BROWNSVILLE
PUBLIC UTILITIES BOARD

Contract Documents
&
Technical Specifications

For

16-INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD

Bid No.: B084-25

Marie C. Leal, P.E.
8/29/2025

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LEGAL NOTICE
AND
INVITATION TO BID
B084-25

Sealed bids will be received by the PUBLIC UTILITIES BOARD of the City of Brownsville, Texas ("BPUB"), at the PUB Purchasing Department office; 1155 FM 511, Olmito, Texas 78575 **until 2:00 PM, September 24, 2025** for the Project described in the Contract Documents and Specifications entitled:

16-INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD

Bids received after this time will not be considered.

Bids will be publicly opened and read aloud on September 24, 2025 at 2:15PM.
Bidders can request a copy of the bid tabulation by emailing dsolitaire@brownsville-pub.com.
Vendors can call in at 2:15 PM, September 24, 2025 to (956) 214-6020 to listen to the bid opening.

Copies of the Contract Documents and Specifications may be obtained at following website: https://www.brownsville-pub.com/rfp_status/open/.

Each bid, in duplicate, shall be enclosed in a sealed envelope and shall be plainly marked on the outside of the envelope: **"B084-25 16-INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD, September 24, 2025, 2:00 PM".** This envelope shall be addressed to Diane Solitaire; Brownsville Public Utilities Board; Purchasing Department; 1155 FM 511, Olmito, Texas 78575.

Each bid shall constitute an offer to the Board, as outlined therein, and shall be irrevocable for at least ninety (90) 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 may be submitted in an amount not less than five (5%) percent of the total amount bid with a Corporate Surety licensed to do business in the State of Texas, 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 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) 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.

Diane Solitaire
Purchasing Department
(956) 983-6366

INSTRUCTIONS TO BIDDERS

Please submit this page upon receipt

Acknowledgment Form

16-INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD

B084-25

For any clarifications, please contact Diane Solitaire at the Brownsville Public Utilities Board, Purchasing Department at (956) 983-6366 or e-mail: dsolitaire@brownsville-pub.com

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: _____

( ) 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**

Questions concerning terms, conditions, and technical specifications should be directed to:

Diane Solitaire, Purchasing & Materials Manager
Email: dsolitaire@brownsville-pub.com

- **Tentative Time Line**

1. September 08, 2025 through September 24, 2025 – Vendor bid preparation.
2. September 24, 2025 at 2:00 PM - **Vendor must submit bid, in duplicate, sealed in an envelope to:**

Diane Solitaire, Purchasing & Materials Manager
1155 FM 511
Olmito, TX 78575

B084-25 – **16-INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD**
Due September 24, 2025 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.

1. September 15, 2025 – Last Day for Questions
2. September 24, 2025 - Open bids at 2:15 PM
3. September 24-26, 2025 - Evaluate bids
4. September 26, 2025 - Deadline to provide final recommendations for Board approval.
5. October 13, 2025 - Send to Utilities Board for formal and possible Contract award approval

- **"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

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, subcontractors, 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 1220, 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 1220. **The W9 or W8 form must be included with bid response.** Attached are sample forms.

- **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 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.

- **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 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 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-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 Fourteen (14) calendar days written notice; for cause: 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 for BPUB's convenience.

- **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 **"16- INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD."**

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) 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. Visits to the Project site shall be arranged by calling Marie C. Leal, P.E. at telephone no. (956) 983-6275.

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 ribbon, 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 address. The BIDDER's 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 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 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, will be rejected. Satisfactory evidence of the 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, his 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:

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 pro-rata 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 non-responsive. The special attention of all BIDDERS is called to this provision, for should conditions make it necessary to revise the quantities, no limit will be fixed for such increased or decreased quantities nor extra compensation 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 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) 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.

Any interpretation, correction, or change of the bid documents will be made by ADDENDUM only. Changes or corrections will only 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 Purchasing Department prior to submitting a response to the bid to ascertain if any Addenda have been issued, and to obtain any all Addenda, execute them, and return Addenda with the response to the bid. All Addenda so issued shall become part of the Contract Documents. Addenda may be posted on BPUB’s webpage.

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 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 may be present, in person or by representative.

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 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.

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 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 to commence Work on the date to be specified in a written "Notice to Proceed" issued by the OWNER and to Substantially Complete the Project as provided in Article 2 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 2.

17. NOTICE OF SPECIAL CONDITIONS:

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

A. Inspection and testing of materials.
B. Insurance requirements.
C. Wage and Hour Provisions.
D. State Sales and Use Tax Exemption Provisions

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 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, sexual preference, physically challenging condition or national origin.

20. PRE-BID CONFERENCE: (RESERVED)

A pre-bid 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. Interested parties are invited to attend. Attendance at the Pre-Bid Conference is not mandatory, but is recommended for all contractors and suppliers interested in bidding the Work for the Project.

21. SUBMITTAL OF TRENCH SAFETY DESIGN: (RESERVED)

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 21 calendar days after the date of the opening of Bids prior to award of the Contract. Failure to timely comply may disqualify BIDDER.

22. INFORMATION TO BE SUBMITTED WITH BID:

Each BIDDER shall submit with his bid pertinent information concerning proposed equipment and materials and proposed construction organization.

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 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 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: (RESERVED)

Each BIDDER shall be responsible for determining prior to bidding, the types of subsurface materials which will be found in the event that any new footings and upright structural supports for the Project are required. 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.

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 storm water 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.

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 to 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 these Specifications 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 Conditions Section entitled "Wage and Labor Standard Provisions - 100% Non-Federally Funded Construction." Copies of the wage rate schedule(s) are included herein, but the responsibility for initial posting and keeping same posted, rests upon the BIDDER.

30. 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, 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, after August 14, 1991, 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.

BID
B084-25
Place: BPUB Purchasing Department
1155 FM 511, Olmito, TX 78575
Due Date: September 24, 2025 at 2:00 PM

Bid of _____ hereinafter called "BIDDER," a _____ (insert type of legal entity e.g. corporation, partnership, individual with d/b/a, etc.) organized and existing under the laws of the State of _____.

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

Gentlemen:

The undersigned BIDDER, in compliance with your Invitation to Bid for the 16-INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD, having read and examined the Plans and Specifications with related 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 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.

BIDDER agrees to perform all Work for which he contracts as described in the Plans and Specifications for the unit prices and/or lump sums shown on the attached Bid Schedule.

BID SCHEDULE
BASE BID – B084-25
BROWNSVILLE PUBLIC UTILITIES BOARD

The Bidder, in compliance with the Invitation for Bids for the 16-INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD , having examined the scope of work and written Specifications, hereby proposes to furnish construction services for the following Unit prices and lump sums.

Items	DESCRIPTION (Write Unit Price in Words)	Est. Qty.	Unit	Unit Price	Costs
1	Mobilization and Demobilization (Not to Exceed 5% of Total Bid) for _____ Dollars and _____ Cents	1	LS	$	$
2	Furnish and Install 16-inch PVC AWWA C-900 DR-18. Complete In-Place for _____Dollars and_____Cents	700	LF	$	$
3	Furnish and Install 16-inch waterline tie-in (including adapter fitting, concrete encasement, and all incidental labor, materials, and equipment). Complete In-Place for _____Dollars and_____Cents	2	EA	$	$
4	Furnish and Install 16-inch 45 deg. Bend. Complete In-Place for _____Dollars and_____Cents	2	EA	$	$

5	Furnish and Install 16-inch 90 deg. Bend. Complete In-Place for _____Dollars and_____Cents	4	EA	$	$
6	Install New 24-Inch Steel Casing (incl. all appurtenances necessary to complete the work). Complete In-Place for _____Dollars and_____Cents	15	LF	$	$
7	Furnish and Install Fire Hydrant and Assembly, including 6-inch valve, all labor and materials. Complete In-Place for _____Dollars and_____Cents	1	EA	$	$
8	Remove and Replace Concrete Sidewalk with New Concrete Sidewalk Meeting ADA Standards. Complete In-Place for _____Dollars and_____Cents	1643	SF	$	$
9	Remove and Replace Concrete Apron with New Concrete Apron Meeting ADA Standards. Complete In-Place for _____Dollars and_____Cents	278	SF	$	$

10	Furnish and Install Dewatering as Needed throughout the Project. Complete In-Place for _____Dollars and_____Cents	1	LS	$	$
11	Traffic Control Plan (Engineered, Signed, and Sealed). Complete In-Place for _____Dollars and_____Cents	1	LS	$	$
12	Traffic Control System (Barricades, signs, and traffic handling). Complete In-Place for _____Dollars and_____Cents	1	LS	$	$
13	Trench Excavation and Shoring Safety System. Complete In-Place for _____Dollars and_____Cents	700	LF	$	$
14	Mandatory Contingency Amount by Owner	1	LS	$ 18,000.00	$ 18,000.00

TOTAL BID AMOUNT (ITEMS 1-14):

TOTAL BID AMOUNT (ITEMS 1-14) WRITTEN IN WORDS

TOTAL AMOUNT OF BID (ITEMS 1-14): $_____

_____

(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%) 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 shown in words will govern.

The above unit prices shall include all labor, materials, excavation, bailing, 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.

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 parties 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) 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 TEXAS §

KNOW ALL MEN BY THESE PRESENTS:

COUNTY OF CAMERON §

THAT WE, the undersigned, _____ _____ as Principal, and _____ as Surety, are hereby held and firmly bound unto the PUBLIC UTILITIES BOARD OF THE CITY OF BROWNSVILLE, TEXAS as OWNER in liquidated damages (not as a penalty) 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 16-INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD.

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 Agreement attached hereto (properly completed in accordance with said BID) and shall furnish payment and performance bonds for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall furnish insurance certificates, and shall in all other respects perform the agreement created by the acceptance of said BID, then this obligation shall be void. Otherwise the same shall remain in 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 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 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 proper 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 listed as approved federal sureties in the most recently issued (as of the date of legal notice) edition of the U. S. Treasury Circular 570.

CONTRACTOR'S

PRE-BID DISCLOSURE STATEMENT

All questions must be answered or your bid will 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 information he desires, so long as that information does not constitute a condition, qualification or exception to the Bid Submittal.

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 Subcontractor _____.

4. What projects has your organization completed within the last five (5) years? 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 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 suppliers or manufacturers for all major items of material and/or equipment within the price totals 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 the 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 questions must be answered or the general contractor's bid will 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 subcontractor may submit any additional 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 Subcontractor _____.

4. Have you ever previously worked as a subcontractor for this general contractor?
__Yes___No; If yes, list the three most recent projects in which your company has served as a subcontractor to this general contractor.

_____
_____
_____

5. What projects has your organization completed within the last five (5) years? 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 finding 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 prices 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 the Engineer and 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: _____

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	☐	☐
	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 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, PROCEEDING, COSTS, DAMAGES, AND LIABILITIES, ARISING OUT OF, CONNECTED WITH, OR RESULTING FROM ANY 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.

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

Name of Entity:_____

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 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 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.

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

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

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

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

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

OFFICE USE ONLY

Date Received

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

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

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

_____
Name of Officer

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

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

☐ Yes ☐ No

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

☐ Yes ☐ No

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

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

7

_____ _____
Signature of vendor doing business with the governmental entity Date

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 Art. 601g, as passed by the 1985 Texas Legislature, the following will apply. The pertinent portion of the Act has been extracted and is as follows:

Section 1. (a)

(1) "Nonresident bidder" means a bidder whose principal place of business is not in this state, but excludes a contractor whose ultimate parent company or majority owner has its principal place of business in this state.

(2) "Texas resident bidder " means a bidder whose principal place of business is in this state, and includes a contractor whose ultimate parent company or majority owner has its principal place of business in this state.

Section 1. (b)

The state or governmental agency of the state may not award a contract for general construction, improvements, services, or public works projects or purchases of supplies, materials or equipment to a nonresident bidder unless the nonresident's bid is lower than the lowest bid submitted by a responsible Texas resident bidder by the same amount that a Texas resident bidder would be required to underbid a nonresident bidder to obtain a comparable contract in the state in which the nonresident's principal place of business is located.

I certify that_____(Company Name) is **a resident Texas bidder** as defined in Art. 601g.

Signature: _____

Print Name: _____

I certify that _____(Company Name) is a **nonresident bidder** as defined in Art. 601g. 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. March 2024)
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.

Before you begin. For guidance related to the purpose of Form W-9, see *Purpose of Form*, below.

Print or type. See *Specific Instructions* on page 3.

1 Name of entity/individual. An entry is required. (For a sole proprietor or disregarded entity, enter the owner's name on line 1, and enter the business/disregarded entity's name on line 2.)

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

3a Check the appropriate box for federal tax classification of the entity/individual whose name is entered on line 1. Check only **one** of the following seven boxes.

☐ Individual/sole proprietor ☐ C corporation ☐ S corporation ☐ Partnership ☐ Trust/estate

☐ LLC. Enter the tax classification (C = C corporation, S = S corporation, P = Partnership) . . . . .

Note: Check the "LLC" box above and, in the entry space, enter the appropriate code (C, S, or P) for the tax classification of the LLC, unless it is a disregarded entity. A disregarded entity should instead 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 Foreign Account Tax Compliance Act (FATCA) reporting code (if any)

(Applies to accounts maintained outside the United States.)

3b If on line 3a you checked "Partnership" or "Trust/estate," or checked "LLC" and entered "P" as its tax classification, and you are providing this form to a partnership, trust, or estate in which you have an ownership interest, check this box if you have any foreign partners, owners, or beneficiaries. See instructions . . . . . ☐

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. See also *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*.

What's New

Line 3a has been modified to clarify how a disregarded entity completes this line. An LLC that is a disregarded entity should check the appropriate box for the tax classification of its owner. Otherwise, it should check the "LLC" box and enter its appropriate tax classification.

New line 3b has been added to this form. A flow-through entity is required to complete this line to indicate that it has direct or indirect foreign partners, owners, or beneficiaries when it provides the Form W-9 to another flow-through entity in which it has an ownership interest. This change is intended to provide a flow-through entity with information regarding the status of its indirect foreign partners, owners, or beneficiaries, so that it can satisfy any applicable reporting requirements. For example, a partnership that has any indirect foreign partners may be required to complete Schedules K-2 and K-3. See the Partnership Instructions for Schedules K-2 and K-3 (Form 1065).

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS is giving you this form because they

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

NOTICE OF AWARD

TO: _____
_____
_____

Project Description: B084-25 16-INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD

Dear Sir/Madam:

The Owner has considered the BID submitted by you for the above-described Work in response to its Legal Notice and Invitation to Bid dated September 24, 2025 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 of this Notice to you.

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 30 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) 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
Title: General Manager /CEO

ACCEPTANCE OF NOTICE

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: B084-25 16-INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD

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, material submittals must be submitted and approved by the BPUB before a Purchase Order is issued and prior to the purchase and shipment of materials.

Brownsville Public Utilities Board:
(Owner)

BY: _____
(Authorized Signature)

DATE: _____

NAME: ___Marilyn D. Gilbert____

TITLE: __General Manager/CEO__

FOR: Brownsville Public Utilities Board

CONSTRUCTION AGREEMENT

THIS AGREEMENT is dated as of the _____ day of _____, 20___, by and between the PUBLIC UTILITIES BOARD of the City of Brownsville, Texas (hereinafter called OWNER) and _____ of _____ an independent contractor, hereinafter called CONTRACTOR).

OWNER and CONTRACTOR, 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 Final Completion of the Work described herein and complete all the Work as specified or indicated in the Contract Documents for 16-INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD.

Article 2. CONTRACT TIME

2.1 The Work shall be Substantially Completed and made ready for later final payment **One hundred and eighty (180) consecutive calendar days** after the date when the Contract time commences to run as provided in paragraph 2.3 of the General Conditions and in the Notice to Proceed, and in accordance with paragraph 14.13 of the General Conditions.

2.2 **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 paragraph 2.1 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, and not as a penalty, for the delay, CONTRACTOR shall pay OWNER Five Hundred Dollars ($500.00) for each consecutive calendar day that expires after the time specified in paragraph 2.1 for Substantial Completion.

Article 3. CONTRACT PRICE.

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

Article 4. 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.

4.1 Progress Payments. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment on or about the Twentieth (20th) 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.

4.1.1 Prior to Substantial Completion, progress payments shall be in an amount equal to 95% of the amount requested in the Application for Payment, with 5% remaining as retainage for the Project, to be released in accordance with paragraph 4.2.

4.1.2 Upon Substantial Completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to 95% of the Contract price, less such amounts OWNER shall determine in accordance with paragraph 14.7 of the General Conditions.

4.2 **Final Payment.** Upon Final Completion and acceptance of the Work in accordance with paragraph 14.13 of the General Conditions, OWNER shall pay the remainder of the Contract price as provided in said paragraph 14.13.

Article 5. CONTRACTOR'S REPRESENTATIONS.

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

5.1 CONTRACTOR has familiarized himself with the nature and extent of the Contract Documents, Work, locality, 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.

5.2 CONTRACTOR has made or caused to be made examinations and investigations of information and the Project site as he deems necessary for the performance of the Work at the Contract Price, 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.

5.3 CONTRACTOR has given OWNER written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents and the written resolution thereof by OWNER is acceptable to CONTRACTOR.

5.4 CONTRACTOR is skilled and experienced in the type of work described in the Contract Documents.

Article 6. CONTRACT DOCUMENTS.

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

6.1 Legal Notice and Invitation to Bid
6.2 Instructions to Bidders
6.3 Bid and Bid Schedule
6.4 Bid Bond
6.5 Contractor's and Subcontractor's Pre-Bid Disclosure Statements
6.6 Notice of Award and Acceptance of Notice
6.7 Notice to Proceed
6.8 Agreement
6.9 Performance Bond
6.10 Payment Bond
6.11 General Conditions
6.12 Supplementary General Conditions
6.13 Technical Specifications
6.14 Addendum(s)
6.15 CONTRACTOR's Certificate(s) of Insurance
6.16 Construction Drawings bearing the following general title: 16-INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD (Sheets 1 through 10)
6.17 Any written modification, including Change Orders, duly delivered after execution of this Agreement.

There are no Contract Documents other than those listed above in this Article 6. The Contract Documents may only be altered, amended or repealed by a written Modification (as defined in Article 1 of the General Conditions).

Article 7. MISCELLANEOUS.

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

7.2 No assignment by a party hereto of any rights under or interests 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 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.

7.3 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.

7.4 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.

7.5 This Agreement and the Contract Documents are subject to all applicable laws, statutes, codes, ordinances, rules and regulations.

7.6 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.

7.7 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 and costs and any necessary disbursements, in addition to any other relief to which the OWNER is entitled.

7.8 The Contract Documents constitute the entire agreement between the parties hereto and supersede all prior agreements, understandings, or oral communications between the parties. The Contract can only be modified or amended by written agreement of the parties.

7.9 These Contract Documents are governed by the laws of the State of Texas and the parties agree that venue for any lawsuits arising from these Contract Documents shall be set in Cameron County, Texas.

(THE REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK)

IN WITNESS WHEREOF, the parties hereto have signed this Agreement in triplicate originals. One counterpart each has been delivered to OWNER and CONTRACTOR. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR. This Agreement will be effective on the date signed by the OWNER below.

BROWNSVILLE PUBLIC UTILITIES BOARD	CONTRACTOR
By: _____	By: _____
Name: Marilyn D. Gilbert	Name: _____
Title: General Manager/CEO	Title: _____
Attest: _____	Attest: _____
Date: _____	Date: _____
Address for giving notices:	Address for giving notices:
Attn: _____	Attn: _____
1425 Robinhood Drive	_____
P. O. Box 3270	_____
Brownsville, TX 78521	_____
(956) 983-6XXX	_____

Contractor hereby acknowledges and understands that this is a "separated contract" pursuant to 34 T.A.C. 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 ARTICLE 6.15, "STATE SALES AND USE TAX EXEMPTION."]

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

THAT _____
(Name of Contractor)

_____
(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, in liquidated damages (not as a penalty) 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: **16-INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD.**

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 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 WORK to be performed thereunder, or the SPECIFICATIONS accompanying the same, shall in any ways affect its obligation on this 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 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 claim may be unsatisfied.

This bond is subject to and governed by Section 2253.02 of the Texas Government Code (Vernon's Texas Codes Annotated) and Article 7.19-1 of Vernon's Texas Insurance Code 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 BOND must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must be legally authorized by the State Board of Insurance to transact business in the State of Texas.

ATTACH POWER OF ATTORNEY

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

THAT _____
(Name of Contractor)

_____
(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, in liquidated damages (not as a penalty) 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: **16-INCH WATERLINE LOOP AT RUBEN M. TORRES BOULEVARD.**

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 SUBCONTRACTOR 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 written change, extension of time, alteration or addition to the terms of the Contract or to WORK to be performed there under, or the SPECIFICATIONS accompanying the same, shall in any ways affect its obligation on this 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 WORK, or to the SPECIFICATIONS.

