Separation Distance Requirements and verify that all proposed work conforms to these regulations. The Contractor shall immediately notify Utility Owner and the Engineer once the Contractor discovers that field conditions cannot meet the TCEQ Chapter 217 Separation Distance Requirements.

B. After the trench is excavated to grade as specified, it shall be filled to grade with a minimum 6-inch bank run sand layer, in accordance with 31 06 20.16 - Utility Backfill Materials. This material shall be mechanically tamped to a density minimum of 90%. This material shall provide a smooth and uniform pipe bed for the entire length of the sewer pipe barrel. Trench foundation preparation may require dewatering, gravel bedding, or cement stabilized sand to create a stable foundation for pipe installation. Stable foundation conditions and trench improvements will be at the direction of the Utility Owner Inspector or the Engineer and at no additional costs to the Owner.

C. Trenching and pipe laying shall be uniformly in a straight line and to uniform elevations unless otherwise specified on the plans. Pipe and fittings shall be carefully handled to avoid damage. Before placing pipe into the trench, the outside of the spigot and the inside of the bell shall be wiped clean and dry, free from oil and grease. Every precaution shall be taken to prevent foreign material from entering the pipe. During layout operation, no debris, tools, clothing or other material shall be placed into the pipe. After placing a length of pipe into the trench, the spigot end shall be centered in the bell, the pipe forced home, brought to the correct alignment and covered with an approved backfill material. Detectable warning metallic tape with “Sewer Line Below” shall be buried as directed by the Utility Owner inspector, but no greater than 4' below the finished grade. The width of the metallic tape shall be 6-inches wide or as specified by the manufacturer.

D. Watertight Joint Materials: The contractor must exert every reasonable effort to secure a watertight joint and prevent infiltration of ground water into or exfiltration of sewage out of all pipe sewers and property service connections. Any joint materials found to be defective or not meeting the specifications shall be rejected and replaced by approved joint materials at no additional cost to Utility Owner.

E. Polyvinyl Chloride Pipe (PVC) Jointing: The contractor shall make certain before jointing polyvinyl chloride pipe that the ring groove in the bell of the pipe is clean with no dirt or foreign material that could interfere with proper seating of the ring. Make sure pipe end is clean. Wipe with a clean dry cloth around the entire circumference from the end to one (1) inch beyond the reference mark. Lubricate the spigot end of the pipe, using only the lubricant supplied by the manufacturer. Be sure the entire circumference is covered. The coating shall be the equivalent of a brush coat of enamel paint. It can be applied by hand, cloth, pad, sponge, or glove. Do not lubricate the ring groove in the bell to avoid lubrication causing ring displacement. The level end is then inserted into the bell so that it is in contact with the ring. Brace the bell, while the level end is pushed in under the ring, so that previously completed joints in the line will not be close. The spigot end is pushed until the reference mark on the spigot end is flush with the end of the bell. If undue resistance to insertion of the level end is encountered or the reference mark does not reach the flush position, disassemble the joint and check the position of the ring. If it is twisted or pushed out of its seat, lean the ring, bell and level end and repeat the assembly steps.

   Water stop joints shall be Polyvinyl Chloride (PVC) or other similar approved joint materials.

F. Sewer Appurtenances - Appurtenances to the sewer shall be provided and laid in accordance with the drawings and in the manner as specified herein. Appurtenances in addition to those required by the drawings or the proposal, as approved or directed by the Engineer, shall be paid for under the appropriate items of the proposal.

G. Service Branches and Fittings - Branches and fittings shall be provided and laid as and where directed. T-branches and Y-branches, placed in the sewer for property service connections, shall be located by the contractor, as directed by the Engineer, at such points in the sewer so as to result in the property service connection having the shortest length possible between the sewer and property line or easement line, unless otherwise indicated on the drawing or directed by the Engineer.

   The Contractor shall install all service lines in accordance with TCEQ separation distance and Southern Building Code requirements. Contractor shall notify the Inspector or Engineer prior to the installation of any service that is in question in accordance to the TCEQ separation or Southern Building Code requirements. Where not approved street grade has been established, the depth of the connection shall be based on the assumed future street grade or on the present street or ground surface, as determined by the Engineer. At times when pipe laying is not in process, the open ends of the pipe shall be closed by a watertight plug or other approved means. This provision shall apply during

the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

H. Stubs - Stubs for future sewer pipe shall be installed as indicated by the drawings. If the specified length of the stub is exceeded, there will be no additional cost to Utility Owner unless the extra length is ordered by the Engineer. Existing sewer pipe stubs shall be removed as required, but only when directed by the Engineer.

I. Stacks - Stacks shall be constructed as and where directed. The height of the stack shall be as indicated on the drawings, set forth in the proposal, as determined by the Engineer. The stack shall encased in-concrete in accordance with the Design Plans.

J. Drop Inlets - Drop inlets to the manhole shall be constructed as and where indicated by the drawings of either of the types shown on the Design Plans, as directed by the Engineer.

K. Cleanouts - Cleanouts on all service laterals shall be installed at the location shown on the plans and in accordance with the Design Plans.

L. Manholes - Manholes shall be constructed as shown in the Drawings to the elevations shown on the plan-profile sheets, and in accordance with manufacturer's installation instructions.

1. Prepare excavation at manhole location should be at least 12-inches wider than the proposed concrete foundation slab specified and to provide working room around manhole.

2. Verify the depth of manhole is sufficient to allow 12 to 18-inches from the finished grade and the cone support ring, as per design plans.

3. For unstable trench foundation, provide a minimum of 4 to 6-inches of crushed limestone or 2-inch gravel, or until a stable foundation is achieved.

4. Set manhole as per manufacturer's installation instructions. Level and plumb manhole and connect sewer lines to manhole with a seal ring as manufactured by Northtown Pipe Protection Products or equal (as per ASTM C-923 requirements). A concrete base encasement shall be placed at least 12 inches outside of the diameter of the manhole and shall come over the top of the anti-flotation ring a minimum of 12 inches. All sides of incoming and outgoing sewer lines shall be covered with a minimum of 6-inches of concrete. Manhole levels shall be verified throughout the placement and finishing of concrete base construction.

5. Backfilling is allowed as soon as the concrete base has hardened enough to provide sufficient support for manhole and fill. Native soil (or band run sand, as specified in Section 31 06 20.16 –Utility Backfill Materials, in unstable areas), free of large stones, debris, or concrete chunks may be used for backfill. Backfill should be place evenly around manhole in 12" maximum loose lifts and should thoroughly

tamped to 90% standard proctor density. Each layer shall be completely compacted before the next layer is installed to avoid uneven lateral pressure which could move the manhole out of plumb. Backfill material shall be subject to approval by the Engineer.

6. Contractor shall maintain the stability of the excavation during backfilling of the manhole which includes both trench protection and dewatering efforts.

7. To bring the manhole to finished grade and provide support for ring and cover, construct chimney using polyethylene rings by Lad Tech or approved equal.

M. Concrete Coating - All concrete surfaces within the manhole shall be coated with 100% solids, solvent-free ultra-high build epoxy coating system. Surfaces to be coated shall be cleaned by sandblasting or by water-blasting with 10% muriatic acid prior to coating. Coating system shall consist of 125 mils of Raven 405 epoxy coating, applied in accordance with manufacturer's recommendations, alternative coating system approved in advance by Engineer.

N. Stoppers and Bulkheads - Open ends of pipes and branches smaller than 15 inches in diameter shall be sealed with stoppers, plugs, or caps, cemented into place in an acceptable manner using a rubber gasket between the stopper and socket. All openings to the pipeline shall be satisfactorily protected from the entrance of earth, water or other material. If a temporary bulkhead is constructed to prevent sewage from backing into the trench excavation or to prevent foreign material from entering the sewer from the new sewer trench, the contractor shall be responsible for reconstructing, repairing, or replacing those portions of the existing sewers removed or damaged by his operations. Existing bulkheads shall be removed as indicated by the drawings or set forth in the proposal, but not until directed by the Engineer.

3.02 TESTING

A. All sewer lines must be tested in accordance with 30 TAC §217.57. The Owner must retain copies of all test results. The Owner must certify in writing that all wastewater lines have passed all required testing to the appropriate regional office within 30 days of test completion and prior to use of the new collection system.

1. For a collection system pipe that will transport wastewater by gravity flow, the design must specify an infiltration and exfiltration test or a low-pressure air test in accordance with ASTM F-1417.

a. Low Pressure Air Exfiltration Testing: The following materials will be furnished by the contractor and utilized for air testing sewer mains:

1) Compressor Air Supply: Any source which will provide at least three hundred (300) cubic feet per minute at one hundred (100) pounds per square inch. The compressor air supply shall be furnished by the contractor.

Plugs, valves, pressure gauges, air hose, connections and other equipment necessary to conduct the air test shall be furnished by the contractor. The test equipment for air testing will consist of valves, plugs, and pressure gauges used to control the rate at which air flows to the test section and to monitor the air pressure inside the plugs. Test equipment shall be assembled as follows:

a) hose connection

b) shut off valve

c) throttle valve

d) pressure reduction valve

e) gauge cock

f) monitoring pressure gauge

2) Test Procedures - The following procedures will be utilized for air testing sewer mains:

a) Apply air pressure until the pressure inside the pipe reaches 4 psig.

b) Allow the pressure inside the pipe to stabilize, then bleed back to 3.5 psig.

c) At 3.5 psig, the time, temperature and pressure will be observed and recorded. A minimum of five (5) readings will be required for each test. If the time in seconds for the air pressure to decrease from 3.5 psig to 2.5 psig is greater than that shown in the following table, the pipe shall be presumed to be free from defect. When these rates are exceeded, pipe breakage, joint leakage, or leaking plugs are indicated and an inspection must be made to determine the cause. The contractor shall affect such repairs as may be required to accomplish a successful air test.

TABLE 1 MINIMUM TEST TIME FOR VARIOUS PIPE SIZES

Nominal Pipe Size, in.	T(time) Min/100 ft.	Nominal Pipe Size, in.	T(time) Min/100 ft.
3	0.2	21	3.0
4	0.3	24	3.6
6	0.7	27	4.2
8	1.2	30	4.8
10	1.5	33	5.4
12	1.8	36	6.0

Nominal Pipe Size, in.	T(time) Min/100 ft.	Nominal Pipe Size, in.	T(time) Min/100 ft.
15	2.1	39	6.6
18	2.4	42	7.3

b. Leakage Test - A leakage test may be requested by the Owner to determine excessive infiltration and to assure that the sewer section is substantially watertight. The Engineer may order the contractor to make leakage tests of as many sections as may be necessary to determine whether the work complies with the criteria for the rate of leakage. A section shall consist of a reach from one manhole to the next manhole provided the manholes are at least 300 feet apart and preferably 400 feet. Leakage tests shall be conducted, and measurements made, for a minimum of one hour. The tests may be conducted over a longer period with no reduction in the rate of leakage.

1) Leakage into Sewer - Leakage into the sewer including manholes, shall not exceed a rate of 50 gallons per 24 hours per inch diameter per mile of sewer. There shall be no gushing or spurting streams entering the sewer or manhole and where encountered they shall be repaired regardless of the rate of infiltration at no additional cost to Utility Owner. Where practicable, the tests for leakage into the sewers shall be made at a time when the groundwater level is at a maximum, but it must be at least one foot above the top of the pipe of the highest elevation in the section being tested.

2) Leakage out of Sewer - Where the groundwater level is less than one foot above the top of-the pipe and where conditions will permit, the sewers shall be subjected to an internal pressure by plugging the pipe at both ends and then filling the sewer and manholes with clean water to a height above the top of the pipe sufficient to obtain satisfactory measurements to determine the rate of leakage, but no less than 2-feet above the top of the upstream pipe. The rate of leakage from the sewers will be determined by the amount of water volume lost during the testing period or by the volume of water needed to maintain the original water surface level. Leakage from the sewers under test shall not exceed a rate of 50 gallons per 24 hours per inch diameter per mile of sewer, except that an allowance of an additional 10 percent of gallonage shall be permitted for each additional 2 feet of head over a basic 2-foot minimum internal head.

3) Requirements of the Contractor - The contractor shall construct such weirs or other means of measurements as may be required, shall furnish water and shall do all necessary pumping to enable the tests to be properly made. When a leakage test fails, the contractor shall do

such other work as may be necessary until the rate of leakage meets the above requirements, as determined by additional leakage tests.

c. Deflection Testing for Gravity PVC Sewer Lines

1) No sooner than 30 days, nor later than 12 months after the pipe has been installed and backfilling has been completed, tests for deflection will be made. A deflection of more than 5 percent of the inside diameter of the pipe shall be cause for rejection, and the line will be removed and replaced at the contractor's expense. A GO-NO-GO Deflection Testing Mandrel, to be furnished by the contractor, and certified by the Owner and Engineer, shall be used. The testing shall consist of the following:

a) Completely flush the line, if required, making sure the pipe is clean of any mud or debris that would hinder the passage of the mandrel.

b) During the final flushing of the line, attach a floating block or ball to the end of the mandrel pull rope and float the rope through the line.

c) After the rope is threaded through the line, connect the pull rope to the mandrel and place the mandrel in the entrance of the rope.

d) Connect a retrieval rope to the back of the mandrel to pull it back if necessary.

e) Remove all slack in the pull rope and place a tape marker on the rope at the ends of the pipe where the mandrel will exit, determining the location of the mandrel in the line.

f) Using manhole guide pulleys, draw mandrel through the sewer line, if any irregularity of pipe deformation exceeding the allowable 5 percent is encountered in the line, the line shall be uncovered at the point.

g) If an obstructed or over-deflected section is found, locate it; uncover pipe; inspect the pipe; if any damaged pipe is found, replace it. Backfill as per design plans.

h) Re-test this entire section for deflection.

i) Any pipe removed shall be replaced by use of gasketed repair couplings. Every deflection test shall be conducted in the presence of the Owner's or Engineer's representative.

2) The Contractor shall furnish all labor and material required to clean and flush and complete all testing required by this specification in accordance with Section f, below. The Owner, at their discretion, may televise the sewer lines. The Contractor shall furnish and install all required traffic control methods, as per TMUTCD, needed for the Owner to conduct the televising of the Work. If there is an insufficient roadway within the project area, the contractor will furnish the equipment necessary to gain full access to the site.

d. Manhole Leakage Testing

1) After completion of manhole construction, wall sealing, or rehabilitation, but prior to backfilling, test manholes for water tightness using hydrostatic or vacuum testing procedures. Manholes shall be tested after installation with all connections (existing and/or proposed) in place. Final acceptance in accordance with the requirements of this specification will consist of vacuum testing of the completed and installed manhole in place to include manhole/adjustment rings and manhole casting. The Contractor shall furnish all labor and material required to complete all testing required by this specification.

a) Vacuum Testing: Vacuum testing shall be performed as follows:

1) Plug influent and effluent lines, including service lines, with suitably sized pneumatic or mechanical plugs. Ensure plugs are properly rated for pressures required for test; follow manufacturer's safety and installation recommendations. Place plugs a minimum of 6 inches outside of manhole walls. Brace inverts to prevent lines from being dislodged if lines entering manhole have not been backfilled. Install vacuum tester head assembly at top access point of manhole and adjust proper seal on straight top section of manhole structure. Following manufacturer's instructions and safety precautions, inflate sealing element to the recommended maximum inflation pressure; do not overinflate.

2) Evacuate manhole with vacuum pump to 10 inches mercury (Hg), disconnect pump, and monitor vacuum for two minutes.

3) If the vacuum pressure drop exceeds 1-inch Hg over a two-minute time period, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

4) MATERIALS - Test equipment shall be assembled as follows:

ii. Engine

iii. Vacuum Pump

iv. Hose

v. Test Head Device capable of sealing opening in manhole casting as required.

vi. Pneumatic test plugs – These plugs shall have a sealing length equal to or greater that the diameter of the connecting pipe to be sealed.

vii. monitoring pressure gauge (rotameter)

b) Hydrostatic Exfiltration Testing: Hydrostatic exfiltration testing shall be performed as follows:

1) Seal wastewater lines coming into the manhole with an internal pipe plug. Then, fill the manhole with water and maintain it full for at least one hour.

2) The maximum leakage for hydrostatic testing shall be 0.025 gallons per foot of manhole diameter per foot of manhole depth per hour.

3) If water loss exceeds amount tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

c) All testing shall be done by the contractor and witnessed by the Owner. All manholes and structures shall be tested as finished and completed for final acceptance.

Any defective work or materials shall be corrected or replaced by the contractor and retested. This shall be repeated until all work and materials are acceptable.

e. Sanitary Sewer Television Inspection

The Owner, at their discretion, may televise the sewer lines to determine all sources and conditions of the leakage. The Owner will provide all personnel and televising equipment for the test.

1) After construction of the sanitary sewer main and prior to placement of the final course of asphalt, the newly constructed sanitary sewer shall be televised immediately upon cleaning. Any abnormalities such as, but not limited to, misaligned joints, cracked/defected pipe, rolled gaskets, shall be repaired by the contractor at his expense. Sections requiring repair shall be re-televised to verify condition of repair. No additional compensation shall be provided for repair or re-televising.

2) If necessary, the Contractor shall perform bypass pumping operations in accordance with all other specification requirements and as outlined below.

   a) The Contractor shall furnish all labor, supervision, tools, equipment, appliances, and materials to perform all operations in connection with bypass pumping of sewage flow for the purpose of preventing interference with the televising of the sanitary sewer manholes and mainlines as well as providing reliable sewer service to the occupants of the buildings being served.

   b) The Contractor will be required to provide adequate pumping equipment and force mains in order to maintain reliable sanitary sewer service in all sanitary sewer lines involved in this project. The Contractor shall notify the Owner should a surcharge occur during the televising process which results in overflows of sewage. In case of bypass equipment failure, the Contractor shall discontinue work and release sewer flows until such time as equipment failure is corrected.

   c) The location of the pump(s), force main(s), and discharge points shall be approved by the Owner. Under no circumstances shall the flow be interrupted or stopped, such that damage is done to either private or public property, or sewage flows or overflows into a storm sewer or natural waterway.

   d) The Contractor shall provide bypass pumping of sewage around each segment(s) of pipe that is to be televised and shall be responsible for all required bulkheads, pumps, equipment, piping, and other related appurtenances to accomplish the sequence of pumping. A qualified person shall man the pumps, on-site, at all times during the bypassing procedure.

   e) All piping, joints, and accessories shall be designed to withstand the maximum bypass system pressure, or a minimum of 50 psi, whichever is greater. During bypass pumping, no sewage shall be leaked, dumped, or spilled into or onto any area outside of the existing sanitary sewer system. When bypass pumping

operations are complete, all piping shall be drained into the sanitary sewer prior to disassembly.

f) The Contractor shall demonstrate that the pumping system is in good working order and can successfully handle flows during cleaning and televising operations, prior to commencing with the cleaning and televising of the system.

g) The Contractor shall be required to have all materials, equipment, and labor necessary to complete the repair or replacement on the jobsite prior to isolating the sewer manhole or line segment and beginning bypass pumping operations.

h) The Contractor shall plug off and pump down the sewer manhole and/or line segment in the immediate work area and shall maintain the sanitary sewer system so that surcharging does not occur. The Contractor shall coordinate with all property owners to ensure that no damage will be caused to their property during any and all sewer televising work. The Contractor shall complete the televising as quickly as possible and shall satisfactorily meet all requirements prior to discontinuing bypass pumping operations and returning flow to the sewer manhole or line segment. The Contractor shall ensure that no damage will be caused to private property as a result of bypass pumping operations. Ingress and egress to adjacent properties shall always be maintained. Ramps, steel plates, or other methods shall be employed by the Contractor to facilitate traffic over surface piping.

i) If sewage accidentally drains into the drainage system or is spilled within the project, the Contractor shall immediately stop the overflow, notify the Owner, and take the necessary action to clean up and disinfect the spillage using an HTH, or equal, chemical.

j) Traffic management shall be done under the approval of respective City, County, or State Traffic Departments. The Contractor shall not open cut existing streets to accommodate bypass pumping piping unless specific written approval is given.

f. Pigging Test

1) After completion of hydrostatic testing and prior to final acceptance, test force mains longer than 200 feet by pigging to ensure piping is free of obstructions.

2) Pigs: Provide proving pigs manufactured of an open-cell polyurethane foam body, without any coating or abrasives which would scratch or otherwise damage interior pipe wall surface or lining. Pigs shall be able to pass through reductions of up to 65 percent of the nominal cross-sectional area of the pipe. Pigs shall be able to pass through standard fittings such as 45-degree and 90-degree elbows, crosses, tees, wyes, gate valves, or plug valves, as applicable to the force main being tested.

3) Test Execution: Pigging test shall be conducted in the presence of the Utility Owner. Provide at least 48-hour notice of scheduled pigging of the force main prior to commencing the test.

END OF SECTION

SECTION 33 39 30

FIBERGLASS MANHOLES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Provide all labor, equipment, materials and services necessary for the manufacture, transportation and placement of fiberglass manholes, as shown on the Drawings or as directed by the Owner.

1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Manholes shall be constructed of glass fiber-reinforced isophalic polyester resin containing chemically enhanced sand for use in sanitary sewer applications. They shall be a one-piece unit of one class, fabricated in a composite laminate. Walls shall be of uniform thickness and shall be free from thin spots and voids. Exterior surface shall be free of ridges and sharp protrusions and reinforcement. Interior surface shall also be smooth and free of ridges to allow for self-cleaning. The exterior surface shall be covered with graded sand to facilitate bonding to the concrete base pad, cement stabilized sand backfill and cement grout used to seal around all incoming lines. Manholes shall conform to the following design criteria:

1. ASTM D-3753 "Standard Specification of Glass-Fiber reinforced Polyester Manholes."

2. ASTM C-581 "Practice for determining chemical resistance of chemical thermosetting resins used in glass-fiber reinforced structures intended for liquid Service."

3. ASTM D-2412 "Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel Plate Loading."

4. ASTM D-695 "Test Methods for Compressive Properties of Rigid Plastics."

5. ASTM D-2584 "Test Method for Ignition Loss of Cured Reinforced Resins."

6. AASHTO H-20 Axial Loading Nominal inside diameter of the manhole shall be 48 inches. Thickness of the manhole shall be 0.50" nominal. Height shall be selected in accordance with project plans.

7. ASTM D 2996 - Standard Specification for Filament-Wound “Fiberglass” (Glass-Fiber- Reinforced Thermosetting-Resin) Pipe.

8. ASTM D 2997 - Standard Specification for Centrifugally Cast “Fiberglass” (Glass-Fiber- Reinforced Thermosetting Resin) Pipe.

9. ASTM D 3753 - Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells.

10. American Association of State Highway and Transportation Officials (AASHTO).

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Design and fabrication details of fiberglass manhole components.

2. Installation instruction for fiberglass manholes.

3. Frames, grates, rings, and covers.

4. Materials to be used in fabricating drop connections.

5. Materials to be used for pipe connections at manhole walls.

6. Materials to be used for stubs and stub plugs, if required.

7. Plugs to be used for sanitary sewer hydrostatic testing.

8. Manufacturer’s data for pre-mix (bag) concrete if used for channel inverts and benches.

9. Manufacturer’s color chart for fiberglass vent pipe coatings.

PART 2 – PRODUCTS

2.01 FIBERGLASS MANHOLES AND BASE SECTIONS

A. Dimensions

1. The manhole shall be a circular cylinder, reduced at the top to a circular manway not smaller than 30” inside diameter. Manholes shall be produced in half-foot increments in length +/- 2”. Nominal inside diameters shall be 48”, 60”, and 72“as shown in the Drawings. Tolerance on the inside diameter shall be +/- 1%.

B. Configuration

1. The manway reducing cone section shall be centered on the manhole barrel and must provide a bearing surface on which a standard ring and cover may be supported and adjusted to grade. The reducer shall be joined to the barrel section at the factory with resin and glass fiber reinforcement, thus providing required monolithic design to prevent infiltration and/or exfiltration through the manhole.

C. Portland Cement

1. Provide prefabricated fiberglass manholes which conform in shape, size, dimensions, and details shown on Drawings. Unless modified by Drawings, use manhole sections conforming to ASTM D 3753.

2. The manholes shall be L.F. Manufacturing, Inc. (LFM) Fiberglass Manholes or approved equal that conforms to ASTM D. 3753-81, Standard Specifications for Fiberglass Reinforced Polyester Manholes and all noted applicable documents. The manufacturer shall submit written certification that their product meets the requirements of ASTM D. 3753-81 with test results of specified manholes included.

3. The manhole shall be manufactured in one class of load rating. This class shall be H-20 wheel load (minimum 16,000 pounds dynamic wheel load).

4. Provide manhole cast-in-place base as shown on the Drawings.

D. Concrete

1. Conform to requirements of Section 03300, Cast-in-Place Concrete.

2. Channel Inverts: Use 5 sack premix (bag) concrete or Class A concrete for inverts not integrally formed with manhole base, with minimum compressive strength of 4000 psi.

3. Concrete Foundation: Use Class A concrete with minimum compressive strength of 4,000 psi for cast-in-place base and for foundation slab under manhole base section where indicated on Drawings.

E. Reinforcing Steel

1. Provide reinforcing steel conforming to requirements of 03300, Cast-in-place Concrete.

F. Miscellaneous Metals

1. Refer to Section 05 56 00 – Castings.

G. Pipe Connection for Sanitary Sewers

1. For drop, provide manufactured connection, such as Insert-a-Tee or equal, which provides positive seal between pipe and wall.

H. Sealant Materials

1. Sealing material between adjustment ring and manhole, between each adjustment ring, and between adjustment ring and manhole cover frame shall be a hydrophilic

elastic sealant, which adheres to concrete, fiberglass and metal, or approved substitute.

2. Butyl Sealant: Provide Press-Seal EZ Stick, or equal, for HDPE rings.

I. Backfill Materials

1. Provide backfill in accordance with Section 03 30 00, Earthwork.

J. Non-Shrink Grout

1. Provide prepackaged, inorganic, flowable, non-gas-liberating, nonmetallic, cement-based grout requiring only addition of water.

2. Grout shall meet requirements of ASTM C 1107 and shall have minimum 28-day compressive strength of 7,000 psi.

K. Vent Pipes

1. Provide external vent pipes for manholes, where indicated on Drawings.

2. Buried Vent Pipes: provide 3-inch or 4-inch PVC DWB pipe conforming to ASTM D 2655. Alternately, provide FRP pipe as specified for vent outlet assembly.

3. Vent Outlet Assembly: Provide vent outlet assembly as show on Drawings, constructed of following specified materials:

a. Fiberglass reinforced pipe conforming to ASTM D 2997. Seal cut ends in accordance with manufacture’s recommendations.

b. Provide epoxy bodied fittings and join pipe to fittings with epoxy adhesive, according to pipe manufacturer’s instructions.

c. Provide socket-flange fittings for epoxy adhesive bonding to pipe ends where shown on Drawings. Flanges shall meet bolt patter dimension for ANSI B 16.1, 125-pound flanges. Flange bolts shall be hot-dip since coated, conforming to ASTM A 307, Class A or B.

d. Provide 2-component, aliphatic polyurethane coating using primer or tie coat recommended by manufacturer. Provide two or more coats to yield dry film thickness of at least 3 mils. Provide Amershield, Tnemec 74, or equal. Color shall be selected by Project Manager from manufacturer’s standard colors.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that lines and grades are correct.

B. Determine if subgrade, when scarified and recompacted, can be compacted to 95 percent of maximum Standard Proctor Density at +- 3% moisture content, according to ASTM D 698 prior to placement of foundation material and base section. If it does not meet the moisture- density requirement, condition the subgrade or treat as an unstable subgrade.

C. Do not build manholes in ditches, swales, or drainage paths unless approved by the Owner.

3.02 PLACEMENT

A. Install fiberglass manholes to conform to locations and dimensions shown on Drawings. Do not install underneath existing or proposed pavement.

B. Place sanitary sewer manholes at points of change of alignment, grade, size, pipe intersections, and end of sewer.

3.03 MANHOLE BASE SECTIONS AND FOUNDATIONS

A. Place base section and foundation as shown in the Drawings.

3.04 CAST-IN-PLACE FOUNDATION

A. Where Drawings indicate cast-in-place manhole base, place concrete as shown on Drawings on 4-inch (minimum) layer of either crushed stone, cement stabilized sand, or seal slab. When unstable subgrade is identified, over-excavate subgrade to allow for placement of 12- inch thick layer of crushed stone wrapped in filter fabric.

3.05 MANHOLE BARREL

A. Lower manhole barrel onto base section. Seal with manufacturer's gasket or approved sealant. Wrap joint with external sealing material, minimum 12-inch width.

B. Where cast-in-place base is used, support manhole barrel in place and brace it from sides of excavation to prevent any movement of barrel during concrete placement and while concrete is setting. Provide minimum clearance between reinforcing steel and manhole barrel bottom as shown on Drawings. Do not support manhole barrel on reinforcing steel. Place bead of water swelling sealant around inside of barrel near bottom, as shown on Drawings, to form seal.

3.06 PIPE CONNECTIONS AT PRECAST MANHOLE BASE

A. Install approved resilient connectors at each pipe entering and exiting sanitary sewer manholes in accordance with manufacturer's instructions.

B. Ensure that no concrete, cement stabilized sand, fill, or other solid material is allowed to enter space between pipe and edge of wall opening at and around resilient connector on either interior or exterior of manhole. When necessary, fill space with compressible material to ensure full flexibility provided by resilient connector.