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

This bond is subject to and governed by Section 2253.02 of the Texas Government Code (Vernon's Texas Codes Annotated) and Article 7.19-1 of Vernon's Texas Insurance Code 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 BOND must not be prior to date of Contract. If Contractor Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must be legally authorized by the State Board of Insurance to transact business in the State of Texas.

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 an 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 was prepared
(1983 edition) was approved and endorsed by:

The Associated General Contractors of America

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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 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 these Articles, 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 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 Agreement (Contract) between OWNER and CONTRACTOR covering the Work to be performed; other Contract Documents including these General Conditions are attached to the Agreement and made a part thereof as provided therein.

Alternates. Additions; 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 bid 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 and any other instruments of security.

Calendar Day - A calendar day of twenty-four hours 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 OWNER, which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Time, issued on or after the Effective Date of the Agreement. Approved Change Orders are part of the Contract Documents.

Contract Documents - The 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) when attached as an exhibit to the Agreement, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all amendments, modifications, later approved Change Orders and supplements issued pursuant to paragraphs 3.4 and 3.5 on or after the Effective Date of the Agreement.

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

Contract Time - The number of days ("calendar" or "working" days computed as provided in 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 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 OWNER and are referred to in the Contract Documents.

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

Engineer- The OWNER - designated Brownsville P.U.B. in-house staff registered professional person, named as the OWNER's engineering representative for the Project. There is no outside independent engineering consultant anticipated to be retained by OWNER for this Project.

Field Order - A written order issued by OWNER which orders minor changes or interpretations in the Work in accordance with paragraph 9.5, but which does not involve a change

in the Contract Price or the Contract Time.

Furnish. To supply at the jobsite the material, equipment, etc., referred to. Installation is not required of the supplier by the specifications, but shall be arranged for by the General CONTRACTOR.

General Requirements - Sections _____ of the Specifications.

Laws and Regulations; Laws or Regulations - Federal and/or State Laws, rules, administrative agency regulations, local ordinances, local codes and/or court orders.

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 Agreement.

Notice to Proceed - A written notice given by OWNER to CONTRACTOR 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 - The City of Brownsville, acting through its Public Utilities Board of the City of Brownsville, Texas and its 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 total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

Provide. To furnish and install the material, equipment, etc. referred to, at the location shown or otherwise approved at the Project job-site.

Resident Project Representative - The authorized representative of OWNER who is assigned to periodically observe the site of the Project, or any part thereof, on behalf of OWNER.

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 illustrate material or equipment for some portion of the Work.

Specifications - Those portions of the Contract Documents consisting of written technical descriptions for the design configuration and/or performance standard of 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 industry.

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 - (See generally paragraph 14.8) The Work (or a specified part thereof) has progressed to the point where, in the opinion of OWNER as evidenced by its definitive written and signed certificate of Substantial Completion, 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, when final payment is due in accordance with 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 facilities or attachments, and any outer encasements containing such facilities (vaults) 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 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, 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 paragraph 4.2 or 4.3 or to emergencies under paragraph 6.22. 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 paragraph 10.2.

Working Day. 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 holidays shall not be considered working days. This Contract is not a Working Day Contract.

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 (commercial terms, legal provisions, etc.), rather than strictly 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 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 five (5) 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 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 might not yet be actually performing Work after 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 OWNER any conflict, error or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from OWNER's Engineer before proceeding with any Work affected thereby, however CONTRACTOR shall not be liable to OWNER for failure to report any conflict, error or discrepancy in the Contract Documents, unless 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 OWNER 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

a preliminary schedule of Shop Drawing submissions; and

2.6.2 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 serve as the basis for progress 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 OWNER.

2.7 By the tenth (10th) calendar day after award of the Contract by OWNER, CONTRACTOR shall deliver to OWNER 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, OWNER and others as appropriate, will be held to discuss the Schedules referred to in paragraph 2.6, to discuss procedures for handling Shop Drawings and other submittals and for processing Applications for Payment; and to establish a working and pragmatic understanding among the parties 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 Application for Payment, a mandatory conference attended by CONTRACTOR, OWNER and others as appropriate, will be held to finalize the Schedules submitted in accordance with paragraph 2.6. The finalized Progress Schedule will be made acceptable to OWNER as providing an orderly progression of the Work to completion within the Contract Time, but such OWNER acceptance will neither impose on OWNER responsibility for the progress or scheduling of the Work, nor relieve CONTRACTOR from full responsibility therefore. The finalized Schedule of Shop Drawing submissions will be acceptable to OWNER's Engineer as providing a workable arrangement for processing the submissions for review. The finalized Schedule of Values will be made acceptable to OWNER's 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 be 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 Agreement, if there were no Bids), 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, or any of their consultants, agents or employees from those set forth in the Contract Documents. Clarifications and interpretations of the Contract Documents shall be issued by OWNER's 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 so report to OWNER's Engineer in writing immediately, and before proceeding with the Work affected thereby, and CONTRACTOR shall obtain a written interpretation or clarification from OWNER's Engineer, however, CONTRACTOR shall not be liable to OWNER for failure to report any conflict, error or discrepancy in the Contract Documents unless 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 paragraph 10.4), or

3.4.3 a Work Directive Change (pursuant to 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 paragraph 9.5),

3.5.2 OWNER Engineer's approval of a Shop Drawing or sample (pursuant to paragraphs 6.26 and 6.27), 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 or Supplier, or other person or organization performing or furnishing any of the Work under a direct contract or Project involvement with 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 OWNER's Engineer, and they shall not reuse any of them on extensions of the Project or any other project without written consent of OWNER and specific written verification or adaptation by OWNER's Engineer. 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 OWNER'S 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 shall provide at his sole cost and option for any and all additional lands and access thereto not specifically provided by OWNER that CONTRACTOR may perceive are required for staging, 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 OWNER's 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 exploring, testing and 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 OWNER's 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 conditions or 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 OWNER's Engineer in writing about the inaccuracy or difference.

4.2.4 **OWNER's Review:** OWNER's Engineer will promptly review the pertinent conditions, determine the necessity of either CONTRACTOR or OWNER obtaining additional physical or geotechnical explorations or tests with respect thereto, and advise CONTRACTOR in writing of the findings and conclusions.

4.2.5 **Possible Document Change:** If OWNER's 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 amount

or length thereof, a CONTRACTOR 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 by the owners of such Underground Facilities, (utilities, pipeline companies, railroads, etc.) or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

4.3.1.1 OWNER 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 for reviewing and checking all such current information and data; for locating all 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 will be 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's Engineer. OWNER's Engineer will promptly review the Underground Facility to determine the extent to which the Contract Documents should be modified to reflect and document the 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 amount 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. OWNER shall provide CONTRACTOR with any reasonably current and existing engineering surveys to assist CONTRACTOR to establish reference points for construction, which in OWNER Engineer's judgment are adequate to enable a skilled CONTRACTOR to proceed with the Work pursuant to customary construction industry standards. CONTRACTOR shall be responsible for laying out the Work (unless otherwise specifically 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 OWNER. CONTRACTOR shall report to OWNER's 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 professionally qualified personnel.

ARTICLE 5. BONDS AND INSURANCE

Performance and Payment Bonds:

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 performance of the Work 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, solely for the primary protection of all proper claimants against the surety for payment in supplying labor and material 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 and payment of all CONTRACTOR's labor, materials and supply obligations under the Contract Documents. **These bonds shall remain in effect 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. 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 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 is terminated in Texas or it ceases to meet the requirements of paragraph 5.1, CONTRACTOR shall within five (5) calendar days thereafter substitute another Bond or 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 rejection of the worker's compensation act, and thereby substituting a CONTRACTOR'S self-insurance reserve, is specifically disallowed.

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 there from;

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 these paragraphs 5.3 and 5.6 shall include the specific type coverage and be written 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. All insurance coverage

furnished under the Contract Documents shall include the City of Brownsville and BPUB as OWNER, and their respective public officials, officers, board members, and employees, as named additional insureds and hereinafter known as "additional insureds."

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 Section 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 Language**

(A) **Definitions:**

Certificate of coverage ("certificate") - A copy of a certificate of insurance, a certificate of authority to self-insure issued by the Commission, or a coverage agreement (TWCC-81, TWCC- 82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's (CONTRACTOR's) employees providing services on a Project, for the duration of the Project.

"Duration of the Project" - includes the time from the beginning of the Work on the Project until the CONTRACTOR's/person's Work on the 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 the 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 the Project.

"Services" - include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a 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 the Project, for the duration of the 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 the 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 a Project, and provide to the OWNER:

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

(F) The CONTRACTOR shall retain all required certificates of coverage for the duration of the 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 the Project.

(H) The CONTRACTOR shall post on each Project site a notice, in the text, form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the 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 a 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 the Project, for the duration of the Project;

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

(5) retain all required certificates of coverage on file for the duration of the 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 the 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 the Project will be covered by workers' compensation coverage for the duration of the 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, or, in the case of a self-insured, with the Commission's Division of Self-Insurance Regulation. 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 5.3.6. 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 5.3.2., 5.3.3., 5.3.4., and 5.3.5. 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.

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

5.5.7 All policies required under Section 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 subparagraph 5.5.1, 5.5.2, 5.5.3, 5.5.4 and paragraph 5.6 hereof, in amounts approved by OWNER.

5.5.9 The insurance required under subparagraphs 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 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 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; 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 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 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 was 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 parties 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 waiver provisions by the Subcontractor in favor of OWNER, and all other parties named as additional insureds.

5.7.2 CONTRACTOR intends that any policies provided in response to paragraph 5.6 shall protect all of the parties 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 parties 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 and 5.4 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 or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy 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 or use a portion or portions of the Work. The insurers of CONTRACTOR providing the property insurance shall consent to such use or occupancy by endorsement on the policy or policies, but the property insurance shall not be canceled or lapse on account of any such partial use or occupancy 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 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 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, 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 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 a 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 workmen for the entire construction period. CONTRACTOR shall comply with all requirements of applicable health authorities. When toilet facilities are no longer required, promptly remove from the Project site, disinfect and clean the area as required. CONTRACTOR shall keep 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 OWNER's 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 OWNER 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 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 CITY'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 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 distribution system must function during the Contract period with a minimum of inconvenience to the electric users and the OWNER's water distribution system must function during the Contract period with a minimum of inconvenience to the water users, and that the OWNER'S sanitary sewer collection and treatment system must function during the Contract period on a 24 hour daily basis throughout the year to meet the requirements of the Texas Commission on Environmental Quality (TCEQ). 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 utility systems. No departure from the normal operating sequence of the systems will be allowed, except with the specific advanced written agreement of OWNER.

6.6.3 CONTRACTOR shall notify OWNER a minimum of 48 hours in advance of any Work which will be tied into the existing utility systems. Method of tie-in shall be submitted to OWNER for OWNER's approval prior to any Work being performed. At no time shall contaminated water that has not been disinfected be allowed to seep into the existing waterlines, and at no time shall sewage be allowed to flow into surrounding 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.

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 where necessary due to 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 756.022 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 Standard Specifications.

6.6.8 CONTRACTOR shall 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 subsidiary to the rest of the Work in this Contract, and shall not constitute a separate pay item.

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

6.6.10 All items of equipment required for this Contract shall be bid to provide as part of the initial price, any literature explaining "Operation and Maintenance" of that item of equipment, if required by Project. If a manufacturer does not print such a standard O&M manual, CONTRACTOR shall provide OWNER with a customized manual approved, in writing by the manufacturer.

Adjusting Progress Schedule:

6.7 CONTRACTOR shall submit to OWNER's Engineer for acceptance (to the extent indicated in paragraph 2.9) adjustments in the Progress Schedule to reflect the impact thereon of new developments; these 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 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 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 system that will remain in place. 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 OWNER's Engineer, if sufficient information is submitted by CONTRACTOR to allow OWNER's Engineer to determine that the material or equipment proposed is equivalent, or equal to, that named by OWNER. The procedure for review by OWNER's 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 OWNER's 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 OWNER's Engineer for acceptance thereof, certifying that the proposed substitute will perform adequately 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 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 license fee or royalty. All variations of the proposed substitute from that specified will be

identified in the application and available maintenance, repair and replacement parts and service will be indicated. The 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 and potential claims of other contractors affected by the resulting change, all of which shall be considered by OWNER's Engineer in evaluating the proposed substitute. OWNER's Engineer may require CONTRACTOR to furnish at CONTRACTOR's 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 OWNER's Engineer, if CONTRACTOR submits sufficient information to allow OWNER's 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 indicated above in paragraph 6.8.1. The procedure for review by OWNER's Engineer will be similar to that provided in paragraph 6.8.1 above, as applied by OWNER's Engineer and as may be supplemented in the General Requirements.

6.8.3 OWNER's Engineer will be allowed a reasonable time within which to evaluate each proposed substitute. OWNER's Engineer will be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without OWNER's Engineer 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 expense a special performance guaranty or other form of surety with respect to any substitute. OWNER's Engineer will record time required by OWNER's Engineer and any OWNER'S Engineer outside technical consultants in evaluating substitutions proposed by CONTRACTOR and in making changes in the Contract Documents occasioned thereby. Whether or not OWNER's Engineer accepts a proposed substitute, CONTRACTOR shall reimburse OWNER for the charges of OWNER's Engineer and any 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 as indicated in paragraph 6.8.2), whether initially or as a substitute, against whom OWNER 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 If the Supplementary Conditions require the identity of certain 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 in advance of a specified date prior to the Effective Date of the Agreement for acceptance by OWNER, and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER's acceptance (either in writing or by failing to make written objection thereto by the date

indicated for acceptance or objection in the bidding documents or the Contractor Documents) of any such Subcontractor, Supplier or other person or organization so identified may be revoked by OWNER 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 may be issued or Written Amendment signed. 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. No acceptance by OWNER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of OWNER to reject any defective or noncompliant Work.

6.10 CONTRACTOR shall be fully responsible to OWNER 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 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 OWNER AND ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY OWNER 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 OWNER 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 for connections to the Work, and OWNER shall pay all charges of such utility owners for 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 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 OWNER's Engineer prompt written notice thereof, and any necessary changes will be authorized by OWNER by one of the methods indicated in paragraph 3.4. <u>If CONTRACTOR performs any Work knowing, or having reason to know, that it is contrary to such Laws or Regulations, and without such notice to OWNER's Engineer, CONTRACTOR shall bear all costs arising there from</u>; however, it shall not be CONTRACTOR's 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 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 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 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 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 State Comptroller of Public Accounts regarding the sales tax status of supplies and equipment that are used and consumed during Project Work, but that are not physically incorporated into the Project realty. 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."

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, or to the owner or occupant thereof, or 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, TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, INDEMNIFY, AND HOLD HARMLESS OWNER 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 PARTY AGAINST OWNER, TO THE EXTENT BASED ON A CLAIM ARISING OUT OF CONTRACTOR'S 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 OWNER FROM THE CONSEQUENCES OF OWNER'S OWN NEGLIGENCE, WHEN THAT NEGLIGENCE ON THE PART OF THE OWNER 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 OWNER, 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 easements provided by OWNER, unless CONTRACTOR separately and privately secures at his own cost, additional private temporary construction easements. Generally, storage of excavation material and all CONTRACTOR equipment and material shall remain within the limits of Project 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 progress payments, regularly maintain and update and store 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 OWNER's Engineer for reference. Upon completion of the Work, these record documents, samples and Shop Drawings, will be delivered to OWNER's 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 provide the necessary protection to prevent damage, injury or loss to:

6.22.1 all employees on the Work and other persons and organizations who may be required to properly visit the Project site and be affected thereby;

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 as necessary to protect and complete the Work.

6.22.5 CONTRACTOR is responsible for locating any underground obstacles. It is not represented 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 utility facilities during the progress of the construction Work, taking care to locate same in advance of the actual Work. OWNER will render all assistance possible 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, when requested to do so, but the accuracy of such information will not be guaranteed by OWNER. 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 OWNER requires strengthening, altering or moving, CONTRACTOR shall perform such Work on same, as OWNER may order, which Work may be paid for as extra Work. Should CONTRACTOR, in the layout of his Work, encounter any pipe, underground utility or structure, the location of which has been furnished to him by OWNER, he shall bring such conditions to the attention of OWNER for 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 damage being caused to existing utilities that immediate attention be given to their repair. Any repair work carried out shall be at the cost of CONTRACTOR and shall be performed to the complete satisfaction of OWNER, who will acknowledge same in writing. It is therefore, the duty of CONTRACTOR, prior to the commencement of construction, to inspect and accurately record in writing to OWNER, the 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, and/or other remedial measures employed as agreed to with OWNER.

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, when 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 paragraph 6.20.2 or 6.20.3 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 OWNER'S Engineer has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.13 that the Work is acceptable to OWNER (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 OWNER, is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give OWNER's 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 OWNER's Engineer determines that a change in the Contract Documents is required because of the CONTRACTOR's prompt action taken in response to an emergency, a Work Directive Change or Change Order will be issued 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 OWNER's Engineer for review and approval, in accordance with the accepted Schedule of Shop Drawing submissions (see paragraph 2.9), or for other appropriate action if so indicated in the Supplementary Conditions, five (5) copies (unless otherwise specified in the General Requirements) of all Shop Drawings, which will bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the internal review of the submission. All submissions will be identified as the OWNER's 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 OWNER'S 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 OWNER 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 final working drawings.

6.26 CONTRACTOR shall also submit to OWNER's 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 responsibilities under the Contract Documents with respect to the review of the submission, and will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which 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 OWNER's 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 OWNER's Engineer for review and approval, of each such CONTRACTOR variation.

6.28 OWNER's Engineer will review and approve with reasonable promptness, Shop Drawings and samples, but OWNER 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 functions integrally. CONTRACTOR shall make corrections required by OWNER's 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 Owner Engineer's specific attention in writing to the most current revisions, other than the corrections called for by OWNER's Engineer on previous CONTRACTOR submittals.

6.29 OWNER 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 OWNER Engineer's attention to each such variation at the time of submission as required by paragraph 6.25.2, and OWNER's 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 OWNER's 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 6.25.1.

6.30 Where a Shop Drawing or sample is required by the Specifications, any related

Work performed prior to OWNER Engineer's review and approval of the pertinent submission will be at the sole risk, 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 in writing.

INDEMNIFICATION:

6.32 CONTRACTOR AGREES TO AND SHALL INDEMNIFY AND HOLD HARMLESS OWNER, ITS PUBLIC OFFICIALS, OFFICERS, BOARD MEMBERS, AND EMPLOYEES, 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 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 THERE FROM 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 OWNER.

IT IS THE EXPRESSED INTENTION OF THE PARTIES HERETO, BOTH CONTRACTOR AND OWNER, THAT THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH IS INDEMNITY BY THE CONTRACTOR, TO INDEMNIFY AND PROTECT OWNER FROM THE CONSEQUENCES OF OWNER'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 NO APPLICATION 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 OWNER, INDEPENDENT OF THE FAULT OF ANY OTHER PERSON OR ENTITY.

6.33 IN ANY AND ALL CLAIMS AGAINST OWNER OR ANY OF ITS 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 OWNER, OWNER'S ENGINEER, CONSULTANTS, AGENTS OR EMPLOYEES ARISING OUT OF THE PREPARATION OR APPROVAL OF PROJECT MAPS, DRAWINGS, PLANS, OPINIONS, REPORTS, SURVEYS, CHANGE ORDERS, DESIGNS, OR SPECIFICATIONS.

6.35 CONTRACTOR shall perform all phases of Work, other than general clean-up, thru the duration of the Contract, as defined in these General and any Supplementary General Conditions. If CONTRACTOR desires to perform Work, other than general clean-up during 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 General Conditions. Pursuant to local BPUB 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.

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 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 records shall be open to inspection by the representatives of the OWNER. With each application for payment, CONTRACTOR shall provide 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, workmen 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.

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 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 direct contract with OWNER (or OWNER, if OWNER 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 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

work of others by cutting, excavating or otherwise altering their work, and will only cut or alter their work with the written consent of OWNER's Engineer and the consent of other contractor(s), persons whose 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 direct contracts between OWNER and such other utility owners and other contractors.

7.3 If any part of CONTRACTOR's Work depends for proper execution or results upon the work of any such other contractor or utility owner (or OWNER), CONTRACTOR shall inspect and promptly report to OWNER's 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. CONTRACTOR's failure so to report will constitute an acceptance of the other 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 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, 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.

ARTICLE 8. OWNER'S RESPONSIBILITIES

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

8.2 In case of termination of the employment of OWNER's 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 paragraphs 14.4 and 14.13.

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 OWNER's Engineer in generally preparing the Drawings and Specifications.