C. Test connection for watertight seal before backfilling.

3.07 PIPE CONNECTIONS AT CAST-IN-PLACE BASE

A. Cut manhole barrel for pipe penetrations following curvature of pipe and with maximum of 1-inch clearance. Seal cut edges with resin. Hole may be circular or cutout with semi-circular top which extends to bottom of barrel.

B. Place continuous bead of water swelling sealant, as shown on Drawings, around pipe penetrations on interior of manhole barrel. Roughen surface of fiberglass prior to placement to improve bond with sealant. Allow sealant to completely cure before placing concrete against it.

C. Extend pipe entering manhole at least 8 inches into manhole. Fit pipes with neoprene water- stop gasket seal placed tightly around pipe using stainless steel clamp. Alternately, pipes may have continuous bead of water swelling sealant, as detailed on Drawings, placed around pipe circumference.

D. When forming invert surface in bottom of manhole, mound concrete around pipe penetrations so that water swelling sealant beads and neoprene water-stop gasket have minimum 2 inches of concrete cover.

E. Test connection for watertight seal before backfilling.

3.08 INVERTS FOR SANITARY SEWERS

A. Construct invert channels as shown in the Drawings.

3.09 DROP CONNECTIONS FOR SANITARY SEWERS

A. Backfill drop assembly with crushed stone wrapped in filter fabric, cement stabilized sand, or Class A concrete to form solid mass. Extend cement stabilized sand or concrete outside of bells minimum 4 inches.

B. Install drop connection when sewer line enters manhole higher than 24 inches above invert of manhole.

C. At drop pipe connections through fiberglass barrel, cut circular hole sized to requirements of manufactured connector. Seal cut edge with resin. Install watertight connector according to manufacturer's recommendations.

3.10 ADJUSTMENT RINGS AND FRAME

A. Combine precast concrete or HDPE adjustment rings so that elevation of installed casting cover matches pavement surface. Do not load manhole except on load bearing shoulder of manhole. Seal between adjustment ring and fiberglass manhole with approved sealant material. Apply a latex bonding agent to precast concrete surface and join with non-shrink grout. Set cast iron frame on adjustment ring in bed of approved sealant material. Install sealant bed consisting of two beads on sealant, each bead having minimum dimensions of 1/2-inch and 1/2-inch wide.

B. Wrap manhole frame and adjustment rings with external sealing material, minimum 3 inches beyond joint between ring and frame and ring and precast section.

C. Set cast iron frame on top of cone or adjustment rings using water swelling sealant materials and adjust elevation of casting cover to match pavement surface. For manholes in unpaved areas, set top frame minimum of 6 inches above existing ground line unless otherwise indicated on Drawings.

3.11 BACKFILL

A. After leakage testing, place and compact backfill material in area of excavation surrounding manholes in accordance with requirements of Section 03 30 00, Earthwork. Use embedment zone backfill material, as specified for adjacent utilities, from manhole foundation up to elevation 12-inches over each pipe connected to manhole. Provide trench zone backfill, as specified for adjacent utilities, above embedment zone backfill.

3.12 FIELD QUALITY CONTROL

A. Conduct leakage testing of sanitary sewer manholes in Section 01 45 23, Watertightness Testing of Liquid Containing Structures and Section 33 05 61 – Utility Structures.

3.13 PROTECTION

A. Protect manholes from damage until work has been finally accepted. Repair damage to manholes at no additional cost to City.

END OF SECTION

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SECTION 40 05 00

BASIC MECHANICAL REQUIREMENTS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install to the required line and grade, all piping together with all fittings and appurtenances, required for a complete installation. Piping to be backfilled and/or encased in concrete is considered to be buried piping. Piping that is not buried is considered to be exposed.

B. The Contractor shall furnish and install fittings, couplings, connections, sleeves, adapters, harness rods and closure pieces as required to connect pipelines of dissimilar materials and/or sizes herein included under this Section and other concurrent Contracts for a complete installation.

C. The Contractor shall furnish all labor, materials, equipment, tools, and services required for the furnishing, installation and testing of all piping as shown on the Drawings, specified in this Section and required for the Work. Piping shall be furnished and installed of the material, sizes, classes, and at the locations shown on the Drawings and/or designated in this Section. Piping shall include all fittings, adapter pieces, couplings, closure pieces, harnessing rods, hardware, bolts, gaskets, wall sleeves, wall pipes, hangers, supports, and other associated appurtenances for required connections to equipment, valves, or structures for a complete installation.

D. Piping assemblies under 4-inch size shall be generally supported on walls and ceilings, unless otherwise shown on the Drawings or ordered by the Engineer, being kept clear of openings and positioned above "headroom" space. Where practical, such piping shall be run in neat clusters, plumb and level along walls, and parallel to overhead beams.

E. The Contractor shall provide taps on piping where required or shown on the Drawings. Where pipe or fitting wall thicknesses are insufficient to provide the required number of threads, a boss or pipe saddle shall be installed.

F. The work shall include, but not be limited to, the following:

1. Connections to existing pipelines.

2. Test excavations necessary to locate or verify existing pipe and appurtenances.

3. Installation of all new pipe and materials required for a complete installation.

4. Cleaning, testing and disinfecting as required.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 01 – General Requirements

B. Division 02 – Existing Conditions

1.03 MATERIAL CERTIFICATION AND SHOP DRAWINGS

A. The Contractor shall furnish to the Owner (through the Engineer) a Material Certification stating that the pipe materials and specials furnished under this Section conform to all applicable provisions of the corresponding Specifications. Specifically, the Certification shall state compliance with the applicable standards (ASTM, AWWA, etc.) for fabrication and testing.

B. Shop Drawings for major piping (2-inches in diameter and greater) shall be prepared and submitted in accordance with Section 01 33 00 – Submittal Procedures. In addition to the requirements of Section 01 33 00 – Submittal Procedures, the Contractor shall submit laying schedules and detailed Drawings in plan and profile for all piping as specified and shown on the Drawings.

C. Shop Drawings shall include, but not be limited to, complete piping layout, pipe material, sizes, class, locations, necessary dimensions, elevations, supports, hanger details, pipe joints, and the details of fittings including methods of joint restraint. No fabrication or installation shall begin until Shop Drawings are approved by the Engineer.

PART 2 – PRODUCTS

2.01 GENERAL

A. All specials and every length of pipe shall be marked with the manufacturer's name or trademark, size, class, and the date of manufacture. Special care in handling shall be exercised during delivery, distribution, and storage of pipe to avoid damage and unnecessary stresses. Damaged pipe will be rejected and shall be replaced at the Contractor's expense. Pipe and specials stored prior to use shall be stored in such a manner as to keep the interior free from dirt and foreign matter.

B. Testing of pipe before installation shall be as described in the corresponding ASTM or AWWA Specifications and in the applicable standard specifications listed in the following sections. Testing after the pipe is installed shall be as specified in Part 3.

C. All buried piping shall have restrained joints for thrust protection unless otherwise specified or shown on the Drawings. All exposed piping shall have flanged joints, unless otherwise specified or shown on the Drawings.

D. The Drawings indicate work affecting existing piping and appurtenances. The Contractor shall excavate test pits as required of all connections and crossings which may affect the Contractor's work prior to ordering pipe and fittings to determine sufficient information for

ordering materials. The Contractor shall take whatever measurements that are required to complete the work as shown or specified.

2.02 WALL PIPES (NOT USED)

2.03 SLEEVES (NOT USED)

2.04 SOLID SLEEVE COUPLINGS (FOR BURIED SERVICE THROUGH 54-INCH)

A. Solid sleeve couplings shall be used to connect buried service piping where shown on the Drawings. Solid sleeves shall be ductile iron, long body and shall conform to the requirements of ANSI A21.10 (AWWA C110). Unless otherwise shown or specified, solid sleeve couplings shall be Style A11760 as manufactured by American Cast Iron Pipe Co., or equal. Solid sleeve couplings shall be restrained with wedge-type restraining glands to meet the pressures specified in 40 06 20 – Schedules.

B. Alternatively, EBAA Iron 3800 Mega-Coupling is acceptable.

2.05 SLEEVE TYPE COUPLINGS (FOR EXPOSED SERVICE AND BURIED SERVICE ABOVE 54-INCH) (NOT USED)

2.06 FLANGED COUPLING ADAPTERS

A. Flanged coupling adapters shall be furnished as required and as shown on the Drawings.

B. Flanged coupling adapters shall be of ductile iron or carbon steel construction and shall be rated for the same pressure as the connected piping.

C. All flanged coupling adapters shall be harnessed by tying the adapter to the nearest pipe joint flange using threaded rods and rod tabs unless otherwise approved by the Engineer.

D. Flanged coupling adapters shall be manufactured by Smith-Blair Model 912 or 913, Romac Industries Model FCG or FC 400, Dresser Industries Model 128-W, or equal.

E. Flanged coupling adapters shall be provided with manufacturer’s fusion bonded epoxy painting system.

2.07 DISMANTLING JOINTS

A. Dismantling joints shall be furnished at locations shown on the Drawings.

B. Dismantling joints for sizes less than 12-inch shall be of ductile iron or carbon steel construction and shall be rated for the same pressure as the connected piping. Dismantling joints for sizes greater than 12-inches shall be of carbon steel construction and shall be rated for the same pressure as the connected piping.

C. Flanges for dismantling joints shall match the bolt pattern and pressure rating of the flanges for the connected piping.

D. All dismantling joints shall be restrained utilizing restraining rods provided by the manufacturer. Restraining rods shall be constructed from ASTM A193 Grade B7 steel. Restraining rods and restraint system shall be installed in strict accordance with manufacturer's recommendations.

E. Dismantling joints shall be provided with manufacturer's fusion bonded epoxy painting system.

F. Dismantling joints shall be manufactured by Smith Blair Model 975, Romac Industries Model DJ400, or equal.

2.08 GROOVED COUPLINGS (NOT USED)

2.09 TAPPING SLEEVES

A. Tapping sleeves shall conform to the minimum OD size ranges and lengths specified in paragraph 3. The Flange shall be manufactured in compliance with AWWA C207, Class D ANSI B.16.1 drilling, recessed for tapping valve MSS-SP60. Mechanical Joint tapping sleeve outlet shall meet or exceed all material specifications as listed below and be suitable for use with standard mechanical joint x mechanical joint resilient wedge gate valves per ANSI/AWWA C509-94.

B. Tapping sleeves from 4" through 12" nominal pipe diameter shall meet the following minimum requirements.

1. The entire fitting shall be stainless steel type 304 (18-8). The body, lug, and gasket armor plate shall be in compliance with ASTM A240. The Flange shall be cast stainless steel in compliance with ASTM A743. The MJ outlet shall be one-piece casting made of stainless steel. The test plug shall be ¾" NPT in compliance with ANSI B2.1 and shall be lubricated or coated to prevent galling. All metal surfaces shall be passivated after fabrication in compliance with ASTMA-380.

2. The gasket shall provide a 360-sealing surface of such size and shape to provide an adequate compressive force against the pipe after assembly, to affect a positive seal under the combinations of joint and gasket tolerances. The materials used shall be vulcanized natural or vulcanized synthetic rubber with antioxidant and antioxidant ingredients to resist set after installation. No reclaimed rubber shall be used. A heavy-gauge-type 304-stainless armor plate shall be vulcanized into the gasket to span the lug area.

3. The lugs shall be heliarc welded (GMAW) to the shell. The lug shall have a pass-through-bolt design to avoid alignment problems and allow tightening from either side of the main. Bolts shall NOT BE integrally welded to the sleeve. Finger Lug

designs are not approved; it is the intent of these specifications to allow a tapping sleeve that has a lug design similar to the approved models.

4. Bolts and nuts shall be type 304 (18-8) stainless steel and lubricated or Teflon coated to prevent galling or seizing. Bent or damaged unite will be rejected.

5. Quality control procedures shall be employed to insure that the shell, Lug, (4” and Larger Nominal Pipe Diameter) armor plate, gasket and related hardware are manufactured to be free of any visible defects. Each unit, after proper installation, shall have a working-pressure rating up to 200 psi, and a test pressure of 250 psi.

6. The sleeve construction shall provide a positive means of preventing gasket cold flow and/or extrusion.

7. Each sleeve shall be stenciled, coded or marked in a satisfactory manner to identify the size range. The markings shall be permanent type, water resistant, that will not smear or become illegible.

2.10 TAPPING SADDLES

A. Tapping saddles may be used on mains sixteen (16) inches and larger where the required tap size does not exceed one-half the size of the main (i.e. 8-inch tapping saddle for use on a 16-inch main). Tapping saddles shall be manufactured of ductile iron providing a factor of safety of at least 2.5 at a working pressure of 250 psi. Saddles shall be equipped with a standard AWWA C-110-77 flange connection on the branch. Sealing gaskets shall be "O" ring type, high quality molded rubber having an approximate seventy durometer hardness, placed into a groove on the curved surface of the tapping saddles. Straps shall be of alloy steel. The tapping saddle shall be the American tapping saddle, U.S. Pipe tapping saddle, or equal. All taps shall be machine cut, no burned taps will be allowed.

B. Body of tapping saddles for water mains shall be of the double strap/bale or double and single band with minimum four studs/bolts on the single band type and shall be cast bronze of the size and application specified. Material shall be in accordance with ASTM B62 and B584 (85-5-5-5) requirements and fabricated to ANCI/AWWAC800, latest revision. Saddles for PVC pipe shall be pre-formed to AWWA C900 and C905 outside diameter dimensions and so stamped or otherwise identified by a permanent inked marking that will not smear or wash off on the body of the saddle.

C. Saddles for PVC water pipe shall conform to the design requirements of the Uni-Bell Handbook of PVC Pipe and AWWA Manual No. M23. The saddle shall provide full support around the circumference of the pipe. Provide a bearing area of sufficient width along the axis of the pipe, 2-inch minimum, ensuring that the pipe will not be distorted when the saddle is tightened.

D. The minimum width of double stainless steel bands for saddles to be installed on 12 inch or smaller water main pipe diameters shall measure one and one half inches each. The minimum width for single stainless steel bands shall measure three inches (3").

E. The minimum gauge of the stainless steel bands shall be eighteen gauge. In order to prevent deformation, the minimum gauge of the stainless steel side bars shall be ten gauge. All welds shall be fully passivated for enhanced corrosion resistance. The bolts/studs shall be 5/8" UNC roll thread with heavy gauge flat hex nuts. All Stainless nuts shall be coated to prevent galling.

F. Gaskets shall be virgin rubber, NSF 61 approved, meet ASTM D-2000 and be NBR or SBR compounded to produce permanence and resistance to set after installation and deterioration during storage.

G. Quality control procedures shall be employed to insure that the bronze saddle casting, straps (bronze bale or stainless stell band), and gasket are manufactured to be free of any visible defects. Each saddle shall have a working pressure rating not less than 175 psi for pipe 12 inches and smaller.

2.11 UNIONS

A. For ductile iron, carbon steel, and grey cast iron pipes assembled with threaded joints and malleable iron fittings, unions shall conform to ANSI B16.39.

B. For copper piping, unions shall have ground joints and conform to ANSI B16.18.

C. For PVC and CPVC piping, unions shall be socket weld type with Viton O-ring.

2.12 THERMOPLASTIC TUBING AND FITTINGS (NOT USED)

2.13 HEAT TRACED PIPING (NOT USED)

2.14 FLEXIBLE RESTRAINED EXPANSION JOINTS

A. Restrained expansion joints shall be manufactured of 60-42-10 ductile iron conforming to material and other applicable requirements of ANSI/AWWA C153/A21.53.

B. Each pressure containing component shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the materials requirements of, and tested in accordance with, ANSI/AWWA C213 and shall meet or exceed the requirements of ANSI/AWWA C550.

C. Seals shall conform to the applicable requirements of ANSI/AWWA C111/A21.11.

D. All bolts used in the assemblies shall be stainless steel and shall be coated with a premium quality epoxy.

E. Flanged ends shall comply with ANSI/AWWA C110/A21.10, with the addition of O-ring groove and O-ring.

F. Mechanical joint ends shall comply with ANSI/AWWA C153/A21.53.

G. Restrained expansion joints shall have a minimum pressure rating of 350 psi with a minimum safety factor of 3:1. Each assembly shall be tested at 350 psi before shipment.

H. Restrained expansion joints shall provide for self-restraint without tie rods and shall provide for expansion and contraction capabilities cast as an integral part of the end connection.

I. Flexible restrained expansion joints shall allow for 8-inches (+6"-2") minimum expansion.

J. Flexible restrained expansion joints shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint having a minimum of 15□ deflection per ball.

K. Restrained expansion joints shall be the Single Ball or Double Ball FLEX-TEND Expansion Joint as manufactured by EBAA Iron Inc., or equal.

PART 3 – EXECUTION

3.01 INSTALLATION

A. All piping shall be installed by skilled workmen and in accordance with the best standard practice for piping installation as shown on the Drawings, specified or recommended by the pipe manufacturer. Proper tools and appliances for the safe and convenient handling and installing of the pipe and fittings shall be used. Great care shall be taken to prevent any pipe coating from being damaged on the inside or outside of the pipe and fittings. All pieces shall be carefully examined for defects, and no piece shall be installed which is known to be cracked, damaged, or otherwise defective. If any defective pieces should be discovered after having been installed, it shall be removed and replaced with a sound one in a satisfactory manner by the Contractor and at his own expense. Pipe and fittings shall be thoroughly cleaned before they are installed and shall be kept clean until they are accepted in the complete work. All piping connections to equipment shall be provided with unions or coupling flanges located so that piping may be readily dismantled from the equipment. At certain applications, Dresser, Victaulic, or equal, couplings may also be used. All piping shall be installed in such a manner that it will be free to expand and contract without injury to itself or to structures and equipment to which it is connected. All piping shall be erected to accurate lines and grades with no abrupt changes in line or grade and shall be supported and braced against movement, temporary, or permanent. All exposed piping shall be installed with vertical and horizontal angles properly related to adjoining surfaces or pipes to give the appearance of good workmanship. Unless otherwise shown or approved, provided a minimum headroom clearance under all piping of 7 feet 6 inches.

B. Unless otherwise shown or specified, all waste and vent piping shall pitch uniformly at a 1/4-inch per foot grade and accessible cleanouts shall be furnished and installed as shown and as required by local building codes. Installed length of waste and vent piping shall be determined from field measurements in lieu of the Drawings.

C. All excavation shall be made in such a manner and to such widths as will provide ample room for properly installing the pipe and permit thorough compaction of backfill around the pipe. The minimum trench widths shall be in strict accordance with the "Trench Width Excavation Limits" as shown on the Drawings. All excavation and trenching shall be done in strict accordance with these specifications and all applicable parts of the OSHA Regulations, 29CFR 1926, Subpart P.

D. ALL EXCAVATION REQUIRED BY THIS CONTRACT SHALL BE UNCLASSIFIED. NO ADDITIONAL PAYMENT WILL BE MADE FOR ROCK EXCAVATION REQUIRED FOR THE INSTALLATION OF PIPE OR STRUCTURES SHOWN ON THE DRAWINGS.

E. Enlargements of the trench shall be made as needed to give ample space for operations at pipe joints. The width of the trench shall be limited to the maximum dimensions shown on the Drawings, except where a wider trench is needed for the installation of and work within sheeting and bracing. Except where otherwise specified, excavation slopes shall be flat enough to avoid slides which will cause disturbance of the subgrade, damage to adjacent areas, or endanger the lives or safety of persons in the vicinity.

F. Hand excavation shall be employed wherever, in the opinion of the Engineer, it is necessary for the protection of existing utilities, poles, trees, pavements, or obstructions.

G. No greater length of trench in any location shall be left open, in advance of pipe laying, than shall be authorized or directed by the Engineer and, in general, such length shall be limited to approximately one hundred (100) feet. The Contractor shall excavate the trenches to the full depth, width and grade indicated on the Drawings including the relevant requirements for bedding. The trench bottoms shall then be examined by the Engineer as to the condition and bearing value before any pipe is laid or bedding is placed.

H. No pressure testing shall be performed until the pipe has been properly backfilled in place. All pipe passing through walls and/or floors shall be provided with wall pipes or sleeves in accordance with the specifications and the details shown on the Drawings. All wall pipes shall be of ductile iron and shall have a water stop located in the center of the wall. Each wall pipe shall be of the same class, thickness, and interior coating as the piping to which it is joined. All buried wall pipes shall have a coal tar outside coating on exposed surfaces.

I. JOINT DEFLECTION SHALL NOT EXCEED 75 PERCENT OF THE MANUFACTURER’S RECOMMENDED DEFLECTION.

J. Excavation and backfilling shall conform to the requirements of Section 31 00 01 – Earthwork, and as specified herein. Maximum trench widths shall conform to the Trench

Width Excavation Limits shown on the Drawings. All exposed, submerged, and buried piping shall be adequately supported and braced by means of hangers, concrete piers, pipe supports, or otherwise as may be required by the location.

K. Following proper preparation of the trench subgrade, pipe and fittings shall be carefully lowered into the trench so as to prevent dirt and other foreign substances from gaining entrance into the pipe and fittings. Proper facilities shall be provided for lowering sections of pipe into trenches. UNDER NO CIRCUMSTANCES SHALL ANY OF THE MATERIALS BE DROPPED OR DUMPED INTO THE TRENCH.

L. Water shall be kept out of the trench until jointing and backfilling are completed. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no water, earth, or other substance will enter the pipes, fitting, or valves. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored as required.

M. All piping shall be installed in such a manner that it will be free to expand and/or contract without injury to itself or to structures and equipment to which it is connected. All piping shall be erected to accurate lines and grades with no abrupt changes in line or grade and shall be supported and braced against movement, temporary, or permanent. All exposed piping shall be installed with vertical and horizontal angles properly related to adjoining surfaces or pipes to give the appearance of good workmanship. Pipes crossing within a vertical distance of less than or equal to one (1) foot shall be encased and supported with concrete at the point of crossing to prevent damage to the adjacent pipes as shown on the Drawings.

N. The full length of each section of pipe shall rest solidly upon the bed of the trench, with recesses excavated to accommodate bells, couplings, joints, and fittings. Before joints are made, each pipe shall be well bedded on a solid foundation; and no pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. Pipe that has the grade or joint disturbed after laying shall be taken up and relaid by the Contractor at his own expense. Pipe shall not be laid in water or when trench conditions are unsuitable for work.

O. Proper and suitable tools and appliances for the safe convenient handling and laying of pipe shall be used and shall in general agree with manufacturer's recommendations.

P. AT THE CLOSE OF EACH WORK DAY, THE END OF THE PIPELINE SHALL BE TIGHTLY SEALED WITH A CAP OR PLUG SO THAT NO WATER, DIRT, OR OTHER FOREIGN SUBSTANCE MAY ENTER THE PIPELINE, AND THIS PLUG SHALL BE KEPT IN PLACE UNTIL PIPE LAYING IS RESUMED.

Q. During the laying of pipe, each pipe manufacturer shall provide his own supervisor to instruct the Contractor's pipe laying personnel in the correct procedure to be followed.

R. Ordinarily only full lengths of pipe (as furnished by the pipe manufacturer) shall be used exceptions: closure pieces at manholes and areas where joint deflection is required.

S. For gravity sewer installations, the Contractor shall use a laser device to maintain the trench and pipe alignment. The laser device shall be re-checked for correct elevation and pipe alignment prior to pipe installation if the device is left in the pipe overnight. Corrected invert elevations at each manhole and any adjustments will be coordinated and approved by the Engineer.

T. ALL PIPING SHALL HAVE TYPE "A" BEDDING AS SHOWN ON THE DRAWINGS, UNLESS OTHERWISE SPECIFIED HEREIN OR INDICATED ON THE DRAWINGS.

3.02 CARBON AND STAINLESS STEEL PIPE (NOT USED)

3.03 JOINTS IN PIPING

A. Restrained joints shall be provided on all pipe joints as specified herein and shown on the Drawings.

B. Push-on joints include a single rubber gasket which fits into the bell end of the pipe. The gasket shall be wiped clean, flexed and then placed in the socket. Any bulges in the gasket which might interfere with the entry of the plain end of the pipe shall be removed. A thin film of lubricant shall be applied to the gasket surface which will come into contact with the spigot end of the pipe. The lubricant shall be furnished by the pipe manufacturer. The plain end of the pipe, which is tapered for ease of assembly, shall be wiped clean and a thick film of lubricant applied to the outside. The pipe shall be aligned and carefully entered into the socket until it just makes contact with the gasket. The joint assembly shall be completed by entering the pipe past the gasket until it makes contact with the bottom of the socket. The pipe shall be pulled "home" with an approved jack assembly as recommended by the pipe manufacturer. If assembly is not accomplished by reasonable force, the plain end shall be removed, and the condition corrected.

C. Flanged joints shall be brought to exact alignment and all gaskets and bolts or studs inserted in their proper places. Bolts or studs shall be uniformly tightened around the joints. Where stud bolts are used, the bolts shall be uniformly centered in the connections and equal pressure applied to each nut on the stud. Pipes in all lines subject to temperature changes shall be cut short and cold sprung into place to compensate for expansion when hot.

D. Mechanical joints shall be made up with gaskets, glands and bolts. When a joint is to be made up, the bell or socket and plain end shall be cleaned and washed with a solution of mild soap in water; the gland and gasket shall be slid onto the plain end and the end then entered into the socket until it is fully "home" on the centering ring. The gasket shall then be painted with soapy water and slid into position, followed by the gland. All bolts shall be inserted and made up hand tight and then tightened alternately to bring the gland into position evenly. Excessive tightening of the bolts shall be avoided. All nuts shall be pulled up using a torque wrench which will not permit unequal stresses in the bolts. Torque shall not exceed the recommendations of the manufacturer of the pipe and bolts for the various sizes. Care shall be taken to assure that the pipe remains fully

"home" while the joint is being made. Joints shall conform to the applicable AWWA Specifications.

E. Threaded and/or screwed joints shall have long tapered full depth threads to be made with the appropriate paste or jointing compound, depending on the type of fluid to be processed through the pipe. All pipe up to, and including 1-1/2-inches, shall be reamed to remove burr and stood on end and well pounded to remove scale and dirt. Wrenches on valves and fittings shall be applied directly over the joint being tightened. Not more than three pipe threads shall be exposed at each connection. Pipe, in all lines subject to temperature changes shall be cut short and cold sprung into place to compensate for expansion when hot. Joints in all piping used for chlorine gas lines shall be made up with a glycerine and litharge cement. Joints in plastic piping (PVC/CPVC) shall be laid and joints made with compounds recommended by the manufacturer. Installation shall conform to the requirements of ASTM D2774 and ASTM D2855. Unions required adjacent to valves and equipment.

F. Soldered joints shall have the burrs removed and both the outside of pipe and the inside of fittings shall be thoroughly cleaned by proper tools recommended for that purpose. Flux shall be applied to both pipe and inside of fittings and the pipe placed into fittings and rotated to insure equal distribution of flux. Joints shall be heated and solder applied until it shows uniformly around the end of joints between fitting and pipe. All joints shall be allowed to self-cool to prevent the chilling of solder. Combination flux and solder paste manufactured by a reputable manufacturer is acceptable. Unions required adjacent to valves and equipment.

G. Welded joints shall be made by competent operators in a first class workmanlike manner, in complete accordance with ANSI B31.1 and AWWA C206. Welding electrodes shall conform to ASTM A233, and welding rod shall conform to ASTM A251. Only skilled welders capable of meeting the qualification tests for the type of welding which they are performing shall be employed. Tests, if so required, shall be made at the expense of the Contractor, if so ordered by the Engineer. Unions shall be required adjacent to valves and equipment.

H. Copper joints shall be thoroughly cleaned and the end of pipes uniformly flared by a suitable tool to the bevels of the fittings used. Wrenches shall be applied to the bodies of fittings where the joint is being made and in no case to a joint previously made. Dimensions of tubing and copper piping shall be in complete accordance with the fittings used. No flare joints shall be made on piping not suited for flare joints. Installations for propane gas shall be in accordance with NFPA 54 and/or 58.

I. Solvent or adhesive welded joints in plastic piping shall be accomplished in strict accordance with the pipe manufacturer's recommendations, including necessary field cuttings, sanding of pipe ends, joint support during setting period, etc. Care shall be taken that no droppings or deposits of adhesive or material remain inside the assembled piping. Solvent or adhesive material shall be compatible with the pipe itself, being a product approved by the pipe manufacturer. Unions are required adjacent to valves and

equipment. Sleeve-type expansion joints shall be supplied in exposed piping to permit 1-inch minimum of expansion per 100 feet of pipe length.

J. Dielectric isolation such as flange isolation kits, dielectric unions, or similar, shall be installed wherever dissimilar metals are connected according to the following table.

	Zinc	Galvanized Steel	Aluminum	Cast Iron	Ductile Iron	Mild Steel/ Carbon Steel	Copper	Brass	Stainless Steel
Zinc			●	●	●	●	●	●	●
Galvanized Steel			●	●	●	●	●	●	●
Aluminum	●	●		●	●	●	●	●	●
Cast Iron	●	●	●				●	●	●
Ductile Iron	●	●	●				●	●	●
Mild Steel/ Carbon Steel	●	●	●				●	●	●
Copper	●	●	●	●	●	●			●
Brass	●	●	●	●	●	●			●
Stainless Steel	●	●	●	●	●	●	●	●	

Notes:
● signifies dielectric isolation is required between the two materials noted.
Consult Engineer for items not listed in table.
Provide flange isolation kits for all flanged connections of dissimilar metals and hardware including connections to equipment.
Contractor shall include all isolation descriptions with piping submittals.

K. Eccentric reducers shall be installed where air or water pockets would otherwise occur in mains because of a reduction in pipe size.

L. Joints in polypropylene and polyvinylidelene fluoride pipe shall be butt fusion weld. All butt welding shall follow the requirements of ASTM D-2657 and the manufacturer's recommendations.

3.04 FLUSHING AND TESTING

A. All piping shall be properly flushed and tested unless specifically exempted elsewhere in the Specifications or otherwise approved by the Engineer. Air and gas pipelines shall be flushed and tested with compressed air. Gravity sewer piping shall be flushed and tested as specified in Section 33 05 61 – Utility Structures. All other liquid conveying pipelines

shall be flushed and tested with water. The Contractor shall furnish and install all means and apparatus necessary for getting the air or water into the pipeline for flushing and testing including pumps, compressors, gauges, and meters, any necessary plugs and caps, and any required blow-off piping and fittings, etc., complete with any necessary reaction blocking to prevent pipe movement during the flushing and testing. All pipelines shall be flushed and tested in such lengths or sections as agreed upon among the Owner, Engineer, and Contractor. Test pressures shall be measured at the lowest point of the pipe segment being tested. The Contractor shall give the Owner and Engineer reasonable notice of the time when he intends to test portions of the pipelines. The Engineer reserves the right, within reason, to request flushing and testing of any section or portion of a pipeline.

B. The Contractor shall provide water for all flushing and testing of liquid conveying pipelines. Raw water or non-potable water may be used for flushing and testing liquid pipelines not connected to the potable water system. Only potable water shall be used for flushing and testing the potable water system.

C. Air and gas piping shall be completely and thoroughly cleaned of all foreign matter, scale, and dirt prior to start-up of the air or gas system.

D. At the conclusion of the installation work, the Contractor shall thoroughly clean all new liquid conveying pipe by flushing with water or other means to remove all dirt, stones, pieces of wood, etc., which may have entered the pipe during the construction period. If after this cleaning any obstructions remain, they shall be corrected by the Contractor, at his own expense, to the satisfaction of the Engineer. Liquid conveying pipelines shall be flushed at the rate of at least 2.5 feet per second for a duration suitable to the Engineer or shall be flushed by other methods approved by the Engineer.

E. Compressed/service air and gas piping shall be flushed by removing end caps from the distribution lines and operating one (1) compressor, in accordance with the manufacturer's instructions.

F. After flushing, all air piping shall be pressure and leak tested prior to coating and wrapping of welded joints. Immediately upon successful completion of the pressure and leak test, welded joints shall be thoroughly cleaned of all foreign matter, scale, rust, and discoloration and coated in accordance with the Specifications.

G. All process air piping shall be leak tested by applying a soap solution to each joint. Leak tests shall be conducted with one (1) blower in service at normal operating pressure.

H. During testing the piping shall show no leakage. Any leaks or defective piping disclosed by the leakage test shall be repaired or replaced by the Contractor, at his own expense, and the test repeated until all such piping shows tight.

I. All buried process air piping shall be pressurized to 25 psig and tested for leaks by applying a soap solution to each joint. The air supply shall be stopped and the pipe pressure monitored. System pressure shall not fall by more than 0.5% of the 25 psig test

pressure over a one-hour test period. Should the system fail to hold the required pressure for one hour, the cause shall be determined and corrected and the test repeated until a successful test of the entire system is obtained.

J. Field leakage tests shall be performed for all submerged process air piping. The procedure shall consist of operating the system under clear nonpotable water for visual identification of all leaks. All field leakage tests shall be witnessed by the Engineer. All submerged piping shall be installed free of any leaks.

K. After flushing, all liquid conveying pipelines shall be hydrostatically tested. The procedure used for the hydrostatic test shall be in accordance with the requirements of AWWA C600. Each pipeline shall be filled with water for a period of no less than 24 hours and then subjected to the specified test pressure for 2 hours. During this test, exposed piping shall show no leakage. Allowable leakage in buried piping shall be in accordance with AWWA C600.

L. Any leaks or defective pipe disclosed by the hydrostatic test shall be repaired or replaced by the Contractor, at his own expense, and the test repeated until all such piping shows tight.

M. After flushing, all gas piping shall be leak tested in accordance with all local codes and regulations and in conformance with the recommendations or requirements of any National Institute or Association for the specific service application.

3.05 DISINFECTION

A. All pipe and fitting connected to and forming a part of a potable water supply shall be disinfected in accordance with the procedures described in AWWA C 651. Disinfection shall also be in accordance with the requirements of TCEQ and the Owner.

B. Disinfection shall be accomplished after the pipe has been flushed, if applicable, and passed the hydrostatic test. Such piping shall be filled with 50 parts per million (PPM) of chlorine and held in contact for not less than 24 hours. Final tests after 24 hours contact time shall show a minimum residual chlorine content of 10 ppm in all parts of the system. Disinfection shall be repeated as often as necessary, and as directed by the Engineer and/or TCEQ and/or the Owner until the minimum residual chlorine content of 10 ppm has been reached. The Contractor shall obtain certificates of satisfactory bacteriological tests and furnish them to the Owner before the request is made for acceptance of the work. The Contractor shall furnish and install, at his own expense, all means and apparatus necessary for performing the disinfection. The chlorine solution shall be thoroughly flushed out prior to placing the new sections of pipe in service. Chlorine residual tests will be made after flushing to assure that residual is not in excess of 1 ppm at any point in system.

C. The Contractor is cautioned that the spent chlorine solution must be disposed of in such a way as not to be detrimental to animal, plant, or fish life. If flushing requires entrance into water way, dechlorination must be performed.

D. The Contractor must make provisions for the disposal and runoff of the flushing operations in order to minimize erosion or impact to residents.

E. During extenuating circumstances, Contractor may request a deviation from the typical disinfection procedure as noted below. Approval in writing must be provided by the Owner before implementing such deviations.

1. When customers are out of service during a shutdown with no leakage past valves, the required minimum detention time will be 3 hours and the chlorine dosage will be 300 ppm.

2. When customers are out of service with some leakage past valves, the required minimum detention time will be 30 minutes with a 500 ppm chlorine dosage.

F. Additional Treatment: Should the new main fail to meet minimum public health standards for bacteriological quality after flushing, further treatment shall be as directed by the Owner. If further disinfection is required, chlorination shall be done at no additional cost. In no case, however, shall the new line be acceptable as complete and satisfactory until the bacteriological quality of the water taken from the main meets the standards of the TCEQ.

END OF SECTION

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SECTION 40 05 31

PVC PIPE

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Reference Section 40 05 00 – Basic Mechanical Requirements.

PART 2 – PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. PVC pipe and fittings shall be manufactured in accordance with ASTM D1785, D1784 and F441, "normal impact" pipe, Schedule 40 or 80 as specified.

B. Fittings used with this pipe shall be socket type or flanged type as specified herein or indicated on the Drawings. Plastic piping shall be installed in full accordance with the manufacturer's recommendations for the specific installation. No field bending or distortion of the pipe will be permitted.

C. PVC pipe shall be Type 1 Grade 1 conforming to ASTM D1784 and D1785. Fittings shall conform to the following standard specifications:

1. Socket Type: (Schedule 40); ASTM D2466

2. Socket Type: (Schedule 80); ASTM D2467

D. Provide flanged fittings of the same material as the specified pipe and material conforming to ANSI B16.5 at all valves and equipment except at true (double) union valves. Flange gaskets shall be natural rubber or other material fully compatible with the fluid being conveyed.

E. Acceptable materials of construction of elastomers for non-chemical service shall be as follows:

Non-Chemical Service	Elastomer Material
Non-Potable Water	EPDM
Process Drain (Gravity)	EPDM, FKM
Process Drain (Pressure)	EPDM, FKM
Potable Water	EPDM
Reclaimed Water	EPDM, FKM

Non-Chemical Service	Elastomer Material
Sample	EPDM, FKM
Sump Pump Discharge	EPDM, FKM

F. Solvent cement for socket type joints shall conform to ASTM D2564 for PVC pipe and fittings. Solvent cement for chemical service shall be Weld-On 724 as manufactured by IPS Corporation, or equal.

G. Acrylonitrile-butadiene-styrene (ABS) shall conform to the requirements of ASTM D2661. Pipe and fittings shall have socket type couplings with solvent cement joints. Solvent cement shall conform to ASTM D2235.

H. Type PSM polyvinyl chloride (PVC) pipe and fittings shall conform to the requirements of ASTM D3034 with a maximum SDR of 35. Pipe and fittings shall have bell and spigot ends with O-ring rubber gasketed, compression type joints. Joints shall conform to the requirements of ASTM Specification D3212. Reruns of reclaimed materials shall not be accepted. Unless indicated otherwise, PVC wall pipes shall be provided for all piping passing through exterior walls. Wall pipes shall have a water stop solvent-welded to the pipe. Each wall pipe shall be of the same class and type as the piping to which it is joined.

I. Perforated and closed drainage pipe and fittings shall be rigid PVC pipe, Schedule 40 unless otherwise shown or specified with solvent welded type joints, or approved equal. Pipe shall be slotted or have two rows of 1/4-inch diameter holes spaced 4-inches apart along the circumference of the pipe. Longitudinal spacing of holes shall be 5-inches maximum.

2.02 PVC PIPE FOR WATER

A. All PVC pipe used for potable water shall be conform to the requirements of AWWA C900 and shall be blue.

B. All PVC pipe used for potable water shall be certified by an accredited agency for compliance with NSF/ANSI 61.

C. C900-Class 165 shall be in sizes between 4 inches and 12 inches and shall meet the requirements of AWWA C900 "Poly Vinyl Chlorine (PVC) Pressure Pipe" and shall conform to all the requirements of ASTM D1784 and ASTM D2241. The pipe shall be DR 25 or thicker and shall be capable of withstanding the overburden pressures determined by the depth of burial in the field.

1. Pipe material shall be made from clean, virgin, NSF approved Class 12454-A PVC compound conforming to resin specification ASTM D1784. Standard laying lengths shall be 20-feet (±1 inch). Random lengths of not more than 15% of the total

footage of each size may be shipped in lieu of the standard lengths. Reruns of reclaimed material shall not be accepted.

2. The pipe shall have bell and spigot ends with push-on, O-ring rubber gasket, compression type joints conforming to the requirements of ASTM D2672. Elastomeric gaskets shall conform to the requirements of ASTM F477.

3. Minimum pipe stiffness (F/dY) at 5% deflection shall be 435 psi for all sizes when tested in accordance with D2241.

4. The pipe shall be designed to pass a quick burst test pressure of 755 psi applied in 60 to 70 seconds when tested in accordance with ASTM D1599, as referenced in ASTM D2241.

5. Fittings for C900-Class 165, DR 25 shall be ductile iron, bolted mechanical joint conforming to the requirements of AWWA C110, Class .

2.03 PVC PIPE FOR SANITARY SEWER

A. All PVC pipe used for sanitary sewer shall be made from class 12454 materials as described in ASTM D1784 and shall be green. Fittings and joints shall conform to ASTM D3034 and D3212, with the exception that solvent cement joints shall not be used.

B. The pipe shall be SDR 35 or thicker for sanitary sewers installed at a depth of 10’ or less. Depth shall be determined from final grade as shown on the Drawings to the top of pipe.

C. The pipe shall be SDR 26 or thicker for sanitary sewers installed at a depth greater than 10’. Depth shall be determined from final grade as shown on the Drawings to the top of pipe.

D. For sanitary sewers installed at a depth equal to or greater than 15’, Contractor shall obtain approval in writing from the ENGINEER prior to installation. Depth shall be determined from final grade as shown on the Drawings to the top of pipe.

E. All pipe shall be capable of withstanding the overburden pressures determined by the depth of burial in the field.

2.04 PVC PIPE JOINT RESTRAINTS

A. All joints for potable water shall be restrained using split serrated restraint harnesses made of ductile iron meeting or exceeding ASTM A536-80, Grade 65-45-12.

1. The inside face or contact surface of the band shall be of sufficient width to incorporate cast or machined non-directionally sensitive serration to grip the outside circumference of the pipe.

2. The serration shall provide full (360 degrees) contact and maintain pipe roundness and avoid any localized points of stress.

3. The split band casting shall be designed to “bottom-out” before clamping bolt forces (110ft-lb minimum torque) can over-stress the pipe, but will provide full non-directionally sensitive restraint at the rated pressures.

4. Bolts and nuts used to attach the split retainer ring shall comply with ANSI B 18.2/18.2.2, SAE Grade 5. Tee-bolts, nuts and restraining rods shall be fabricated from high-strength, low-alloy steel per AWWA C111- 90.

5. The split ring type non-directionally sensitive restrainer system shall be capable of a test pressure twice the maximum sustained working pressure.

6. The restraint system may consist of two types: the two split retainer rings and for new construction use only the one split and one solid cast backup ring.

B. Joint restraints shall be Model 1500 by EBAA Iron, Model 3000PP by Tyler Union or approved equal.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Polyvinyl chloride (PVC) pipe shall be laid and joints assembled according to the respective manufacturer's recommendation. PVC pipe installation shall comply with applicable sections of the Uni-Bell PVC Pipe Association Recommended Standard Specifications.

B. Plastic piping shall not be installed when the temperature is less than 60 degrees F except as otherwise recommended by the manufacturer and approved by the Engineer.

C. Any pipe having a deflection of the inside diameter greater than 5% after 30 days of installation shall not be accepted.

END OF SECTION

SECTION 40 05 33
HIGH DENSITY POLYETHYLENE (HDPE) PIPE

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Reference Section 40 05 00 – Basic Mechanical Requirements.

PART 2 – PRODUCTS

2.01 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

A. The pipe shall be manufactured from Type III, Category 5, Class C, Grade P34 polyethylene resin in accordance with ASTM D-1248 and shall be SDR11, minimum. The pipe shall be manufactured in accordance with ASTM F-714 and shall conform to cell classification PE 345434C for PE 3408 under ASTM D-3350. The pipe material shall conform to the following cell classification requirements:

Property	Value	ASTM Test Procedure Designation
Density	0.955 gm/cm^3	D-1505
Melt Flow	0.1 gm/10 mil	D-1238
Flexural Modular	133,000 psi	D-790
Tensile Strength	3500 psi	D-638
ESCR	F_o>5000	D-1693
Hydraulic Design Basis	1600 psi	D-2837
UV Stabilizer	2-3% carbon black	D-160

B. The HDPE pipe shall have an elastic modulus of 100,000 psi as tested under ASTM D-638. The brittleness temperature shall be not greater than –180ºF nor the Vicat Softening Temperature greater than 255ºF as tested under ASTM D-746 and D-1525, respectively. The coefficient of thermal expansion shall be 8 x 10^{-5} inch/ºF as tested under ASTM D-606. The Shore Hardness D shall be greater than 61 as tested under ASTM D-2240. The Hydrostatic Design Stress Basis (HDB) shall be 1,600 psi at 23ºC and 800 psi at 60ºC as tested under ASTM D-2837. The pipe shall contain no recycled materials or compounds.

C. HDPE pipe shall be marked either continuously or on intervals not to exceed five (5) feet by indirect printing with the following information:

1. Name and/or trademark of the manufacturer.

2. Nominal pipe size.

3. Dimension ratio.

4. The letters PE followed by the polyethylene grade per ASTM D-1248, followed by the Hydrostatic Design basis in 100's of psi.

5. Manufacturing Standard Reference.

6. Production Code from which time and date of manufacture can be determined.

D. HDPE fittings shall be manufactured to the requirements of ASTM D-3261 and this Specification. Fabricated fittings shall be manufactured from pipe of at least one SDR heavier pipe than the system piping and shall be pressure rated to match the system piping. The butt fusion outlets of fabricated fittings shall be machined to the same SDR as the system piping to which they are to be fused. The manufacturer shall subject samples of each production lot of molded fittings to x-ray inspection for voids. Voids shall not be permitted, should voids be found in the samples, the entire production lot shall be x-ray inspected. If additional voids are found, the production lot shall be rejected. The x-ray testing shall be conducted by an independent laboratory and certified test reports made available to the Engineer upon request. Initial sampling shall be limited to not less than 5% of the production lot.

E. HDPE pipes and fittings shall be joined one to another by thermal butt fusion, saddle fusion, or socket fusion in accordance with procedures recommended by the pipe manufacturer and as outlined in ASTM D-2657. The manufacturer shall provide fusion training services to the Contractor upon request.

F. Butt fusion joining of unlike SDR's shall not be permitted. Transition from one SDR to another shall be accomplished by the use of mechanical couplings or a transition nipple, which is a short length of the heavier SDR pipe with one end machined to the lighter SDR.

G. Mechanical connections of polyethylene pipe to systems or fittings of other materials, or to unlike SDR, shall be by means of flanged connections (flange adapters and back-up rings rated for the same pressure service as the system piping), or mechanical compression couplings designed for jointing HDPE to HDPE or HDPE to another piping material.

H. Flanged joints shall use compatible bolts in accordance with the American Standard Gaskets of reinforced rubber or asbestos-rubber shall be required when joining to non-HDPE materials. Flanged HDPE joints shall be gasketed at all service pressures.

I. Bolts in flanged joints shall be evenly torqued in a crossing pattern. Bolts shall be re-torqued after one hour or more has passed. HDPE pipe adjacent to flanged joints and

the joints themselves shall be rigidly supported for a distance of one (1) foot or one pipe diameter, whichever is greater, beyond the flange assembly.

J. When mechanical compression couplings are used HDPE pipes shall be reinforced by a stiffener in the pipe bore. Stiffeners shall be properly sized from the size and SDR of pipe being joined. Mechanical couplings shall be installed in accordance with the manufacturer's recommended procedure.

K. Tests for compliance with this Specification shall be made as specified herein and in accordance with the applicable ASTM Specification. A certificate of compliance and a report of each test shall be furnished by the manufacturer for all material furnished under this Specification. HDPE pipe and fittings shall be rejected for failure to meet the requirements of this Specification.

END OF SECTION

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SECTION 40 05 51

VALVES, GENERAL

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install, complete with all assemblies and accessories, all valves shown on the Drawings and specified herein including all fittings, appurtenances and transition pieces required for a complete and operable installation.

B. All valves shall be constructed of first quality materials which have strength, wearing, and corrosion resistance characteristics entirely suitable for the types of service for which the individual valves are designated. Except where noted otherwise, valves designated for water service shall conform to pertinent sections of the latest revision of AWWA C500 Specifications. Cast iron valve bodies and parts shall meet the requirements of the latest revision of ASTM Designation A-126, "Standard Specifications for Gray Iron Castings for Valves, Flanges, and Pipe Fittings, Class B."

C. All valve body castings shall be clean, sound, and without defects of any kind. No plugging, welding, or repairing of defects will be allowed.

D. Valves shall have flanged ends for exposed service and mechanical joint ends for buried service, unless otherwise shown on the Drawings or specified herein. Flanged ends shall be flat-faced, 125 lb. American Standard unless otherwise shown or specified in accordance with ANSI B16.1. All bolt heads and nuts shall be hexagonal of American Standard size. The Contractor shall be responsible for coordinating connecting piping. Valves with screwed ends shall be made tight with Teflon tape. Unions are required at all screwed joint valves.

1.02 SUBMITTALS

A. The following items shall be submitted in accordance with, or in addition to the submittal requirements specified in Section 01 33 00 – Submittal Procedures:

1. Performance tests shall be conducted in accordance with the latest revision of AWWA C500.

2. Shop Drawings conforming to the requirements of Section 01 33 00 – Submittal Procedures, are required for all valves, and accessories. Submittals shall include all layout dimensions, size and materials of construction for all components, information on support and anchoring where necessary, pneumatic and hydraulic characteristics and complete descriptive information to demonstrate full compliance with the Documents. Shop Drawings for electrically operated/controlled valves shall include all details, notes, and diagrams which clearly identify required coordination with the electrical power supply and remote

status and alarm indicating devices. Electrical control schematic diagrams shall be submitted with the Shop Drawings for all electrical controls. Diagrams shall be drawn using a ladder-type format in accordance with JIC standards. Shop Drawings for pneumatically operated/controlled valves shall include all details, notes, and diagrams which clearly identify required coordination with the compressed air (service air) system and electrical controls.

3. Operation and maintenance manuals and installation instructions shall be submitted for all valves and accessories in accordance with the Specifications. The manufacturer(s) shall delete all information which does not apply to the equipment being furnished.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall provide the services of a qualified representative of the manufacturer(s) of the equipment named below to check out and certify the installation(s), to supervise the initial operation, and to instruct the Owner's operating personnel in proper operation and maintenance procedures in accordance with the following schedule:

Item	Valve/Operator Type	Minimum On-Site Time Requirements
1	Automatic Control Check Valve	One (1) 8-hour day
2	Surge Anticipators	One (1) 8-hour day
3	Motor Operated Modulating Valves	One (1) 8-hour day
4	Motor Operated Open-Close Valves (required only if manufacturer is other than for Item 3 above)	One (1) 8-hour day
5	Pneumatic Hydraulic Cylinder Operated Valves	One (1) 8-hour day

B. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor. The manufacturer's representative shall sign in and out at the office of the Engineer's Resident Project Representative on each day he is at the project.

C. A written report covering the representative's findings and installation approval shall be mailed directly to the Engineer covering all inspection and outlining in detail any deficiencies notes.

D. The times specified are exclusive of travel time to and from the facility and shall not be construed as to relieve the manufacturer of any additional visits to provide sufficient service to place the equipment in satisfactory operation.

PART 2 – PRODUCTS

2.01 FLOW INDICATORS

A. Flow indicators shall be the Akron ball-type as manufactured by Brooks Instrument Co., Fischer and Porter, or equal, and shall have bronze bodies, glass dome, and plastic ball.

2.02 CORPORATION STOPS

A. Corporation stops shall be of bronze with tapered male iron pipe threads on inlets and outlets. Terminal outlets shall have screwed bronze hex head dust plugs or caps. Unions shall be used on all corporation stop outlets with connecting piping. Corporation stops shall have a minimum working pressure rating of 250 psi and shall be as manufactured by Mueller Co., Hays Mfg. Div. of Zurn Industries, or equal.

2.03 FLOOR BOXES

A. Floor boxes shall be provided for all nut operated or floor accessed valves. Floor boxes shall be of the adjustable, sliding type, cast iron, suitable to withstand heavy traffic, as manufactured by James B. Clow & Sons, Kennedy Valve Mfg. Co., or equal. The covers shall be marked with appropriate designations of piping contents (i.e.: water, sewer) and bases shall be the round type. All nut operated valves in this Section shall be clearly identified by stainless steel or laminated plastic identification tags. The tags shall be permanently affixed to the inside of the floor boxes, under grating, etc. and shall bear the embossed letters which clearly identify each valve by its appropriate designation.

B. Two (2) valve operating wrenches shall be supplied in 4-foot lengths with tee handles for each size nut supplied. Valve wrenches shall be Model No. F-2520 as manufactured by James B. Clow & Sons, Kennedy Valve Mfg. Co., Figure No. 122, or equal.

2.04 VALVE BOXES

A. The Contractor shall furnish and install valve boxes as shown on the Drawings and specified herein.

B. All valve boxes shall be placed so as not to transmit shock or stress to the valve and shall be centered and plumb over the operating nut of the valve. The ground in the trench upon which the valve boxes rest shall be thoroughly compacted to prevent settlement. The boxes shall be fitted together securely and set so that the cover is flush with the finished grade of the adjacent surface. A concrete pad as detailed on the Drawings shall be provided around the valve box, sloped outwards.

C. All valve boxes shall be 2-piece cast iron, sliding type, 5-1/4" shaft, with heavy duty traffic weight collar and the lid marked with the appropriate carrier product (i.e.: WATER). Boxes shall be as manufactured by James B. Clow & Sons, Kennedy Valve Mfg. Co., Charlotte Pipe and Foundry Company, or equal.

2.05 STRAINERS

A. Y-Strainers shall be Y-pattern cast iron body, flanged or screwed ends with stainless steel or Monel, 20 mesh strainers. Strainers shall be 200 psi, cold-water service strainers, as manufactured by WATTS, Crane Co., Zurn, or equal.

B. Caustic service Y-strainers shall be provided as shown on the drawings. Strainers shall be full port-full flow design manufactured of 304 or 316 stainless steel body. Y-strainers shall be furnished with flanged ends. The strainer screen shall be 1/32-inch perforation, easily removable, manufactured of the same material as the valve body.

C. Stainless steel Y-strainers shall be provided as shown on the drawings. Strainers shall be full port-full flow design manufactured of 304 or 316 stainless steel body. Y-strainers shall be furnished with flanged ends. The strainer screen shall be 1/32-inch perforation, easily removable, manufactured of the same material as the valve body.

D. PVC and CPVC y-strainers shall be provided in PVC and CPVC piping and as shown on the Drawings. Strainer shall be provided with PVC or CPVC body and end cap, EPDM or Viton seal as required for the chemical service, and 20 mesh screen. Temperature rating shall be 30ºF to 140ºF, and pressure rating shall be 150 psi @ 70ºF, non-shock. PVC and CPVC y-Strainers shall be as manufactured by Asahi/America, Hayward, or equal.

E. Manually cleaned strainers shall be the duplex basket tapered plug type.

1. Strainers 3-inches in diameter and larger shall have flanged ends conforming to ANSI B16.1-125/150-pound standard.

2. Strainers less than 3-inches in diameter shall have screwed end connectors, unless otherwise shown on the Drawings.

3. Strainers shall be constructed with an ASTM A48, Class 30 cast iron body, ductile iron trim, removable 0.045-inch staggered hole perforation, 304 stainless steel filter baskets and gauges on the inlet and outlet.

4. All strainers shall be suitable for 125 psi service.

5. Switching flow from one basket to the other shall be accomplished by moving the handle through a 180º arc. The switching operation shall not stop flow through the strainer and shall provide for on-line removal of either basket with the other basket functional. The plug shall be automatically positioned with integral stops and shall be easily lifted and reseated under pressure.

6. The strainer shall be designed to minimize the possibility of material bypassing the plug while being rotated and to prevent debris from building up under the plug. The strainer covers shall be designed for quick opening with swing away yoke.

7. Each basket compartment shall have a side drain outlet.

8. All strainers shall be provided with support legs.

9. Duplex basket strainers shall be similar to the Model 53BTX as manufactured by Hayward, or equal.

F. PVC and CPVC simplex basket strainers shall be provided in PVC and CPVC piping as shown on the Drawings. 1/2”-4” strainers shall be one-piece molded body with (3) ports to facilitate straight-thru flow pattern or u-shape flow pattern as required. Connections shall be true union type to ease installation/future maintenance. The cover, vent plug, and drain plug shall all be hand-removable, requiring no tools. EPDM or Viton seals shall be used as required for chemical service, and internal baskets shall be 1/32” perforation (20-mesh) for 1/2”-1” sizes, and 1/8” perforation for 1-1/2”-8” sizes. 6” and 8” strainers shall be fabricated construction and shall contain flanged connections as standard. The pressure rating for 1/2”-8” sizes shall be 150 psi @ 70ºF, non-shock. Strainers shall be manufactured by Hayward Industrial Products, or equal.

2.06 QUICK DISCONNECT COUPLINGS

A. Quick disconnect type coupling for compressed/service air shall be provided where indicated on the Drawings. Coupling shall provide for instantaneous shutoff in socket end when lines are disconnected. Couplings shall be constructed of 316 stainless steel with a BUNA-N O-ring and integral safety lock. Couplings shall comply with Military Specification 4109 (interchangeable with standard plug of the same size).

2.07 BACKFLOW PREVENTERS

A. Backflow preventer shall be the size shown on the Drawings and shall be of the double check valve principle. Backflow preventer installation shall include isolation valves and four test cocks, furnished as an assembly. For backflow preventers less than 2-1/2", the installation assembly also shall include a strainer. Isolation valves for backflow preventers shall be ball valves, except for size 2-1/2" and larger which shall be resilient seat gate valves. Test cocks shall be located as recommended by the manufacturer to facilitate functional testing of the assembly. The backflow preventer shall be a WATTS 709, or equal.

B. Reduced Pressure Backflow Preventer shall be of the size shown on the Drawings and shall be of the reduced pressure principle type in accordance with AWWA Standards C510 and C511, with two (2) independent operating spring loaded check valves and one (1) spring loaded, diaphragm actuated, differential pressure relief valve shall be installed between the check valves. Backflow preventer shall be bronze body construction, with EPT rubber discs and Buna-N and nylon diaphragm. Screws and springs shall be of stainless steel. End connections shall be screwed, unless otherwise specified or shown on the Drawings. Reduced pressure backflow preventer installations shall include isolation valves and four test cocks, furnished as an assembly. For reduced pressure backflow preventers less than 2-1/2" the installation assembly also shall include a strainer. Isolation valves for reduced pressure backflow preventers shall be ball valves, except for sizes 2-1/2" and larger which shall be resilient seat gate valves. Test cocks

shall be located as recommended by the manufacturer to facilitate functional testing of the assembly. The reduced pressure backflow preventer shall be as manufactured by Beeco Division, Hersey Products Inc., Aergap Model 6CM, WATTS 909, or equal.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Except where noted otherwise herein, all valves shall be installing and tested in accordance with the latest revision of AWWA C500. Before installation, all valves shall be lubricated, manually opened and closed to check their operation and the interior of the valves shall be thoroughly cleaned. Valves shall be placed in the positions shown on the Drawings. Joints shall be made as directed under the Piping Specifications. The valves shall be so located that they are easily accessible for operating purposes and shall bear no stresses due to loads from the adjacent pipe. The Contractor shall be responsible for coordinating connecting piping.