8.5 (RESERVED)

8.6 OWNER is obligated to execute Change Orders as indicated in paragraph 10.4.

8.7 OWNER's responsibility in respect to certain inspections, tests and approvals is set forth in paragraph 13.4.

8.8 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. OWNER ENGINEER'S STATUS DURING CONSTRUCTION

Owner's Representative:

9.1 OWNER's Engineer will be OWNER's primary representative during the construction period.

Visits to Site:

9.2 OWNER's Engineer 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. OWNER's Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work, because CONTRACTOR is solely responsible for same. OWNER 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 working for OWNER, OWNER's 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 may furnish a Project Field Representative to assist OWNER's Engineer in observing the daily performance of the Work. 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 duties, responsibilities and limitations of authority of any such Project Field Representative and assistants will be determined by the OWNER.

Clarifications and Interpretations:

9.4 OWNER's 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 OWNER's 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 OWNER's 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 OWNER's 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 perform the Work involved promptly. 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 OWNER's Engineer will have the authority to disapprove or reject Work which OWNER's 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 OWNER Engineer’s responsibility for Shop Drawings and samples, see paragraphs 6.23 through 6.28 inclusive.

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

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

Determinations for Unit Prices:

9.10 OWNER's Engineer will determine the final actual quantities and classifications of any Unit Price Work performed by CONTRACTOR. OWNER's Engineer will review with CONTRACTOR, OWNER Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). OWNER Engineer's written decisions thereon will be final and binding upon OWNER and CONTRACTOR.

Decisions on Disputes:

9.11 OWNER's 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 OWNER's Engineer in writing, with a request for a formal decision in accordance with this paragraph, which OWNER's Engineer will render in writing within a reasonable time. Written notice of each such claim, dispute and other matter will be delivered by the CONTRACTOR (but in no event later than thirty (30) calendar days) after the occurrence of the event giving rise thereto, and written supporting data will be submitted to OWNER's Engineer within sixty (60) calendar days after such occurrence, unless OWNER's Engineer allows an additional period of time 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 OWNER's Engineer will not be personally liable in connection with any non-negligent interpretation or decision rendered in good faith in such official and professional capacity. The rendering of a decision by OWNER's 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 14.16) 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 OWNER Engineer's Responsibilities:

9.13 Neither OWNER Engineer's authority to act under this Article 9, or elsewhere in the Contract Documents, nor any decision made by OWNER Engineer in good faith either to exercise or not exercise such authority, shall give rise to any personal duty or personal responsibility of OWNER Engineer to CONTRACTOR, and 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 OWNER's Engineer as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for 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 OWNER's 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 OWNER's 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. OWNER's Engineer will not be responsible for CONTRACTOR's failure to perform or furnish the Work in

accordance with the Contract Documents.

9.16 OWNER's 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 6.22, 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 acceptance of defective Work by OWNER under paragraph 13.13; or 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 OWNER's 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 6.29.

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 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 OWNER'S 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 OWNER's 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 OWNER's Engineer in accordance with paragraph 9.11. No claim for an adjustment in the Contract price will be valid 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 quantities of the 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 General 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 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.

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 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 rental agreements approved by OWNER, 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 related to the Work that OWNER is not exempt from paying, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

11.4.5.5 Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them, or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

11.4.5.6 Losses and damages (and related expenses), not compensated by insurance or otherwise, to the Work, or otherwise sustained by CONTRACTOR in connection with the 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 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, 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 additional Bonds and insurance required because of changes in 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 same (except for the cost of premiums covered by subparagraph 11.4.5.9 above).

11.5.5 Costs due to 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, disposal of materials or equipment wrongly supplied, and making good any damage to 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 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 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 submit in a form acceptable to OWNER's ENGINEER, an itemized cost breakdown together with supporting data.

Cash Allowances:

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

11.8.1 The 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 unloading and handling on the Project site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances. No demand for additional payment on account of any thereof will be valid.

Prior to final payment, an appropriate Change Order will be issued as recommended by OWNER's 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, times the estimated quantity of each item as indicated in the Agreement. The OWNER's estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual final quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by OWNER's 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 OWNER's estimated quantity of such item indicated in the Agreement (generally plus or minus 25%), and there is no corresponding and offsetting adjustment(s) with respect to any other item(s) of Work, and if CONTRACTOR believes that CONTRACTOR has incurred additional expense as a result thereof, CONTRACTOR may make a 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.

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 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 OWNER's 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 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 OWNER's Engineer in accordance with paragraph 9.11. No claim for an adjustment in the Contract Time will be valid 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 or neglect by OWNER or others performing additional separate work as contemplated by Article 7, or to fires, floods exceeding the 100 year frequency, 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 defects discovered by OWNER shall be given to CONTRACTOR. 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 OWNER's 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, 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 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, of any other provision of the Contract Documents shall free CONTRACTOR from his workmanship guarantee. Failure 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 responsibility to OWNER under this Agreement. All equipment shall be warrantied and/or guaranteed be either CONTRACTOR or its supplier/manufacturer 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 manufacturers shall extend well beyond the initial one (1) year post acceptance period. The CONTRACTOR shall transfer 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.

Access to Work:

13.2. OWNER, OWNER's Engineer, OWNER's Field Representative, 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 provide proper and safe conditions for such reasonable access.

It is agreed by CONTRACTOR that OWNER shall be and is hereby authorized to appoint from time to time, OWNER Engineer's subordinate supervisors, observers, and/or inspectors, as the said OWNER may deem proper to inspect the material furnished and observe the Work performed under this construction Agreement, and to see that the said material is furnished and said Work is generally done in accordance with the Specifications. This OWNER function, for OWNER's sole benefit, does not excuse the CONTRACTOR from quality control assurance, which is solely his responsibility. CONTRACTOR shall furnish all reasonable aid and assistance required by the OWNER's Engineer, subordinate supervisors, observers and/or inspectors for the proper observation, inspection and examination of the Work and all parts of the Work. CONTRACTOR shall regard and obey the directions and instructions of the OWNER's

Engineer and any subordinate supervisors, or inspector so appointed, when such directions are consistent with the obligations of this Agreement and the accompanying Specifications, provided, however, that should CONTRACTOR object to any order by any subordinate supervisor or inspector, CONTRACTOR may within six (6) calendar days make written notice to OWNER for his decision. Except as herein before provided, the authority of subordinate supervisors or inspectors shall be limited to the rejection of unsatisfactory Work and materials and to the suspension of the Work, until the questions of Work acceptability can be referred to OWNER's Engineer.

13.2.1. CONTRACTOR shall cooperate with any OWNER testing laboratory to the end that the function and services of the laboratory may be properly performed. CONTRACTOR shall give 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 first test only. Testing of equipment, lines and valves shall be the responsibility of CONTRACTOR and he shall notify OWNER's Engineer and/or inspectors of his scheduled time for such tests, so that the test can be witnessed by an OWNER's representative. If initial tests show failure, the CONTRACTOR shall cover the costs of retesting the areas that failed after corrective action has been taken, as well as the personnel and equipment costs incurred by OWNER in said retesting, on a per diem basis. The per diem costs shall be determined based on the hourly wage plus reasonable overhead of OWNER's personnel needed and present at the Project site during retesting, and by the locally prevailing rental rate for the vehicles and equipment utilized in retesting. These retesting time costs shall be paid by CONTRACTOR prior to OWNER's acceptance of the Work improvements.

Tests and Inspections:

13.3. CONTRACTOR shall give OWNER's 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 in connection therewith, and furnish OWNER's Engineer the required final certificates of inspection, testing or approval. CONTRACTOR shall also be responsible for and shall pay all costs in connection with any special inspection or testing required in connection with OWNER 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 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 OWNER's Engineer, if so specified).

13.6 If any Work (including the work of others) that is to be inspected, tested or approved is covered or otherwise concealed by CONTRACTOR without written concurrence of OWNER's Engineer, it must, if requested by OWNER'S Engineer, be uncovered and revealed for OWNER observation. Such uncovering shall be at CONTRACTOR's expense, unless CONTRACTOR has given OWNER's Engineer timely notice of CONTRACTOR's intention to cover the same and OWNER's Engineer has not acted with reasonable promptness in response to such CONTRACTOR notice.

13.7 Neither observations by OWNER's Engineer nor inspections, tests or approvals by others shall relieve CONTRACTOR from CONTRACTOR's obligations to perform the Work and constantly employ quality control in accordance with the Contract Documents.

Uncovering Work:

13.8 If any Work is covered contrary to the written request of OWNER's Engineer, it must, if requested by OWNER's Engineer, be uncovered for OWNER Engineer's observation and replaced at CONTRACTOR's expense.

13.9 If OWNER's Engineer considers it necessary or advisable that covered Work be observed by OWNER's Engineer or inspected or tested by others, CONTRACTOR, at OWNER Engineer's request, shall uncover, expose or otherwise make available for observation, inspection or testing as OWNER'S Engineer may require, that portion of the Work in question, 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 costs of such uncovering, exposure, observation, inspection and testing, and of satisfactory repair, replacement and reconstruction, (including but not limited to fees and charges or engineers, architects, attorneys and other professionals), 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 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, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order 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 party.

Correction or Removal of Defective Work:

13.11 If required by OWNER's Engineer, CONTRACTOR shall promptly, as directed, either correct all defective Work, whether or not fabricated, installed or completed, if the Work has been rejected by OWNER's Engineer, and remove it from the Project site and replace it with non-defective Work. CONTRACTOR shall bear all direct, indirect and consequential costs of such correction or removal (including but not limited to fees and charges of engineers, 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 instructions, or in an emergency where delay would cause serious risk of loss or damage, 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 engineers, architects, attorneys and other professionals) will be paid by CONTRACTOR. In special circumstances, where a particular item of equipment is placed in continuous service before acceptance of all the Work, the minimum one (1) year workmanship guarantee and equipment warranty correction period for that item may start to run from an earlier date, if so provided in the Specifications or by Written Amendment.

Acceptance of Defective Work:

13.13 If instead of requiring correction or removal and replacement of defective Work, OWNER (and, prior to OWNER Engineer's recommendation of final payment), prefers to accept it as is, OWNER may do so. CONTRACTOR shall bear all direct, indirect and consequential costs attributable to OWNER's evaluation of, and determination to accept such defective Work (such costs to be approved by OWNER's Engineer as to reasonableness and to include but not be limited to fees and charges of engineers, architects, attorneys and other professionals). If any such OWNER acceptance occurs prior to OWNER 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 may make a claim therefore as provided in Article 11. If the acceptance occurs after such final payment, an appropriate amount as determined by OWNER will be paid by CONTRACTOR to OWNER.

OWNER May Correct Defective Work:

13.14 If CONTRACTOR fails within a reasonable time after written notice by OWNER's Engineer to proceed to correct, and to actually correct defective Work; or to remove and replace rejected Work as required by OWNER's 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 seven (7) calendar days written notice to CONTRACTOR, correct and remedy any such 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 Project site; take possession of all or part of the Work; and suspend CONTRACTOR's services related thereto; take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Project site; and incorporate in the Work all materials, and CONTRACTOR shall allow OWNER, OWNER's 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 may make a claim therefore as provided in Article 11. Such direct, indirect and consequential costs will include, but not be limited to: fees and charges of engineers; 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 hereunder.

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 progress payments and will be incorporated into a form of Application for Payment acceptable to OWNER's Engineer. Progress payments on account of Unit Price Work will be based on the number of units actually completed.

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 OWNER for review, an Application for Payment filled out and signed by CONTRACTOR, covering the Work completed as of the date of the Application, and accompanied by such supporting documentation as is required by the Contract Documents. The amount of retainage with respect to progress payments (customarily 5%) will be as stipulated in the Agreement.

CONTRACTOR's Warranty of Title:

14.3 CONTRACTOR warrants and guarantees that title to any Work and materials covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment, free and clear of any and all prior claims for payment.

Review of Applications for Progress Payment:

14.4 OWNER's Engineer will, within ten (10) calendar days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and process the Application, or return the Application to CONTRACTOR indicating in writing OWNER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application. Twenty (20) calendar days after presentation of the Application for Payment with OWNER Engineer's recommendation, the amount recommended will (subject to the provisions of the last sentence of paragraph 14.7) become due, and when due will be paid by OWNER to CONTRACTOR.

14.5 OWNER Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by OWNER's Engineer, based upon ENGINEER's limited on-site observations of the Work in progress as an experienced and qualified design professional; and on OWNER Engineer's review of the Application for Payment and the accompanying data and Schedules; that the Work has progressed to the point indicated, that, to the best of OWNER 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 OWNER Engineer's recommendation); and that CONTRACTOR is entitled to payment of the amount recommended. However, by recommending any such payment, OWNER's Engineer will not thereby be deemed to have represented that exhaustive or continuous on-site inspections have been made to check the quality or the quantity of the Work beyond the responsibilities specifically assigned to OWNER's 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 OWNER Engineer's recommendation of final payment will constitute an additional representation by OWNER that to the best of OWNER Engineer's knowledge, the conditions precedent to CONTRACTOR's being entitled to final payment, as set forth in paragraph 14.13, have been fulfilled.

14.7 OWNER's Engineer may refuse to recommend the whole or any part of any payment if, in OWNER Engineer's professional opinion, it would be incorrect to make such representations to OWNER. 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 OWNER Engineer's opinion, to protect OWNER from loss because:

14.7.1 the Work is defective, or completed Work has been damaged requiring 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 OWNER 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 payment in whole or in part of the amount recommended by OWNER's Engineer, because claims have been made against OWNER on account of CONTRACTOR's improper performance of the Work, or payment bond claims have been filed in connection with the Work and OWNER wishes to consult with CONTRACTOR and/or CONTRACTOR's surety, or there are other items entitling OWNER to a set-off against the amount recommended, but OWNER must give CONTRACTOR written notice stating the reasons for such action.

Substantial Completion:

14.8 When CONTRACTOR considers the entire Work ready for OWNER's intended use, CONTRACTOR shall notify OWNER's Engineer in writing that the entire Work is Substantially Complete (except for items specifically listed by CONTRACTOR as incomplete) and request that OWNER issue a certificate of Substantial Completion. Within a reasonable time thereafter, OWNER and CONTRACTOR shall make an inspection of the Work to determine the status of completion. If OWNER's Engineer does not consider the Work Substantially Complete, OWNER's Engineer will notify CONTRACTOR in writing giving the reasons therefore. If OWNER's Engineer considers the Work Substantially Complete, OWNER's Engineer will prepare and process 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 items to be completed or corrected before final payment ("punch-list"). At the time of delivery of the tentative certificate of Substantial Completion, OWNER's Engineer will deliver to CONTRACTOR a written recommendation as to the division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, maintenance, heat, utilities, insurance and warranties. OWNER Engineer's aforesaid recommendation will be binding on OWNER and CONTRACTOR, until final payment.

14.9 OWNER shall have the right to exclude CONTRACTOR from the Work after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the 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 and CONTRACTOR agree constitutes a separately functioning and useable part of the Work that can be used 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 Substantially Complete. If CONTRACTOR agrees, CONTRACTOR will certify to OWNER that said part of the Work is Substantially Complete and request OWNER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after such request, OWNER, and CONTRACTOR shall make an inspection of that part of the Work to determine its status of completion. If OWNER considers that part of the Work to be Substantially Complete, the provisions of paragraphs 14.8 and 14.9 will apply with respect to certification of Substantial Completion of that part of the Work, and the division of responsibility in respect thereof and access thereto.

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 OWNER's Engineer and within a reasonable time thereafter OWNER, and CONTRACTOR, shall make an inspection of that part of the Work to determine its status of completion and will prepare a list of the items remaining to be completed or corrected thereon before final payment. If CONTRACTOR does not object in writing to OWNER that such part of the Work is not ready for separate operation by OWNER, OWNER's Engineer will finalize the list of items to be completed or corrected and will deliver such list to 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. During such 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 occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirements of paragraph 5.15 in respect of CONTRACTOR's property insurance.

Final Inspection:

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

A qualified person 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 corrections to the satisfaction of OWNER's Engineer and delivered certificates of inspection, marked-up record documents, if any, depicting as-built conditions (as provided in paragraph 6.19) and other documents--all as required by the Contract Documents; and after OWNER's 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 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 claims arising out of, or filed in connection with the Work. In lieu thereof and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full; an affidavit of CONTRACTOR that the releases and receipts include all labor, services, material and equipment for which a Payment Bond claim could be filed, and that all payrolls, material and equipment bills, and other 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 consent of the surety to final payment, if any is required by surety. If any Subcontractor or Supplier fails to furnish a release or receipt in full, CONTRACTOR may furnish a special indemnity Bond, or other collateral satisfactory to OWNER, to indemnify OWNER against any potential third party claim.

Final Payment and Acceptance:

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

CONTRACTOR shall submit satisfactory evidence to the OWNER that all payrolls, and other 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, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of OWNER's 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 payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to OWNER's Engineer with the Application for such Payment. Such 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 OWNER's 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 acceptance by OWNER; nor any failure to do so; nor the issuance of a notice of acceptability by OWNER's 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 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 and properly 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 thirty (30) calendar days by notice in writing to CONTRACTOR, 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 State 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 State 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 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 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, CONTRACTOR or surety shall pay the difference to OWNER. Such costs incurred by OWNER will be 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, the termination will not affect any rights or remedies of OWNER 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.

15.4 Upon seven (7) calendar days written notice to CONTRACTOR, OWNER may, without cause and without prejudice to any other right or remedy, elect to abandon the Work and terminate the Agreement. In such case, CONTRACTOR shall mitigate demobilization costs as best as possible and be paid for all Work 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 engineers, architects, attorneys and other professionals and court costs).

15.5 (RESERVED)

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 DONE 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 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 is a reasonable time for Substantial Completion of same, taking into consideration the average climatic range and weather conditions that the CONTRACTOR must reasonably anticipate, and usual industrial conditions prevailing in the Cameron County area.

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

16.4 The damage to OWNER by reason of this Contract not being Substantially Completed as of that date 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 Agreement for each calendar day the job runs beyond such Substantial Completion date, and the joint fixing of such damages constitutes a part of the consideration for the Contract. It is further agreed that **TIME IS OF THE ESSENCE** of each and every portion of this Contract 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, additional time is allowed for the Substantial Completion of any Work, the new time fixed by such extension shall be **OF THE ESSENCE** of this Contract. Provided that CONTRACTOR shall not be charged with 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 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; epidemics; quarantine restrictions; strikes; freight embargoes and unusually severe weather not customary for the Cameron County, Texas area.

16.4.3 To any delays of Subcontractors 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 then within seven (7) calendar days from the beginning of such delay, notify OWNER, in writing, of the causes of the delay. OWNER shall then ascertain the facts and extent of the delay and notify CONTRACTOR within a reasonable time of OWNER's decision in the matter regarding any adjustment to the Contract time and a 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 given 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 giver of the notice.

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 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 period. If the last calendar day of any such period falls on a calendar day listed as a BPUB holiday by the Contract Documents, such calendar day will be omitted from the computation.

17.2.1 A calendar day of twenty-four hours is measured from midnight, 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 employees or agents, or others for whose 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 observance 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 6.30, 13.1, 13.12, 13.14, 14.3 and 15.2, and all of the rights and remedies available to OWNER and OWNER'S Engineer 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 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 Contract Documents, or at a later date, shall constitute 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 GENERAL CONDITIONS

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

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1. GENERAL STATEMENT

This is a 100% Non-Federally funded and competitively bid Public Works Contract and Texas Government Code Section 2258.001 et seq., 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 pre-Bid federal prevailing wage rates for Cameron County, Texas, as published by the United States Department of Labor, Dallas, Texas pursuant to the original intent and authority of the Resolution passed by the Public Utilities Board of Brownsville on February 24, 1992 (hereinafter referred to as "BPUB"). Copies of the wage rates are contained immediately behind these Supplementary General Conditions, and are included instruments of this Contract and full compliance with same shall be required.

Additionally, on April 16, 2007, the BPUB Board of Directors approved a local "living wage" policy that requires all Contractors and Subcontractors performing 100% Non-Federally funded Work for the BPUB to pay a minimum wage rate of $8.00/hour, regardless of any lower federal wage rate for Cameron County. The BPUB requires that all Contractors and Subcontractors also comply with this policy. Otherwise, the BPUB adopts the Federal Department of Labor Wage scales for Cameron County on 100% Non-Federally funded projects as specified later herein behind these Supplementary General Conditions.

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. WAGE & HOUR OFFICE, PUBLIC WORKS, RESPONSIBILITIES

The OWNER's Engineer or the BPUB Wage & Hour Monitor is primarily responsible for all Wage and Labor Standard Provisions investigation and enforcement and will monitor Contractor/subcontractor practices to assure the BPUB General Manager and CEO that:

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

b. Any Apprentices/trainees designated by CONTRACTOR as 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 state regulatory agencies.

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

d. Employees are periodically interviewed (at random) on the 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 OWNER'S Engineer and/or Wage & Hour Monitor from the Board and General Manager and CEO 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 OWNER's Engineer and/or Wage & Hour Monitor, BPUB for further investigation. Claims and disputes not reported by the employee to the OWNER 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 may have 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 debarment of the CONTRACTOR/subcontractor from future OWNER contracts for lack of responsibility, as later determined by the OWNER. Recurrent violations, whether remedied or not, will be considered by the General Manager and CEO when assessing the responsibility history of a potential contractor/subcontractor prior to competitive award of future Public Works projects. The general 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, State and federal statutes.

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

In the event that a 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 (before bidding, if possible) to the OWNER identifying that class of laborers/mechanics not listed in the 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 local or federal decisions, the General Manager and CEO of the OWNER, shall classify said laborers/mechanics by issuing a special local wage determination decision to the 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 any fringe rates not less than those contained in the Wage Determination Decision included in this Contract. Only payroll deductions as are mandated by State or federal law, and those legal deductions previously approved in writing by the employee, or as are otherwise permitted by State 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 CONTRACTOR's fringe benefit programs. The approved programs shall be in place at the time of OWNER Contract execution and provisions thereof disclosed to the OWNER's Engineer or Wage and Hour Monitor, for legal review prior to Project commencement.

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 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 non-federally funded Contract Work (except for worksite 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 40 hours in such Work period, unless said laborer/mechanic receives compensation at a rate not less than one and one-half times the basic hourly rate of pay for all hours worked in excess of 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.

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. An employee is not allowed to receive less than the local $8.00 pr. hour minimum living wage or the minimum hourly basic rate of pay specified in the Wage Determination Decision, whichever is greater.

9. WORK CONDUCTED ON HOLIDAYS-NON-FEDERALLY FUNDED PROJECTS

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 the calendar days observed as such in any given year, along with additional OWNER-designated local holidays to be annually determined by OWNER and provided in writing to CONTRACTOR, 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 Texas Government Code Section 2258.001 et seq. and as further generally described in an administrative directive to the OWNER's Engineer and BPUB's Wage & Hour Monitor from the General Manager and CEO entitled "Conducting Wage and Labor Standards Investigations on 100% Non-Federally Funded BPUB Construction Projects", as may be amended) 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 State 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 party 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 OWNER, 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. Texas Government Code Section 2258.001 et seq., 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 be construed by and between the OWNER and the CONTRACTOR/subcontractor as liquidated damages, and not as a penalty, and will 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 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 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 money, such wages and any associated liquidated damages 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. Recovery after expiration of the three year period is prohibited.

11. DISPLAYING WAGE DETERMINATION DECISIONS/AND NOTICE TO LABORERS/MECHANICS STATEMENT

The applicable Wage Determination Decision as described in the "General Statement" (and as specifically included in the 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 workmen 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 site of Work:

Both the OWNER and the CONTRACTOR/subcontractor agree that you must be compensated with not less than the minimum hourly base pay of $8.00 pr. hour or other greater minimum hourly base pay based upon job classification, and 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 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 or the calendar days observed as such in any given year, along with additional OWNER-designated local holidays to be annually determined by OWNER and provided to CONTRACTOR.

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 appropriate minimum wage for the type of Work you do, you must make direct inquiry to the CONTRACTOR/subcontractor and inquire in writing, within sixty (60) calendar days of your receipt of any allegedly incorrect wage or benefit check or report, to the BPUB(OWNER's) Engineer and/or BPUB Wage & Hour Monitor, 1425 Robinhood Drive, Brownsville, Texas 78520. It is mandatory that you promptly file written inquiry of any allegedly incorrect wage or benefit checks or reports with the BPUB within the sixty (60) calendar day period, so that you do not waive your potential right of recovery under the provisions of the BPUB (OWNER) construction Contract that governs this Project.

Both the OWNER 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's Engineer or Wage & Hour Monitor of the BPUB. 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's Engineer or Wage & Hour Monitor, BPUB. 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 OWNER's Engineer or Wage & Hour Monitor, and shall contain a "Weekly Statement of Compliance", as called for by the Contract Documents. Such payrolls will be forwarded to OWNER's Engineer or Wage & Hour Monitor, 1425 Robinhood Drive, Brownsville, Texas 78520.

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 CONTRACTOR/subcontractors shall maintain records which demonstrate: any CONTRACTOR/subcontractors 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 authorized OWNER's Engineer or Wage & Hour Monitor of the BPUB at reasonable times and locations for purposes of monitoring compliance with this Contract.

13. LABOR DISPUTES

The CONTRACTOR/subcontractor shall immediately notify the BPUB General Manager and CEO or his designated representative of any actual or impending CONTRACTOR/subcontractor labor dispute which may affect, or is affecting, the Schedule of the CONTRACTOR's or any other contractor's/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 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 jobsite and Scheduling effects of the labor dispute.

14. COMPLAINTS, PROCEEDINGS, OR TESTIMONY BY CONTRACTOR/SUBCONTRACTOR 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 OWNER's Engineer and/or Wage & Hour Monitor displaying and presenting proper BPUB identification credentials to the jobsite superintendent or his representative. While on the jobsite, the OWNER's Engineer and/or Wage & Hour Monitor shall observe all 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 by the OWNER's Engineer

and/or 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 BPUB public works Project shall be induced, by any means, to give up to the CONTRACTOR/subcontractor or City of Brownsville or BPUB 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 BPUB 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 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 State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his first 90 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 OWNER'S Engineer or Wage & Hour Monitor of the BPUB, 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 OWNER's Engineer or Wage & Hour Monitor of the BPUB. 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 18.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 in the Specifications for this Project.

When a "full investigation" (as called for in, and as construed under Texas Government Code Section 2258.001 et. seq., and as further generally described in an administrative directive to the OWNER's Engineer and BPUB's Wage & Hour Monitor from the General Manager entitled "Conducting Wage and Labor Standards Investigations on 100% Non-Federally Funded BPUB Construction Projects", as may be amended) evidences a violation of the Apprentice or Trainee to Journeyman ratios effective for CONTRACTOR/subcontractor employees working on this Contract, the POWNER, in addition to such other rights as may be afforded it under State and/or federal law and/or other sections of this Contract (especially paragraph 10, of these Supplementary General Conditions "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

CONTRACTOR/subcontractor 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 City of Brownsville, State 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 section, 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 State and federal agencies and CONTRACTOR's 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 BPUB General Manager is required to employ any person participating in a supervised work release or furlough program that is sanctioned by appropriate State 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 State enabling or implementing statutes, especially as they in combination apply 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 State and federal labor

provisions, to be inserted in all subcontracts relative to the Work to bind subcontractors to the same Wage and Labor Standards as contained in these terms of the General 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.

General Decision Number: TX20250003 01/03/2025
Superseded General Decision Number: TX20240003
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)(1).

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 20, 2022: Executive Order 14026 generally applies to the contract. The contractor must pay all covered workers at least $17.75 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 2025.

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 $13.30 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 2025.

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	01/03/2025

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 ($17.75) or 13658 ($13.30). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

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) (iii)).

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

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate 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. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100%

of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the 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. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

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

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to

davisbaconinfo@dol.gov or by mail to:

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

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail 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 an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail 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 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.

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END OF GENERAL DECISION

BPUB TECHNICAL SPECIFICATIONS

SECTION 01 01 00

SUMMARY OF WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Contract documents, including Division 0 and Division 1 Contract requirements and Technical Specifications.

1.02 SCOPE OF WORK

A. This section describes the Project in general and provides an overview of the extent of the Work to be performed by the CONTRACTOR. Detailed requirements and extent of Work is stated in the applicable Specification Sections and shown on the Drawings. CONTRACTOR shall, except as otherwise specifically stated herein or in any applicable part of these Contract Documents, provide and pay for all labor, materials, equipment, tools, construction equipment, and other facilities and services necessary for proper execution, testing, and completion of the Work.

B. Any part or item of the Work which is reasonably implied or normally required to make the installation satisfactorily operable shall be performed by the CONTRACTOR and the expense thereof shall be included in the applicable unit prices or lump sum prices bid for the Work. It is the intent of these Specifications to provide the OWNER with the complete system. All miscellaneous appurtenances and other items of Work that are incidental to meeting the intent of the Specifications shall be considered as having been included in the applicable unit prices or lump sum prices bid for the Work even though these appurtenances and items may not be specifically called for in the Bid Documents.

C. The Work shall include furnishing all tools, labor, materials, equipment, spare parts and miscellaneous items necessary for the complete construction of the following:
   1. Demolition of existing structures, facilities, and equipment, furnishing all labor, materials, equipment, supervision, supplies and tools, and performing all operations in connection with the demolition of old structures, portions of old structures, and all applicable items.
   2. Furnishing, laying, jointing and testing of all sewer pipe, including sewer pipe, fiberglass sewer manholes and sewer appurtenances, both in open cut and in tunnels, as shown on the drawings or as directed by the engineer.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. Execute all Work, including excavation, installing pipe and backfill, constructing or installing all sewer and water pipe, including valves, fire hydrants, fiberglass sewer manholes, water appurtenances, sewer appurtenances, open cut, tunnels, site work, concrete and testing. The Work of this Contract is specified on the Drawings and in the Technical Specifications listed in the Table of Contents.

B. Secure all construction-related permits, other than those provided by OWNER, and pay for the same.

C. Arrange for the necessary temporary water service and pay for this service and all water consumed during the construction Work.

D. Provide adequate temporary sanitary facilities.

1.04 TRAFFIC CONTROL

A. Develop and submit a traffic control plan which will show both day and night time operations for the installation of the sanitary sewer manholes, pipelines, and associated improvements in conformance with the current edition of the Texas Manual of Uniform Traffic Control Devices for plan review and approval by the OWNER, City of Brownsville, and if applicable TXDOT prior to the start of construction. If applicable, the TXDOT permit for work in the TXDOT ROW is subject to TXDOT approval of the CONTRACTOR's traffic control plan.

B. Furnish, install and maintain barricades, warning signs and other traffic handling devices of the size and type specified in the Manual of Uniform Traffic Control Devices or as directed by the ENGINEER or highway department official.

C. Inspect and properly maintain traffic controls each evening and during the weekend in addition to normal daytime working hours. The CONTRACTOR is responsible for all costs associated with installation and maintenance of traffic controls.

D. Designate one person who will be accessible to the OWNER on a 24-hour basis and will be responsible for the maintenance of the barricades and the work site.

E. Coordinate any interruption of traffic with TXDOT, the OWNER, Fire and Police Departments, and the ENGINEER at least 24 hours in advance of such interruptions.

F. Furnish, install, and maintain street barricades on all dead end streets and as necessary during construction to maintain job safety.

1.05 EASEMENTS OF RIGHT-OF-WAY

A. CONTRACTOR shall confine his construction operations within the limits indicated on the Drawings, and shall use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplies so as to cause the least possible damage to property and interference with traffic. If the CONTRACTOR requires additional easement for his operations, the CONTRACTOR is solely responsible for acquisition and maintenance of the easement. No additional compensation will be provided by the OWNER.

B. Easements
   1. Easements across private property are indicated on the Drawings. CONTRACTOR shall set stakes to mark the boundaries of construction easement across private property. The stakes shall be protected and maintained until completion of construction and cleanup.

C. Rights-of-Way
   1. Permits for Work in rights-of-way shall be obtained by the CONTRACTOR. All Work performed and all operations of CONTRACTOR, his employees, or subcontractors, within the limits of railroad and highway rights-of-way, shall be in conformity with the requirements and be under the control (through OWNER) of the railroad or highway authority owning, or having jurisdiction over and control of, the right-of-way in each case.

1.06 OPERATION OF EXISTING FACILITIES

A. Existing water and wastewater facilities shall be kept in continuous operation throughout the construction period. No interruption will be permitted which adversely affects the degree of service provided. Provided permission is obtained from OWNER in advance, portions of the existing facilities may be taken out of service for short periods corresponding with periods of minimum service demands.

B. CONTRACTOR shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation during the construction period.

1.07 CONNECTIONS TO EXISTING FACILITIES

A. Unless otherwise specified or indicated, CONTRACTOR shall make all necessary connections to existing facilities including structures, drain lines, and utilities. In each case, CONTRACTOR shall receive permission from OWNER or the owning utility prior to undertaking connections. CONTRACTOR shall protect facilities against deleterious substances and damage.

B. Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials and labor shall be on hand at the time of undertaken the connection. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

1.08 UNFAVORABLE CONSTRUCTION CONDITIONS

A. No portion of the Work shall be constructed under conditions which adversely affect the quality or efficiency thereof, unless special means or precautions are taken by CONTRACTOR to perform the Work in a proper and satisfactory manner.

END OF SECTION

SECTION 01 01 01

HEALTH AND SAFETY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies general health and safety requirements of this Contract, including but not limiting the Contractor's responsibility to fully acquaint himself with this project's site conditions and hazards and to fully comply with all applicable local, state, and federal safety regulations. The Contractor shall abide by these specifications and the General Conditions of the Contract.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. 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. This includes, but is not limited to compliance with 29 CFR Part 1910 and 29 CFR Part 1926.

B. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Contractor shall take all the necessary precautions for the safety of contractor operatives/employees, sub-contractor operatives/employees, Owner employees and consultants, and the general public. Contractor shall provide the necessary protection to prevent damage, injury, or loss to any and all persons at the jobsite including but not limited to all contractor personnel and persons belonging to other agencies or organizations who may be required to visit the project site.

C. Contractor shall assign a responsible representative to be kept at the Project site during the progress of any and all work 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 the Contractor's superintendent, unless otherwise designated in writing by the Contractor to Owner.

D. Coordination of any system interruption required by the Contractor's safety program or plan shall be initiated by the Contractor and be coordinated in advance with the Owner and costs associated with such system interruption shall be subsidiary to the project cost. Any alternate power supply/generator and/or by-pass pumping required by the Contractor's safety program or plan and costs associated with it shall be the sole responsibility of the Contractor and be subsidiary to the Health and Safety Requirements bid item.

E. Contractor is responsible for locating and tracing any obstacles located underground and embedded in any concrete walls, floors, or platforms before excavating, breaking, coring or penetrating and before any construction and installation work is performed. Obstacles may include but not be limited to sewers, waterlines, energized electric lines, gas lines, telephone lines, and other utilities. Owner will render assistance to Contractor in the matter of determining the location of existing utilities by making available such existing maps and records as may be readily accessible to Owner, when requested to do so by the Contractor, but the accuracy of such information shall not be expected by the Contractor and will not be guaranteed by the Owner. Costs associated with locating and tracing obstacles shall be subsidiary to the project cost.

F. Contractor shall provide safe Project site access and safe detour paths as necessary during construction for Project site visitors.

G. Any and all engineered safety plans when required by applicable Laws and Regulations and the Contractor's safety program and plan for this project such as but not limited to Trench Safety Plan and Fall Protection Plan shall be the responsibility of the Contractor and payment of such shall be subsidiary to the project cost.

END OF SECTION

SECTION 01 01 25

CONSTRUCTION SCHEDULE

PART 1 - PART 1 GENERAL

1.01 GENERAL

A. Provide Construction Schedules for Work included in this Contract in accordance with requirements in this Section. Create a Construction Schedule using Critical Path Method (CPM) computer software capable of mathematical analysis of Precedence Diagramming Method (PDM) schedules. Provide printed activity listings and bar charts in formats described in this Section.

B. Combine activity listings and bar charts with a narrative report to form the Contractor's Construction Schedule submittal for the Engineer.

1.02 SCHEDULING STAFF

A. Employ or retain services of an individual experienced in critical path scheduling for the duration of the Contract. This person shall cooperate with the Engineer and shall update the Contractor's schedule at least monthly as required to indicate current status of the Work.

1.03 SUBMITTALS

A. Make Construction Schedule submittals for review by the Engineer in accordance with requirements of the Conditions of the Contract.

B. During the pre-construction meeting provide sample bar charts and activity listings produced from the scheduling software proposed. Scheduling software is subject to approval of the Engineer and must meet requirements provided in this Section. Review of the samples will be provided by the Engineer within 7 days of the submittal.

C. Within 21 days of receipt of approval of the Contractor's format, or 30 days of the Notice to Proceed, whichever is later, submit a proposed Construction Schedule for review. The Construction Schedule submittal shall be based on the following:
   1. The level of detail and number of activities required in the schedule are dependent on the project type.
      a. For wastewater projects, the work shall be categorized by Work Type and Area Code in the schedule.
   2. For projects with multiple types of tasks within the scope, these types of work shall be indicated separately within the schedule.
   3. For projects with work at different physical locations or service areas, or different facilities within a site, each location or facility shall be indicated separately within the schedule. Work on each floor of a multi-story building shall be shown as separate tasks.
   4. For projects with multiple crafts or significant subcontractor components, these elements shall be indicated separately within the schedule. Unless permitted by the Engineer, tasks shall consist of work covered by only one

division of the Project Manual.

5. Unless permitted by the Engineer, each schedule task shall be the same as a schedule of values line item, and vice versa.
6. For projects with significant major equipment items or materials representing over 5 percent of the Total Contract Price, the schedule shall indicate dates when these items are to be purchased, when they are to be delivered, and when installed. Activities for testing, adjustment, and delivering O & M manuals shall be included.
7. No task except the acquisition of major equipment items shall represent more than one percent of the Total Contract Price for facility projects and 3 percent of the Total Contract Price for other projects. The duration of tasks may not exceed 40 calendar days.
8. For projects where operating facilities are involved, each period of work which will impact any process or operation shall be identified in the schedule and must be agreed to by the Engineer and the facility operator prior to starting work in the area.
9. Construction Schedule submittals shall include:
   a. Printed bar charts which meet the criteria outlined in this Section and which are produced by the Contractor's approved scheduling software.
   b. Activity listings which meet the criteria outlined in this Section and which are produced by the Contractor's approved scheduling software.
   c. Predecessor/successor listing sorted by Activity ID which meets the criteria outlined in this Section and which is produced by the Contractor's approved scheduling software.
   d. A logic network diagram shall be required with the first construction schedule submittal for facilities projects.
   e. A graphic or tabular display of estimated monthly billings for the Work shall be prepared and submitted by the Contractor with the first schedule submittal. This information is not required in monthly updates, unless significant changes in work require re-submittal of the schedule for review. The display shall allocate units indicated in the bid schedule or the schedule of values to Construction Schedule activities. (Weighted allocations are acceptable, where appropriate). The dollar value associated with each allocated unit will be spread across the duration of the activity on a monthly basis. The total for each month and a cumulative total will be indicated. These monthly forecasts are only for planning purposes of the Engineer. Monthly payments for actual work completed will be made by the Engineer in accordance with the Conditions of the Contract.
   f. A narrative report which shall provide the information outlined in this Section.

D. No payment will be made until the Construction Schedule and billing forecast are accepted by the Engineer.

E. If the Contractor desires to make changes in his method of operating and scheduling, after approval of the original schedule has been given by the Engineer, the Contractor shall notify the Engineer in writing, stating the reasons for the change. If the Engineer considers these changes to be of significant nature, the Contractor may be required to revise and resubmit for approval all or the affected portion of the Contractor's Construction Schedule to show the effect on the Work.

F. Upon written request from the Engineer, the Contractor shall revise and submit for approval all or any part of the Construction Schedule submittal to reflect changed conditions in the Work or deviations made from the original plan and schedule.

G. The Contractor's Construction Schedule shall thereafter be updated with Actual Start and Actual Finish Dates, Percent Complete, and Remaining Duration of each Activity and submitted monthly. The data date to be used in updating the monthly Construction Schedule shall be the same data date as is used in the monthly Application for Payment. This monthly update of the schedule shall be required before the monthly Application for Payment will be processed for payment.

1.04 SCHEDULING COMPUTER SOFTWARE REQUIREMENTS

A. The Contractor's Construction Schedule shall be created using CPM computer software which provides mathematical analysis of PDM schedules. The software shall be capable of creating bar charts and activity listings which can be sorted by various fields, i.e., Sort by Activity ID; Sort by Early Start; Sort by Total Float; Sort by Area Code; sort by specification section number; and sort by Subcontractor. The software shall be capable of producing a logic network diagram.

B. The PDM scheduling software shall be capable of producing activity listings and bar charts with the following information for each activity in the schedule:
   1. Activity ID
   2. Activity Description
   3. Estimated (Original) Duration
   4. Remaining Duration
   5. Actual Duration
   6. Early Start Date
   7. Late Start Date
   8. Early Finish Date
   9. Late Finish Date
   10. Free Float
   11. Total Float
   12. Activity Codes (such as Area Code, Work Type, Specification Section, Subcontractor)

C. The PDM scheduling software shall be capable of printing calendars using the mathematical analysis of the schedule, indicating the Contractor's standard work days of the week and scheduled holidays.

D. Scheduling software shall be capable of printing an activity listing which indicates the Predecessors and Successors, Lag Factors and Lag Relationships used in creating the logic of the schedule.

E. Scheduling software shall be capable of printing a bar chart of the entire schedule for the Work included in this Contract. The bar chart format shall provide a monthly time scale and shall be such that a 12-month time scale shall not exceed one page width. Bar charts may be printed or plotted on 8.5" x 11", 8.5" x 14" or 11" x 17" sheet sizes. Over-size plots are not acceptable.