B. All valves shall be tested at the operating pressures at which the particular line will be used. Any leakage or "sweating" of joints shall be stopped, and all joints shall be tight. All motor operated and cylinder operated valves shall be tested for control operation as directed by the Engineer.

C. Provide valves in quantity, size, and type with all required accessories as shown on the Drawings.

D. Install all valves and appurtenances in accordance with manufacturer's instructions. Install suitable corporation stops at all points shown or required where air binding of pipe lines might occur. Install all valves so that operating handwheels or wrenches may be conveniently turned from operating floor but without interfering with access, and as approved by Engineer. Unless otherwise approved, install all valves plumb and level. Valves shall be installed free from distortion and strain caused by misaligned piping, equipment or other causes.

E. Valve boxes shall be set plumb and centered with the bodies directly over the valves so that traffic loads are not transmitted to the valve. Earth fill shall be carefully tamped around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face, if less than 4 feet.

3.02 SHOP AND FIELD TESTING

A. Shop and field testing of valves shall be as follows:

1. Certified factory testing shall be provided for all components of the valve and operator system. Valves and operators shall be shop tested in accordance with the requirements in the latest revision of AWWA C500, including performance tests, leakage test, hydrostatic tests, and proof-of-design tests. The manufacturer

through the Contractor shall submit certified copies of the reports covering the test for acceptance by the Engineer.

2. Shop testing shall be provided for the operators consisting of a complete functional check of each unit. Any deficiencies found in shop testing shall be corrected prior to shipment. The system supplier through the Contractor shall submit written certification that shop tests for the electrical/pneumatic system and all controls were successfully conducted and that these components provide the functions specified and required for proper operation of the valve operator system.

3. The Contractor shall conduct field tests to check and adjust system components, and to test and adjust operation of the overall system. Preliminary field tests shall be conducted prior to start-up with final field tests conducted during start-up. The factory service representative shall assist the Contractor during all field testing and prepare a written report describing test methods, and changes made during the testing, and summarizing test results. The service representative shall certify proper operation of the valve operator system upon successful completion of the final acceptance field testing.

4. Preliminary and final field tests shall be conducted at a time approved by the Engineer. The Engineer shall witness all field testing.

5. All costs in connection with field testing of equipment such as energy, light, lubricants, water, instruments, labor, equipment, temporary facilities for test purposes, etc. shall be borne by the Contractor. The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

6. Preliminary field tests shall be conducted prior to start-up and shall include a functional check of the entire valve operator system and all system components. Preliminary field tests shall demonstrate that the valve operator system performs according to specifications and that all equipment, valves, controls, alarms, interlocks, etc., function properly. The preliminary field test report must be approved by the Engineer prior to conducting final field acceptance tests. Based on results of preliminary field tests, the Contractor shall make any adjustments required to settings, etc., to achieve the required valve closing time and operation specified or otherwise directed by the Engineer.

7. Final field acceptance tests shall be conducted simultaneously with the start-up and field testing of the pumps, air compressors, process air blowers, etc. Field tests shall be conducted for the full range of operating modes and conditions specified and as directed by the Engineer. Each of the valves shall be tested at minimum, maximum, and normal head/flow conditions, and under all specified conditions of opening and closing. Performance of pneumatic valves and

compressed air system under normal operating conditions and during simulated power failures shall be checked.

8. Field testing shall include optimization of opening and closing times of the valves. The Contractor shall provide the means for accurate measurement of pipeline pressures as directed by the Engineer. Valve opening and closing times shall be adjusted based on process requirements to optimize operation of the valves. Final valve opening and closing times as determined by field tests shall be approved by the Engineer prior to final acceptance of the system.

END OF SECTION

SECTION 40 05 61

GATE VALVES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Reference Section 40 05 00 – Basic Mechanical Requirements.

B. Except where noted otherwise, valves designated for water service shall conform to pertinent sections of the latest revision of AWWA C500 Specifications.

1.02 SUBMITTALS

A. As required in Section 40 05 51 – Valves General, and Section 01 33 00 – Submittal Procedures.

B. The Contractor shall furnish to the Owner, through the Engineer, a Performance Affidavit.

C. Performance tests shall be conducted in accordance with the latest revision of AWWA C500 and affidavits shall conform to the requirements of the Specifications.

PART 2 – PRODUCTS

2.01 GATE VALVES

A. RESILIENT WEDGE GATE VALVES (GV-RW)

1. Size: 4-Inch to 12-Inch

a. Gate valves 4 inch through 12 inch, rated for 250 psig working pressure.

b. Non-rising stem (NRS) design, shall fully comply with the requirements of AWWA C509 for resilient-seated gate valves and shall be manufactured by Kennedy Valve, Clow, or equal.

c. Gate valve body, bonnet, and wedge shall be cast iron conforming to ASTM A126, Class B. All pressure retaining joints shall be sealed with O-ring seals. Flat gaskets shall not be acceptable.

d. Stems and stem nuts shall be bronze. Stems shall contain integral thrust collars. NRS valves shall contain two O-rings above the stem thrust collar and one O-ring below the stem thrust collar. All stem O-rings shall be replaceable with valve in the full open position and subjected to full pressure.

NRS stems shall have two low-friction thrust washers located above and below the stem collar to reduce operating friction.

e. Wedge shall be totally encapsulated with a permanently bonded rubber material. Rubber shall be suitable for use in drinking water and shall be EPDM.

f. Waterway shall be smooth, unobstructed, and free of all pockets, cavities, and depressions in the seat area.

g. Body, bonnet, and stuffing plate shall be shop coated inside and out with a fusion bonded epoxy (10 mils minimum dry film thickness) complying with AWWA C550 and shall be NSF-61 certified. Damage surfaces shall be repaired in accordance with the manufacturer's recommendations.

h. Valves shall be flanged or mechanical joint as shown on the drawings. Provide 2-inch square standard AWWA operating nut unless otherwise shown on the Drawings or specified herein.

i. All valve assembly hardware shall be minimum 304 stainless steel.

j. Gate valves shall be suitable for horizontal installation for buried service in areas where a minimum 48-inch cover is not provided. In those cases, valves shall be provided with bevel gear for horizontal installation.

END OF SECTION

SECTION 40 05 68.23

MISCELLANEOUS VALVES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Reference Section 40 05 00 – Basic Mechanical Requirements.

B. Valves intended for chemical service shall be constructed of materials suitable for the intended service.

PART 2 – PRODUCTS

2.01 GLOBE VALVES (NOT USED)

2.02 SOLENOID VALVES (NOT USED)

2.03 BACKFLOW PREVENTION VALVES

A. Double Check Style (BFPV-DC)

1. Backflow preventer shall be the size shown on the Drawings and shall be of the double check valve principle. Backflow preventer installation shall include isolation valves and four test cocks, furnished as an assembly. For backflow preventers less than 2-1/2", the installation assembly also shall include a strainer. Isolation valves for backflow preventers shall be ball valves, except for size 2-1/2" and larger which shall be resilient seat gate valves. Test cocks shall be located as recommended by the manufacturer to facilitate functional testing of the assembly. The backflow preventer shall be as follows.

    a. Backflow preventers for pipe sizes 1/2” to 2” shall be a WATTS LF007, or equal.

    b. Backflow preventers for pipe sizes 2 1/2” to 10” shall be a WATTS 709, or equal.

    c. Backflow preventers for 12” pipe shall be a WATTS 774, or equal.

B. Reduced Pressure Style (BFPV-RP)

1. Reduced Pressure Backflow Preventer shall be of the size shown on the Drawings and shall be of the reduced pressure principle type in accordance with AWWA Standards C510 and C511, with two (2) independent operating spring-loaded check valves and one (1) spring loaded, diaphragm actuated, differential pressure

relief valve shall be installed between the check valves. Backflow preventer shall be bronze body construction, with EPT rubber discs and Buna-N and nylon diaphragm. Screws and springs shall be of stainless steel. End connections shall be screwed, unless otherwise specified or shown on the Drawings. Reduced pressure backflow preventer installations shall include isolation valves and four test cocks, furnished as an assembly. For reduced pressure backflow preventers less than 2-1/2" the installation assembly also shall include a strainer. Isolation valves for reduced pressure backflow preventers shall be ball valves, except for sizes 2-1/2" and larger which shall be resilient seat gate valves. Test cocks shall be located as recommended by the manufacturer to facilitate functional testing of the assembly. The reduced pressure backflow preventer shall be as manufactured by Beeco Division, Hersey Products Inc., Aergap Model 6CM, WATTS 909, or equal.

2.04 PRESSURE RELIEF, REDUCING AND REGULATING VALVES (NOT USED)

2.05 HOSE VALVES (HV) (NOT USED)

2.06 NEEDLE VALVES (NV) (NOT USED)

2.07 PINCH VALVES (NOT USED)

2.08 MUD VALVES (MDV) (NOT USED)

2.09 TELESCOPING VALVES (TSV) (NOT USED)

2.10 SURGE RELIEF VALVE (SRV)

2.11 AIR ADMITTANCE VALVE (AAV)

END OF SECTION

Appendix A: Geotechnical Engineering Study

RABA KISTNER

GEOTECHNICAL ENGINEERING STUDY

FOR

DOWNTOWN WATER AND WASTEWATER UTILITY LINE IMPROVEMENTS (PHASE 2) BROWNSVILLE, CAMERON COUNTY, TEXAS

RABA KISTNER

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TBPE Firm F-3257
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Project No. ABA23-011-00
July 6, 2023

Mr. Ricardo Pineda, E.I.T.
Senior Graduate Engineer
Brownsville Public Utilities Board (Brownsville PUB)
1425 Robinhood Drive
Brownsville, Texas 78521

RE: Geotechnical Engineering Study
Downtown Water and Wastewater Utility Line Improvements (Phase 2)
From E. 7th Street to International Boulevard
Brownsville, Cameron County, Texas

Dear Mr. Pineda:

RABA KISTNER, Inc. (RKI) is pleased to submit the report of our Geotechnical Engineering Study for the above-referenced project. This study was performed in accordance with **RKI** Proposal No. PBA23-014-00, dated May 11, 2023. Written authorization to proceed with this study was received by our office via mail, on May 31, 2023, by means of the *Professional Engineering Services Contract* between Brownsville PUB and **RABA KISTNER, Inc. (RKI)**, dated May 24, 2023. The purpose of this study was to drill borings along the existing street alignments, to determine subsurface conditions, and to provide geotechnical information for the design and installation of the proposed water and wastewater lines.

We appreciate the opportunity to be of professional service to you on this project. Should you have any questions about the information presented in this report, please call. We look forward to assisting Brownsville PUB during the construction of the project by conducting the construction materials engineering and testing services (quality assurance program).

Very truly yours,

RABA KISTNER, INC.

Adamari Davila, EIT
Graduate Engineer

Katrin M. Leonard, P.E.
Vice President

STATE OF TEXAS
KATRIN M. LEONARD
95810
LICENSED PROFESSIONAL ENGINEER
July 6, 2023

AD/KML

Attachments
Copies Submitted: Above (1)

GEOTECHNICAL ENGINEERING STUDY

For

DOWNTOWN WATER AND WASTEWATER UTILITY LINE IMPROVEMENTS
(PHASE 2)
FROM E. 7th STREET TO INTERNATIONAL BOULEVARD
BROWNSVILLE, CAMERON COUNTY, TEXAS

Prepared for

BROWNSVILLE PUB
Brownsville, Texas

Prepared by

RABA KISTNER, INC.
McAllen, Texas

PROJECT NO. ABA23-011-00

July 6, 2023

TABLE OF CONTENTS

ATTACHMENTS

INTRODUCTION

RABA KISTNER, Inc. (RKI) has completed the authorized subsurface exploration for the proposed water and wastewater lines to be installed in Brownsville, Cameron County, Texas. This report briefly describes the procedures utilized during this study and presents our findings along with geotechnical information for the design and installation of the proposed water and wastewater lines.

PROJECT DESCRIPTION

It is our understanding that the proposed project involves the design and installation of about 10 feet deep, new water and wastewater utility lines along the street alignments shown in Figure 1. The proposed improvement project is located between E. 7th Street and International Boulevard in Brownsville, Cameron County, Texas.

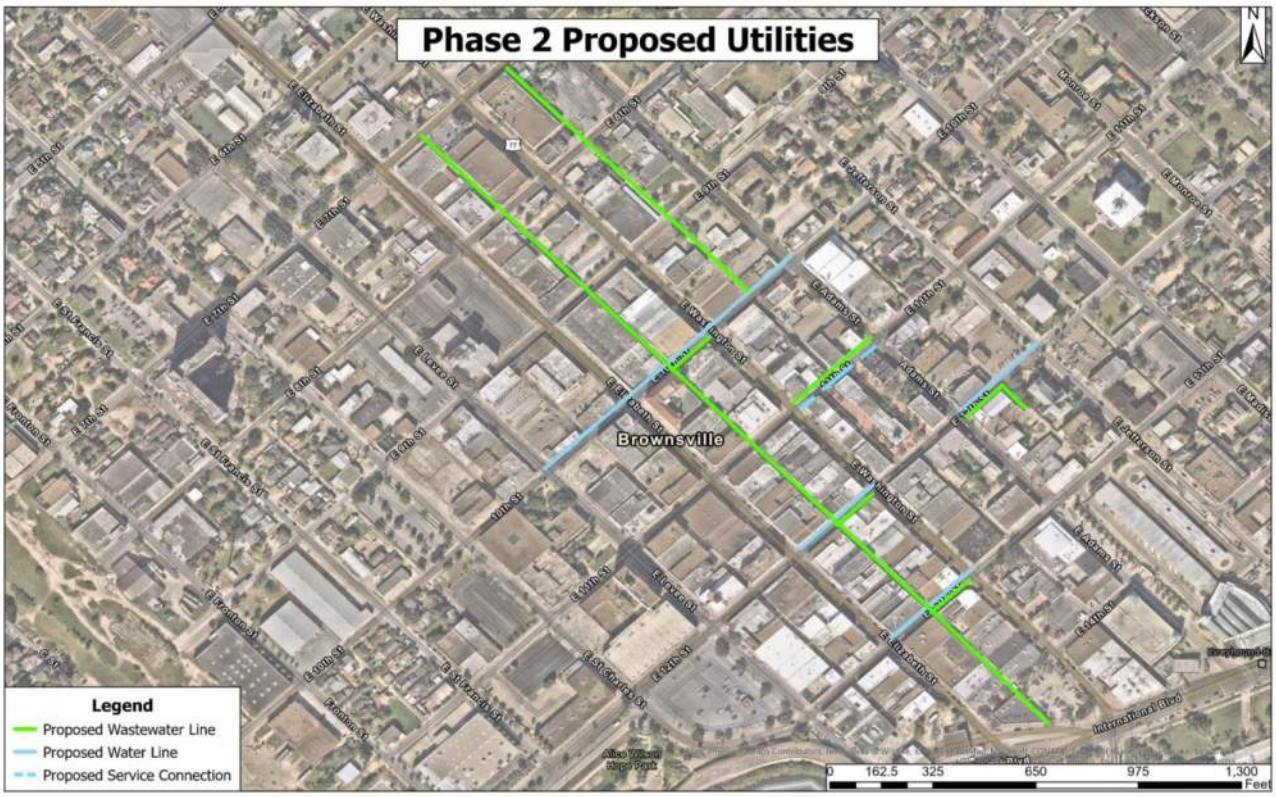


Figure 2 – Proposed Water and Wastewater Utility Line Improvements

At the time of our field operations, the subject site can generally be described as existing street alignments that are relatively level. Surface drainage is visually estimated to be poor to fair.

LIMITATIONS

This engineering report has been prepared in accordance with accepted Geotechnical Engineering practices in the region of South Texas for the use of Brownsville PUB (CLIENT) and its representatives for design purposes. This report may not contain sufficient information for purposes of other parties or other uses and is not intended for use in determining construction means and methods.

The recommendations submitted in this report are based on the data obtained from eleven borings drilled along the proposed alignments, our understanding of the project information provided to us by the CLIENT, and the assumption that site grading will result in only minor changes in the topography existing at the time of our study. If the project information described in this report is incorrect, is altered, or if new information is available, we should be retained to review and modify our recommendations.

This report may not reflect the actual variations of the subsurface conditions within the subject site. The nature and extent of variations across the subject site may not become evident until construction commences. The construction process itself may also alter subsurface conditions. If variations appear evident at the time of construction, it may be necessary to reevaluate our recommendations after performing on-site observations and tests to establish the engineering impact of the variations.

The scope of our Geotechnical Engineering Study does not include an environmental assessment of the air, soil, rock, or water conditions either on or adjacent to the subject site. No environmental opinions are presented in this report. **RKI**'s scope of work does not include the investigation, detection, or design related to the prevention of any biological pollutants. The term "biological pollutants" includes, but is not limited to, mold, fungi, spores, bacteria, and viruses, and the byproduct of any such biological organisms. A Phase 2 Environmental Site Assessment is recommended due to a gasoline like odor encountered in Borings B-1 and B-12 at the time of our drilling operations, in order to determine the limits of the contamination.

If final grade elevations are significantly different from the grades existing at the time of our study (more than plus or minus 1 ft), our office should be informed about these changes. If needed and/or desired, we will reexamine our analyses and make supplemental recommendations.

BORINGS AND LABORATORY TESTS

The subsurface conditions along the subject site were evaluated by eleven borings drilled within the alignments, as shown in the following table.

Proposed Improvement	Number of Borings	Depth, ft. *	Boring Identification	Approximate Bearing Depth, ft. *
Water and Wastewater Utility Lines Installation	11	20	B-1 through B-7, and B-9 through B-12	10

* below the pavement surface elevation existing at the time of our study.

The borings (designated as "B-") were drilled on June 8, 2023 through June 13, 2023, at the locations shown on the Boring Location Map, Figure 1. The boring locations are approximate and were located in the field by an **RKI** representative, based on the site plan titled *"Phase 2 Proposed Utilities"*, provided to our office via electronic-mail attachment by the CLIENT on Monday, April 10, 2023. It should be noted that the drilling operations of Boring B-8 was stopped at a depth of 2 ft below the pavement surface elevation existing at the time of our study, due to concrete being encountered. In addition, gasoline like odor was encountered in Borings B-1 and B-12 during the drilling operations at about 8 ft below the pavement surface elevation existing at the time of our study. The borings were drilled utilizing straight flight augers and were backfilled with the auger cuttings following completion of the drilling operations. The upper two inches of each boring were topped off with a cold asphalt mix, and flushed with the adjacent pavement surface. During the drilling activities, the following Split-Spoon (with Standard Penetration Test, SPT) and Shelby-Tube (ST) samples were collected.

The SPT samples were obtained in accordance with accepted standard practices and the penetration test results are presented as "blows per foot" on the boring logs. Representative portions of the samples were sealed in containers to reduce moisture loss, labeled, packaged, and transported to our laboratory for subsequent testing and classification.

In the field and laboratory, each sample was evaluated and visually classified by a member of our Geotechnical Engineering staff in general accordance with the Unified Soil Classification System (USCS). The geotechnical engineering properties of the strata were evaluated by the following laboratory tests: natural moisture content, Atterberg limits, unconfined compressive strength tests, dry unit weight determinations, sulfate content determinations, and percent passing a No. 200 sieve determinations.

With the exception of the sulfate content tests, the results of the field and laboratory tests are presented in graphical or numerical form on the boring logs illustrated on Figures 2 through 13. A key to the classification of terms and symbols used on the logs is presented on Figure 14. The results of the laboratory and field testing are also tabulated on Figure 15 for ease of reference.

SPT results are noted as "blows per ft" on the boring logs and on Figure 15, where "blows per ft" refers to the number of blows by a falling 140-lb (pound) hammer required for 1 ft of penetration into the subsurface materials.

Samples will be retained in our laboratory for 30 days after submittal of this report. Other arrangements may be provided at the written request of the CLIENT.

GENERAL SITE CONDITIONS

SITE GEOLOGY

Based on our cursory review of the Geologic Atlas of Texas, (McAllen-Brownsville Sheet, dated 1976), published by the Bureau of Economic Geology at the University of Texas at Austin, the subject site appears to be located within Alluvium (floodplain) deposits consisting of clays, silts, sands, and gravel deposits of the Quaternary epoch (Holocene period).

According to the Soil Survey of Cameron County, Texas, published by the United States Department of Agriculture - Soil Conservation Service, in cooperation with the Texas Agricultural Experiment Station, the project site appears to be located within the Rio Grande-Matamoros soil association consisting of nearly level to gently sloping, well drained and moderately well drained silt loams and silty clays. The corresponding soil symbols appear to be the following:

Soil Symbol	Soil Name
RU	Rio Grande – Urban land complex
LG	Laredo-Urban land complex

STRATIGRAPHY

It should be noted that the borings were drilled along existing pavement areas. Specific information about the existing pavement thicknesses are shown on the logs.

The subsurface stratigraphy at this site can be describes as intermixed layers of lean clay, lean clay with sand, fat clay, silty clayey sand, clayey sand, and silty sand. Each stratum has been designated by grouping soils that possess similar physical and engineering characteristics. As previously mentioned, a gasoline like odor was encountered in Borings B-1 and B-12 at a depth about 8 ft below the pavement surface elevation existing at the time of our study. Hence, a Phase 2 Environmental Site Assessment is recommended at this site.

The boring logs should be consulted for more specific stratigraphic information. Unless noted on the boring logs, the lines designating the changes between various strata represent approximate boundaries. The transition between materials may be gradual or may occur between recovered samples. The stratification given on the boring logs, or described herein, is for use by **RKI** in its analyses and should not be used as the basis of design or construction cost estimates without realizing that there can be variation from that shown or described.

The boring logs and related information depict subsurface conditions only at the specific locations and times where sampling was conducted. The passage of time may result in changes in conditions, interpreted to exist, at or between the locations where sampling was conducted.

GROUNDWATER

Groundwater was observed at the site at the following boring locations:

Boring Identification	Groundwater Depth, ft. *	Boring Identification	Groundwater Depth, ft. *
B-1	8-1/2	B-7	9
B-2	DRY	B-8	DRY
B-3	8-1/2	B-9	8
B-4	7-1/2	B-10	8
B-5	11	B-11	7-1/2
B-6	8-1/2	B-12	5

* below the pavement surface elevation existing at the time of our study.

Please note that the groundwater level in the borings may not have stabilized. Hence, there is a potential for groundwater to exist beneath this site at shallower depths on a transient basis following periods of precipitation. Fluctuations in groundwater levels occur due to variations in rainfall, surface water run-off, or other factors not evident at the time of exploration. The construction process itself may also cause variations in the groundwater level.

SULFATE CORROSION POTENTIAL

The potential of soluble sulfates in the subgrade soils within the study area was preliminary evaluated by conducting laboratory sulfate content tests. These tests were conducted on soil specimens obtained from depths of about 2 ft below the pavement surface elevations existing at the time of our study at the following boring locations.

Boring Identification	Sulfate Content Parts per Million (ppm)
B-2	3,600
B-3	120
B-5	120
B-7	12,400
B-10	120
B-11	120

The laboratory test results of Borings B-2 and B-7 indicate a sulfate content values higher than 3,000 parts per million (ppm). On the basis of the laboratory sulfate content test results, some of the tested on-site soils appear to have a potential to cause sulfate-induced heave. Typically, the concentration of soluble sulfate on soils becomes a concern when the concentration reaches about 3,000 ppm and higher. The sulfate concentration in soils may vary over short distances, and as such, additional testing is

recommended at the time of construction to confirm the concentration of sulfates in the exposed subgrade soils within the subject site.

We recommend that proper guidelines of lime treatment application for soils containing soluble sulfates higher than 3,000 ppm be followed. Enclosed we have included two documents, one is a Texas Department of Transportation (TxDOT) Document titled "Guidelines for Treatment of Sulfate-Rich Soils and Bases in Pavement Structures" and the other is a Technical Memorandum titled "Guidelines for Stabilization of Soils Containing Sulfates", published by the National Lime Association. These documents provide guidelines for the proper implementation of lime treatment for soils containing soluble sulfates.

UTILITY CONSTRUCTION CONSIDERATIONS

SITE DRAINAGE

Drainage is an important key to the successful performance of any utility line. Good surface drainage should be established prior to and maintained after construction to help prevent water from ponding within or adjacent to the proposed utility line alignments, and to facilitate rapid drainage away from the utility line alignments.

DEWATERING

Groundwater was encountered in the borings at a depth as shallow as 5 ft below the pavement surface elevation existing at the time of our study. However, there is a possibility for groundwater to exist at shallower depths than those encountered in our borings (see section titled Groundwater). Fluctuations in groundwater levels and groundwater seepage should be anticipated during construction. In addition, we understand that the proposed water and wastewater lines are planned to be about 10 ft below the ground surface elevation existing at the time of our study. The contractor should be made aware and ready to handle/intercept potential water for anticipated excavations.

Based on the subsurface conditions encountered in the borings, and the typical fluctuations in groundwater levels in this region, groundwater will be encountered during the excavation activities. Excavations below the groundwater table generally require lowering the piezometric level to permit construction in a relatively dry state. This should be performed to control seepage into the excavations and to reduce artesian water pressures below the bottom of the excavations. Deep wells and/or well point systems, as well as sumps and pumps after completion of the excavations are commonly used. The implementation of one and/or more of these methods should be anticipated for the installation of the waterline. A minimum groundwater drawdown of at least 5 ft below the bottom of the utility lines should be anticipated by the General Contractor in order to allow the construction operations to proceed on the bottom of the excavation. The design of dewatering systems is beyond the scope of this study. The General Contractor should be prepared to control excess water encountered in the excavations due to perched water pockets, seepage, and/or rainfall. Proper construction procedures and equipment will be critical for proper performance of the dewatered excavations. Additionally, protection of personnel entering the excavations and providing a dry, stable subgrade upon which to construct foundations will be crucial.

TRENCH BACKFILL

The trench bottoms should be uniform and level so that the pipe barrel will have full support along its full length. The pipe bedding materials from the trench bottom to the bottom of the pipe (or to a minimum distance above or below the top of the pipe if recommended by the pipe manufacturer) should consist of a minimum of 6 inches of compacted granular materials (preferably well-graded crushed rock and gravel or well-graded sand materials, such as GW, SW, SP, or mixtures of the same per the American Society for Testing and Materials (ASTM) D2487 and meeting the pipe manufacturer's recommendations. The backfill material above the bedding material should be placed and compacted in accordance with the following paragraphs.

In non-roadway areas and areas where no future construction will occur, the backfill material from the bottom of the trench excavation up to the proposed finished terrain elevation should be placed in maximum 12-inch uniform thickness lifts, moisture-conditioned to within the range of three percentage points below the optimum moisture content to three percentage points above the optimum moisture content and compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D698 laboratory compaction procedures.

In roadway areas or areas that will support future structure (i.e. pavement), the backfill material from the bottom of the trench excavation up to 30 inches below the proposed finished subgrade elevation should be placed in maximum 8-inch uniform thickness lifts, moisture-conditioned to within the range of three percentage points below the optimum moisture content to three percentage points above the optimum moisture content and compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D698 laboratory compaction procedures.

Furthermore, in roadway areas or areas that will support future structure, the backfill material from 30 inches below the proposed finished subgrade elevation up to the proposed finished grade elevation should be placed in maximum 8-inch uniform thickness lifts, moisture-conditioned to within the range of three percentage points below the optimum moisture content to three percentage points above the optimum moisture content and compacted to a minimum of 98 percent of the maximum dry density as determined by ASTM D698 laboratory compaction procedures.

SELECT FILL

If utilized, materials used as select fill for final site grading preferably should be crushed stone or gravel aggregate. We recommend that materials specified for use as select fill meet the TxDOT 2014 Standard Specification for Construction and Maintenance of Highways, Streets, and Bridges, Item 247, Flexible Base, Type A through Type E, Grades 1, 2, 3, and 5.

Alternatively, the following soils, as classified according to the USCS, may be considered satisfactory for use as select fill materials at this site: SC, GC, CL, and combinations of these soils. In addition to the USCS classification, alternative select fill materials shall have a maximum liquid limit of 40 percent, a plasticity index between 7 and 18 percent, and a maximum particle size not exceeding 4 inches or one-half the loose lift thickness, whichever is smaller. In addition, if these materials are utilized, grain size analyses and

Atterberg Limits must be performed during placement at a minimum rate of one test each per 5,000 cubic yards of material due to the high degree of variability associated with pit-run materials.

If the above listed alternative materials are being considered for bidding purposes, the materials should be submitted to the Geotechnical Engineer for pre-approval at a minimum of 10 working days or more prior to the bid date. Failure to do so will be the responsibility of the General Contractor. The General Contractor will also be responsible for ensuring that the properties of all delivered alternate select fill materials are similar to those of the pre-approved submittal. It should also be noted that when using alternative fill materials, difficulties may be experienced with respect to moisture control during and subsequent to fill placement, as well as with erosion, particularly when exposed to inclement weather. This may result in sloughing of beam trenches and/or pumping of the fill materials.