1.05 NARRATIVE SCHEDULE REPORT

A. The Narrative Report shall include a listing of the Activities Started This Month; Activities Completed This Month; Activities Continued This Month; Activities Scheduled to Start or Complete Next Month; Problems Encountered This Month; Actions Taken to Solve These Problems.

B. The narrative Schedule Report shall include a description of changes made to the Construction Schedule Logic (i.e., changes in Predecessors and Lags); Activities Added to the Schedule; Activities Deleted from the Schedule; any other changes made to the Schedule other than the addition of Actual Start Dates and Actual Finish Dates and changes of Data Date and Remaining Durations for re-calculation of mathematical analysis.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01 01 26

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Measurement and payment criteria applicable to the Work performed under a unit price payment method.

B. Defect assessment and non-payment for rejected work.

1.02 AUTHORITY

A. This Section is the authority for measurement methods and definitions of pay items, and supersedes any such direction which may be stated or implied in the Drawings or in individual sections of the technical specifications (Divisions 2 and higher).

B. Take all measurements and compute quantities. The OWNER will verify measurements and quantities.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

1.03 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Proposal are for bidding and contract purposes only. Quantities and measurements supplied or placed in the Work and verified by the OWNER determine payment.

B. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit sum/prices contracted.

1.04 MEASUREMENT OF QUANTITIES

A. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

B. Measurement by Area: Measured by square dimension using mean length and width or radius.

C. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

D. Stipulated Sum/Price Measurement: Items measured by weight, volume, area,

1.05 PAYMENT

A. Payment Includes: Full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work, including overhead and profit.

B. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the OWNER multiplied by the unit sum/price for Work which is incorporated in or made necessary by the Work.

1.06 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction for defective Work.

C. The authority of the OWNER to assess the defect and identify payment adjustment, is final.

1.07 NON-PAYMENT FOR REJECTED PRODUCTS

A. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.
   4. Products placed beyond the lines and levels of the required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling and disposing of rejected Products.

1.08 STANDARDS FOR COMPUTING PAY ITEMS

A. See the General Conditions, particularly paragraphs 2.6.3, 2.9, and 14.1, for additional direction regarding use and application of pay items.

B. The intent of Pay Items is to address all items shown, specified, required, reasonably implied, or otherwise necessary for the completion of the Work indicated in the Contract Documents. No separate payment will be made for costs (including, but not necessarily limited to labor, equipment, materials, or other CONTRACTOR expenses) arising from the completion of the Work which was indicated in the Contract Documents, whether or not a Pay Item expressly includes such costs. Should the Work include costs not expressly included in any Pay Item, CONTRACTOR is presumed to have included such costs in his bid under related pay items.
   1. Other Pay Items not specifically listed in the Pay Item Descriptions below, which are for specific work (such as decommissioning or demolition of an existing facility), may be identified in the Bid Form. These items are provided in order to establish a basis for payment upon completion of work including and related to that described for the Pay Item in the Bid Form.
      Should the Work include costs not expressly or impliedly included under any Pay Item, CONTRACTOR is presumed to have included such costs in his bid under the Pay Item entitled "ALL OTHER WORK".

C. Excavation is unclassified, and construction requiring excavation is paid under the appropriate Pay Item value regardless of the character of ground encountered during Construction.

D. Pay Item Descriptions
   1. MOBILIZATION - Lump sum price (which shall not exceed 5% of the Total Base Bid Amount) shall include all work necessary to mobilize, demobilize and remobilize as necessary to perform Work in accordance with the Contract Documents.

2. REMOVE EXISTING PIPE - Price per linear foot of water and/or sewer (gravity or pressure) line removed and disposed of, regardless of size, depth, or material, which follows the same general alignment of proposed pipes. Flow bypass operations to maintain service to connected customers during construction is also included.
3. ABANDON EXISTING PIPE - Price per cubic yard of flowable fill or grout to be placed in existing buried pipes which are to be filled and abandoned in place.
4. (EACH SIZE) PRESSURE PIPE - Price per linear foot of water and/or pressure sewer line regardless of material and depth of installation shall include furnishing, installing, excavating, bedding, backfilling, and testing the pipe and fittings. Also included is the incidental removal and replacement of existing structures (including all occurrences of less than 25 feet of contiguous pipe) which conflict with, but do not follow the same general alignment of proposed pipes. Restoration, including but not limited to replacement of pavement for the width of the trench plus benches on either side of the trench is also included.
5. CONNECT TO EXISTING (EACH SIZE) DRY LINE - Price per each connection shall include all work necessary for locating and making connection to existing inactive pressure line; including fittings and removing abandoned pipe.
6. CONNECT TO EXISTING (EACH SIZE) WET LINE - Price per each connection shall include all work necessary for locating and making connection to existing active pressure line; including fittings and removing abandoned pipe.
7. (EACH SIZE) (EACH TYPE) VALVE - Price per each for buried valves furnished, installed, excavated, bedded, backfilled, and tested, regardless of depth.
8. (EACH SIZE) GRAVITY SEWER AT (EACH DEPTH) - Price per linear foot of gravity sewer line regardless of material shall include furnishing, installing, excavating, bedding, backfilling, and testing the pipe and appurtenances. Depth for payment shall be measured from the finished grade to the invert of the pipe. Connection to existing gravity sewer lines, manholes, and service connections (whether active or inactive), which is necessary for completion and activation of the new sewer, is included. Also included is the incidental removal and replacement of existing structures (including all occurrences of less than 25 feet of contiguous pipe) which conflict with, but do not follow the same general alignment of proposed pipes. Restoration, including but not limited to replacement of pavement for the width of the trench plus benches on either side of the trench is also included.
9. OPEN-CUT SEWER SERVICE LATERALS - Price per each lateral constructed between the sewer main trench excavation and the property line of the customer served, regardless of size, including a new cleanout at the property line, as well as determining location of and making connection to the existing lateral at the property line. Price includes furnishing, installing, excavating, bedding, backfilling, and testing the lateral and appurtenances. Restoration, including but not limited to replacement of pavement for the width of the trench plus benches on either side of the trench is also included.

10. JACKED SEWER SERVICE LATERALS - Price per each lateral constructed between the sewer main trench excavation and the property line of the customer served by jacking methods, regardless of size, including a new cleanout at the property line, as well as determining location of and making connection to the existing lateral at the property line. Price includes furnishing, installing, and testing the lateral and appurtenances, as well as excavating, backfilling, and restoration of entry and exit pit areas.
11. (EACH DIAMETER) MANHOLES AT (EACH DEPTH RANGE) - Price shall be determined per each manhole based on the specified depth range (for example,0-8 feet, 8-12 feet, etc.). The depth shall be the actual depth from the top to the flow line of the manhole. Price shall include frame and standard or water tight covers. Restoration, including replacement of pavement for the manhole excavation plus benches around the excavation is also included.
12. DROP CONNECTIONS - Price shall be determined per vertical foot for each manhole drop connection constructed regardless of size. Depth for payment shall be measured between the upper and lower inverts of the drop pipe.
13. REMOVE EXISTING MANHOLE - Price per each manhole removed and disposed of, regardless of diameter, depth, or material.
14. ABANDON EXISTING MANHOLE - Price per each manhole abandoned in place, including plugging connected sewer lines, excavating, backfilling, filling manhole, removing upper section(s), and pavement replacement for the extent of the excavation plus benches around the excavation perimeter.
15. JACK & BORE (EACH CASING SIZE) - Price shall be determined per linear foot for furnishing and installing casing pipe by boring or tunneling, furnishing and threading carrier pipe, blocking, sealing ends; excavating, dewatering, and backfilling pits; and all other work that is required to complete the installation.
16. (EACH SIZE) CASING PIPE - OPEN TRENCH - Price shall be determined per linear foot for furnishing and installing casing pipe in an open trench, furnishing and threading carrier pipe, spacers, sealing ends, pits and all other work that is required to complete the installation. Price shall include excavation and backfill.
17. DEWATERING - Price shall be determined per linear foot of pipe installed by open trench methods, where dewatering is deemed necessary by the OWNER's inspector in order to keep the trench dry for pipe installation.
18. TRENCH SAFETY - Price shall be determined per linear foot of trench, where excavation depth exceeds five feet, to include compliance with all applicable OSHA and Texas Health and Safety Code requirements.
19. TRENCH SAFETY PLAN - Lump Sum Price shall include compensation for CONTRACTOR's registered Professional Engineer to design the Trench Safety system, as well as CONTRACTOR's training of employees and other related administration of the Trench Safety Plan.
20. PAVEMENT REPLACEMENT - Price shall be determined per square yard of asphaltic pavement to be replaced outside of utility excavation limits, including removal of existing subgrade, base, and surface, and replacement with new subgrade, base, and surface.

21. PAVEMENT REPAIR - Price shall be determined per square yard of asphaltic pavement to be repaired outside of utility excavation limits, including milling of existing surface, and replacement with new surface.
22. ALL OTHER WORK - Lump Sum Price shall include all work indicated in the Contract Documents (including, but not necessarily limited to labor, equipment, materials, or other CONTRACTOR expenses arising from the completion of the Work) which the CONTRACTOR deems to be expressly and impliedly omitted from, and unrelated to, other Pay Items listed in the Bid Form.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01 01 30

SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Submittal procedures for:
   1. Schedule of Values.
   2. Construction Schedules.
   3. Shop Drawings, Product Data, and Samples
   4. Operations and Maintenance Data.
   5. Manufacturer's Certificates.
   6. Construction Photographs.
   7. Project Record Documents.
   8. Video Tapes.
   9. Design Mixes.

1.02 SUBMITTAL PROCEDURES

A. Scheduling and Handling:
   1. Schedule submittals well in advance of the need for the material or equipment for construction. Allow time to make delivery of material or equipment after submittal has been approved.
   2. Develop a submittal schedule that allows sufficient time for initial review, correction, resubmission and final review of all submittals. The Engineer will review and return submittals to the Contractor as expeditiously as possible but the amount of time required for review will vary depending on the complexity and quantity of data submitted. In no case will a submittal schedule be acceptable which allows less than 30 days for initial review by the Engineer. This time for review shall in no way be justification for delays or additional compensation to the Contractor. Recognizing that time is of the essence, the Contractor is to stamp the top of each submittal with the words ROUTINE or CRITICAL. Routine submittals shall be processed in accordance with the timeframe set forth previously. Critical submittals are those that: were overlooked by the Contractor, involve complex coordination, or are crucial to the successful completion of a specific portion of the project. For critical submittals:
      a. Contractor shall indicate on the submittal his realistically estimated date of when a review must be returned;
      b. Upon return of critical submittals, Contractor shall date-stamp the transmittal page with date and time received;
      c. Contractor is cautioned that the use of critical submittals is not a substitute for proper due diligence on his part. Review of critical submittals found to be routine shall be accompanied by an invoice for excess time and material expenditures that were required in order to complete the critical review as compared to a routine review. The Resident Project Representative shall

make the determination as to whether a critical submittal was in fact routine.

3. The Engineer's review of submittals covers only general conformity to the Drawings, Specifications and dimensions which affect the layout. The Contractor is responsible for quantity determination. Quantities may be verified by the Engineer. The Contractor is responsible for any errors, omissions or deviations from the Contract requirements; review of submittals in no way relieves the Contractor from his obligation to furnish required items according to the Drawings and Specifications.
4. Submit sufficient copies of documents. Unless otherwise specified in the following paragraphs or in the Specifications, provide 3 copies in addition to the number the Contractor requires returned. For portions of the project involving electrical or signal components, provide one additional copy (4 copies in addition to the number the Contractor requires returned).
5. Revise and resubmit submittals as required. Identify all changes made since previous submittal.
6. A maximum of three (3) reviews will be conducted on any one submittal. Submittals requiring more than three (3) reviews will be considered inadequate and result in a recovery of review expenses from the Contractor.
7. The Contractor shall assume the risk for material or equipment which is fabricated or delivered prior to approval. No material or equipment shall be incorporated into the Work or included in periodic progress payments until approval has been obtained in the specified manner.

B. Transmittal Form and Numbering:
   1. Transmit each submittal to the Engineer with a Transmittal Cover.
   2. Sequentially number each transmittal including the Specification Section number followed by a area designation number and the sequential number beginning with the number 1. Re-submittals shall use the original number with an alphabetic suffix (i.e., 2A for first re-submittal of Submittal 2 or 15C for third re-submittal of Submittal 15). Each submittal shall only contain one type of work, material, or equipment. Mixed submittals will not be accepted.
   3. Identify time nature of submittal, either ROUTINE or CRITICAL.
   4. Identify variations from requirements of Contract Documents and identify product or system limitations.
   5. For submittal numbering of video tapes, see paragraph 1.10 Video.

C. Transmittal Cover:
   1. Transmittal Cover, certifying that the items have been reviewed in detail and are correct and in accordance with Contract Documents, except as noted by any requested variance. A stamp may be used to print the information on the Transmittal Cover except for the Contractor’s signature. Regardless of whether the transmittal cover is typed or stamped, the transmittal cover text shall be a minimum of fourteen (14) point.
   2. As a minimum, Transmittal Cover information shall include:
      a. Contractor's name.
      b. Job number.
      c. Submittal number.

d. Certification statement that the Contractor has reviewed the submittal and it is in compliance with the Contract Documents.
e. Signature line for Contractor.
f. Submittal type – routine or critical

3. The bottom half of the Transmittal Cover shall be kept blank.

D. Electronic copy submittals:

1. Electronic copies of the approved paper copy Operation and Maintenance Manuals are to be produced in Adobe Acrobat's Portable Document Format (PDF) Version 9.0 or higher.
2. Do not password protect and/or lock the PDF document.
3. Create one (1) PDF document (PDF file) for each equipment O&M Manual.
4. Drawings or other graphics must be converted to PDF format and made part of the one (1) PDF document.
   a. Scanning to be used only where actual file conversion is not possible.
5. Rotate pages that must be viewed in landscape to the appropriate position for easy reading.
6. Images only shall be scanned at a resolution of 300 dpi or greater.
   a. Perform Optical Character Recognition (OCR) capture on all images.
   b. Achieve OCR with the "original image with hidden text" option.
   c. Word searches of the PDF document must operate successfully to demonstrate OCR compliance.
7. Create bookmarks in the navigation frame, for each entry in the Table of Contents/Index.
   a. Normally three (3) levels deep (i.e., "Chapter," "Section," "Sub-section").
8. Thumbnails must be generated for each PDF file.
9. Set the opening view for PDF files as follows:
   a. Initial view: Bookmarks and Page.
   b. Magnification: Fit in Window.
   c. Page layout: Single page.
   d. Set the file to open to the cover page of the manual with bookmarks to the left, and the first bookmark linked to the cover page.
   e. All PDF documents shall be set with the option "Fast Web View" 1 to open the first 2 pages of the document for the viewer while the rest of the document continues to load.
   f. File naming conventions:
      1) File names shall use a "ten dot three" convention (XXXXX-YYYY-Z.PDF) where XXXXX is the Specification Section number, YYYY is the area designation number and Z is the sequential submittal number.
10. Labeling:
    a. As a minimum, include the following labeling on all CD-ROM discs and jewel 19 cases:
       1) Project Name.
       2) Equipment Name and Project Tag Number.
       3) Project Specification Section.
       4) Manufacturer Name.
       5) Vendor Name.

11. Binding:
    a. Include labeled CD(s) in labeled jewel case(s). Bind jewel cases in standard three-ring binder Jewel Case Page(s), inserted at the front of the Final paper copy submittal.
    b. Jewel Case Page(s) to have means for securing Jewel Case(s) to prevent loss (e.g., flap and strap).

1.03 CONSTRUCTION SCHEDULE

A. Submit Construction Schedules in accordance with Section – Construction Schedule.

1.04 OPERATIONS AND MAINTENANCE DATA

A. Submit Operations and Maintenance data in accordance with Section - Operations and Maintenance Data.

1.05 MANUFACTURER'S CERTIFICATES

A. When required in Specification sections, submit manufacturers' certificate of compliance for review by Engineer.

B. Transmittal Cover, as described in paragraph 1.02C, shall be placed on front page of the certification.

C. Submit supporting reference data, affidavits, and certifications as appropriate.

D. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.

1.06 CONSTRUCTION PHOTOGRAPHS

A. Submit Construction Photographs in accordance with Section – Construction Photographs.

1.07 PROJECT RECORD DOCUMENTS

A. Submit Project Record Documents in accordance with Section - Project Record Documents.

1.08 VIDEO

A. Submit television video tapes as required for Acceptance Testing for Sanitary Sewers.

B. Transmittal forms for video tapes shall be numbered sequentially beginning with TV01, TV02, etc.

1.09 DESIGN MIXES

A. When specified in Specifications, submit design mixes for review.

B. Transmittal Cover, as described in paragraph 1.02C, shall be placed on front page of each design mix.

C. Mark each design mix to identify proportions, gradations, and additives for each class and type of design mix submitted. Include applicable test results on samples for each mix.

D. Maintain a copy of approved design mixes at mixing plant.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL

A. Submittals made as part of this project will become a vital portion of the project record and will be referenced by the Owner for the useful life of the project. All submittals shall be of high quality. To this end, the following requirements are made:
   1. As much as possible, all catalog cuts and manufacturer's information shall be original.
   2. Copies, when required, shall be clean and entirely legible.
   3. Neither facsimiles nor copies of facsimiles are to be included as part of any submittal.
   4. Binders, if used, shall be rugged, lock-ring type. Spine of binders shall be clearly labeled with the information outlined in items 1.02 C.2.a. through c.

B. Reviewed submittals shall be returned to Contractor for distribution to subcontractors and other trades as required. As a minimum, submittals returned to the Contractor will be marked with review comments indicating findings of the review and giving instruction as to necessity of a re-submittal. The Engineer may, at his option, use a stamp for this purpose. Detailed correspondence covering the review may also accompany returned submittals.

END OF SECTION

SECTION 01 01 39

COORDINATION AND MEETINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Coordination.

B. Preconstruction Conference.

C. Site Mobilization Meeting.

D. Progress Meetings.

E. Preinstallation Conference.

F. Field Engineering.

1.02 COORDINATION

A. Inform OWNER and ENGINEER of the address for sending to which official correspondence and the address and telephone number of CONTRACTOR's representative who will be Project Manager for the Contract and responsible and available outside of normal working hours for emergency repairs and maintenance of safety devices.

B. During periods of construction and testing keep OWNER and ENGINEER informed in writing with name, address, and telephone number of CONTRACTOR's representative who will be responsible and available outside of normal working hours for emergency repairs and the maintenance of safety devices.

C. Identify correspondence, drawings, data and materials, packing slips or other items associated with this Contract as that identified on the Cover.

D. Coordinate scheduling, submittals, and Work for the various Sections of Specifications to effectuate an efficient and orderly sequence for installing interdependent construction elements, with provisions for accommodating items installed later.

E. Coordinate Work of various Sections with interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.

F. Coordinate space requirements and installation of mechanical and electrical work, which are indicated by diagram on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, maintenance, and repairs.

G. In finished areas (except as otherwise indicated), conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

H. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for OWNER's partial occupancy.

I. After OWNER occupancy of premises, coordinate access to site for correction of defective Work and/or incomplete Work to minimize disruption of OWNER's activities.

J. Provide coordination in accordance with Article 7 of the General Conditions.

1.03 PRECONSTRUCTION CONFERENCE

A. OWNER to schedule a preconstruction conference in accordance with General Conditions Article 2.

B. Agenda:
   1. Distribute Contract Documents.
   2. Finalize preliminary Progress Schedule, submittal schedule and schedule of values.
   3. Designate personnel representing each party.
   4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, testing, Change Orders and Contract closeout procedures.
   5. Scheduling.

1.04 SITE MOBILIZATION MEETING (NOT USED)

A. OWNER to schedule a meeting at the Project site before CONTRACTOR occupancy.

B. Attendance Required: OWNER, *ENGINEER, * *Special Consultants, * CONTRACTOR, *CONTRACTOR's Superintendent, * and major Sub CONTRACTORs.

C. Agenda:
   1. Use of premises by OWNER and CONTRACTOR.
   2. OWNER's requirements *and *partial* occupancy*.
   3. Construction facilities and controls provided by OWNER.
   4. Temporary utilities provided by OWNER.
   5. Survey and *building* * * layout.
   6. Security and housekeeping procedures.
   7. Schedules.
   8. Procedures for testing.
   9. Procedures for maintaining record documents.
   10. Requirements for start-up of equipment.
   11. Inspection and acceptance of equipment put into service during construction period.

1.05 PROGRESS MEETINGS

A. OWNER to schedule a progress meeting no later than 60 days after the Preconstruction Conference and a monthly meeting throughout progress of the Work. Make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

B. Attendance: CONTRACTOR, major Subcontractors, OWNER, and ENGINEER, as appropriate to agenda topics for each meeting.

C. Agenda:
   1. Review minutes of previous meetings.
   2. Unresolved issues.
   3. Review Work progress.
   4. Observations, problems, and decisions.
   5. Identification of problems that impede planned progress.
   6. Review of submittals schedule and status of submittals.
   7. Review of off-site fabrication and delivery schedules.
   8. Maintenance of progress schedule.
   9. Corrective measures to regain projected schedules.
   10. Planned progress during succeeding Work period.
   11. Coordination of projected progress.
   12. Maintenance of quality and work standards.
   13. . Effect of proposed changes on progress schedule and coordination.
   14. Other business relating to Work.