Soils classified as CH, MH, ML, SM, GM, OH, OL, and Pt under the USCS and not meeting the alternative select fill material requirements, are **not** considered suitable for use as select fill materials at this site.

Select fill should be placed in loose lifts **not** exceeding 8 in. in thickness and compacted to at least 98 percent of maximum dry density as determined by ASTM D698. The moisture content of the fill should be maintained within the range of two percentage points below the optimum moisture content to two percentage points above the optimum moisture content until the final lift of fill is permanently covered.

The select fill should be properly compacted in accordance with these recommendations and tested by **RKCI** personnel for compaction as specified.

TRENCH EXCAVATION SLOPING/BENCHING

Excavations that extend to or below a depth of 5 ft below construction grade shall require the General Contractor to develop a trench safety plan to protect personnel entering the trench or trench vicinity. The development of the trench safety plan, which may require the collection of specific geotechnical data and could include designs for sloping and benching of various types of shoring, is beyond the scope of this study. Any such designs and safety plans shall be developed and prepared in accordance with current Occupational Safety and Health Administration (OSHA) guidelines and other applicable industry standards.

To assist in preparing an excavation safety plan, we have classified the soils encountered along this site based on the data collected during this study. The on-site soils encountered above the groundwater levels within this site classified as Type “B” soils under current OSHA regulations pertaining to excavations. This classification is based on the observed cohesive nature of the soil, the unconfined compressive strength values obtained during field drilling operations, and the anticipated vibration from nearby traffic. In excavations penetrating these soils, the sloping and benching schemes specified for Type “B” soils under the OSHA regulations require that the excavation sidewalls be sloped no steeper than 1:1 (horizontal:vertical). The on-site sand soils and the soils encountered below the groundwater levels within this site are classified as Type “C” soils under current OSHA regulations pertaining to excavations. In excavations penetrating these soils, the sloping and benching schemes specified for Type “C” soils under the OSHA regulations require that the excavation sidewalls be sloped no steeper than 1-1/2:1 (horizontal:vertical).

EXCAVATION EQUIPMENT

The boring logs are not intended for use in determining construction means and methods and may therefore be misleading if used for that purpose. We recommend that General Contractors and their subcontractors interested in bidding on the work perform their own tests in the form of test pits to determine the quantities of the different materials to be excavated, as well as the preferred excavation methods and equipment for this site.

ADDITIONAL UTILITY WORK CONSIDERATIONS

Our experience indicates that significant settlement of backfill can occur in utility trenches, particularly when trenches are deep, when backfill materials are placed in thick lifts with insufficient compaction, and when water can access and infiltrate the trench backfill materials. The potential for water to access the backfill is increased where water can infiltrate flexible base materials due to insufficient penetration of curbs, and at sites where geological features can influence water migration into utility trenches. It is our belief that another factor which can significantly impact settlement is the migration of fines within the backfill into the open voids in the underlying free-draining bedding material.

To reduce the potential for settlement in utility trenches, we recommend that consideration be given to the following:

- Backfill materials should be placed and compacted in controlled lifts appropriate for the type of backfill and the type of compaction equipment being utilized and backfilling procedures should be tested and documented.
- Consideration should be given to wrapping free-draining bedding materials with a geotextile fabric (similar to Mirafi 140N or CONTECH C-Drain Geocomposite) to reduce the infiltration and loss of fines from backfill material into the interstitial voids in bedding materials; and
- Locating the water-bearing utilities, roof drainage outlets and irrigation spray heads outside of the select fill and perimeter drain boundaries.

CONSTRUCTION RELATED SERVICES

CONSTRUCTION MATERIALS ENGINEERING AND TESTING SERVICES

As presented in the attachment to this report, *Important Information About Your Geotechnical Engineering Report*, subsurface conditions can vary across a project site. The conditions described in this report are based on interpolations derived from a limited number of data points. Variations will be encountered during construction, and only the geotechnical design engineer will be able to determine if these conditions are different than those assumed for design.

Construction problems resulting from variations or anomalies in subsurface conditions are among the most prevalent on construction projects and often lead to delays, changes, cost overruns, and disputes. These variations and anomalies can best be addressed if the geotechnical engineer of record, **RABA**

KISTNER, Inc., is retained to perform the construction materials engineering and testing services during the construction of the project. This is because:

- **RKI** has an intimate understanding of the geotechnical engineering report's findings and recommendations. **RKI** understands how the report should be interpreted and can provide such interpretations on site, on the CLIENT's behalf.
- **RKI** knows what subsurface conditions are anticipated at the site.
- **RKI** is familiar with the goals of the CLIENT and the project's design professionals, having worked with them in the development of the project's geotechnical workscope. This enables **RKI** to suggest remedial measures (when needed) which help meet others' requirements.
- **RKI** has a vested interest in client satisfaction, and thus assigns qualified personnel whose principal concern is client satisfaction. This concern is exhibited by the manner in which contractors' work is tested, evaluated and reported, and in selection of alternative approaches when such may become necessary.
- **RKI** cannot be held accountable for problems which result due to misinterpretation of our findings or recommendations when we are not on hand to provide the interpretation which is required.

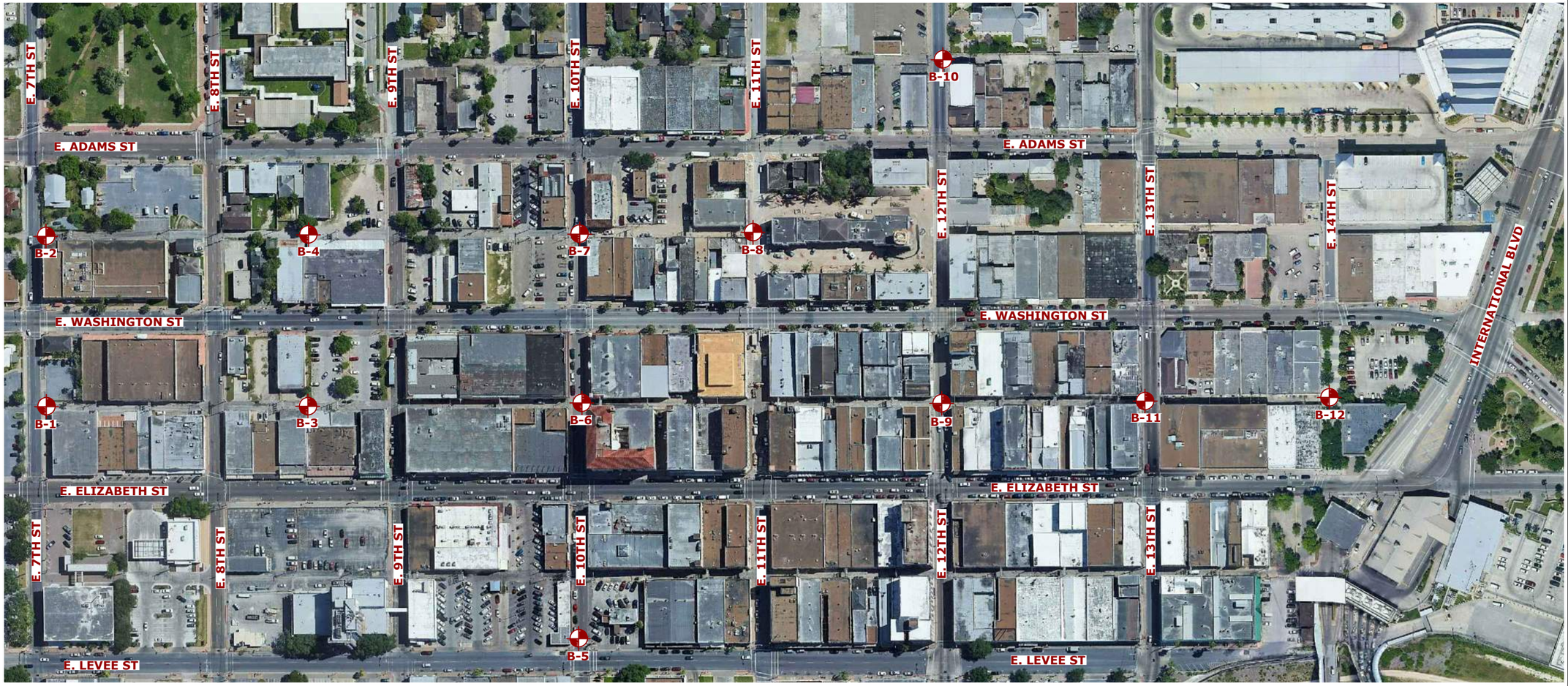
BUDGETING FOR CONSTRUCTION TESTING

Appropriate budgets need to be developed for the required construction materials engineering and testing services. At the appropriate time before construction, we advise that **RKI** and the project designers meet and jointly develop the testing budgets, as well as review the testing specifications as it pertains to this project.

Once the construction testing budget and scope of work are finalized, we encourage a preconstruction meeting with the selected General Contractor to review the scope of work to make sure it is consistent with the construction means and methods proposed by the contractor. **RKI** looks forward to the opportunity to provide continued support on this project, and would welcome the opportunity to meet with the Project Team to develop both a scope and budget for these services.

* * * * * * * * * * * * * * * * * *

ATTACHMENTS



RABA KISTNER
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BORING LOCATION MAP
DOWNTOWN WATER AND WASTEWATER UTILITY LINE IMPROVEMENTS PHASE 2

FROM E. 7TH STREET TO INTERNATIONAL BOULEVARD
BROWNSVILLE, CAMERON COUNTY, TEXAS

REVISIONS:

No.	DATE	DESCRIPTION

PROJECT No.:	ABA23-011-00
ISSUE DATE:	07-05-2023
DRAWN BY:	DV
CHECKED BY:	AD
REVIEWED BY:	SC

FIGURE:
1

C:\Active Projects\McAllen\2023\ABA23\ABA23-011-00 Prop. WW Utility Line Improvements-Phase 2\Drawings\Figure 1 - 11x17.dwg

LOG OF BORING NO. B-1

Downtown Water and Wastewater Utility Line Improvements
Phase 2
Brownsvillle, Cameron County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

SURFACE ELEVATION: Existing Grade, ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT; WATER CONTENT; LIQUID LIMIT; 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			Hot-Mix Asphaltic Concrete (HMAC) - 5 in.					
			Flexible Base Material (FBM) - 12 in.					
			CLAYEY SAND (SC) loose to medium dense to loose, brown	6				38
				6			21	
5				13				
				5				
			During the drilling operations, groundwater was encountered at a depth of about 8.5 ft. Upon completion of the drilling operations, groundwater was measured at a depth of about 9.5 ft.					
10			- gasoline like odor was encountered at a depth of 8 ft	6			10	
15			**SILTY SAND (SM)** very loose to loose, brown	3				
				8				
20			Boring terminated at a depth of about 20 ft.					
25								

DEPTH DRILLED:	20.0 ft	**DEPTH TO WATER:**	8.5 ft	**PROJ. No.:**	ABA23-011-00
DATE DRILLED:	6/8/2023	**DATE MEASURED:**	6/8/2023	**FIGURE:**	2

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-2

Downtown Water and Wastewater Utility Line Improvements
Phase 2
Brownsvillle, Cameron County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT; 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: Existing Grade, ft					
			Hot-Mix Asphaltic Concrete (HMAC) - 3 in.					
			Flexible Base Material (FBM) - 9 in.					
			FAT CLAY (CH) very stiff to stiff to very stiff, dark brown to brown	13			16	
				8				86
5				8			32	
					94			
10				19				
15								
				16				
20			Boring terminated at a depth of about 20 ft.					
			NOTES: Upon completion of the drilling operations, the boring was observed dry.					
25								

DEPTH DRILLED:	20.0 ft	**DEPTH TO WATER:**	DRY	**PROJ. No.:**	ABA23-011-00
DATE DRILLED:	6/9/2023	**DATE MEASURED:**	6/9/2023	**FIGURE:**	3

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-3

Downtown Water and Wastewater Utility Line Improvements
Phase 2
Brownsvillle, Cameron County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: Existing Grade, ft			0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 (PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT) 10 20 30 40 50 60 70 80		
			Hot-Mix Asphaltic Concrete (HMAC) - 4 in.					
			Flexible Base Material (FBM) - 7 in.					
			FAT CLAY (CH) firm, dark brown	5	90		34	
5				8				99
			LEAN CLAY (CL) stiff, brown	9			25	
			SILTY SAND (SM) loose to medium dense, brown During the drilling operations, groundwater was encountered at a depth of about 8.5 ft. Upon completion of the drilling operations, groundwater was measured at a depth of about 8.5 ft.	5				
10								
15				14				
				18				
20			Boring terminated at a depth of about 20 ft.					
25								

DEPTH DRILLED:	20.0 ft	**DEPTH TO WATER:**	8.5 ft	**PROJ. No.:**	ABA23-011-00
DATE DRILLED:	6/8/2023	**DATE MEASURED:**	6/8/2023	**FIGURE:**	4

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-4

Downtown Water and Wastewater Utility Line Improvements
Phase 2
Brownsvillle, Cameron County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

SURFACE ELEVATION: Existing Grade, ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
	Hot-Mix Asphaltic Concrete (HMAC) - 5 in.				
	Flexible Base Material (FBM) - 12 in.				
	SILTY SAND (SM) medium dense to loose, brown	14			31
		8		NP	
5	**FAT CLAY (CH)** stiff, brown				
	During the drilling operations, groundwater was encountered at a depth of about 18 ft. Upon completion of the drilling operations, groundwater was measured at a depth of about 7.5 ft.	8		35	
10		10			
15		10			
20		8			
	Boring terminated at a depth of about 20 ft.				
25					

SHEAR STRENGTH, TONS/FT²

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT

10 20 30 40 50 60 70 80

DEPTH DRILLED:	20.0 ft	**DEPTH TO WATER:**	7.5 ft	**PROJ. No.:**	ABA23-011-00
DATE DRILLED:	6/9/2023	**DATE MEASURED:**	6/9/2023	**FIGURE:**	5

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-5

Downtown Water and Wastewater Utility Line Improvements
Phase 2
Brownsvillle, Cameron County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

SURFACE ELEVATION: Existing Grade, ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
	Hot-Mix Asphaltic Concrete (HMAC) - 5 in.				
	Flexible Base Material (FBM) - 12 in.				
	LEAN CLAY (CL) very soft to soft, brown	2		19	
		2			86
5		3		16	
	LEAN CLAY (CL) stiff to very stiff, dark brown	8			
10		10			
	During the drilling operations, groundwater was encountered at a depth of about 16 ft. Upon completion of the drilling operations, groundwater was measured at a depth of about 16 ft.				
15		14			
		16			
20	Boring terminated at a depth of about 20 ft.				
25					

SHEAR STRENGTH, TONS/FT²

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT

10 20 30 40 50 60 70 80

DEPTH DRILLED:	20.0 ft	**DEPTH TO WATER:**	11 ft	**PROJ. No.:**	ABA23-011-00
DATE DRILLED:	6/9/2023	**DATE MEASURED:**	6/9/2023	**FIGURE:**	6

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-6

Downtown Water and Wastewater Utility Line Improvements
Phase 2
Brownsvillle, Cameron County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: Existing Grade, ft			0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 (PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT) 10 20 30 40 50 60 70 80		
			Hot-Mix Asphaltic Concrete (HMAC) - 3 in.					
			Portland Cement Concrete (PCC) - 3 in.					
			Flexible Base Material (FBM) - 6 in.	5			20	
			LEAN CLAY (CL) firm, dark brown to brown	8				98
5					101		11	
				6				
			During the drilling operations, groundwater was encountered at a depth of about 10 ft. Upon completion of the drilling operations, groundwater was measured at a depth of about 9.5 ft.					
10			**SILTY SAND (SM)** loose to medium dense to loose, brown	7				
15				11				
				9				
20			Boring terminated at a depth of about 20 ft.					
25								

DEPTH DRILLED:	20.0 ft	**DEPTH TO WATER:**	8.5 ft	**PROJ. No.:**	ABA23-011-00
DATE DRILLED:	6/8/2023	**DATE MEASURED:**	6/8/2023	**FIGURE:**	7

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-7

Downtown Water and Wastewater Utility Line Improvements
Phase 2
Brownsvillle, Cameron County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

SURFACE ELEVATION: Existing Grade, ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
	Hot-Mix Asphaltic Concrete (HMAC) - 2-1/2 in.	7			93
	Flexible Base Material (FBM) - 6 in.				
	FAT CLAY (CH) firm, dark brown to brown	8		52	
5			97		
	LEAN CLAY with SAND (CL) firm, brown	6			79
	SILTY SAND (SM) loose to medium dense, brown				
10	During the drilling operations, groundwater was encountered at a depth of about 9 ft.	6		NP	
15		15			
		21			
20	Boring terminated at a depth of about 20 ft.				
25					

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	20.0 ft	**DEPTH TO WATER:**	9 ft	**PROJ. No.:**	ABA23-011-00
DATE DRILLED:	6/9/2023	**DATE MEASURED:**	6/9/2023	**FIGURE:**	8

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-8

Downtown Water and Wastewater Utility Line Improvements
Phase 2
Brownsvillle, Cameron County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: Existing Grade, ft			0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0		
			Hot-Mix Asphaltic Concrete (HMAC) - 2-1/2 in.			PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT		
			Flexible Base Material (FBM) - 7 in.			10 20 30 40 50 60 70 80		
			During the drilling operations, concrete was encountered at a depth of about 2 ft.					
			Boring terminated at an auger refusal depth of about 2 ft.					
			NOTES:					
			Upon completion of the drilling operations, the boring was observed dry.					
5								
10								
15								
20								
25								

DEPTH DRILLED:	2.0 ft	**DEPTH TO WATER:**	DRY	**PROJ. No.:**	ABA23-011-00
DATE DRILLED:	6/9/2023	**DATE MEASURED:**	6/9/2023	**FIGURE:**	9

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-9

Downtown Water and Wastewater Utility Line Improvements
Phase 2
Brownsvillle, Cameron County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: Existing Grade, ft					
			Hot-Mix Asphaltic Concrete (HMAC) - 3 in.					
			Wooden Plank - 4 in.					
			Portland Cement Concrete (PCC) - 6 in.					
			SILTY, CLAYEY SAND (SC-SM) very loose, brown	3			6	
				3				21
5			**LEAN CLAY (CL)** soft to stiff, dark brown to brown	4				
			During the drilling operations, groundwater was encountered at a depth of about 8 ft. Upon completion of the drilling operations, groundwater was measured at a depth of about 8 ft.	2			11	
10				3				
15				8				
				11				
20			Boring terminated at a depth of about 20 ft.					
25								

DEPTH DRILLED:	20.0 ft	**DEPTH TO WATER:**	8 ft	**PROJ. No.:**	ABA23-011-00
DATE DRILLED:	6/8/2023	**DATE MEASURED:**	6/8/2023	**FIGURE:**	10

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-10

Downtown Water and Wastewater Utility Line Improvements
Phase 2
Brownsvillle, Cameron County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: Existing Grade, ft			0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 (PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT) 10 20 30 40 50 60 70 80		
			Hot-Mix Asphaltic Concrete (HMAC) - 6 in.					
			Flexible Base Material (FBM) - 6 in.					
			SILTY SAND (SM) medium dense to loose, brown	14				
				7			NP	
5			**LEAN CLAY (CL)** firm to stiff, brown	7				93
			During the drilling operations, groundwater was encountered at a depth of about 8 ft. Upon completion of the drilling operations, groundwater was measured at a depth of about 8 ft.	5			13	
10				11				
15				9				
				12				
20			Boring terminated at a depth of about 20 ft.					
25								

DEPTH DRILLED:	20.0 ft	**DEPTH TO WATER:**	8 ft	**PROJ. No.:**	ABA23-011-00
DATE DRILLED:	6/8/2023	**DATE MEASURED:**	6/8/2023	**FIGURE:**	11

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-11

Downtown Water and Wastewater Utility Line Improvements
Phase 2
Brownsvillle, Cameron County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: Existing Grade, ft			0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 (PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT) 10 20 30 40 50 60 70 80		
			Hot-Mix Asphaltic Concrete (HMAC) - 3 in.					
			Wooden Plank - 4 in.					
			Flexible Base Material (FBM) - 11 in.					
			SILTY SAND (SM) very loose to loose, brown	3				37
				3			NP	
5				5				
			FAT CLAY (CH) soft to firm, brown	3			32	
			During the drilling operations, groundwater was encountered at a depth of about 9.5 ft. Upon completion of the drilling operations, groundwater was measured at a depth of about 7.5 ft.					
10				5				
15				6				
				6				
20			Boring terminated at a depth of about 20 ft.					
25								

DEPTH DRILLED:	20.0 ft	**DEPTH TO WATER:**	7.5 ft	**PROJ. No.:**	ABA23-011-00
DATE DRILLED:	6/13/2023	**DATE MEASURED:**	6/13/2023	**FIGURE:**	12

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-12

Downtown Water and Wastewater Utility Line Improvements
Phase 2
Brownsvillle, Cameron County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

SURFACE ELEVATION: Existing Grade, ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			Portland Cement Concrete (PCC) - 5 in.					
			LEAN CLAY with SAND (CL) soft to firm, brown	4			8	
				6				72
5			**SILTY SAND (SM)** very loose, brown During the drilling operations, groundwater was encountered at a depth of about 5 ft. Upon completion of the drilling operations, groundwater was measured at a depth of about 7 ft.	4			1	
				7				
			LEAN CLAY (CL) firm to stiff, dark brown to brown - gasoline like ordor was encountered at a depth of 8 ft	12				
10								
15				6				
				11				
20			Boring terminated at a depth of about 20 ft.					
25								

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	20.0 ft	**DEPTH TO WATER:**	5 ft	**PROJ. No.:**	ABA23-011-00
DATE DRILLED:	6/9/2023	**DATE MEASURED:**	6/9/2023	**FIGURE:**	13

KEY TO TERMS AND SYMBOLS

MATERIAL TYPES

SOIL TERMS


CALCAREOUS


CALICHE


CLAY


CLAYEY


GRAVEL


GRAVELLY


PEAT


SAND


SANDY


SILT


SILTY


FILL

ROCK TERMS


CHALK


CLAYSTONE


CLAY-SHALE


CONGLOMERATE


DOLOMITE


IGNEOUS


LIMESTONE


MARL


METAMORPHIC


SANDSTONE


SHALE


SILTSTONE

OTHER


ASPHALT


BASE


CONCRETE/CEMENT


BRICKS / PAVERS


WASTE


NO INFORMATION

WELL CONSTRUCTION AND PLUGGING MATERIALS


BLANK PIPE


SCREEN


BENTONITE


CEMENT GROUT


BENTONITE & CUTTINGS


CONCRETE/CEMENT


CUTTINGS


GRAVEL


SAND


VOLCLAY

SAMPLE TYPES


AIR ROTARY


GRAB SAMPLE


CORE


GEOPROBE SAMPLER


ROTOSONIC -DAMAGED


MUD ROTARY


NO RECOVERY


NX CORE


PITCHER


ROTOSONIC -INTACT


SHELBY TUBE


SPLIT BARREL


SPLIT SPOON


TEXAS CONE PENETROMETER


DISTURBED

STRENGTH TEST TYPES


POCKET PENETROMETER


TORVANE


UNCONFINED COMPRESSION


TRIAXIAL COMPRESSION UNCONSOLIDATED-UNDRAINED


TRIAXIAL COMPRESSION CONSOLIDATED-UNDRAINED

NOTE: VALUES SYMBOLIZED ON BORING LOGS REPRESENT SHEAR STRENGTHS UNLESS OTHERWISE NOTED

PROJECT NO. ABA23-011-00

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

Terms used in this report to describe soils with regard to their consistency or conditions are in general accordance with the discussion presented in Article 45 of SOILS MECHANICS IN ENGINEERING PRACTICE, Terzaghi and Peck, John Wiley & Sons, Inc., 1967, using the most reliable information available from the field and laboratory investigations. Terms used for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in American Society for Testing and Materials D2487-06 and D2488-00, Volume 04.08, Soil and Rock; Dimension Stone; Geosynthetics; 2005.

The depths shown on the boring logs are not exact, and have been estimated to the nearest half-foot. Depth measurements may be presented in a manner that implies greater precision in depth measurement, i.e 6.71 meters. The reader should understand and interpret this information only within the stated half-foot tolerance on depth measurements.

RELATIVE DENSITY

Penetration Resistance Blows per ft	Relative Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
> 50	Very Dense

COHESIVE STRENGTH

Resistance Blows per ft	Consistency	Cohesion TSF
0 - 2	Very Soft	0 - 0.125
2 - 4	Soft	0.125 - 0.25
4 - 8	Firm	0.25 - 0.5
8 - 15	Stiff	0.5 - 1.0
15 - 30	Very Stiff	1.0 - 2.0
> 30	Hard	> 2.0

PLASTICITY

Plasticity Index	Degree of Plasticity
0 - 5	None
5 - 10	Low
10 - 20	Moderate
20 - 40	Plastic
> 40	Highly Plastic

ABBREVIATIONS

B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
BTEX = Total BTEX
TPH = Total Petroleum Hydrocarbons
ND = Not Detected
NA = Not Analyzed
NR = Not Recorded/No Recovery
OVA = Organic Vapor Analyzer
ppm = Parts Per Million

Qam, Qas, Qal = Quaternary Alluvium
Qat = Low Terrace Deposits
Qbc = Beaumont Formation
Qt = Fluviatile Terrace Deposits
Qao = Seymour Formation
Qle = Leona Formation
Q-Tu = Uvalde Gravel
Ewi = Wilcox Formation
Emi = Midway Group
Mc = Catahoula Formation
El = Laredo Formation
Kknm = Navarro Group and Marlbrook Marl
Kpg = Pecan Gap Chalk
Kau = Austin Chalk

Kef = Eagle Ford Shale
Kbu = Buda Limestone
Kdr = Del Rio Clay
Kft = Fort Terrett Member
Kgt = Georgetown Formation
Kep = Person Formation
Kek = Kainer Formation
Kes = Escondido Formation
Kew = Walnut Formation
Kgr = Glen Rose Formation
Kgru = Upper Glen Rose Formation
Kgrl = Lower Glen Rose Formation
Kh = Hensell Sand

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy.
Fissured	Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 1/8 inch thick extending through the sample.
Seam	Inclusion 1/8 inch to 3 inches thick extending through the sample.
Layer	Inclusion greater than 3 inches thick extending through the sample.
Laminated	Soil sample composed of alternating partings or seams of different soil type.
Interlayered	Soil sample composed of alternating layers of different soil type.
Intermixed	Soil sample composed of pockets of different soil type and layered or laminated structure is not evident.
Calcareous	Having appreciable quantities of carbonate.
Carbonate	Having more than 50% carbonate content.

SAMPLING METHODS

RELATIVELY UNDISTURBED SAMPLING

Cohesive soil samples are to be collected using three-inch thin-walled tubes in general accordance with the Standard Practice for Thin-Walled Tube Sampling of Soils (ASTM D1587) and granular soil samples are to be collected using two-inch split-barrel samplers in general accordance with the Standard Method for Penetration Test and Split-Barrel Sampling of Soils (ASTM D1586). Cohesive soil samples may be extruded on-site when appropriate handling and storage techniques maintain sample integrity and moisture content.

STANDARD PENETRATION TEST (SPT)

A 2-in.-OD, 1-3/8-in.-ID split spoon sampler is driven 1.5 ft into undisturbed soil with a 140-pound hammer free falling 30 in. After the sampler is seated 6 in. into undisturbed soil, the number of blows required to drive the sampler the last 12 in. is the Standard Penetration Resistance or "N" value, which is recorded as blows per foot as described below.

SPLIT-BARREL SAMPLER DRIVING RECORD

Blows Per Foot	Description
25	25 blows drove sampler 12 inches, after initial 6 inches of seating.
50/7"	50 blows drove sampler 7 inches, after initial 6 inches of seating.
Ref/3"	50 blows drove sampler 3 inches during initial 6-inch seating interval.

NOTE: To avoid damage to sampling tools, driving is limited to 50 blows during or after seating interval.

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Downtown Water and Wastewater Utility Line Improvements
Phase 2
Brownsvillle, Cameron County, Texas

FILE NAME: ABA23-011-00.GPJ 7/3/2023

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-1	1.4 to 2.9	6	24						38		
	2.9 to 4.4	6	18	39	18	21	SC				
	5.0 to 6.5	13	18								
	7.5 to 9.0	5	26								
	10.0 to 11.5	6	30	32	22	10	SC				
	15.0 to 16.5	3	28								
	18.5 to 20.0	8	31								
B-2	1.0 to 2.5	13	25	53	37	16	CH				
	2.5 to 4.0	8	25						86		
	5.0 to 6.5	8	25	55	23	32	CH				
	7.0 to 9.0		29					94		0.94	UC
	10.0 to 11.5	19	28								
	15.0 to 17.0		31							1.50	PP
	18.5 to 20.0	16	25								
B-3	0.9 to 2.4	5	27								
	2.4 to 4.4		27	60	26	34	CH	90		0.34	UC
	5.0 to 6.5	8	30						99		
	7.5 to 9.0	9	26	47	22	25	CL				
	10.0 to 11.5	5	30								
	15.0 to 16.5	14	31								
	18.5 to 20.0	18	28								
B-4	1.1 to 2.6	14	15						31		
	2.6 to 4.1	8	17	NP	NP	NP	SM				
	5.0 to 7.0		27							1.10	PP
	7.5 to 9.0	8	29	59	24	35	CH				
	10.0 to 11.5	10	31								
	15.0 to 16.5	10	33								
	18.5 to 20.0	8	29								
B-5	1.3 to 2.8	2	21	35	16	19	CL				
	2.8 to 4.3	2	26						86		
	5.0 to 6.5	3	35	37	21	16	CL				
	7.5 to 9.0	8	28								
	10.0 to 11.5	10	30								
	15.0 to 16.5	14	27								
	18.5 to 20.0	16	27								
B-6	1.0 to 2.5	5	19	39	19	20	CL				
	2.5 to 4.0	8	26						98		
	5.0 to 7.0		21	33	22	11	CL	101		0.46	UC
	7.5 to 9.0	6	25								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Downtown Water and Wastewater Utility Line Improvements
Phase 2
Brownsvillle, Cameron County, Texas

FILE NAME: ABA23-011-00.GPJ 7/3/2023

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-6	10.0 to 11.5	7	28								
	15.0 to 16.5	11	28								
	18.5 to 20.0	9	28								
B-7	0.0 to 1.5	7	21						93		
	2.5 to 4.0	8	35	76	24	52	CH				
	5.0 to 7.0		25					97		0.83	UC
	7.5 to 9.0	6	23						79		
	10.0 to 11.5	6	28	NP	NP	NP	SM				
	15.0 to 16.5	15	29								
	18.5 to 20.0	21	24								
B-8	0.8 to 2.3										
B-9	1.1 to 2.6	3	14	27	21	6	SC-SM				
	2.6 to 4.1	3	13						21		
	5.0 to 6.5	4	27								
	7.5 to 9.0	2	33	34	23	11	CL				
	10.0 to 11.5	3	31								
	15.0 to 16.5	8	33								
	18.5 to 20.0	11	31								
B-10	1.0 to 2.5	14	14								
	2.5 to 4.0	7	8	NP	NP	NP	SM				
	5.0 to 6.5	7	26						93		
	7.5 to 9.0	5	27	34	21	13	CL				
	10.0 to 11.5	11	22								
	15.0 to 16.5	9	28								
	18.5 to 20.0	12	23								
B-11	1.5 to 3.0	3	13						37		
	3.0 to 4.5	3	15	NP	NP	NP	SM				
	5.0 to 6.5	5	12								
	7.5 to 9.0	3	30	50	18	32	CH				
	10.0 to 11.5	5	29								
	15.0 to 16.5	6	34								
	18.5 to 20.0	6	29								
B-12	0.4 to 1.9	4	21	34	26	8	CL				
	2.5 to 4.0	6	25						72		
	5.0 to 6.5	4	38	24	23	1	SM				
	7.5 to 9.0	7	32								
	10.0 to 11.5	12	26								
	15.0 to 16.5	6	35								
	18.5 to 20.0	11	26								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined

Guidelines for Treatment of Sulfate-Rich Soils and Bases in Pavement Structures

Construction Division
Materials & Pavements Section
Geotechnical, Soils & Aggregates Branch

September 2005

RKCI Project No. ABA23-011-00
Figure No. 16

Table of Contents

Chapter 1
Introduction

Contents:

Section 1
Disclaimer

The Texas Department of Transportation, in conjunction with the Texas Transportation Institute, has developed this document to serve as guidance for TxDOT personnel for soil and base treatment in sulfate-rich areas. The information and guidance provided herein reflects the authors' knowledge and experience and may not reflect the views of others. Although much research has been conducted on the subject of the treatment of sulfate-bearing soils and bases during the past several decades, materials, design, and construction techniques are continuing to evolve. This document will likewise evolve.

Direct questions regarding these guidelines to the Geotechnical, Soils, and Aggregates Branch of the Construction Division at 512-506-5907.

Chapter 2
Sulfate Induced Heave

Contents:

Section 1
Introduction

In general, the use of calcium-based additives (lime, cement, and Class CS fly ash) to treat soils and bases has been performed with success over many years. Over the past 20 years, a phenomenon has surfaced in which many subgrade soils treated with calcium-based additives experience heaving problems due to the chemical reactions with sulfate and/or sulfide minerals and calcium-modified soils, as illustrated in Figure 1. Field observations indicate that the reactions can be very rapid and occur overnight following a single rainfall event. In other cases the reaction is delayed and may take years for the problem to manifest itself in terms of excessive pavement roughness. Research has revealed the rate of the reaction is due to the particle size of the sulfate crystals (finer grained sulfates = faster reaction) and the amount of water present in the system (more water = faster reaction). Sulfate-induced heave has surfaced around the state as well as the country. Texas has experienced heave problems with treated soils containing high sulfate concentrations before completion of construction, as seen in Figure 1(a). Sources of sulfates often occur in seams and stratified pockets, and many of the cases investigated in Texas revealed sulfate problems in small, localized areas, as seen in Figure 1(b). It is not uncommon to have one or two sulfate-induced heaves that are several stations apart on the same project.

(a) (b)

Figure 1: (a) U.S. 67 near Waxahachie during construction, showing vertical heaves generated by lime treatment of sulfate-rich soils (Harris, Scullion, Sebesta, 2004); (b) Illustrates a Localized Heave (Petry, 1992)

Detrimental soil properties, such as shrink-swell and low shear strength, still need to be addressed despite the presence of sulfates. This document will provide guidance on:

- basic mechanisms and causes of sulfate heave,
- risk assessment for sulfate heave potential within an alignment, prior to design,
- use of additives and construction techniques for sulfate levels and prevailing conditions within project alignment, and
- establishing quality management practices for treatment of sulfate-rich soils.

Section 2

Sulfate Induced Heave Chemical Reactions

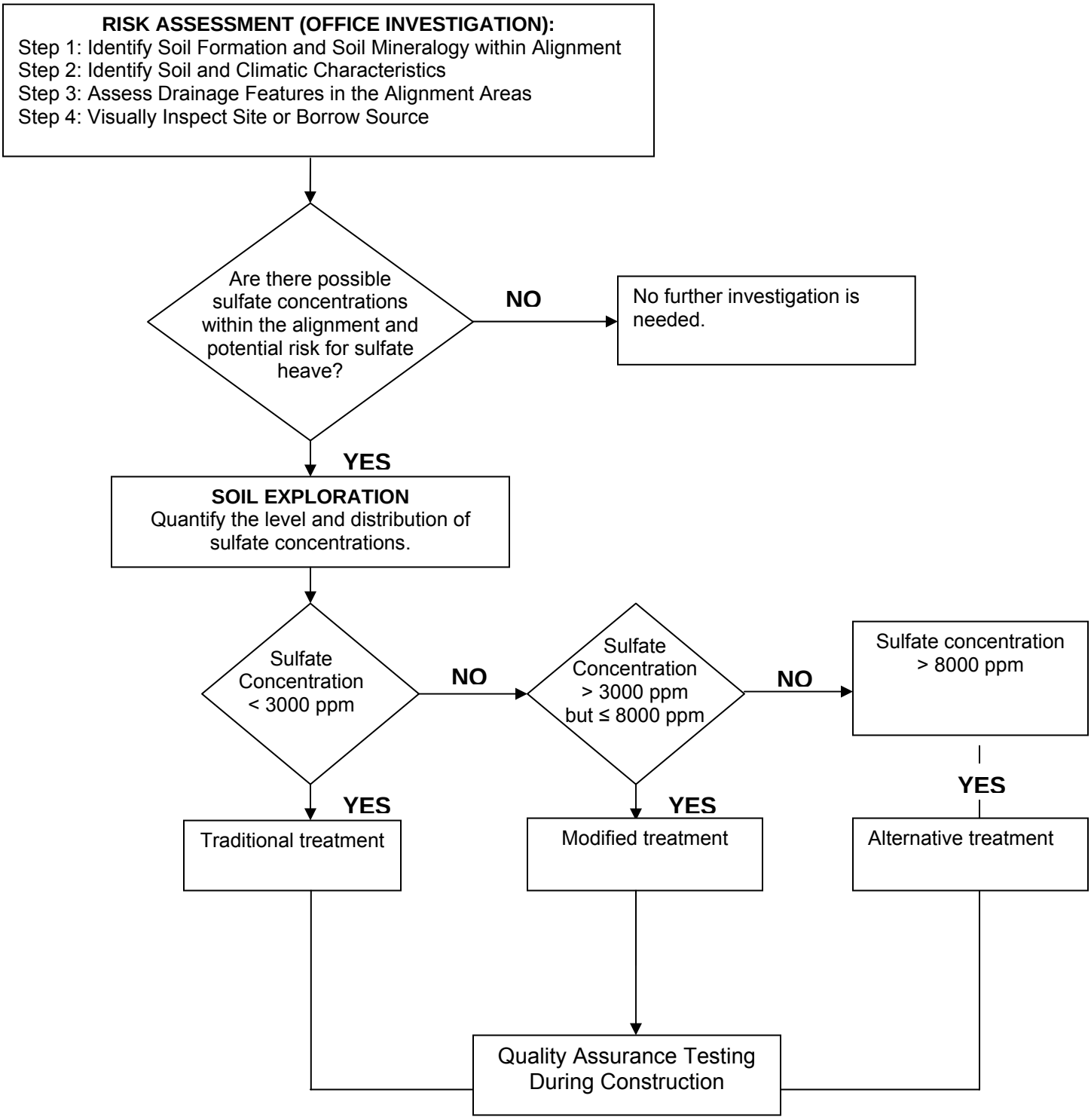
Sulfate heave is initiated when calcium based additives are used to treat subgrade soils that contain sulfate/sulfide minerals. Research has determined that the cause of heaving is due to the formation of minerals that contain large amounts of water in their structure and reach expansions approximately twice their volume. This mineral is called ettringite. Ettringite is formed when clay minerals, which contain alumina and silica, combine with sulfate minerals, water, and calcium. Calcium-containing additives raise the pH of the system to above 12, which causes dissolution of clay minerals and releases aluminum and silica into the system. Water may be supplied from a number of sources. It may be supplied during the treatment process, occur as precipitation after treatment, or be supplied from the groundwater or adjacent reservoirs. Sulfur is supplied from the sulfide and/or sulfate bearing soils or water. The result of this reaction is the generation of crystals that can expand approximately 2 to 2.5 times their original volume. This expansion is the cause of swell in the treated soil and the pavement structure.

Chapter 3
Treating Subgrade Soils with Sulfates

Contents:

Section 1

Methodology



Section 2

Risk Assessment

Sulfate detection prior to specifying and constructing calcium treated soils is the only means of prevention of sulfate-induced heave. The following is a method to estimate the potential risk for sulfate heave on a project. The goal of the risk assessment process is to reveal potential problem areas within a project. If there is a probable risk for sulfate induced heave within the project, the appropriate level of exploration, testing, and controls can be applied to the project.

Step 1: Identify Soil Formation and Soil Mineralogy within Alignment

The first step in detection is determining the soil formations within the limits of the proposed construction project. Research and forensics data have revealed certain soil formations have a higher probability to possess significant sulfate sources, like gypsum, than others. For example, some of the most severe heaves identified from the Dallas/Fort Worth area to the border counties of Laredo are associated with the Eagle Ford formation, as shown in Figure 2. This formation approximately parallels Interstate 35. Other areas with high sulfate concentrations have been identified around Texas. Counties known to have problematic sulfate concentrations are identified in gold in Figure 2. This map offers a general overview of potential areas with known sulfate heave potential.

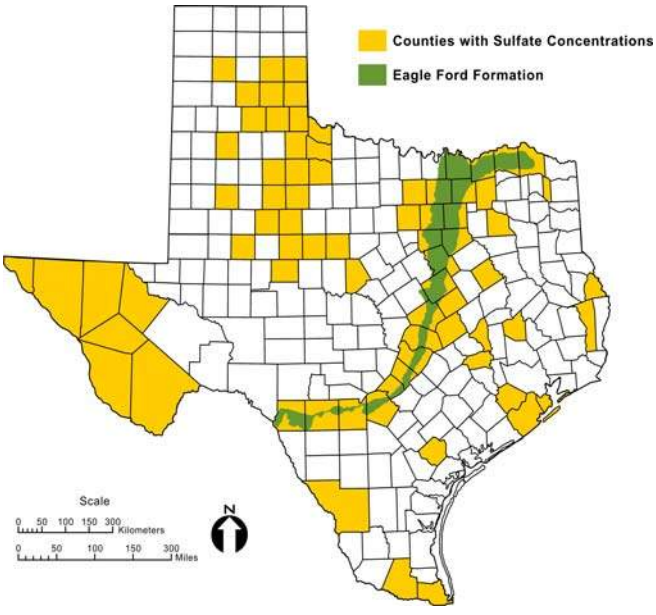


Figure 2: Texas counties with measurable sulfate concentrations (>100 ppm).

Maps from the Bureau of Economic Geology from the University of Texas offer information and assistance in determining the soil formations and mineralogy within the project. The first step is to overlay the alignment of the project on the appropriate Bureau of Economic Geology county map, and identify the soil formations that overlap the alignment of the roadway, as seen in Figure 3.

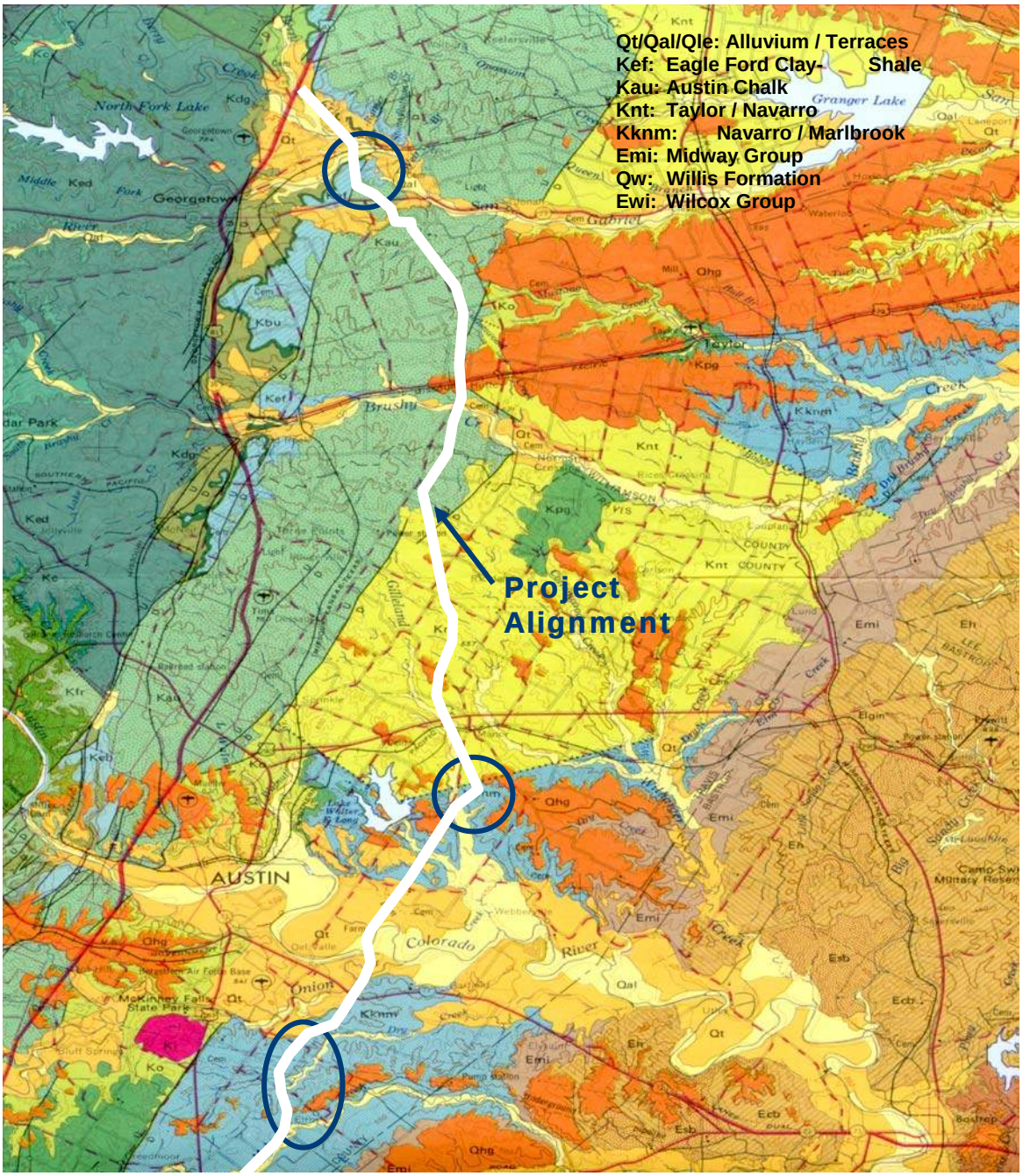


Figure 3: Illustration of a project alignment overlaid on a Bureau of Economic Geology county map.

Once the soil formations within the project alignment are identified, investigate the mineralogical composition of the soil formations. This information is found in the index information booklet that accompanies the geological atlas maps, as seen in Figure 4. The parent rock formation descriptions in the index of these maps provide insight into the mineralogy present in the rock and the soil. The following minerals can be potential sources of sulfate/sulfide minerals:

- Alunite
- Bassinite
- Kainite
- Kierserite
- Mirabilite
- Thenardite
- Arcanite
- Jarosite
- Barite
- Antlerite
- Angelesite
- Pyrite
- Pyritic
- Marcasite
- Marcasitic
- Gypsum
- Gypsiferous
- Selenite
- Selenitic
- Satin spar
- Alabaster
- Anhydrite
- Anhydritic

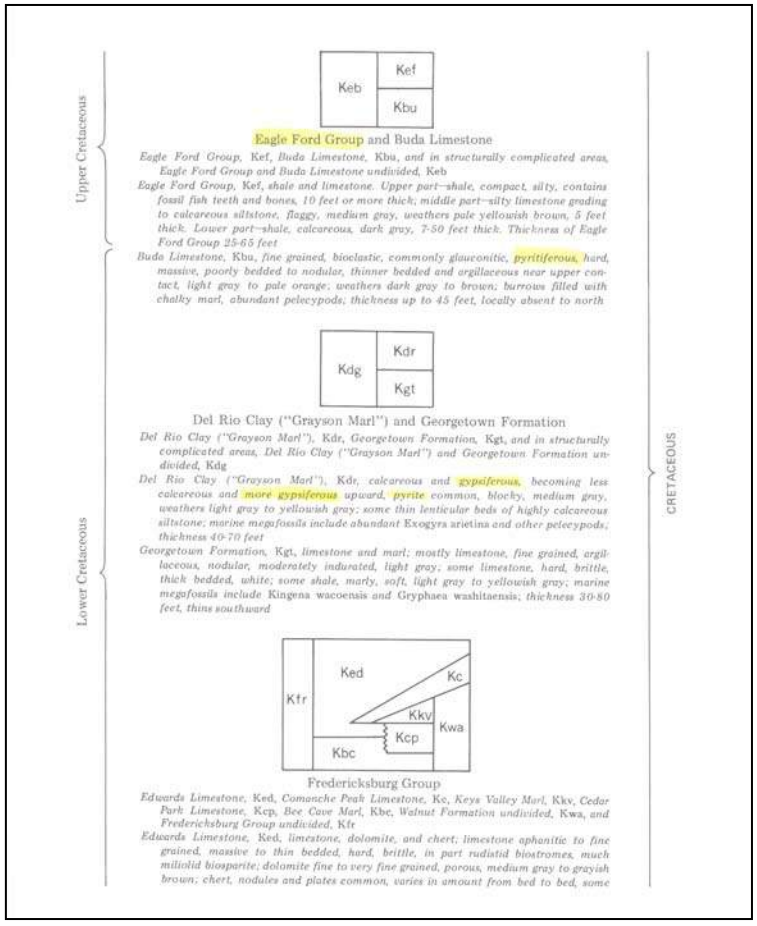


Figure 4: Illustration of the mineralogical index booklet of the geological maps.

Another source of information to identify the potential for sulfate concentrations within an alignment is GIS maps. These maps contain historical laboratory test data obtained from testing performed on previous projects and soil investigations. Unlike the county maps, these maps illustrate the sulfate concentrations on the actual highway and within the limits the data represents, as seen in Figure 5. Higher concentrations may exist within the colored areas representing tested areas due to the variability of the sulfate concentrations. In addition, sulfate concentrations may exist in areas in which the map does not show evidence from laboratory testing. Treatment and construction decisions should not be based solely on the information in these maps. Rather, the maps are meant to provide an indication of the possibility of sulfates in a certain area.

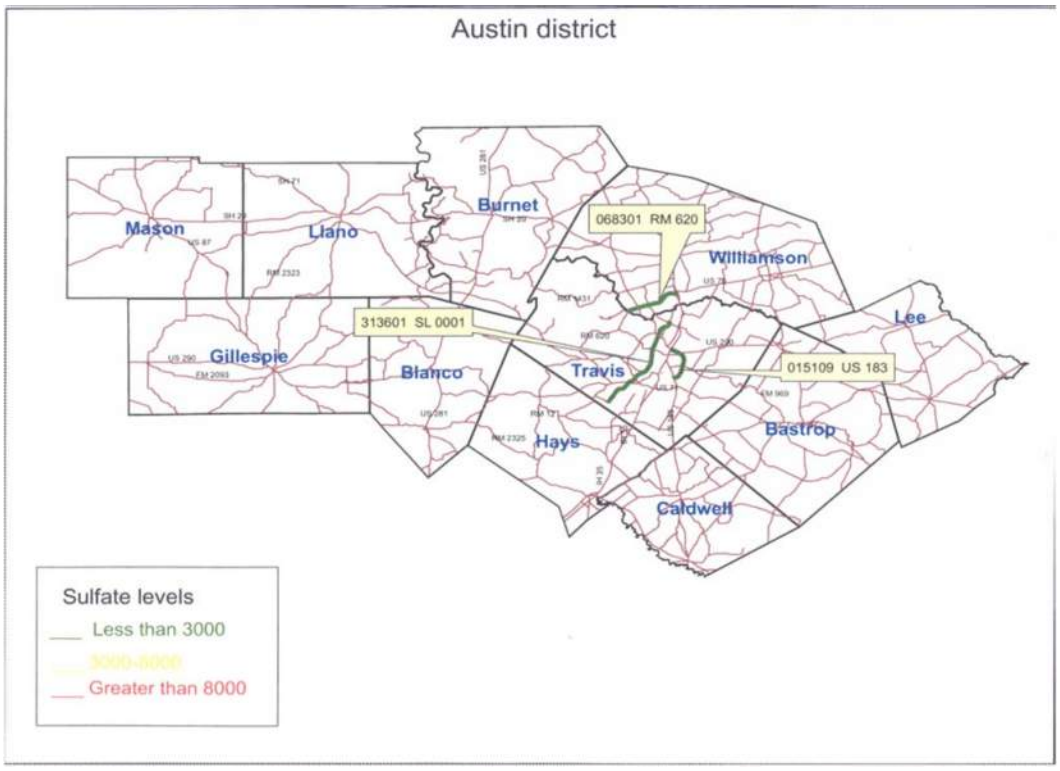


Figure 5: GIS maps of sulfate concentrations on existing roadways.

Step 2: Identify Soil and Climatic Characteristics

Climatic Impact

In order for the formation of ettringite and sulfate heave to occur, the reaction requires access to water. Climatic areas with high annual rainfall and humid conditions contribute to the potential for sulfate formation and in turn, sulfate induced heave. Water can gain access to sulfate minerals through ditches (seepage) and openings in the surface such as cracks or permeable layers in pavement structures. High annual rainfall also raises the water table and transports dissolved sulfates from underlying parent formations, especially in soils with high suction properties (clays). The transported sulfates can then come into contact with calcium treated soils through hydraulic transport or capillary action.

Soil Classification

The classification of the soil can also provide another tool in assessing the potential risk for sulfate outcrops. Soil with low hydraulic conductivities and high capillary or suction properties are prone to serve as reservoirs for growing and storing sulfate bearing minerals. Soil properties like low permeability and high capillarity are typically associated with clays and shales. In soils with low permeability, water cannot readily flow through the soil. Sulfates are not easily dissolved and transported to streams or other areas of lower hydraulic potential. With the high capillary action common in these types of soils, the soil suction can draw water from deeper strata that contain sulfates or sulfides and cause them to oxidize in the upper strata. The end result is that sulfate stagnates in these clay or shale layers, causing high concentrations of sulfate bearing minerals to develop. In addition, during dry conditions, clays and shales can form a network of desiccation cracks and faults into which water can migrate. When they dry out, sulfate crystalline formations remain, as seen in Figure 6.

Figure 6: Sulfate crystalline formations in desiccated clay.

High sulfate concentrations can exist in soils such as gravels, sands, and/or silts. Typically this occurs in arid regions such as western regions of Texas. If a calcium-based additive is used to modify a granular material, the risk for sulfate heave is still present.

Step 3: Assess Drainage Features in the Aligning Areas

The availability of water is critical for the formation of ettringite. A project's topographical characteristics must be evaluated for low lying areas, especially in cuts. These low lying areas can accumulate large amounts of water and when combined with calcium-based treatments, may create a high risk for sulfate heave.

In addition, terrain with rolling hills or a project with several slopes can also contribute to the accumulation and availability of water. During drying cycles, sulfates can become apparent on the surface in the form of powdery, white efflorescence. These sulfates can be transported into desiccation cracks in clays or washed down slopes into calcium-treated layers in roadways, as seen in Figure 7.

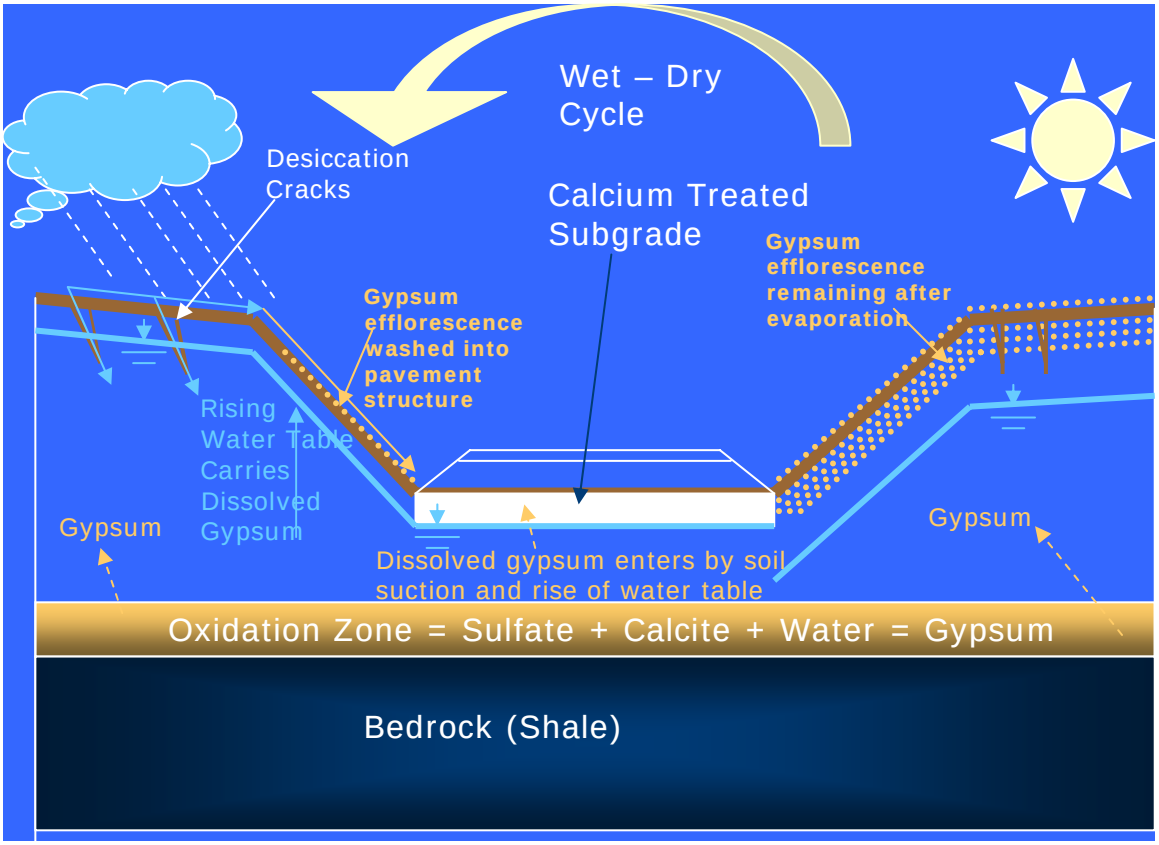


Figure 7: Illustration of the effect of low-lying areas and slopes on the transport of sulfates and water accumulation.

Step 4: Visual Inspection of Site or Borrow Source

Field detection of sulfates is crucial in the pre-design phase of a project. If any of the previous steps reveal possible risk of sulfates in the alignment of the roadway, perform a visual inspection of the site and potential borrow sources that may be used as select fill. Sulfate bearing crystals, like gypsum, can vary in size. These crystals can grow to a size readily visible to the eye, as seen in Figure 8(a) or they can be microscopic, as seen in Figure 8(b). In fact, gypsum crystals larger than softballs have been found in parts of Texas.