1.06 PREINSTALLATION CONFERENCE

A. When required in individual Specification Section, convene a preinstallation conference at work site before commencing Work of the Section.

B. Require attendance of parties directly affecting, or affected by, work of the specific Section. Notify ENGINEER 5 days in advance of meeting date.

C. Make arrangements for meeting and preside at conference.

D. Review conditions of installation, preparation and installation procedures, and coordination with related work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 FIELD ENGINEERING

A. Surveying: All surveying shall be performed by a Land Surveyor registered in the State of Texas.
   1. Existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other utilities and construction. Use "One-Call," l-800-DIG-TESS or (800) 344-8377.

2. Furnish all surveys necessary to perform the Work. Maintain surveyor's log of control and other survey work. Keep log available for reference.
3. Verify layout information shown on the Drawings in relation to existing benchmarks before laying out of the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.
4. Promptly report lost or destroyed reference points, benchmarks, or control points. Promptly report requirements relocate reference and control points due to changes in grades. Promptly replace lost or destroyed control points based on the original survey control points.

END OF SECTION

SECTION 01 01 40

WARRANTIES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This section specifies general administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

1.02 SUBMITTAL REQUIREMENTS

A. Submit written warranties to the OWNER prior to the date fixed by the Engineer for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the work, or a designated portion of the work, submit written warranties upon request of the Owner.

B. Assemble warranties, service, and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.

C. Number of original signed copies required: Two (2) each.

D. Table of Contents: Neatly types, in orderly sequence. Provide complete information for each item.
   1. Product or work item.
   2. Firm, with name of principal, address and telephone number.
   3. Scope.
   4. Date of beginning of warranty, service, or maintenance contract.
   5. Duration of warranty, or service maintenance contract.
   6. Provide information for Owner's personnel:
      a. Proper procedure in case of failure.
      b. Instances which might affect the validity of warranty.
   7. Contractor, name of responsible principal, address and telephone number.

1.03 FORMS OF SUBMITTALS

A. Prepare in duplicate packets.

B. Format:
   1. Size 8-1/2 inches x 11 inches, punch sheets for standard 3-post binder.
      a. Fold larger sheets to fit into binders.
   2. Cover: Identify each packet with typed or printed title 'WARRANTIES". List:
      a. Title of Project.
      b. Name of Contractor.
   3. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum post width of 2 inches.

1.04 WARRANTY SUBMITTAL REQUIREMENTS

A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with the Contractor's for one (1) years, unless otherwise specified, commencing at the time of final acceptance by the Owner.

B. The Contractor shall be responsible for obtaining certificates for equipment warranty for all major equipment specified under Divisions 11, 13, 14, 15 and 16 and which has a 1 HP motor or which lists for more than $1,000. The Engineer reserves the right to request warranties for equipment not classified as major. The Contractor shall still warrant equipment not considered to be "major" in the Contractor's once-year warranty period even though certificates of warranty may not be required.

C. For certain pieces of equipment, the OWNER may require a warranty greater than one (1) years. The requirement for extended warranty shall be specified in individual sections of the Specifications.

1.05 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

B. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace, or rebuild the work to an acceptable condition complying with requirements of Contract Documents. The Contractor's is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the work through a portion of its anticipated useful service life.

D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the OWNER can enforce such other duties, obligations, rights, or remedies.

E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

F. The Owner reserves the right to refuse to accept work for the project where a special warranty, certification, or similar commitment is required on such work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.

G. Disclaimers and Limitations: Manufacturer's disclaimers and limitation on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers and subcontractors required to countersign special warranties with the Contractor.

PART 2 PRODUCTS – (NOT USED)

PART 3 EXECUTION -(NOT USED)

END OF SECTION

SECTION 01 01 61

BASIC PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for transportation, delivery, handling, and storage of materials and equipment.

1.02 PRODUCTS

A. Products: Means material, equipment, or systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components designated for reuse.

B. Do not reuse materials and equipment, designated to be removed, except as specified by the Contract Documents.

C. Provide equipment and components from the fewest number of manufacturers as is practical, in order to simplify spare parts inventory and to allow for maximum interchangeability of components. For multiple components of the same size, type or application, use the same make and model of component throughout the project.

1.03 TRANSPORTATION

A. Make arrangements for transportation, delivery, and handling of equipment and materials required for timely completion of the Work.

B. Transport and handle products in accordance with instructions.

C. Consign and address shipping documents to the proper party giving name of Project and street address. Shipments shall be delivered to the Contractor.

1.04 DELIVERY

A. Arrange deliveries of products to accommodate the short term site completion schedules and in ample time to facilitate inspection prior to installation. Avoid deliveries that cause unnecessarily lengthy use of limited storage space.

B. Coordinate deliveries to avoid conflict with Work and conditions at the site and to accommodate the following:
   1. Work of other contractors or the Owner.
   2. Limitations of storage space.
   3. Availability of equipment and personnel for handling products.
   4. Owner's use of premises.

C. Have products delivered to the site in manufacturer's original, unopened, labeled containers.

D. Immediately upon delivery, inspect shipment to assure:
   1. Product complies with requirements of Contract Documents.
   2. Quantities are correct.

3. Containers and packages are intact; labels are legible.
4. Products are properly protected and undamaged.

1.05 PRODUCT HANDLING

A. Coordinate the off-loading of materials and equipment delivered to the job site. If necessary to move stored materials and equipment during construction, Contractor shall relocate materials and equipment at no additional cost to the Owner.

B. Provide equipment and personnel necessary to handle products, including those provided by the Owner, by methods to prevent damage to products or packaging.

C. Provide additional protection during handling as necessary to prevent breaking, scraping, marring, or otherwise damaging products or surrounding areas.

D. Handle products by methods to prevent over bending or overstressing.

E. Lift heavy components only at designated lifting points.

F. Handle materials and equipment in accordance with Manufacturer's recommendations.

G. Do not drop, roll, or skid products off delivery vehicles. Hand carry or use suitable materials handling equipment.

1.06 STORAGE OF MATERIAL

A. Store and protect materials in accordance with manufacturer's recommendations and requirements of these Specifications.

B. Make necessary provisions for safe storage of materials and equipment. Place loose soil materials, and materials to be incorporated into the Work to prevent damage to any part of the Work or existing facilities and to maintain free access at all times to all parts of the Work and to utility service company installations in the vicinity of the Work. Keep materials and equipment neatly and compactly stored in locations that will cause a minimum of inconvenience to other contractors, public travel, adjoining owners, tenants, and occupants. Arrange storage in a manner to provide easy access for inspection.

C. Restrict storage to areas available on the construction site for storage of material and equipment as shown on Drawings or approved by the Resident Project Representative.

D. Provide off-site storage and protection when on-site storage is not adequate.

E. Do not use lawns, grass plots, or other private property for storage purposes without written permission of the owner and other person in possession or control of such premises.

F. Protect stored materials and equipment against loss or damage.

G. Store in manufacturers' unopened containers.

H. Materials delivered and stored along the line of the Work shall be neatly, safely, and compactly stacked along the work site in such manner as to cause the least inconvenience and damage to property owners and the general public, and shall be not closer than 3 feet to any fire hydrant. Public and private drives and street crossings shall be kept open.

I. Damage to lawns, sidewalks, streets or other improvements shall be repaired or replaced to the satisfaction of the Resident Project Representative. The total length which materials may be distributed along the route of construction at any one time is 500 lineal feet, unless otherwise approved in writing by the Resident Project Representative.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01 01 70

PROJECT CLOSEOUT PROCEDURE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK AND RELATED DOCUMENTS

A. Furnish all work and materials, appliances, tools, equipment, facilities, transportation and services required and incidental thereto, as shown on drawings and/or specified herein including but not limited to; the submittal of closeout documents, final cleaning of materials and equipment and furnishing permit clearances, guarantees and warranties.

B. Related Work Specified Elsewhere:
   1. Submittal Requirements: Section 01300

C. The completion of the closeout procedures indicated in these specifications will be a condition for releasing final payment.

1.02 PROJECT CLEAN-UP

A. Provide all required personnel, equipment and materials needed to maintain the specified standard of cleanliness. Use only materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material, or as approved by the Engineer/Architect.

B. Final cleaning shall mean a level of cleanliness generally provided by skilled cleaners using commercial quality, site maintenance equipment and materials.

C. The Contractor shall schedule a final cleaning as approved by the Engineer/Architect.

D. The contractor shall restore any disturbed areas or structures to pre-construction conditions or improved conditions.

1.03 ONSITE TRAINING

A. The Contractor shall provide a demonstration of the operation techniques and methods of the mechanical, electrical and plumbing systems. This demonstration must be coordinated with the Engineer/Architect. The operation and maintenance manuals must be available for use during this training period. Training shall be a minimum of eight (8) hours long.

B. The Contractor shall propose a time in writing to the Engineer/Architect allowing at least seventy-two (72) hours' notice.

1.04 AS BUILT DRAWINGS

A. Final "As-Built" drawings shall be prepared by the Contractor in accordance with the Technical Specifications. These drawings shall indicate all changes or deviations from the construction documents. These drawings shall be submitted as a hard copy and electronic PDF format to the Engineer/Architect on a CD. The drawings must clearly state AS BUILT and be neatly organized.

B. Copies of “As-Built” wiring diagrams shall be laminated and placed inside each Lift Station’s control panel

1.05 GUARANTEES AND WARRANTIES

A. The Contractor shall provide a construction warranty letter.

B. The Contractor shall provide final clearances from all permitting agencies.

1.06 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual Specification sections.

B. Deliver to location within the Owner’s jurisdiction as directed by the Engineer; obtain receipt prior to final Application for Payment.

1.07 FINAL COMPLETION

A. The Contractor shall supply a written request for a Final Completion inspection. This request shall include the following:
   1. Certification that the work and actions specified in the Contract Documents has been completed and that the Owner has full use of the site.
   2. All equipment has been tested and balanced and is fully functional.
   3. The Onsite Training Program has been completed and there are no outstanding issues resulting from said program.
   4. A copy of the list of deficiencies generated by the Substantial Completion Inspection, with each item initialed and showing date completed.
   5. A list of all Subcontractors and material suppliers with name, address and phone number. Include source for parts replacement and local representative if different.
   6. Submit all test/adjust/balance records and start-up performance reports.
   7. Submit all tools, keys and any special devices to assure complete operation by the Owner.
   8. Final application for payment.
   9. Waivers, Sworn Statements and Affidavits of Payments to Subcontractors and Suppliers.

END OF SECTION

SECTION 01 01 71

MOBILIZATION

PART 1 - G E N E R A L

1.01 SECTION INCLUDES

A. Organization and mobilization of the Contractor's forces.

B. Transporting construction plant and equipment to the jobsite and setting up of same.

C. Transporting various tools, materials, and equipment to the jobsite.

D. Erection of temporary buildings and facilities as required for field offices, staging, storage, and

1.02 MEASUREMENT AND PAYMENT

A. Measurement and payment for mobilization is on a stipulated price basis.

B. Payment: Mobilization will be paid for at the Contract lump sum price, and will include accumulating tools, apparatus, equipment, materials which are not intended to be incorporated in the Work, and personnel, and performing final removal and demobilization. The Contract lump sum price will be paid as follows:

1. 45 percent of the Contract lump sum price will be made upon receipt and approval by the Engineer of the following items (as applicable):
   a. Schedule of Values
   b. Trench Protection Plan
   c. Construction Schedule
   d. Establishment of Field Office
   e. Dewatering Plan
2. 45 percent of the Contract lump sum price will be made upon completion of the Work amounting to five percent of Original Contract Price. The amount of Contract Price designated for mobilization may not be applied in the computing of the five percent of the Original Contract Price.
3. 10 percent of the Contract lump sum price after the Engineer has determined that the Contractor has left the work site in a clean condition after the completion of all phases of work.

C. Mobilization payments will be subject to retainage amounts stipulated in the General Conditions.

D. All cost difference between the stipulated amount and the actual cost of the initial mobilization and the cost of all subsequent mobilization shall be included in the various other prices bid.

1.03 DESCRIPTION

A. Mobilization shall include mobilization of all construction equipment, materials, supplies, appurtenances, facilities, and the like which are not intended to be incorporated in the Work, staffed and ready for commencing and prosecuting the Work; and the subsequent demobilization and removal from the jobsite of said equipment,

appurtenances, facilities, and the like upon completion of the Work.

B. Mobilization shall also include assembly and delivery to the jobsite of plant, equipment, tools, materials, and supplies necessary for the prosecution of work which are not intended to be incorporated in the Work; the clearing of and preparation of the Contractor's work area; the complete assembly, in working order, of equipment necessary to perform the required work; personnel services preparatory to commencing actual work; and all other preparatory work required to permit commencement of the actual work on construction items for which payment is provided under the Contract.

1.04 SUBMITTALS

A. Submit a plan of the proposed layout of the construction site, including fences, roads, parking, buildings, staging, and storage areas, within seven days after the effective date of the Notice to Proceed.

1.05 DELIVERY

A. Delivery to the jobsite of construction tools, equipment, plant, temporary buildings, materials, and supplies shall be accomplished in conformance with local governing ordinances and regulations.

1.06 TOOLS AND SUPPLIES

A. Provide construction tools, equipment, materials, and supplies of the types and quantities necessary to facilitate the timely execution of the Work.

B. Provide personnel, products, construction materials, equipment, tools, and supplies at the jobsite at the time they are scheduled to be installed or utilized.

1.07 DEMOBILIZATION

A. Upon completion of the Work, remove construction tools, apparatus, equipment mobile units and buildings, unused materials and supplies, plant, and personnel from the jobsite.

B. Restore all areas utilized for mobilization to their original, natural state or, when called for in the Contract Documents, complete such areas indicated.

PART 2 - P R O D U C T S – NOT USED

PART 3 - E X E C U T I O N – NOT USED

END OF SECTION

SECTION 01 01 80

CONSTRUCTION PHOTOGRAPHS AND VIDEO

PART 1 - GENERAL

1.01 PHOTOGRAPHY

A. CONTRACTOR shall be responsible for the production of pre-construction, during construction (construction progress) and post-construction photographs as provided herein. OWNER's Representative may also designate additional subjects for photographs in addition to the general guidelines identified below.

B. All photographs must be produced by a competent photographer and shall be digital color photography of commercial quality. All CONTRACTOR-generated photographs must be stored in a .jpeg file format. Each photograph shall be submitted in duplicate as two 3-inch by 5-inch prints of professional quality enclosed in clear plastic binders. The prints shall be accompanied by digital photographs in CD disc format. Each print shall be marked with the name and number of Contract, name of CONTRACTOR, description and location of view and identity of photographer.

C. Each photograph submittal must include a Photo Log that includes the name and number of Contract, name of CONTRACTOR, the name of the photographer, and company of the photographer, photograph number, the date of the photograph and the filename that the camera assigns to the photo (e.g. MVC-001.jpg). In addition, appropriate descriptive information to properly identify the location of view must be entered into the Photo Log to assist in maintaining a concise project record (e.g. location of MH 5 - Line A or Sta. 2+00 - Line A or location of Sedimentation Basin5, sludge pump A).

D. All pre-construction photographs must be submitted prior to the CONTRACTOR beginning any Work that may cause site disturbance. All construction progress photographs shall be submitted with the monthly progress payment. All post construction photographs shall be submitted prior to release of final payment to the CONTRACTOR.

1. Pre-construction photographs must be taken at sufficient intervals to be able to fully document the pre-construction conditions of the Work, but in no case less than 100 feet along the street, right-of-way or water/wastewater line route before commencement of Work. Each photograph location shall be taken from a minimum of two (2) views (one forward station view and one backward station view along the street or pipeline route) within the limits of construction. Particular attention must be devoted to pre-existing damage to streets, curbs, sidewalks, driveways, signs, mailboxes, etc. for which the CONTRACTOR could be blamed following construction. An identification marker such as houses, businesses, signs, property numbers, mail boxes, landscaping, etc. must be included in each view to properly confirm its location for ease of later identification. At a minimum, photographs must be taken of the following views:
    a. the entire street (full width and length)
    b. all curbs (both sides of street) - all pre-existing curb damage not called for replacement within the Work must be documented, including major cracks
    c. all driveways, steps, and curbs (both sides of street)

d. fence and gate conditions
e. trees, ornamental shrubs, plantings/planter boxes and evidence of irrigation features
f. other privately owned features that might be disturbed by the construction
g. prominent utility features, such as: guy wires, poles, signs, valves, meters, pull boxes, etc.
h. streams and stream banks within the limits of construction
i. other significant or prominent features in order to protect the OWNER and CONTRACTOR following construction (e.g. close up photographs of preexisting broken curbs, cracked/failed pavement, damaged adjacent retaining walls, etc.)
j. views of structures in areas where CONTRACTOR will be working within five (5) feet of said structure
k. other views as requested by the OWNER

2. For street, right-of-way and/or pipeline alignment documentation, construction progress photographs shall be taken from a minimum of two (2) views (one forward station view and one backward station view along the street and/or pipeline route, and one front view and one side view for fittings and appurtenances of pipeline projects) within the limits of construction. Additional photographs shall be taken at stations of significant features and, for pipeline projects at dead ends, tees, bends, valves, manholes, connections, at locations of concrete placement, at stations which will potentially affect adjacent property owners, and at other such times and locations as requested by the OWNER.

E. Construction progress photographs of the same views taken during preconstruction photography must be taken during the progress of the Work and shall be submitted monthly with the CONTRACTOR's monthly progress payments. Post-construction photographs must be taken of the same views taken during preconstruction photography to fully document the completed project. Post construction photographs must be taken after cleanup and site restoration, and must be submitted prior to release of final payment.

1.02 PRE-CONSTRUCTION VIDEO

A. For all horizontal projects (streets and water & wastewater lines) the CONTRACTOR shall also document by video, within the limits of construction, all pre-existing site conditions / elements as documented in above.

B. The video documentation shall provide a clear and continuous view of the project alignment and everything within the limits of construction.

C. The video shall not be taken from inside a vehicle that is moving. The video shall be taken standing within the limits of construction, as applicable.

D. The pre-construction video shall be digital and submitted to the OWNER in CD disc format prior to the occurrence of any site disturbance.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01 01 85

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Maintenance and Submittal of Project Record Documents and samples.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Maintain one record copy of documents at the site in accordance with the Contract Documents.

B. Store Record Documents and samples in field office if a field office is required by Contract Documents, or in a secure location. Provide files, racks, and secure storage for Record Documents and samples.

C. Label each document "PROJECT RECORD" in neat, large, printed letters.

D. Maintain Record Documents in a clean, dry, and legible condition. Do not use Record Documents for construction purposes.

E. Keep Record Documents and Samples available for inspection by Resident Project Representative.

1.03 RECORDING

A. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.

B. Contract Drawings and Shop Drawings: Legibly mark each item to record all actual construction, or "as built" conditions, including:
   1. Measured depths of elements of foundation in relation to finish first floor datum.
   2. Measured horizontal locations and elevations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Elevations of underground utilities referenced to bench mark utilized for project.
   4. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
   5. Field changes of dimension and detail.
   6. Changes made by modifications.
   7. Details not on original contract drawings.
   8. References to related shop drawings and modifications.

C. Record information with a red felt-tip marking pen on a set of blue or black line opaque drawings, provided by Engineer.

1.04 SUBMITTALS

A. At contract closeout, deliver Project Record Documents to Engineer and prepare the Final “As-Built” data in accordance with the Technical Specification.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01 10 10

PREPARING RIGHT OF WAY

SUBSECTION 101S

101S.1 Description

This item shall govern the preparation of the right of way for construction operations by removal and disposal of all obstructions from the right of way and from designated easements, where removal of such obstructions is not otherwise indicated as a separate pay item.

Such obstructions shall be considered to include, but not be limited to, remains of houses not completely removed by others, foundations, floor slabs, concrete, brick, lumber, plaster, cisterns, water wells, septic tanks and drain fields, basements; abandoned utility pipes, conduits, underground service station tanks, fences, retaining walls, outhouses, shacks and all other debris.

This item shall also include, but not be limited to, the removal of trees, stumps, roots, bushes, shrubs, curb and gutter, driveways, paved parking areas, miscellaneous stone, brick, sidewalks, drainage structures, manholes, inlets, abandoned railroad tracks, scrap iron, and all rubbish and debris whether above or below ground. Care should be taken to identify and protect existing infrastructure.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text the inch-pound units are given preference followed by SI units shown within parentheses.