Figure 8: (a) Large grain gypsum crystals (b) Small grain gypsum crystals

Large grain-size gypsum crystals can be visually seen as sparkling, diamond-like crystals on natural or constructed slopes, in excavated areas, or naturally occurring on the surface, as seen in Figure 9(a). Small grain-size gypsum crystals can be visually detected as powdery, white efflorescence during dry seasons on the surface of the ground, as seen on Figure 9(b).

Figure 9: (a) Illustration of large grain gypsum crystals on a natural slope (b) Illustration of fine grain present on the surface through efflorescence.

Chapter 4
Pre-Design Soil Investigation

Contents:

Section 1

Requirements and Procedures

If there is an apparent risk for sulfate heave in the alignment of a project, a soil investigation is required prior to design. Requirements and procedures for these investigations are described below. The objective of this investigation is to identify and quantify the levels and distribution of sulfate concentrations within the alignment. The concentrations determined from the investigation will assist materials and pavements engineers in selecting the appropriate treatment type, additive levels, and construction techniques.

For pre-design investigation, schedule a drilling and soil investigation. Refer to the "Soil Investigation" section of the Pavement Design Manual for the details. Sulfate testing must be added to the schedule of testing recommended in the "Soil Investigation" section.

The minimum recommended frequency for drilling and logging test holes for areas with potential sulfates is every 500 feet, on alternating sides of the width of the roadbed. In cut sections, drill the test hole to a depth which corresponds to the final grade elevation of the subgrade of the proposed pavement. For example, if a section requires a 10 foot cut to meet the subgrade elevation, the driller must drill 10 feet to the proposed subgrade elevation before capturing soil samples for sulfate testing. Take samples at the final grade elevation and at least 7-10 feet below the final grade elevation. It is recommended that soil samples be taken at one-foot intervals.

Perform Part II of Tex-145-E, to determine the concentration of sulfate for each sample. Once the concentrations are determined, illustrate the level and distribution of sulfate concentration along the alignment of the project as seen in Figure 10.

Quantifying the sulfate levels and distribution will assist the materials and pavements engineer in determining where alternative material and pavement designs need to be performed. It is recommended that material designs and construction technique options be made for the highest concentrations measured in the alignment. The distribution will provide the areas and depths requiring alternative material and pavement designs. The more testing performed, the more precisely the limits can be defined for certain treatment techniques. For example, in Figure 10, from STA 0+00 to 16+00, traditional treatment can be implemented; from STA 16+00 to 34+00, alternative treatment is required; from STA 34+00 to 56+00, modified treatment can be utilized. Defining each area that requires specific treatments promotes more efficient and effective use of resources and money. Refer to the next section to determine the treatment types and construction techniques required for varying concentrations.

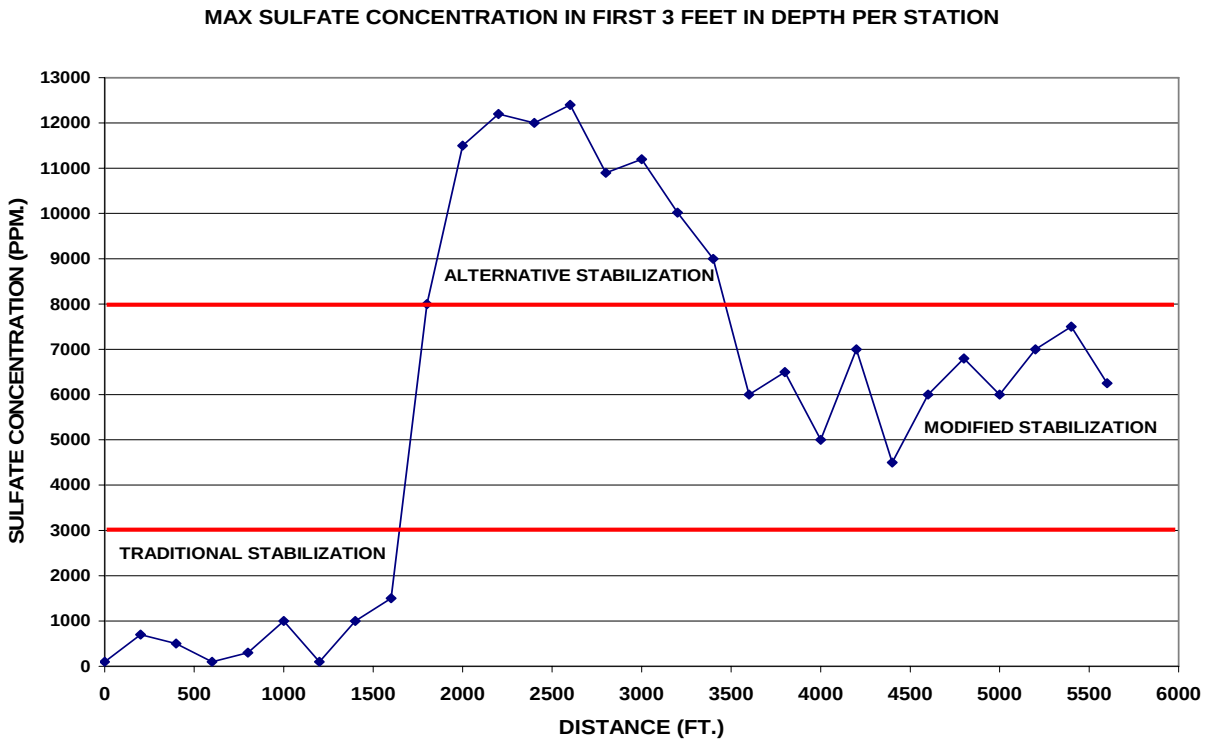


Figure 10: Distribution of sulfate concentrations along an alignment.

Chapter 5
Guidelines for Treatment of Sulfate Soils

Contents:

Section 1
Overview

Sulfates can occur in any type of soil regardless of the texture or plasticity. Therefore, sulfate-induced heave can occur in spite of the soil type. Typically, there is a higher probability for sulfates to occur in soils with high plasticity due to its high suction properties and ability to retain moisture containing soluble sulfates. Sulfates can also exist in granular soils, especially in arid regions or in strata that experience little water migration. Regardless of the soil type, due diligence is required in treating areas at risk. The following guidelines address all types of aggregate-soils.

Section 2

Moderately to Highly Expansive Soils (PI > 15)

The purpose of treatment of expansive soils is typically to mitigate swell potential. Soils with low hydraulic conductivities and high capillary or suction properties are prone to serve as reservoirs for growing and storing sulfate bearing minerals. Research Project 4240 has determined the critical levels and conditions for successful lime treatment of expansive, sulfate-rich soils. Treatment with cement and Class CS fly ash in expansive, sulfate-rich soils has not yet been researched. The following flowchart provides a treatment decision tree based on sulfate levels.

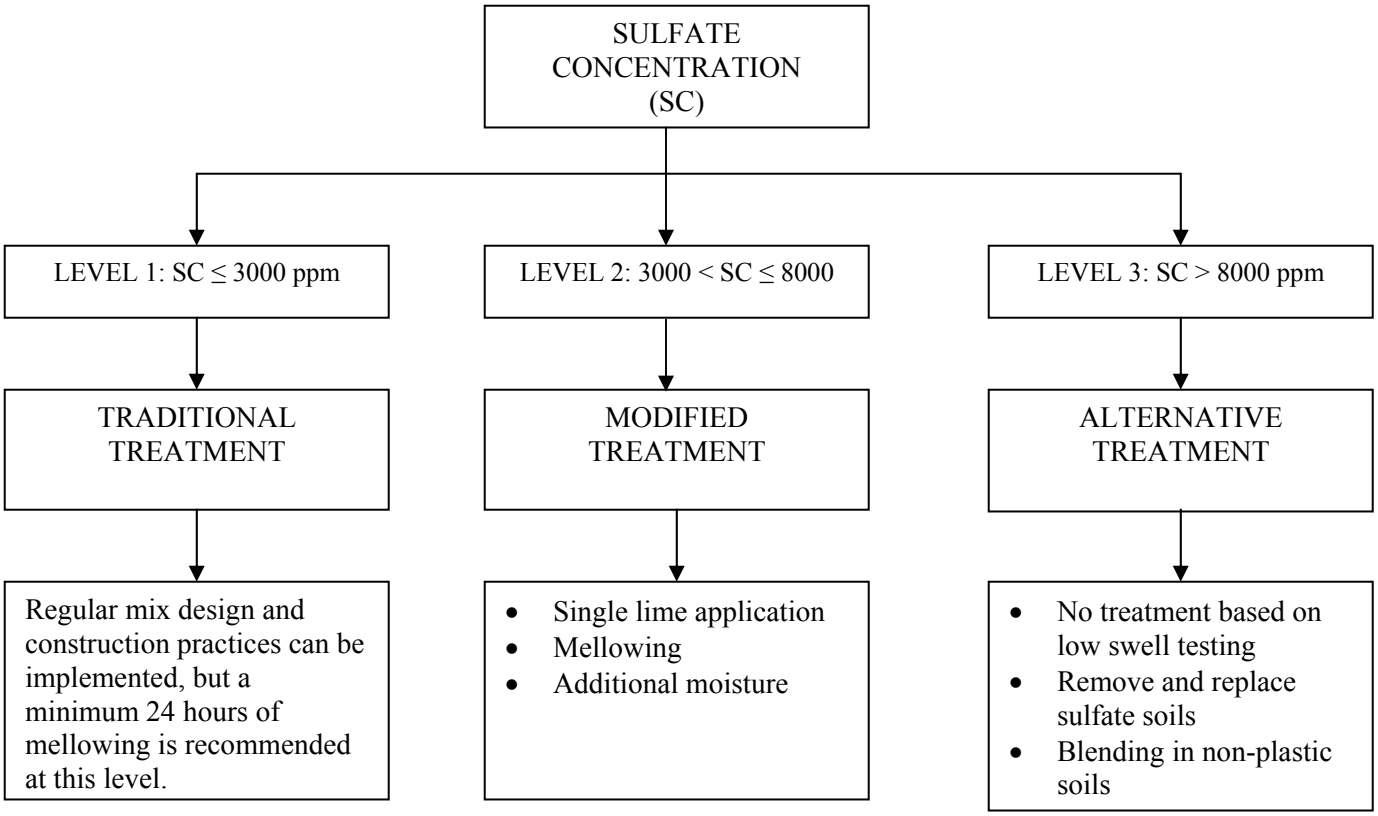


Figure 11: Decision tree to determine type of treatment for varying sulfate contents.

Level 1: Traditional Treatment (SC ≤ 3000 ppm)

Research and field experience have shown soils with sulfate levels of 3000 ppm or less pose low potential for sulfate heave. Standard construction and mix design practices, as specified in applicable items in TxDOT's 2004 Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, can be utilized to treat with sulfate concentrations below 3000 ppm. Sulfate reaction still occurs in these types of soils, but with adequate mixing and moisture, the effects are typically not detrimental.

Level 2: Modified Treatment (3000 ppm < SC ≤ 8000 ppm)

Research and some cursory field data has shown that soils with PI >15 and sulfate levels greater than 3000 ppm but less than or equal to 8000 ppm can be successfully treated with lime. Since research to date has only produced data using lime as an additive, the following recommendations are **for lime treatment only.** Use of other additives is not recommended without first performing extensive laboratory testing. The following modified construction methods must be followed to ensure the prevention and mitigation of sulfate heave:

Material Mix Design

Perform the mix design (Tex-121-E) as required by the specification to determine the optimum lime content, but use a representative sample of soil with the most representative sulfate concentration. An inherent amount of lime will be consumed by the sulfate reaction, so the lime content must be designed for the specific soil and representative concentration of sulfate. The amount of mellowing time and moisture content required for a specific soil can be estimated during the mix design process. Once the optimal lime content is determined, multiple samples, at varying moisture contents above optimum moisture, can be mixed at the design lime content. The sulfate reduction of the mixes can be monitored and determined over time using Tex-145-E, Part II. Once the sulfate level falls below 3000 ppm, record the amount of time and moisture content required to achieve this concentration at the most rapid rate. This amount of time and moisture content can be used in the field as controls for mellowing time and moisture content. For example, in Figure 12, the sample with 24% moisture and the full 6% lime content reached a concentration below 3000 ppm faster than the other samples. It took about 1.9 days to reach 3000 ppm, but round up the time to 2 days for practicality.

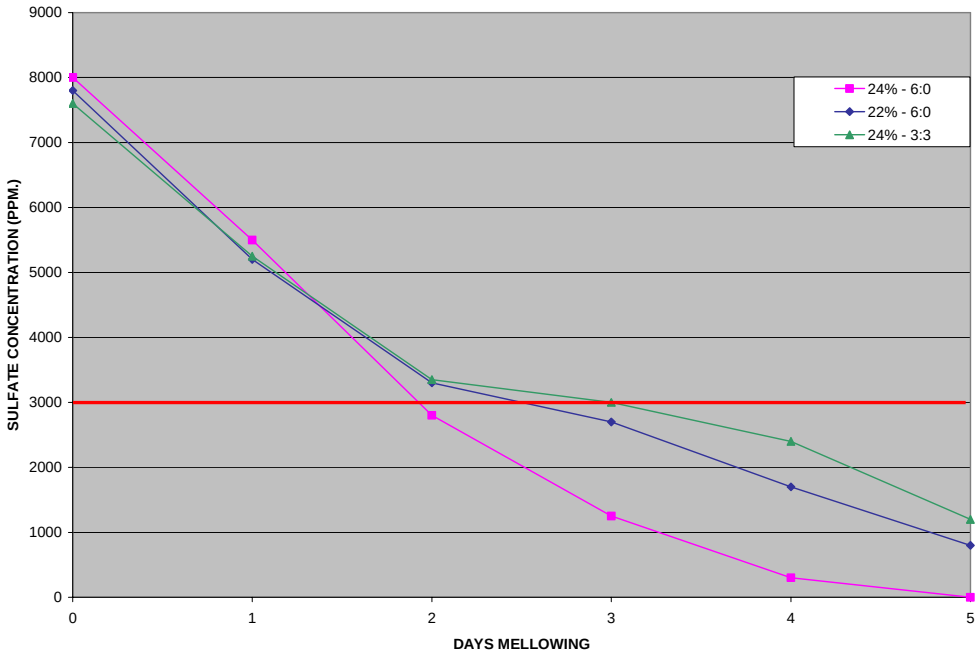


Figure 12: Determination of the optimum moisture content and minimum amount of time required to lower the sulfate content to 3000 ppm.

Application and Mixing

Apply the total lime content in one application. Thorough mixing is critical as this will promote complete and rapid reaction between the soil, sulfates, and water. Use of mixers with in-line water application or application of lime in slurry form is recommended to achieve thorough mixing. Light compaction will help seal the soil-lime mixture during mellowing and reduce lime oxidation. After mellowing, remix the soil-lime and perform final placement and compaction.

Mellowing and Moisture Control

Mellowing is the process of allowing the lime treated soil to remain in an uncompacted state for a period of time in order for the lime to react with the clay particles and sulfates. As the sulfate level increases, the corresponding reaction time required to lower the concentration of sulfates to a tolerable level (< 3000 ppm.) also increases. This reaction requires adequate moisture to initiate and complete the reaction between the sulfate, soil and lime. Additional moisture can assist in driving down the mellowing time and increasing the rate of reaction. But if water is added for this purpose, one must account for the time and effort to rework the material in order to lower the moisture content of the mellowed material to the optimum moisture for compaction. Use the estimated mellowing time and moisture content determined from the mix design. The mellowing period can be translated to the construction specifications and operations of the project. Ensure the moisture content is maintained by sprinkling the mixture regularly to prevent excessive evaporation. Approximate moisture content can be measured with a nuclear density gauge. Since calcium affects nuclear density moisture content, a correction factor must be applied. The most certain manner to control the

moisture content is to perform an oven-dry moisture content (Tex-103-E) on a sample of the mixture.

Always consider that the mellowing time and moisture content determined from laboratory testing is performed in a system protected from environment and construction conditions found in the field. Issues, like uniformity of mixing, coverage, and evaporation, cannot be simulated in laboratory testing. Engineering judgment must be exercised when specifying mellowing time and moisture content.

Level 3: Alternative Treatment (SC > 8000 ppm)

The recommendations for soils with sulfate concentrations above 8000 ppm are as follows:

Remove and Replace

Remove and replace the sulfate-rich soils with select fill.

Blend in Low Sulfate Materials

For soils with a PI between 15 and 35, blending in non-plastic, granular material such as sand or aggregate, can effectively reduce the plasticity and swell. If this option is chosen, the gradation of the granular material must meet the requirements in Table 1. Determine the potential vertical rise of the mixture in accordance with Tex-124-E potential vertical rise (pvr) with varying amounts of the proposed granular material blended into the sulfate-rich material. Select the amount of granular material that reduces the pvr to one inch or less, which equates to a volumetric swell of approximately 6% or less. Use Tex-117-E to verify that strength requirements are met.

Table 1: Gradation Requirements of Added Material (minimum % passing)

Sieve Size	Base	Subgrade
1-3/4 in.	100	100
3/4 in.	85	85
No. 4	--	60

No Treatment

If the pvr is one inch or less and the strength is adequate or can be addressed by increasing the thickness of the base, hotmix asphalt concrete, or concrete layers, no treatment is recommended. The use of a geogrid can aid in obtaining density on layers acting as 'working platforms' or may add some structural capacity to the subgrade, but this will not address the swelling potential of the soil, if it is an issue. Enforce strict mixing and moisture-density requirements and increase frequency of density control testing to ensure uniformity and stability.

Alternative Additives

Alternative mitigation methods and products such as ground granulated blast furnace slag (GGBFS) and lime/fly ash blends are being researched in Research Project 4240. Laboratory data obtained to date indicates promising results in reducing the swell potential of expansive soils with sulfates. Test sections are currently being constructed to obtain field validation.

Section 3
Minimally Expansive Soils or Bases (PI ≤ 15)

Soils in arid regions or in strata with small amounts of water migration can allow sulfates to accumulate. The following are guidelines for calcium-based additives for low plasticity or non-plastic soils and bases.

Sulfate Concentration ≤ 3000 ppm

Research and field experience have shown soils and bases with sulfate levels of 3000 ppm or less pose low potential for sulfate heave. Standard construction and mix design practices, as specified by the appropriate item in TxDOT's 2004 Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, can be utilized in calcium treated soils or bases with sulfate concentrations below 3000 ppm. Sulfate reaction still occurs in these types of soils, but with adequate mixing and moisture, the effects are typically not detrimental.

Sulfate Concentration > 3000 ppm

Calcium-based additives are often used in low plasticity and non-plastic materials to increase strength properties, reduce moisture susceptibility or treat physically unstable, graded soils and bases. Failures have been documented in Texas due to sulfate heave in low plastic soils treated with calcium-based modifiers. Alternatives to using calcium-based additives and still achieving improved engineering properties are as listed:

- Add non-plastic materials like sand or aggregate to achieve the desired strength or physical stability required.
- Re-analyze the pavement design to determine if structural capacity can be achieved without stabilizing the sulfate-containing material. If material stability is a problem, it may have to be enhanced by mechanical methods such as fabric or geogrid.
- Remove and replace existing material or select another source of material if new material is being is brought to the project site. This is the best method to prevent sulfate-induced heave for these types of materials.

Techniques like mellowing and moisture treatment, as discussed in the previous section for plastic soils, can be attempted but only on soils or bases with less than 8000 ppm. The soil or base material being treated must have the ability to be mixed with the calcium additive multiple times and have adequate time for the ettringite formation to occur in an uncompacted state. Once this is achieved, the mixture can be reworked, shaped, and compacted.

Chapter 6
Quality Assurance Testing During Construction

Contents:

Section 1

Detecting Sulfates in Soils

TxDOT research project 4240 has developed rapid field tests to detect sulfates in soils. These test methods provide a means for detecting concentrations on the roadway during rough and final grading as well as verification of the concentrations measured during soil exploration and used for mix design.

- Level I, Tex-146-E
  - Tex-146-E is a field method to measure soil conductivity.
  - Conductivity is an indicator of the presence of salts and can be used as a screening tool to identify potential sulfate problem areas on a project.
  - Research has found that soil with a conductivity greater than 238 micro-siemens at a 1:20 soil/water dilution ratio indicates the possibility of the presence of sulfates. If conductivities greater than 200 micro-siemens are detected, begin Level II testing.
- Level II, Tex-145-E
  - Tex-145-E is a laboratory method that will accurately quantify the portion of the conductivity results that are attributed by sulfates rather than by other salts.
  - Part I is used for quality control during construction. The total sulfate concentration up to 8000 ppm is determined by Part I.
  - Sulfate concentrations in excess of 8000 ppm require extensive time to measure and if desired, can be determined by using Part II. Part II should always be used during the pre-design, soil exploration phase in order to select the proper treatment techniques and identify treatment limits. Multiple treatment techniques may be required within the project limits.

The minimum recommended frequency for sulfate screening during construction is once per each 500 feet on alternating sides for the entire width of the roadbed and for the full depth of treatment. The more frequent the testing, the greater the accuracy will be in locating and mapping sulfate concentrations on a project. Colorimeter testing will only need to be performed in response to high results from conductivity testing. If the risk assessment and pre-design soil investigation performed prior to the project's letting indicated all sulfate concentrations in existing materials within the project limits were less than or equal to 3000 ppm, minimum sampling frequencies can be reduced.

Once a location with an undesirable sulfate concentration is identified, increase the testing frequency in proximity to the location until the boundaries of the sulfates are identified. Sulfate concentrations can occur in seams and pockets. Method of treatment, construction technique and additive percentages may need to be adjusted during construction in response to varying sulfate levels. Refer to the "Guidelines for Treatment of Sulfate Soils" chapter of this document for recommended methods of treatment and construction.

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TECHNICAL MEMORANDUM

GUIDELINES FOR STABILIZATION OF SOILS CONTAINING SULFATES

AUSTIN WHITE LIME, CHEMICAL LIME, TEXAS LIME

Purpose of This Technical Memorandum

This memorandum is prepared for members of the engineering and construction communities to establish a protocol for lime stabilization of clay soils containing soluble sulfates. It is critical to perform a thorough investigation of a site where sulfates have been identified so that a program can be devised to produce a strong, stabilized structural layer that will perform as expected for its entire design life. Any additional testing and analysis that is required can easily be justified considering the enormous expense of alternatives to lime stabilization which commonly include removal and replacement of the expansive clays or full-depth paving with an unnecessarily thick asphalt or concrete pavement section.

The memorandum presents a brief background explaining the scope of the problems associated with sulfate bearing soils when stabilized. This is followed by a practical explanation of the reactions which result in distress in sulfate soils stabilized with lime or with other calcium-based stabilizers. This practical discussion provides a basic level of understanding of the complex causes of sulfate-induced distress. This is necessary so that designers and builders will understand the reason for the protocol used in the stabilization of sulfate-bearing soils. Furthermore, this background will help to address questions posed regarding the need for more careful attention to testing, mix design, construction and quality control required when dealing with sulfate-bearing soils.

Background

In 1986 Jim Mitchell, professor of civil engineering at the University of California at Berkeley, presented a paper in the Terzaghi Lecture Series published by the American Society of Civil Engineers (ASCE). This paper addressed several interesting and rather unique geotechnical engineering problems. One of these problems was the Stewart Avenue pavement failure in Las Vegas, Nevada. The paper gained widespread notoriety because it was published by ASCE under the prestigious Terzaghi Lecture series and because it addressed unconventional and distinctive geotechnical engineering failures.

The Mitchell paper was followed by a paper by Dal Hunter also addressing the Stewart Avenue failure but with a more complete description of the chemical and mineralogical aspects. Sulfate induced problems in soils stabilized with calcium-based stabilizers such as lime, Portland cement and fly ash have been documented since the late 1950's. The mechanism has been studied by a number of highly qualified cement

chemists in an effort to understand and control sulfate attack on Portland cement concrete structures.

Basic Mechanisms of Reactions

An in-depth discussion of the complex reactions of sulfate-induced distress in stabilized soils is not within the scope of this technical memorandum. However, it is important for engineering and construction professionals to understand the fundamentals of sulfate-induced distress.

Basically four components are the culprits in sulfate-induced distress in stabilized soils: calcium, aluminum, water and sulfates. Together in the right combination these components will produce calcium-aluminate-sulfate-hydrate minerals with very large expansion potential, in some cases as high as 250%. One of these minerals is called ettringite. This mineral holds very large quantities of water within its structure. During the formation of ettringite very high swell pressures can develop, and very large volume increases can and do occur.

The formation of ettringite and similar troublesome minerals can be prevented by interrupting the supply of any one of the four components: calcium, aluminum, water or sulfate. When lime and water for construction are added to clay, the calcium is supplied by the lime, and the aluminum is released from the clay in the high pH system produced by lime and water. If the soil contains a high sulfate concentration in the form of gypsum, for example, all the ingredients with the exception of water are present for the formation of the expansive minerals. Using a low aluminate Portland cement (such as type V, sulfate-resistant cement) does not solve the problem because the source of the aluminum is not entirely the Portland cement but the soil.

There is no easy answer to the problem. Calcium is present when either lime or Portland cement are used for soil stabilization. Soils containing clay are rich with aluminum, a basic structural unit of clay. Water is necessary for compaction and for stabilization reactions and is present within pavement structures during their service life. Unfortunately, the sulfates usually cannot be efficiently or economically removed from the soil.

Factors Affecting the Reactions

A number of efforts have been made to control the reactions that result in the formation of the problematic expansive minerals. Some of these efforts have been successful, but others have not. Some are successful but economically impractical.

Presently, the best approach when dealing with lime stabilization of clay with a significant soluble sulfate content is to force the formation of the deleterious minerals

prior to compaction. If these minerals form during the mellowing period before placement and compaction, no damage will be done to the pavement. Fortunately, the expansive minerals do form relatively rapidly as long as the sulfates are soluble, the aluminum is released from the clay and adequate water is available for the formation of the minerals. The keys to success are to force the expansive mineral ettringite to form prior to placement and compaction of the pavement layer by providing adequate mellowing time (time delay between application of the stabilizer and compaction of the stabilized soil) and adequate water.

Adequate mellowing time may (practically) be as little as 24 hours or as much as 7-days, depending on the level of soluble sulfates in the soil. An adequate amount of water is typically 3 to 5 percentage points above the optimum needed to achieve maximum density during compaction. Excess water should be applied during the mellowing period, and plentiful amounts of water should be applied to the surface of the stabilized layer during curing.

Water is ***the*** most important component of the equation. Adequate water must be supplied throughout the stabilization construction process to force formation of the ettringite prior to compaction. The worst scenario would be to compact a lime-treated, sulfate-bearing clay with too little water. This is especially a problem if quicklime is used, and too little water is used to completely hydrate the quicklime. If this were the case, water entering the soil subsequent to compaction would cause development of expansive minerals in the compacted layer and produce very high and very disruptive expansive pressures. For this reason use of lime slurry is always recommended in stabilization of sulfate-bearing clays. Lime slurry provides the abundance of water and uniformity of hydration required to lower risk. In the event that slurry is unavailable, the soil should be kept at 5% over optimum during the mellowing period to solubilize the sulfates. Remember, quicklime was used at Stewart Avenue, and forensic studies showed inadequate water and poor construction techniques in many areas. The result was post-construction heave when water ultimately reached the quicklime causing hydration of the quicklime and the ensuing expansive chemical reactions.

Guidelines for Using Lime in Sulfate Bearing Soils

In an effort to assist you in recommending lime stabilization in sulfate-bearing clays, the following general recommendations are made.

Sulfate Levels Too Low to be of Concern

If the total level of soluble sulfates is below 0.3%, or 3,000 parts per million (ppm), by weight of soil, then lime stabilization should not be of significant concern. The potential for a harmful reaction is low. However, good mix design and construction practices should be followed as usual. If soluble sulfates are detectable at all, lime slurry

should be used, if possible, in lieu of dry lime and adequate water (optimum for compaction plus at least 3%) should be used for mixing.

Sulfate Levels of Moderate Risk

Total soluble sulfate levels of between 0.3% (3,000 ppm) and 0.5% (5,000 ppm) are of moderate concern. Generally, these sulfate levels do not result in harmful disruption, but on occasions have caused localized distress. Localized distress is often due to seams of higher sulfate concentration not detected in testing. The potential for some localized distress is a "fact of life" with sulfate levels in this range.

When encountering sulfate levels in the range of 0.3% to 0.5%, it is imperative to follow good mix design and good construction techniques explicitly. Special attention must be given to using excess water during mixing, mellowing and curing. Mixing water should be at least 3% to 5% above optimum for compaction. Lime slurry should be used in lieu of dry quicklime or hydrated lime.

The mellowing period should typically be at least 72-hours, but may need to be longer depending upon experience.

Sulfate Levels of Moderate to High Risk

Total soluble sulfate levels between 0.5% (5,000 ppm) and 0.8% (8,000 ppm) represent moderate to high risk. These soils can and have been successfully treated but require very close attention to construction technique. Generally, the same mix design and construction guidelines as described for soils containing sulfate levels between 0.3% and 0.5% should be followed. However, before treating these soils with lime laboratory testing to determine swell potential is recommended. This testing will not only establish the approximate amount of swell but also will help establish the required period of mellowing between mixing and compaction.