101S.2 Submittals

The submittal requirements of this specification item may include:

A. A permit when utility adjustments are made in the right-of-way, and

B. A plan for removal and deposition of all non-salvageable materials and debris.

101S.3 Construction Methods

Prior to commencement of this work, all required erosion controls and tree protection measures indicated on the Drawings shall be in place. The existing utilities shall be located and protected as specified in the Standard Contract Documents, "General Conditions" and/or as specified on the Drawings. A permit shall be required when utility adjustments are to be made in preparation for construction in the right-of-way, as specified.

Areas within the construction limits shall be cleared of all obstructions, abandoned

structures, and other items as defined above. All vegetation, except trees or shrubs indicated for preservation, shall also be removed. Trees and shrubs, which are scheduled for preservation, shall be carefully trimmed as directed and shall be protected from scarring, barking or other injuries during construction operations. All exposed cuts over 2 inches (50 millimeters) in diameter, exposed ends of pruned limbs or scarred bark shall be treated with an approved asphalt material within 24 hours of the pruning or injury.

Construction equipment shall not be operated nor construction materials stockpiled under the canopies of trees, unless otherwise indicated on the Drawings and/or specified in the Contract Documents. Excavation or embankment materials shall not be placed within the drip line of trees until tree wells are constructed.

Culverts, storm sewers, manholes and inlets shall be removed in proper sequence for maintenance of traffic and drainage.

Unless otherwise indicated on the Drawings and/or Contract Documents, all underground obstructions, stumps and roots shall be removed to the following depths:

1. In areas to receive 6 inches (150 mm) or more embankment, a minimum of 12 inches (300 mm) below natural ground.
2. In areas to receive less than 6 inches (150 mm) of embankment, a minimum of 18 inches (450 mm) below the lower elevation of embankment, structure or excavation.
3. In areas to be excavated a minimum of 18 inches (450 mm) below the lower elevation of the embankment, structure or excavation.
4. In all other areas, a minimum of 12 inches (300 mm) below natural ground.

Holes remaining after removal of all obstructions, objectionable material, trees, stumps, etc. shall be backfilled with select embankment material and compacted by approved methods.

When a utility in service conflicts with the construction, it shall be modified as specified in the Standard Contract Documents, and/or as specified on the Drawings.

Where an abandoned underground piped utility is found, it shall be cut and plugged with 6 inches (150 mm) of approved concrete, brick and mortar, or a precast stopper grouted in place.

Material to be removed will be designated as salvageable or non-salvageable by the Engineer or designated representative prior to removal from the construction site by the Contractor. All material, which is located within the public right-of-way and is declared by the Engineer as salvageable, will remain the property of the OWNER and will be stored at the site or loaded on OWNER trucks as directed by the Engineer. All non-salvageable materials and debris shall become the property of the Contractor and shall be removed from the site and deposited at a permitted disposal site.

101S.4 Payment

The work and material presented herein will not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used unless specified as a separate pay item in the contract bid form.

END OF SECTION

SECTION 01 10 21

SITE GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. Within limits shown on PLANS, or in areas where existing grade is altered, strip existing topsoil to a depth of 6-inches and stockpile in approved areas for subsequent replacement. CONTRACTOR is to remove and dispose of all excess materials.

1.02 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.
   1. American Society for Testing and Materials (ASTM)
      a. ASTM D698, Test Method For Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbs/ft.)

1.03 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

PART 2 - PRODUCTS

2.01 MATERIALS AND/OR EQUIPMENT

A. Fill: Use excess excavation or borrow material with prior approval of the ENGINEER. Borrow material to be from the approved source as shown on the PLANS or in the geotechnical report. On completion of work borrow area to be cleaned and dressed. Reuse of material stripped from borrow site is not allowed unless specifically shown on PLANS.

PART 3 - EXECUTION

3.01 SITE DRAINAGE

A. Maintain surface drainage on site during construction.

3.02 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. Fill Under Structure: Refer to Section 02224 for Structural Excavation and Backfill requirements.

B. Place approved fill within 4 inches of finish grade shown on all areas not covered by structures or roads. Fill in l0-inch maximum layers (loose measured) and compact at or near optimum moisture to at least 90%. Standard proctor density, unless otherwise shown on PLANS.

C. Waste: Waste stripped material from within limits indicated. Spread waste material over designated area, dress by blading and slope to provide drainage.

D. Final Cleanup: Level washes, ruts, depressions, and mounds to give area smooth finish.

E. Grading for Fenced Lift Station Sites:
   1. Complete site fill to within 4 inches of finished grade on all areas not covered by structures of roads.
   2. Clear ground surface of all foreign materials. Place 2 inches of compacted sand bedding, sloped to drain away from well.
   3. Install geotextile membrane supported by the 2 inches of compacted sand bedding. Hold geotextile in place with wire staples at approximately 4 feet on center.
   4. Complete finish grading by the application of 2 inches of uniformly crushed stone. Aggregate size to be between ¾ inch and 1 ½ inches.

END OF SECTION

SECTION 01 10 55

PUBLIC SAFETY AND CONVENIENCE

PART 1 - GENERAL

1.1 Related Documents:

Drawings and general provisions of Contract, including General Conditions, Supplemental General Conditions, and Division 1 requirements.

PART 2 - PRODUCTS

(NOT USED) PART 3 -

EXECUTION

3.1 General

CONTRACTOR shall maintain reasonable local vehicular and pedestrian dust free traffic, including use of driveways, to proceed safely with minimum inconvenience, except during actual construction operations. CONTRACTOR provided flaggers shall assist traffic when a street is operating under a single lane. Two-way traffic shall be maintained at all other times unless otherwise authorized by Owner.

CONTRACTOR shall provide, at the work zone location during temporary traffic control installation, a designated Competent Traffic Control Person to ensure compliance with the traffic control plans and the provisions of the Contract.

Training Certificates for the designated Competent Person shall be provided with submittals at the Precon. Training certificates for competent persons shall be good for four (4) years from the date of training. After such time the competent person must show that additional training or re- certification has been completed to maintain competent person status.

CONTRACTOR shall maintain a smooth and safe ride for traffic by placing steel plates with Asphaltic concrete berms, temporary fill or bridging and temporary surfacing with cold or hot-mix Asphaltic concrete paving in accordance with applicable City Standards.

Sidewalks shall not be obstructed, except by special permission of Owner or E/A. Access to private dwelling and to commercial establishments shall be provided at all times.

CONTRACTOR shall plan and execute his operations in a manner that will cause a minimum interference with traffic. The CONTRACTOR shall place and maintain in good condition, standard barricades at each end of the Project and at other locations where traffic is rerouted or blocked from using regular traffic lanes. Barricades and warning signs shall be in accordance with Texas Manual on Uniform Traffic Control Devices (MUTCD).

Signs, barricades and warning devices informing public of construction features shall be placed and maintained by the CONTRACTOR who shall be solely responsible for their maintenance.

Unless otherwise specified elsewhere in Division 1, neither explosives nor blasting shall be permitted on this Project.

3.2 Traffic Control

3.2.1 It shall be the sole responsibility of the CONTRACTOR to furnish, install, maintain and remove barricades, detour signs, warning signs, lights and all regulatory traffic control devices of the size and type specified, at locations indicated, or as directed or approved by the OWNER in accordance with the Texas Manual on Uniform Traffic Control Devices, (MUTCD), Part VI, Traffic Control for Street and Highway Construction and Maintenance Operations and. Upon phase completion, the Contractor shall immediately revise the temporary traffic devices to reflect the next phase or if the project is complete remove them from the public right of way.

3.2.2 Throughout the life of the Contract, all existing roads and Traffic Control devices included in the Work shall be maintained by the CONTRACTOR to a condition, in the opinion of the OWNER, which is equal to or better than that which existed when Work commenced. Maintenance of existing roads and devices shall take priority over all other Work items and shall be subject to a seven-day-a-week, 24-hours-per-day time frame. The CONTRACTOR shall provide a smooth and safe riding surface for all vehicles along the route of this Project. This could include, but not be limited to, small cars, motorcycles, mopeds and bicycles. If the condition of the street surface deteriorates, for any reason, CONTRACTOR shall take necessary steps to insure immediate restoration.

3.2.3 During construction of streets, drainage, and utility projects, if conditions of existing street surface require maintenance to upgrade from their state when the Work began, a separate pay item may be included in Bid. Otherwise, maintenance work will not be paid for directly but will be considered subsidiary to various Bid items of this Contract.

3.2.4 In the event that CONTRACTOR fails, in opinion of OWNER, to maintain a smooth surface for public comfort, fails to provide ingress and egress to private property, and/or does not provide and maintain proper traffic control devices, OWNER may provide these services and deduct any cost thereof, including overtime and administrative expenses, from all estimates thereafter due the CONTRACTOR. Such action by the OWNER shall not relieve the CONTRACTOR of his liability to protect the public at construction site. Owner may also assess an investigation fee, as established by separate Fee Ordinance, for violations resulting in more than one deficiency report issued to Contractor.

3.2.5 A permit must be obtained from Texas Department of Transportation (TxDOT), prior to Work being performed on state highway routes passing through the City.

3.2.6 CONTRACTOR shall notify the Owner’s Representative, Police Department, Fire Department, EMS, and Right of Way Management Division at least seven

Calendar Days in advance of beginning proposed Work, with intention to close or partially block any street or any part thereof, or of any construction affecting free flow of traffic. The CONTRACTOR shall plan and adequately provide barricades and warning devices. The same parties shall be notified when normal traffic flow is restored.

3.2.7 Should the CONTRACTOR, in his operations, reduce an existing two-way roadway to less than 20 feet in width, CONTRACTOR shall provide a route through or around the narrowed area as approved by Owner or E/A.

3.2.8 The CONTRACTOR's Flaggers shall be required any time it is necessary for the CONTRACTOR's equipment to move into or across an open traffic lane, or at other such times as directed by the Owner's Representative. A flagger shall be utilized to aid exit of hauling equipment from open traffic lanes to the Work area, and entry of hauling equipment from Work area to open traffic lanes. Flaggers shall be dressed and conduct operations in accordance with Texas Manual on Uniform Traffic Control Devices and the Transportation Criteria Manual. Flagging operations shall be the sole responsibility of the CONTRACTOR.

3.2.9 The CONTRACTOR and Subcontractors shall confine their activities to the immediate area of the construction site and provide the following:

a. Appropriate temporary fences, barricades, and/or Metal Beam Guard Fence if required, for site work involving excavation, utility extensions, remote construction work or other circumstances involving safety of public or protection of the work in progress.

b. Warning lights at open trenches, excavations, etc., during hours from dusk to dawn each day. Protection of structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout and other hazards.

3.3 Spoil Disposal

CONTRACTOR may make other arrangements for spoil disposal subject to E/A evaluation of the CONTRACTOR-supplied proof that the Owner(s) of the proposed site(s) has a valid fill permit issued by the appropriate governmental agency. Finally, the CONTRACTOR shall submit a haul route plan including a map of the proposed route(s) for the E/A and Owner's approval.

3.4 Restoration

WATER AND WASTEWATER CONSTRUCTION REQUIREMENTS

3.4.1 In order to minimize environmental and potential flood impacts, the sum of the amount of trench opened in advance of the completed line and the amount of trench left unfilled at any time shall be restricted to one (1) full block or 300 linear feet, whichever is less.

3.4.2 Restoration shall be an on-going process during construction operations and shall immediately precede completion of construction of each successive section of the line, which shall not exceed 1,200 linear feet without approval of the OWNER.

3.5 Street Markers and Traffic Control Signs

It shall be responsibility of the CONTRACTOR to remove, preserve and reset, as required, Street Marker and Traffic Control Signs that are within construction limits to the line and heights as described in Texas Manual on Uniform Traffic Control Devices before any sidewalks or street excavation is begun. Signs shall not be laid on the ground. No payment will be made for this work but shall be considered subsidiary to the various Bid items. Traffic Sign Activity Section of the Transportation Department (457-4850) shall be notified a minimum of five Working Days prior to completion of the Project so that signs may be checked for damage. Any damage to signs or posts shall be paid for by the CONTRACTOR.

3.6 Burning Permit

Open burning within City limits will not be allowed. Trench burning shall require a permit from the Fire Marshal. Burning permits outside City limits shall be obtained from the appropriate authority.

The CONTRACTOR shall secure and pay for all burning permits.

3.7 Driveways

Unless otherwise indicated, the approach grade of existing driveways shall be modified as indicated and as directed by the Owner's Representative. The OWNER will contact property owners whose driveways require grade modification beyond street right-of-way and the OWNER will obtain their concurrence for approach grade modification. Within the right-of- way, all driveways shall be replaced with concrete driveways. Outside the right-of-way, when approach grade modifications are required, flexible base shall be placed by the CONTRACTOR to resurface existing dirt or gravel driveways; asphalt and concrete drives shall be replaced in kind by the CONTRACTOR. Excavation, Flexible Base, Portland Cement Concrete and Asphaltic Concrete, used for driveways as prescribed above shall not be measured for payment but shall be considered subsidiary to various Bid items in the Contract unless payment is included as a separate Contract pay item.

3.8 Removal or Relocation of Fences and Sprinkler Systems

Removal or relocation of privately owned fences and sprinkler systems not specified in Bid, and within public right-of-way is the primary responsibility of the property owner. OWNER will cause property owners to be aware of any known conflicts and encourage them to make desired adjustments in advance of construction. In the event the property owner does not, or will not, make adjustments necessary for construction of improvements to be made under this Contract, CONTRACTOR, after receiving written approval from the OWNER, shall remove those portions that interfere with the Work, as follows:

3.8.1 Fences shall be disassembled, by hand, into hand manageable sizes and placed on the private property.

3.8.2 For sprinkler systems, the CONTRACTOR, after assuring that electrical and/or mechanical controls are disconnected, shall remove sprinkler heads, valves, controls, and any other miscellaneous items, including distribution pipe, or wire, saw cut from the system. The CONTRACTOR shall present these materials to the property owner. Where piping is cut, the pipe shall be permanently capped or plugged, unless otherwise directed by the OWNER.

Work for removal or relocation of fences and sprinkler systems shall not be paid for directly but shall be subsidiary to the various related Bid items.

END OF SECTION

SECTION 01 10 56
TRAFFIC CONTROL AND REGULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES
A. Traffic Control and Regulation

1.02 METHODS OF PAYMENT
A. Measurement and payment for Traffic Control and Regulation is on a stipulated price basis.
B. Payment: Traffic Control and Regulation will be paid for at the Contract lump sum price.

1.03 REFERENCES
A. Texas Manual of Uniform Traffic Control Devices (TMUTCD)
B. Texas Department of Transportation (TxDOT) permit (if applicable)
C. City of Brownsville
D. Cameron County

1.04 PERFORMANCE REQUIREMENTS
A. Provide all necessary signs, barricades, marking, lighting, and other equipment and supplies required to comply with the TMUTCD (and TxDOT permit, if applicable)
B. Provide all necessary certified flagmen required to comply with the TMUTCD (and TxDOT, City, and/or County permit, if applicable)

PART 2 - PRODUCTS
A. Equipment and materials must be furnished, installed and operated by an experienced contractor regularly engaged in traffic control system design, installation and operation.
B. All equipment must be in good repair and operating order.
C. Sufficient standby equipment and materials shall be kept available to ensure continuous operation, where required.

PART 3 - EXECUTION
A. Provide labor, material, equipment, techniques and methods required to provide safe traffic control and regulation. Monitor effectiveness of the installed system and its effect on adjacent property.
B. Notify, TxDOT, City and /or County as required by the permit(s) (if applicable).
C. Provide continuous system operation, including nights, weekends and holidays. Arrange for appropriate backup if electrical power is primary energy source for traffic control system.
D. Remove system(s) upon completion of construction or when traffic control is no longer required.

END OF SECTION

SECTION 01 10 60

LABORATORY AND INSPECTION SERVICES

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

A. This item shall consist of all required testing and inspection services required to provide certification that the completed construction is in substantial compliance with the contract, plans and specifications.

B. Testing and inspections shall include: all underground utilities (water, sewer & drainage), roadway embankment, subgrade, base & asphalt, curbs of all types, concrete pavements, concrete structures, signage, striping, and all other facilities as may be included in the overall scope of construction.

C. Inspections may include observations to determine compliance with the prescribed stormwater pollution prevention plan (SW3P), trench safety, personal protection equipment and traffic control plans.

D. The ENGINEER has the authority to observe, test, inspect, approve, and accept the work. The ENGINEER decides all questions about the quality and acceptability of materials, work performed, work progress, Contract interpretations, and acceptable Contract fulfillment. The ENGINEER has the authority to enforce and make effective these decisions.

E. The ENGINEER acts as a referee in all questions arising under the terms of the Contract. The ENGINEER's decisions will be final and binding.

1.02 MEASUREMENT AND PAYMENT

A. Measurement:
   1. This work shall be considered incidental to the completion of the project and no additional compensation shall be paid for this work.

B. Payment
   1. No separate payment shall be made for this item.

1.03 LABORATORY REPORTS

A. The testing laboratory shall provide and distribute copies of laboratory reports to the distribution list provided by the Engineer.

B. One copy of each laboratory report distributed to the Contractor shall be kept at the site field office for the duration of the project.

C. Before close of business on the working day following test completion and review, reports which indicate failing test results shall be transmitted immediately via fax from the testing laboratory to the material supplier, Contractor, Engineer and Resident Project Representative.

1.04 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Laboratory may not approve or accept any portion of the Work.

C. Laboratory may not assume any duties of the Contractor.

D. Laboratory has no authority to stop the Work

1.05 CONTRACTOR RESPONSIBILITIES

A. Provide safe access to the Work and to manufacturer's facilities for the Engineer, Resident Project Representative and for testing laboratory personnel.

B. Provide to the testing laboratory a copy of the construction schedule and a copy of each update to the construction schedule.

C. Notify the Engineer and the testing laboratory during normal working hours of the day previous to the expected time for operations requiring inspection and testing services. If the Contractor fails to make timely prior notification, then the Contractor shall not proceed with the operations requiring inspection and testing services.

D. Request and monitor testing as required to provide timely results and to avoid delay to the Work. Provide samples to the laboratory in sufficient time to allow the required test to be performed in accordance with specified test methods before the intended use of the material.

E. Cooperate with laboratory personnel in collecting samples on site. Provide incidental labor and facilities for safe access to the Work to be tested; to obtain and handle samples at the site or at source of products to be tested; and to facilitate tests and inspections including storage and curing of test samples.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 LABORATORY TESTING

A. All required laboratory testing shall be completed by an independent, qualified testing laboratory approved by the OWNER. All initial testing shall be paid for by the OWNER. Any retesting required shall be paid for by the CONTRACTOR.

B. Laboratory sampling and testing specified in individual Specification sections shall conform to the latest issues of ASTM standards, TxDOT methods, or other recognized test standards as approved by the Engineer.

C. The requirements of this section shall also apply to those tests for approval of materials, for mix designs, and for quality control of materials as performed by the testing laboratories employed by the Owner.

D. Cost for additional review time will be billed to the CONTRACTOR by the OWNER for the actual hours required for the re-testing in accordance with the current rates as established by the contract between the OWNER and the Testing Lab. Cost for the additional review shall be paid to the OWNER by the CONTRACTOR on a monthly basis.

3.02 INSPECTIONS

A. PROVIDERS: All required inspections shall be provided by either the independent testing laboratory or by the Engineer. All initial inspections conducted during normal business hours (8:00 am to 5:00 pm, Monday – Friday, excluding Holidays) shall be provided by the OWNER at no charge. Any inspections or testing requested by the CONTRACTOR to be provided at any other time will be paid for by the CONTRACTOR. Any re-inspections or re-testing required shall be paid for by the CONTRACTOR.

B. COSTS: Cost for additional review time will be billed to the CONTRACTOR by the OWNER for the actual hours required for the retesting in accordance with the current rates as established by the contract between the OWNER and the Testing Lab. Cost for the additional review shall be paid to the OWNER by the CONTRACTOR on a monthly basis.

C. INSPECTORS: Inspectors and Field Technicians are authorized representatives of the ENGINEER. Inspectors are authorized to examine all work performed and materials furnished, including preparation, fabrication, and material manufacture. Inspectors inform the CONTRACTOR of failures to meet Contract requirements. Inspectors may reject work or materials and may suspend work until any issues can be referred to and decided by the ENGINEER. Inspectors cannot alter, add, or waive Contract provisions, issue instructions contrary to the Contract, act as foremen for the CONTRACTOR, or interfere with the management of the work. Inspection or lack of inspection will not relieve the CONTRACTOR from obligation to provide materials or perform the work in accordance with the Contract. CONTRACTOR shall provide safe access to all parts of the work and provide information and assistance to the ENGINEER to allow a complete and detailed inspection and give the ENGINEER sufficient notice to inspect the work. Work performed without suitable inspection, as determined by the ENGINEER, may be ordered removed and replaced at CONTRACTOR's expense. CONTRACTOR shall remove or uncover portions of finished work as directed. Once inspected, restore work to Contract requirements. If the uncovered work is acceptable, the costs to uncover, remove, and replace or make good the parts removed will be paid for in accordance "Changes in the Work." If the work is unacceptable, CONTRACTOR shall assume all costs associated with repair or replacement, including the costs to uncover, remove, and replace or make good the parts removed. When a government entity, utility, Railroad Company, or other entity accepts or pays a portion of the Contract, that organization's representatives may inspect the work but cannot direct the CONTRACTOR. The right of inspection does not make that entity a party to the Contract and does not interfere with the rights of the parties to the Contract.