Sulfate Levels of High and Unacceptable Risk

Total soluble sulfate levels of greater than 0.8% (8,000 ppm) are generally of high risk to stabilize with lime. In certain situations, such soils have been successfully treated. However, the risk is generally too high for routine work. If such soils are to be treated, it should only be done following laboratory testing and by an experienced contractor, well-schooled in lime stabilization of high sulfate soils.

Treatment of such high sulfate soils requires lime slurry, mixing, mellowing, curing water contents of 3% to 5% above optimum for compaction and may require an extended mellowing period of longer than 72-hours. The required mellowing period may be as long as 7-days during which monitoring of density is recommended. Double application techniques (discussed below) may be effective in successfully treating high sulfate soils.

Soils with total soluble sulfate contents greater than 1.0% (10,000 ppm) generally are not suitable for lime stabilization because of the high risk of sulfate-induced disruption and failure. However, such concentrations often exist as seams on a project as opposed to being evenly distributed throughout a site. If the seams can be characterized using tools such as the field electrical conductivity test, detailed in Appendix C, then strategies such as removal or blending may be employed to diminish the sulfate concentrations.

Reducing Sulfates to an Acceptable Level

Evaluation of several projects that have experienced swelling problems related to elevated levels of sulfates suggests that it is seams of especially high concentration that contribute the most to pavement failures. If consistent (homogeneous) levels of sulfates exist throughout a project they can be dealt with using a variety of strategies. If, on the other hand, seams of unusually high concentrations are present they may migrate laterally as water enters the subgrade over the project's life to stable areas where, in the presence of water, calcium, and alumina ettringite may form. A practical difficulty in the field has been to identify the locations of sulfate seams so that they can be removed or diluted. A quick and easy test has been developed at the Texas Transportation Institute to reduce that problem by measuring the electrical conductivity of the soil. That test is described in more detail in Appendix C of this memorandum.

Seams containing high concentrations of sulfates are often localized on a project site. If they can be accurately characterized they may either be removed or dispersed throughout the project, diluting the total sulfate concentration to an acceptable level and homogeneity. An excellent example of sulfates being blended to a benign level occurred during the construction of the Denver International Airport. The sulfates on that project ranged higher than 3% in several areas. The high sulfates at the Denver International Airport were blended into lower sulfate areas to create a homogeneous soil throughout the project. The soil was then treated by pre-wetting and a progressive, or double, application of lime that included a mellowing period to allow ettringite to form prior to the final application of lime. The lime stabilization strategy was successful and stands as a testimonial to the marriage of sound engineering and quality construction practices.

Progressive (Double) Application of Lime

In certain situations a progressive (double) application of lime is effective in reducing heave potential and in providing successful long-term stabilization. Double mixing is obviously more expensive and, therefore, must be cost effective. Double mixing uses one-half the required lime initially. The soil, excess water and lime are then mixed followed by a mellowing period of from 72-hours to about 7-days. The purpose of the long mellowing period is to allow time for expansive reactions prior to compaction. Then

the second lime treatment is applied (the other half of the required lime is used). The lime-soil mixture is then compacted. Double treatment does not mean twice the amount of lime. It means that the same amount of lime is added in two increments. This technique should be thoroughly evaluated through laboratory testing of site-specific soils to establish appropriate lime application amounts, mellowing times, etc. before proceeding with field construction.

How to Get a "Handle" on Whether or Not Sulfates May Be of Concern

The only "fool proof" way to know whether or not sulfates will be a problem is to test the soil for sulfates. This is done by sampling the soil at enough locations and at the appropriate depths to reasonably assess the level and extent of sulfates.

Quantitative sulfate testing requires the extraction of sulfates from the soil. This is done by solubilizing the sulfates in water, followed by quantitative measurement. Since sulfate salts, such as gypsum (calcium sulfate), have specific levels of solubility, the amount of sulfate extracted from the soil is determined by the type of sulfates present and amount of water added. Therefore, 10 parts water to 1 part soil will result in more solubilized sulfates than 3 parts water to 1 part soil, especially at higher sulfate contents. Experience has shown that an extraction protocol using 10 parts water to 1 part soil is the best for evaluating potential problems resulting from sulfate reactions. This also allows better comparison with most of the test data developed in related research efforts to date. ***Note that the sulfate levels and associated treatment guidelines provided in this document are based on the 10 parts water to 1 part soil testing ratio and may not be applicable to other water:soil ratios.***

Sulfates soluble in water are measured in parts per million (ppm) and often expressed either in ppm or percent. 10,000 ppm are equivalent to 1.0%. Therefore, 3,000 ppm are equivalent to 0.3% and 5,000 ppm to 0.5%, etc. The soluble sulfate content should be reported on a ***dry soil basis*** to insure consistency of test results. Soluble sulfates should be extracted from the soil using 10 parts distilled water to 1 part soil. Test method Tex-620-J (appendix A) prepared by the Texas Department of Transportation is recommended. Any of several quantitative methods (barium precipitation, ion chromatography, etc.) may be effectively used to measure the water solubilized sulfates. Again, the important thing to remember is that the water:soil ratio used in preparation of the solution will control the amount of sulfates solubilized and measured by any of these methods, and that guidelines presented here are based on 10:1 extractions.

In testing for sulfates, it is important to remember that sulfates often are present in concentrated areas and may not be uniformly distributed. Seams or veins of sulfates are common. It is also important to realize that sulfates tend to concentrate at a certain depth below the surface of the soil. This depth of concentration is dependent on the climatic conditions of the area or region. In Texas, this depth is often three to six feet (about one to two meters) below the surface.

Sulfates typically are concentrated nearer the surface in drier, western regions. As we move eastward into wetter and more humid climates, the general rule is that sulfates, if present, tend to concentrate at lower depths.

Probably the most beneficial and reliable preliminary tool for assessing the presence and significance of sulfates within an area is the United States Department of Agriculture's County Soils Report. A report is available for every county in the United States and can be obtained from the Soil Conservation Service, a County Agent or the State land grant university. The soils report provides an abundance of engineering information conveniently tabulated. There is also a discussion of each soil series within the county and a discussion of the soil profile. This discussion will generally identify the presence of gypsum and other sulfate salts and the depth of significant concentrations, if any. This is an extremely valuable reconnaissance tool. Keep in mind that it is very important not only to identify the presence of sulfates but also the depth of occurrence. For example, a soil may be essentially sulfate free in the upper two or three feet (0.67 to 1.0 meters) but have sulfate concentrations at a depth of 6 feet (approximately 2 meters). In this case, sulfates would not be of concern during normal surface stabilization operations but could be of concern in cut and fill areas.

Required Testing and Frequency of Testing

The best approach in checking for sulfates is to ask the county agent where sulfates typically occur and at what depth to expect significant concentrations. It is also wise to buy or check out a County Soil Report. You can locate the construction job of interest to you on the aerial photographs of the county in the back of the report. From these photos the soil series in the area can be identified. Pertinent information on each soil series in presented in the discussion section and in the tabulated agricultural and engineering data for each soil.

If sulfates are present and identified in the County Soils Report, a field testing plan should be established with the geotechnical engineer. The frequency of testing depends on the level of sulfates present and the geological information for the region. If initial testing confirms the presence of sulfates in concentrations that may present problems, additional testing using the conductivity process may be warranted. The conductivity procedure and equipment are described in Appendix C.

If total soluble sulfate levels are above 0.5%, tests to determine the degree of expansion that may occur should be performed. These tests require monitoring the vertical and circumferential swell on compacted lime-soil cylinders (see appendix B). The cylinders are subjected to water by placing them on porous stones, surrounding them with absorptive towels and allowing the samples to take on water for at least 30 days or until swell levels off. The measured circumferential and vertical swells are then compared to criteria established by the engineer. If total soluble sulfate levels exceed 0.8%, this type of testing should be mandatory.

Addressing and Countering Inaccurate and Misleading Assertions

Probably the most common misconception is that ***lime is the only stabilizer that causes sulfate-induced heave***. The fact is that any calcium-based stabilizer has the potential to cause heave in sulfate-bearing soils. Not only lime but also Portland cement and type C fly ash are sources of calcium. In fact the Portland Cement Association (PCA) promotes the concept that lime results from the hydration of Portland cement and is available for soil stabilization. Many cases have been documented of sulfate-induced heave or damage in cement- and fly ash-stabilized soils. Indeed some fly ashes high in sulfates have been the source of the distress.

Another common assertion is that ***sulfate resistant Portland cement can be used to effectively stabilize sulfate-bearing clays without the fear of deleterious reactions***. This claim is not true. Sulfate resistant Portland cement was developed to resist the attack of sulfate-bearing water on concrete. Sulfate-bearing water will react with calcium and aluminum in the concrete to form the expansive ettringite mineral in the hardened concrete causing cracking and degradation of the concrete. Cement chemistry researchers found low-aluminum cement to be effective in reducing the expansive reaction. This is logical as one of the components of ettringite has been reduced - aluminum.

However, this approach does not work in soil stabilization because clay is a source of abundant quantities of aluminum. Therefore, using a low aluminum cement is a moot point.

An assertion of some credibility is that ***low calcium fly ashes will minimize heave potential.*** The problem with this statement is that low calcium ashes are low in the component that is the key to stabilization of clay soils - available calcium. Low calcium fly ash is primarily a pozzolan - a finely divided source of silicates and aluminates that has the potential to develop cementitious properties in the presence of water and lime. Clay is also a pozzolan. Therefore, adding pozzolans to pozzolans without the key ingredient, calcium, is poor engineering judgement. In other words, adding low calcium ash to a clay may not induce heave, but neither is it an effective stabilizer of the clay.

APPENDIX A

TEXAS DEPARTMENT OF TRANSPORTATION

TEST METHOD TEX-620-J
DETERMINING CHLORIDE AND SULFATE CONTENT IN SOILS

TEST METHOD TEX-619-J
ANALYSIS OF WATER FOR CHLORIDE AND SULFATE IONS

DETERMINING CHLORIDE AND SULFATE CONTENT IN SOILS

This method describes how to determine the chloride and sulfate content in soil.

Apparatus

Balance, calibrated to weigh to nearest 0.1 g (0.004 oz.)

Balance, calibrated to weigh to nearest 0.0005 g (0.00002 oz.)

Sieves, U.S. Standard 4.75 mm (No. 4) and 425 µm (No. 40)

Pulverizer and Crusher

Oven, capable of maintaining a temperature of 60 ± 5 °C (140 ± 9 °F)

Beakers - 400 mL (13.5 oz.)

Stirring rod

Hot Plate

Funnels

Whatman #42 filter paper, 185 mm (7.4 in.) (round)

Wash bottle

Volumetric Flask - 500 mL (15 oz.)

Pipette.

Reagents

Dilute Silver Nitrate Solution

Sample Preparation

Step	Action
1	Obtain 300 g (10.5 oz.) representative sample when material top size is smaller than 4.75 mm (No. 4).
2	Pulverize the 300 g (10.5 oz.) to pass the 425 µm (No. 40) sieve.
3	Weigh to the nearest 0.1 g (0.004 oz.)
4	If material top size is larger than 4.75 mm (No. 4) , obtain approximately 3000 g (105 oz.) representative sample and crush/grind to pass the 4.75 mm (No. 4) sieve.
5	Obtain 300 g (10.5 oz.) representative sample of the minus 4.75 mm (No. 4) material.
6	Pulverize the 300 g (10.5 oz.) to pass the 425µm (No. 40) sieve.
7	Weigh to the nearest 0.1 g (0.004 oz.).
8	Dry the sample in a 60 ± 5 °C (140 ± 9 °F) oven and cool to 25 ± 3 °C (77 ± 5°F) in a desiccator to constant weight.

Procedure

Step	Action
1	Weigh 30 g (1.05 oz.) of the sample material into a 400 mL (14 oz.) tall form beaker and add 300 mL (10.5 oz.) of deionized water.
2	Place the beaker on a hot plate and heat to near boiling for 24 hours.
3	Stir the sample into solution occasionally throughout the 24 hours and keep the beaker covered with a watch glass.
4	At the end of the 24 hour digestion period filter the sample through a No. 42 Whatman filter and wash with hot water until filtrate is free of chlorides. **NOTE:** Test the filtrate for chloride by adding 1 to 2 drops of filtrate from the funnel to a dilute silver nitrate solution. Any turbidity indicates chlorides present.
5	Pipette an Aliquot from the filtrate and determine the sulfate and chloride content according to Tex-619-J.
6	Calculate the sulfate and chloride contents: $Cl = \frac{\text{Normality } AgNO_3 \times 3.5453 \times \text{mL of } AgNO_3 \times \text{Aliquot} \times 10000}{\text{Sample Weight}} = \text{ppm}$ $SO_4 = \frac{41.15 \times \text{Wt. of Residue} \times \text{Aliquot} \times 10000}{\text{Sample Weight}} = \text{ppm}$

ANALYSIS OF WATER FOR CHLORIDE AND SULFATE IONS

This method covers the calculation of chloride and sulfate ions in water to determine its suitability for concrete, sprinkling or similar uses. Interferences and methods of treating them may be found in ASTM D512 (Method B) for chloride and ASTM D516 (Method A) for sulfate.

Apparatus

Muffle furnace, 427 to 593 °C (800 to 1,100 °F)
Oven, 100 °C (212 °F)
Balance, analytical
Magnetic stirrer
Desiccator
Hot Plate
Meeker burner
Filter papers, No. 2 and No. 42 Whatman or equals
pH paper, range 8 to 9
Platinum crucible
Volumetric flask 500 mL (15 oz.)
Beaker, 200 mL (6 oz.) tall form
Beaker, 250 mL (7.5 oz)
Buret, 50 mL (1.5 oz.)
Graduated cylinder, 25 mL (0.75 oz.)
Filter Funnel
Wash Bottle.

Reagents

All reagents must be ACS reagent grade. Use deionized or distilled water to prepare solutions.

Silver Nitrate Solution, 0.1 Normal. Standardize against a sodium chloride solution of known concentration

Potassium Chromate Indicator Solution. Dissolve 50 g (1.75 oz.) of potassium chromate (K_2CrO_4) in 100 mL (3 oz.) of water

Nitric Acid (1 + 19). Mix 1 volume of concentrated nitric acid (70% by wt) with 19 volumes of water

Sodium Hydroxide Solution (1 g/l). Dissolve 1 g (0.03 oz.) of sodium hydroxide (NaOH, pellet form) in water and dilute to 100 mL (3 oz.)

Barium Chloride Solution, 10%. Dissolve 10 g (0.03 oz.) of barium chloride ($BaCl_2 2H_2O$) in 90 mL (2.7 oz.) of water

Hydrochloric Acid. Concentrated hydrochloric acid (HCL) (37% by wt.)

Procedure

Sample Preparation

Step	Action
1	Filter 500 mL (15 oz.) of the as-received water sample into a 500 mL (15 oz.) volumetric flask using a No. 2 Whatman filter paper.
2	Weigh 50 g (1.75 oz.), to the nearest milligram, of the filtered sample into a 200 mL (6 oz.) tall bottom beaker.
3	Adjust the sample pH to between 8 and 9 using nitric acid or sodium hydroxide solution.
4	Add 11 drops of the potassium chromate indicator and titrate using the silver nitrate solution in a 25 mL (0.75 oz.) buret.
5	The end-point is reached when a brick-red color persists throughout the sample.
6	Determine the chloride ion concentration (weight percent) as follows: $\% \text{ Chloride} = 3.545 VN/S$ Where: V = mL of silver nitrate solution N = normality of silver nitrate solution S = sample weight, grams (ounces)

Procedure (continued)

- Sulfate Ion Determination

Step	Action
1	Weigh 80 g (2.8 oz.), to the nearest milligram, of the filtered sample into a 250 mL (7.5 oz.) beaker.
2	Add 10 mL (0.34 oz.) of concentrated hydrochloric acid to the sample.
3	Heat to near boiling.
4	Add 25 mL (0.75 oz.) of barium chloride solution and heat again for 10 minutes.
5	Remove from the hot plate and let cool for 15 minutes.
6	Filter through a No. 42 filter paper and wash the precipitate with hot water until the washings are free of chlorides, as indicated by testing the washings with silver nitrate.
7	Place the filter paper and precipitate in a weighed platinum crucible and dry in a 100 °C (212°F) oven for 1 hour.
8	Remove crucible from oven and slowly char the paper to a white ash using a Meeker burner.
9	Place the crucible and residue into the muffle furnace for 1 hour.
10	Cool in a desiccator and weigh.
11	Determine the concentration of sulfate: % Sulfate = 41.15 R/S Where: R = residue weight, grams (ounces) S = sample weight, grams (ounces)

APPENDIX B

SIMPLIFIED SWELL TEST

Materials Required

1. Compaction mold and compaction equipment to meet ASTM D 698 or D 1557.
2. Calipers to measure vertical height and diametral width of the compacted sample.
3. Porous stone, water reservoir and absorbent fabric to transmit water to soil.

Testing Procedure

1. Compact two replicate samples at 100% and 95% of the required compaction energies (i.e., ASTM D 698 or ASTM D 1557 or Tex-113a).

2. Immediately after compaction, place the sample on a porous stone in a water reservoir with the water level even with the top of the porous stone.

3. Place a absorbent fabric around the circumference of the samples with the bottom 25-mm of the fabric below the top of the water reservoir so that the fabric can "wick" water to the circumference of the sample. The samples are placed in a 25^{o}C temperature environment for 7-days. Vertical height and diametral dimensions are recorded at the end of each day. Six diametral measurements are made: two at 25-mm below the surface, two at the mid-height and two at 25-mm above the base. The diametral dimensions are recorded at approximately 90^{o} from one another. Measure the vertical height at two random points.

4. After 7-days the samples are carefully placed in a 12^{o}C (plus or minus one degree) temperature room for an additional 21-days or until swell stops.

Calculations and Presentation of Data

1. Calculate the average of the diametral dimension measurements (average of six) after sample fabrication and the average of the vertical height after sample fabrication. Use these values as datum values.

2. Calculate average diametral and vertical measurements at the end of each day. Calculate the percentage of change in diametral measurement as the ratio of the average diametral measurement divided by the diametral datum multiplied by 100%. Calculate the percentage change in vertical measurement as the ratio of the average vertical height divided to the vertical height datum multiplied by 100%.

3. Plot the data as % diametral and vertical dimension (ordinate) change versus time (abscissa) for a 28-day period or until swell ceases to occur.

APPENDIX C

Electrical Conductivity Test

This test was developed at the Texas Transportation Institute (TTI) by Sanet Bredenkamp and Robert L. Lytton. It is described in detail in Research Report 1994-5, **Reduction of Sulfate Swell in Expansive Clay Subgrade in the Dallas District**. The report sets forth a method by which sulfate content in the soil as well as its probable expansion can be estimated using the conductivity test. That method remains to be confirmed through comprehensive field tests at this time and is not included here. The **Electrical Conductivity Test** can, however, identify the presence of soluble salts in the soil rapidly and simply. The salts that are identified may or may not be sulfates, so additional tests need to be run to assess both the type of salt and the level of concentration. Because the test is inexpensive and quick it may be used to identify the boundaries of high sulfate seams to assist in formulating a strategy for dealing with them. The following procedures are taken directly from the report which is available from the National Technical Information Service (NTIS - www.ntis.gov). The reference number is PB96-136007INZ.

Materials Required

1. Wide mouth plastic containers with water-proof lids.
2. Distilled water.
3. Battery driven digital scale that can measure up to 500g.
4. Hand held conductivity meter.
5. Calibration solutions for the conductivity meter.

Note: according to the Bredenkamp/Lytton Report the cost of materials is less than $600.

Testing Procedure

1. Find the location where the sulfate test is to be performed and usn an auger to obtain two small soil samples at approximately 10 and 20 cm below the soil surface. Only 5 grams of soil is needed to perform the test.
2. Weigh approximately 5 g of each soil sample into two separate plastic containers. If the soil is wet, break lumps apart and leave the soil to air-dry for 1 to 2 hours. Record the exact dry weight of the samples.
3. Add distilled water with a mass of exactly 20 times the dry weight of the soil sample to the dry sample. Tightly close the lid of the plastic container and shake vigorously until the soil dissolves and forms a homogeneous solution.
4. Calibrate the conductivity meter as described in the instruction manual accompanying the device.
5. Take conductivity measurements on each soil:water mixture and record the data in milli Siemens (mS). Note: 1 uS = 0.001 mS. The experience of the authors of the study indicates that mixtures with a conductivity > 8 mS have a potential to cause a problem.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

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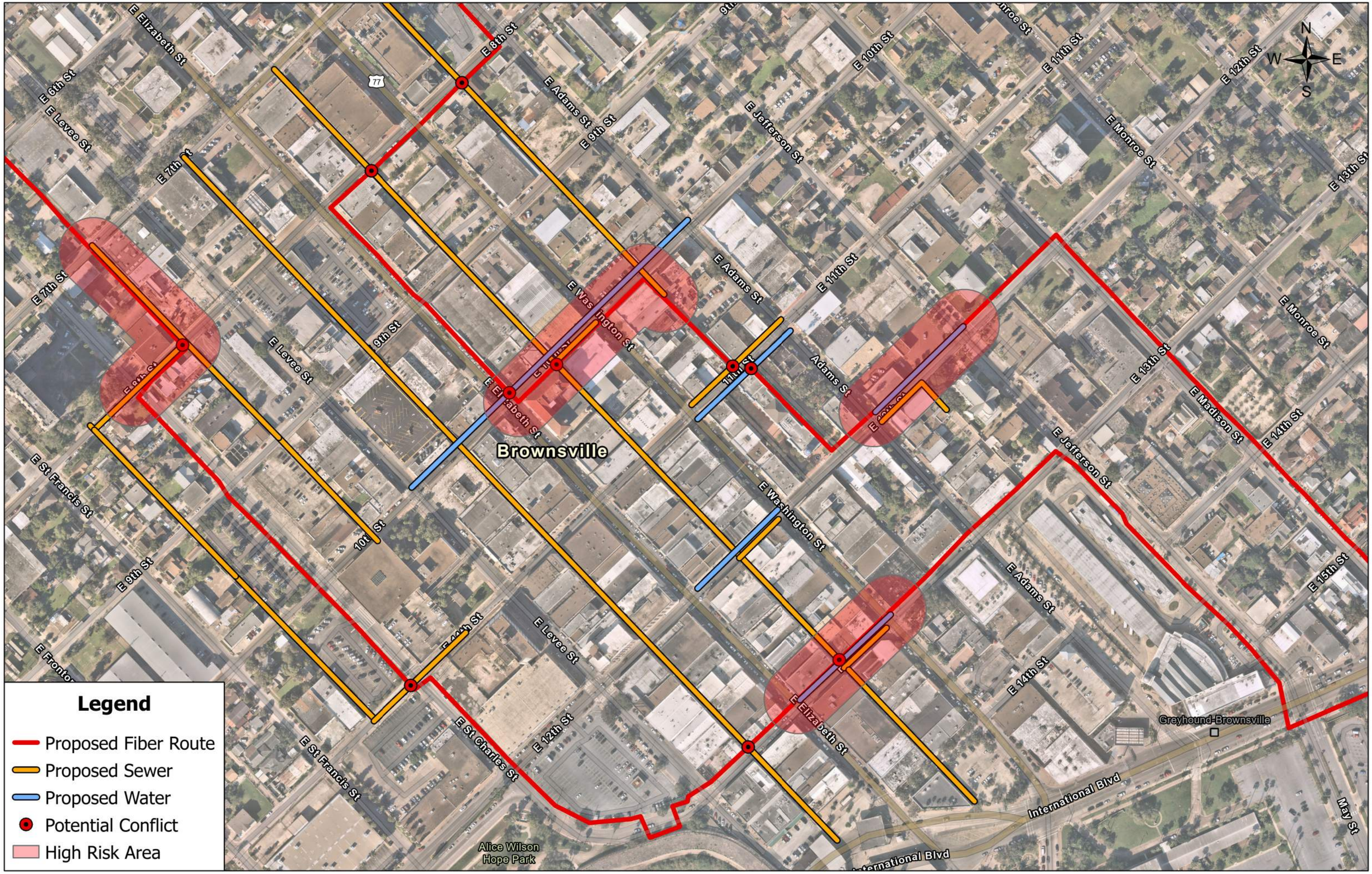
Appendix **B**: Potential Fiber Optic Conflicts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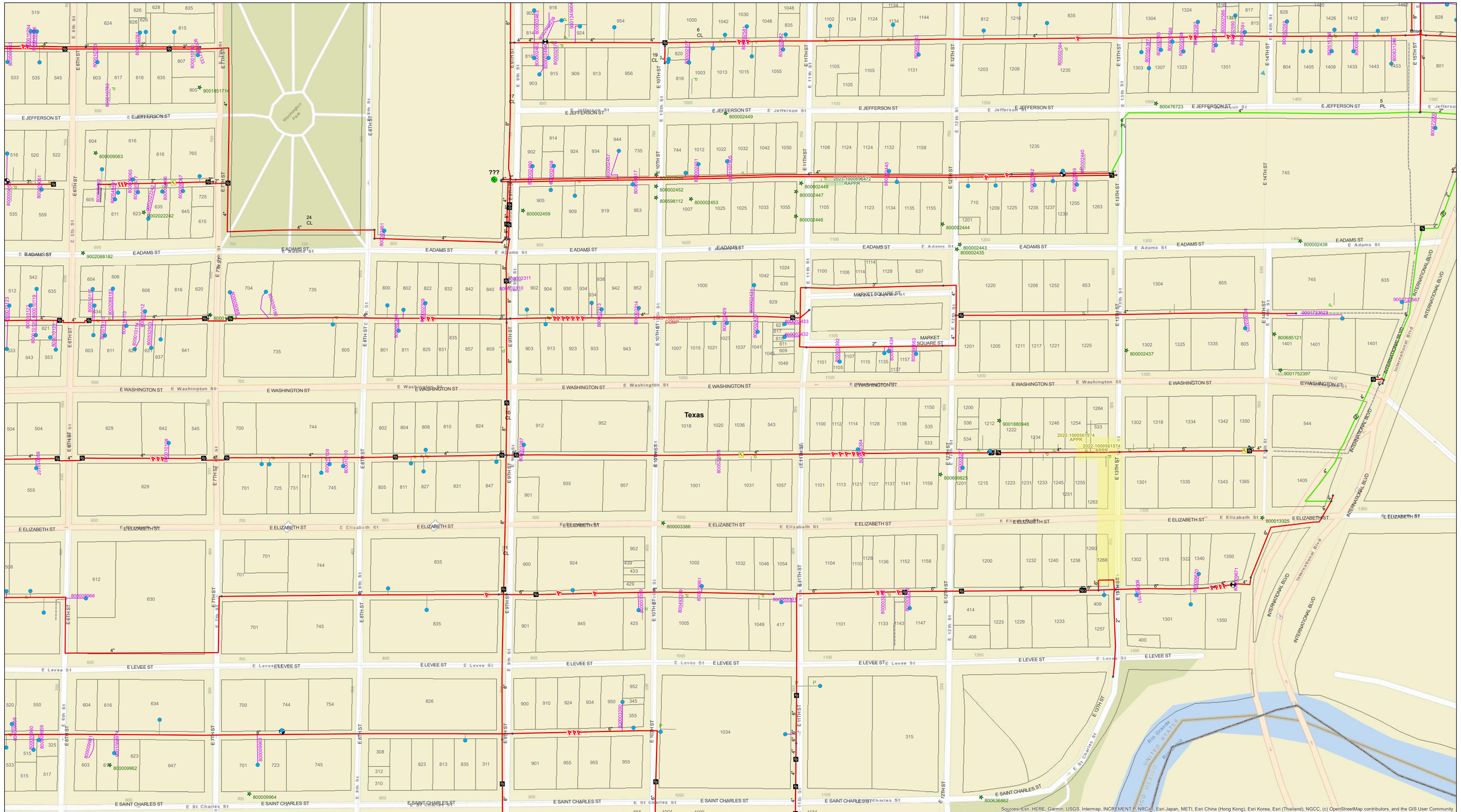
E 13th St
E Washington St
9th St
Brownsville
E St Francis St
10th St
E 14th St
E St Charles St
E Madison St
E 15th St
Greyhound-Brownsville
International Blvd
May St
Alice Wilson Hope Park
Legend
Proposed Fiber Route
Proposed Sewer
Proposed Water
Potential Conflict
High Risk Area

Appendix C: As-built Data



Legend

Label Only

Service Point

Short Stop

Three-Way Tee

Insulated Coupling

Coupling

Other

Gas Valve- Emergency

Operating Classification

- Emergency Valve
- Non-Emergency Valve
- Regulator Station
- Town Border Station
- Locate Station
- Test Point
- Anode
- Rectifier
- Bond Junction
- GroundBed
- Bond Wire
- Rectifier Cable
- Casing
- Insertion

Distribution Main by Material

Pipe Material

- Bare Steel
- Coated Steel
- PE
- ABS
- Cast Iron
- Copper
- PVC
- Wrought Iron
- Abandoned Main
- Transmission
- HPD
- Production
- Line Name

Service Line by Status

- Invalid/Other Status

Status

- Decommissioned
- Operating
- Pending

Sync Status

- New Asset

Service Line - Pending Decommission

- Null Offset

Service Line Offset

- Offset - Potentially Active, Pending Decommission; YES
- Potentially Active, Pending Decommission; NO; NO ; no
- Abandoned Service Line
- Utility Easement
- Street Centerlines
- Parcel Boundary
- State

0 100 200 Feet

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