D. FINAL INSPECTION: After all work is complete, the CONTRACTOR will request a final inspection by the ENGINEER authorized to accept the work. The final inspection will be made as soon as possible, and not later than 5 calendar days after the request. No working day charges will be made between the date of request and final inspection. After the final inspection, if the work is satisfactory, the ENGINEER will notify the CONTRACTOR in writing of the final acceptance of the work. If the final inspection finds any work to be unsatisfactory, the ENGINEER will identify in writing all deficiencies in the work requiring correction. Correct the deficiencies identified. Working day charges will resume if these deficiencies are not corrected within 7 calendar days, unless otherwise authorized by the ENGINEER. Upon correction, the ENGINEER will make an inspection to verify that all deficiencies were corrected satisfactorily. The ENGINEER will provide written notice of the final acceptance.

3.03 SCHEDULING

A. It shall be the CONTRACTOR'S responsibility to contact either the testing lab or the Brownsville Public Utilities Engineering staff at least 48 hours before the required testing or inspection is to occur.

B. It shall be the CONTRACTOR'S responsibility to plan the construction in such a manner to allow the appropriate tests and inspections to be conducted without disruption to the construction process.

3.04 PREPARATION

A. CONTRACTOR shall be responsible for preparing the project site as necessary to conduct all required testing. This shall include, but may not be limited to: proper grading of construction site, completion of required compaction activities, complete installation of all forms, installation of all required reference points (grade stakes), provision of adequate traffic control, additional personnel and/or supplies and all necessary safety measures (i.e. OSHA compliant Trench Safety) as needed.

END OF SECTION

SECTION 01 10 72

FIELD SURVEYING

PART 1 - GENERAL

1.01 QUALITY CONTROL

A. Conform to State of Texas laws for surveys requiring licensed surveyors.

1.02 UNIT PRICES

A. No separate payment will be made for Field Surveying. Include the cost of Field Surveying in other related bid items.

1.03 SUBMITTALS

A. Submit to Engineer the name, address, and telephone number of Surveyor before starting survey work.

B. Submit documentation verifying accuracy of survey work on request.

C. Submit certificate signed by surveyor, that the elevations and locations of the Work are in conformance with Contract Documents.

D. Submit information under provisions of Section 01330 - Submittal Procedures.

1.04 PROJECT RECORD DOCUMENTS

A. Maintain a complete and accurate log of control and survey work as it progresses.

B. Prepare a certified survey setting forth dimensions, locations, angles, and elevations of construction and site Work upon completion of foundation walls and major site improvements.

C. Submit Record Documents under provisions of Section 01785 - Project Record Documents.

1.05 EXAMINATION

A. Verify locations of survey control points prior to starting Work.

B. Notify Engineer immediately of any discrepancies discovered.

1.06 SURVEY REFERENCE POINTS

A. Control datum for survey is that established by Owner-provided survey as indicated on Drawings.

B. Locate and protect survey control points prior to starting site work; preserve permanent reference points during construction.

C. Notify Engineer 48 hours in advance of need for relocation of reference points due to changes in grades or other reasons.

D. Report promptly to Engineer the loss or destruction of any reference point.

E. Contractor shall reimburse Owner for cost of reestablishment of permanent reference points disturbed by Contractor's operations.

1.07 SURVEY REQUIREMENTS

A. Utilize recognized engineering survey practices.

B. Establish elevations, lines and levels to provide appropriate controls for the Work. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading; fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, and ground floor elevations.

C. Verify periodically layouts by same means.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

SECTION 01 10 76

WASTE MATERIAL DISPOSAL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Disposal of waste material and salvageable material.

1.02 MEASUREMENT AND PAYMENT

A. No separate payment will be made for waste material disposal under this Section. Include payment in unit price for related sections.

1.03 SUBMITTALS

A. Obtain and submit disposal permits for proposed disposal sites if required by federal, state and local ordinances.

B. Submit a copy of written permission from property owner, along with description of property, prior to disposal of excess material.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.01 SALVAGEABLE MATERIAL

A. Excavated Material: When indicated on Drawings, load, haul, and deposit excavated material at a location or locations shown on Drawings outside the limits of Project.

B. Other Salvageable Materials: Conform to requirements of individual Specification Sections.

3.02 EXCESS MATERIAL

A. Vegetation, rubble, broken concrete, debris, asphaltic concrete pavement, excess soil, and other materials not designated for salvage, shall become the property of Contractor and shall be removed from the job site and legally disposed of.

B. Waste materials shall be removed from the site on a daily basis, such that the site is maintained in a neat and orderly condition.

END OF SECTION

SECTION 02 00 00

MILLING AND PAVEMENT

MILLING PAVEMENT

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Milling of existing asphalt or concrete pavement surface as required for installation of pavement overlay.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for removing existing pavement surface by milling is on a square yard basis. Separate pay items and measurements will be made for milling of asphalt surface or milling of concrete surface as applicable.

2. No separate payment under this section for milling associated with installation of speed humps.

PART 2 P R O D U C T S

2.1 EQUIPMENT

A. For milling and installing of speed humps, the contractor shall use an appropriate type of milling machine to remove the existing asphalt or concrete surface as shown. The milling machine shall be capable of milling a minimum 18 inch wide path and also shall be able to turn in tight corners.

B. The teeth of the machine shall be capable of milling concrete or asphalt as appropriate. The equipment for removing the pavement surface shall be a power operated planing machine with a minimum six-foot cutting width. For detail work and for cutting widths less than six feet, equipment with less than six-foot cutting widths will be allowed. The equipment shall be self-propelled with sufficient power, traction and stability to maintain accurate depth of cut and slope. The equipment self-propelled

with sufficient power, traction and stability to maintain accurate depth of cut and slope. The equipment shall be capable of cutting four inches of asphaltic concrete pavement, one inch of portland cement concrete pavement, or a combination of two inches of asphaltic concrete pavement and one half inch portland concrete pavement in one continuous operation.

C. The equipment shall be equipped with an approved automatic dual longitudinal grade control system and a transverse control system unless otherwise directed by the project manager. The longitudinal controls shall be capable of operating from any longitudinal grade reference, including stringline, ski, mobile stringline, or matching shoe. The transverse controls shall have an automatic system for controlling cross slope at a given rate.

D. The grade reference used by the Contractor may be of any type approved by the project manager. Control points shall be established for the finished profile. These points shall be set at intervals not to exceed 50 feet. The Contractor shall set the grade reference from the control points. The grade reference shall have sufficient support so that the maximum deflection shall not exceed 1/16 inch between supports.

E. The machine shall have a manual system providing for uniformly varying the depth of cut while the machine is in motion, thereby making it possible to cut flush to all inlets, manholes, or other obstructions within the paved area. The speed of the machine shall be variable in order to leave the desired grid pattern.

F. The machine shall be equipped with integral loading and reclaiming devices to immediately remove material being cut from the surface of the roadway and discharge the cuttings into a truck, all in one operation. The machine shall be equipped with devices to control dust created by the cutting action.

G. Various machines may be permitted to make trail runs to demonstrate the capabilities of that machine. Any machine that is incapable of meeting the requirements of this Section, in the opinion of the project manager, will not be permitted.

H. A street sweeper equipped with a water tank, spray assembly to control dust, a pick-up broom, a gutter broom, and a dirt hopper shall be provided by the Contractor. The street sweeper shall be capable of removing cuttings and debris from the planed pavement.
Other sweeping equipment may be provided in lieu of the street sweeper when approved by the project manager in writing.

I. The Contractor shall provide any other equipment and personnel necessary for proper operation of the planing machine, to minimize dust and to remove cuttings.

PART 3 E X E C U T I O N

3.1 PREPARATION

A. The Contractor shall not mill roadway more than 7 calendar days prior to construction.

B. If Contractor does not install speed hump in the specified time, the OWNER, without notice to the Contractor, may effect repairs to the milled area and deduct the cost of the expense incurred by the OWNER for repair work from currently due or future invoiced amounts.

3.2 MILLING

A. The existing pavement to within 1 foot of the face of the curb shall be removed for a depth of one inch or otherwise designated or shown on drawing for milling of the existing pavement.

B. The pavement surface shall be removed for the length, depth and width and to the typical section shown on drawings. The planed surface shall provide a satisfactory riding surface free from gouges, continuous longitudinal grooves, ridges, oil film and other imperfections of workmanship and shall have a uniform textured appearance.

C. When removing an asphaltic concrete pavement from an underlying portland cement concrete pavement, all of the asphaltic concrete pavement shall be removed, leaving a uniform surface of portland cement concrete, unless otherwise directed by the project manager.

D. Any vertical or near vertical longitudinal face exceeding 1 ¼ inches in height in the pavement surface open to traffic at the end of a work period shall be sloped a minimum of 1:1. Transverse faces that are present at the end of a work period shall be tapered in a manner acceptable to the project manager.

E. Loose portland cement concrete material from the operation shall be disposed of at sites obtained by the Contractor or otherwise approved by the project manager. All materials removed under this contract become the property of the Contractor. Contractor shall legally dispose of all such removed materials.

F. Pavement that is not removed by the planing machine adjacent to steep curbs, inlets, manholes or other obstructions shall be removed by other methods acceptable to the project manager.

G. The pavement and curb surfaces shall be swept with a street sweeper or other sweeping equipment to remove all debris leaving a clean and presentable condition.

H. Milling is required along the outside perimeter of the hump to the depth of one inch on both concrete and asphalt pavement. Mill the existing pavement to within one foot of the curb face.

3.3 PROTECTION

A. Damage to water valve, water meters, manholes, curbs or other improvements shall be repaired or replaced at no additional cost to the OWNER.

3.4 SURFACE TEXTURE AND TESTS

A. In areas where traffic will be permitted, the texture product shall be a grid pattern or any other pattern with discontinuous longitudinal striations that will provide, in the opinion of the project manager, a satisfactory temporary riding surface.

B. The surface of the pavement, after planing, shall be ready for HMAC overlay and shall be true to the established line, grade and cross section. The pavement surface, when tested with a 10-foot straightedge placed parallel to the centerline of the roadway or tested by other equivalent or acceptable means, shall not have any deviation greater than 1/8 inch in 10 feet. The deviations shall be measured from the top of the texture. Any point in the surface not meeting this requirement shall be corrected as directed by the project manager at the Contractor's expense.

END OF SECTION

SECTION 02 00 02
SUBGRADE PREPARATION

SUBSECTION 201S

201S.1 Description

This item shall govern scarifying; blading and rolling the subgrade to obtain a uniform texture and provide as nearly as practicable a uniform density for the top 6 inches of the subgrade or greater if specified on the construction drawings.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

201S.2 Submittals

The submittal requirements of this specification item may include:

A. A plan identifying classification and characteristics (P.I., optimum moisture-density, etc.) of insitu subgrade soils, as well as the source, classification and characteristics of any proposed borrow material,
B. Type and size of equipment proposed to produce the required compaction, and
C. Compaction (moisture-density, etc) test results for in-situ subgrade soils and/or borrow materials.

201S.3 Construction Methods

The surface of the subgrade shall be scarified and shaped in conformity with the typical sections and the lines and grades indicated on the Drawings; by the removal of existing material or addition of approved material as established by the Engineer or designated representative. Any deviation in the subgrade cross section which exceeds 1/2 inch in a length of 10 feet (12 mm in a length of 3 meters), measured longitudinally, shall be corrected by loosening, adding or removing material, and then reshaping and compacting by sprinkling and rolling.

All unsuitable material shall be removed and replaced with approved material. All foundations, walls or other objectionable material shall be removed to a minimum depth of 18 inches (450 mm) under all structures and 12 inches (300 mm) under areas to be vegetated. All holes, ruts and depressions shall be filled with approved material and compacted by approved methods.

The subgrade shall be prepared sufficiently in advance to insure satisfactory prosecution of the Work. The Contractor will be required to set blue tops for the subgrade on the centerline, at the quarter points and along the curb lines or edge of pavement at maximum

intervals of 50 feet (15 meters). The subgrade shall be tested by proof rolling prior to placement of the first course of base material. Any unstable or spongy subgrade areas identified by proof rolling shall be corrected either by additional re-working, drying and compaction, or by removal and replacement of unsuitable materials. When specifically directed by the Engineer or designated representative, the Contractor shall re-work the subgrade* as follows:

A. Remove the unstable subgrade to the full depth of the unstable insitu material or to a minimum depth of 6 inches, whichever is greater;
B. Spread the material over a sufficient area to allow reworking of the excavated material;
C. Disc, scarify or otherwise breakup the excavated material and allow to dry (Note: If approved by the Engineer or designated representative, the addition of lime or other additive may be used to aid in the drying process or to stabilize the unstable material);
D. Fill the excavated area with the re-worked material and compact to specified densities; and
E. Proof roll the re-worked area.

* The Rework process will not be allowed for unstable organic subgrade soils. These type soils will be permanently removed and replaced with materials approved by the Engineer or designated representative.

All suitable material removed may be utilized in the subgrade with the approval of the Engineer or designated representative. All other material required for completion of the Subgrade, shall also be subject to approval by the Engineer or designated representative.

It is the intent of this specification to provide the required density and moisture control for the subgrade based on the plasticity characteristics of the approved materials. The subgrade materials shall be sprinkled as required and compacted to the extent necessary to provide the density specified below, unless otherwise indicated on the Drawings. The Plasticity Index (P.I.) will be established in accordance with TxDOT Test Methods Tex-104-E, Tex-105-E and Tex-106-E. The density determination will be made in accordance with TxDOT Test Method Tex-114-E and field density measurements will be made in accordance with TxDOT Test Method Tex-115-E.

Description	Density, Percent	Moisture
Non-swelling Soils (P.I. less than 20)	Not less than 95	
Swelling Soils (P.I. between 20 and 35)	Not less than 95 nor more than 102	Not less than optimum
Swelling Soils (P.I. greater than 35)	Not less than 95 nor more than 100	Not less than optimum

Subgrade materials on which planting or turf will be established shall be compacted to a minimum of 85 percent of the density as determined in accordance with TxDOT Test Method Tex-114-E. Field tests for density in accordance with TxDOT Test Method Tex-115-E will be made as soon as possible after compaction operations are completed. If the material fails to meet the density specified, it shall be reworked as necessary to obtain the density required.

Prior to placement of any base materials, the in-place density and moisture content of the top 6 inches, of compacted subgrade shall be checked. If the tests indicate that the relative density and moisture do not meet the limits specified in the table above, the subgrade shall be reworked as necessary to obtain the specified compaction and moisture content. All initial testing will be paid for by the OWNER. All retesting shall be paid for by the Contractor.

201S.4 Measurement

All acceptable subgrade preparation when included in the contract as a separate pay item, will be measured by the square yard (square meter: 1 square meter equals 1.196 Square yards). The measured area includes the entire width of the roadway for the entire length as indicated on the Drawings.

201S.5 Payment

The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used. When specified as a separate pay item in the contract bid form, subgrade preparation shall be measured as specified above and paid for at the contract unit bid price for "Subgrade Preparation". The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

END OF SECTION

SECTION 02 00 03

LIME STABILIZATION

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

A. Treating of subgrade, subbase, and base courses by the pulverization, addition of lime, mixing and compacting the mixed material to the required density.

B. Application to natural ground, embankment, existing pavement, base or subbase under this contract, or as directed by the ENGINEER, which shall be constructed as specified herein and in conformity with the typical section, lines, grades as shown on the plans.

1.02 QUALITY ASSURANCE:

A. Comply with the latest published edition (or addended portions thereof) of the following standards and codes:
   1. ASTM C—207 or Type N — Requirements for Hydrated Lime
   2. ASTM Designation C5 — Quick Lime for Structural Purposes
   3. Texas SDHPT Test Method Tex—600—J - Hydrated Lime
   4. ASTM D—1557 - Density of Compacted Materials
   5. ASTM D-2049 - Density of Compacted Materials
   6. Texas SDI-IPT Test Method Tex 113—E — Density of Compacted Materials
   7. AASHTO T—99, Method C - Density of Compacted Materials
   8. AASHTO M-216 - Hydrated Lime

1.03 MEASUREMENT AND PAYMENT

A. When included as a separate line item, lime treatment may be measured for payment in square yards for the thickness of material shown on the plans for the surface area of completed and accepted work or lime will be measured by the ton of 2,000 pounds dry weight. Lime treatment shall be paid for at the contract unit price per square yard or paid at the contract unit cost per ton of 2,000 pounds dry weight.

B. When not included as a separate line item, lime treatment shall be considered incidental to the completion of construction and the costs thereof shall be included in the line items provided.

C. The contract unit price for lime treatment shall be the total compensation for preparing roadbed; for loosening, pulverizing, application of lime, water content of slurry mixture and the mixing water; mixing, shaping, sprinkling, compacting, finishing, curing and maintaining; for manipulations required, for all labor, equipment, fuels, tools and incidentals necessary to complete the work.

D. The contract unit price for lime shall be full compensation for furnishing the material; for all freight involved; for all unloading, storing and hauling; and for all labor, equipment, fuels, tools, and incidentals necessary to complete the work.

PART 2 - PRODUCTS

2.01 HYDRATED (DRY) LIME:

A. Use, for stabilization of soils, a dry powder consisting primarily of calcium hydroxide ($Ca(OH)_2$).

B. Provide Material in accordance with Texas SDHPT Test Method TEX— 600—J and conforming to the following chemical composition:
   1. Hydrate Alkalinity, Percent by Weight $Ca(OH)_2$ 90% Min. Unhydrate Lime Content, Percent by Weight CaO 5% Max. "Free Water" Content, Percent by Weight H_20 4% Max.
      a. And with the following residue retainage:
         1) Residue Retained on No. 6 Sieve None
         2) Residue Retained on No. 10 Sieve 1% Max.
         3) Residue Retained on No. 30 Sieve 2.5% Max.

C. Store and handle hydrated lime in closed, weather proof containers, storage bins, or bags until immediately before application to the road.

D. Furnish hydrated lime in trucks, as applicable, with weight of lime measured on certified scales and clearly marked on the truck or stamped on a haul ticket.

E. Furnish hydrated lime in bags, as applicable, bearing the manufacturer's certified weight. Bags varying more than five percent may be rejected.

2.02 HYDRATED LIME SLURRY:

A. Provide a pumpable suspension of solids, principally composed of hydrated lime, in water.

B. Provide material with a "Solids Content" having a hydrated alkalinity Ca(OH)2 of not less than 90 percent by weight and a residue retainage equal to the retainage specified in Part 2.01B above.

C. Supply Type B, commercial lime slurry, with a "dry solids content" of at least 31% by weight of the slurry (Grade 1).

D. Procure mixing water only from City water mains. The Contractor shall make arrangements with the BPUB to obtain a meter and subsequent payment for water used.

2.03 QUICKLIME (MASON'S LIME):

A. Provide quicklime, as a dry powder in a tank, to form a lime slurry.

PART 3 - EXECUTION

3.01 GENERAL:

A. Provide a completed course of treated materials containing a uniform lime mixture, free from loose or segregated areas, of required density and moisture content, well bound for its full depth, and with a smooth surface and suitable for placement of subsequent courses.

B. Regulate sequence work, use proper amounts of lime, maintain the work and rework the courses as necessary to meet the requirements of this specification.

C. Construct and shape smooth roadbed to conform to typical sections, lines and grades as shown on the plans, or as directed by the ENGINEER.

D. Excavate materials to be treated to the proposed bottom of lime treatment grade, or secondary grade and remove or windrow to expose secondary grade.

E. Correct any wet or unstable material below the secondary grade by scarifying, adding lime and compacting until uniform stability is achieved.

F. Use a cutting or pulverizing machine, as applicable, to remove subgrade material accurately to secondary grade and to pulverize the material at the same time. When cutting or pulverizing machine is used, the requirement for exposing and windrowing the material is waived.

G. Roll subgrade before use of pulverizing machinery and correct any soft areas that rolling operations shall reveal.

H. Materials for new base and subbase shall be delivered, placed and spread in the required amount per station. The material shall be thoroughly mixed prior to the addition of lime.

I. Lime shall be spread only on that area where first mixing operation can be completed in the same working day.

3.02 SLURRY PLACING:

A. Mix lime, in amounts as shown on plans, or as specified by the Materials Engineering Laboratory, with water in trucks or approved distributors and apply as a thin water suspension or slurry. Provide slurry free of objectionable materials.

B. The distribution of lime at the rates shown on the plans, as directed herein, and/or as directed by the ENGINEER, shall be attained by uniformly successive passes over a measured surface of roadway until the proper moisture and lime content is achieved.

C. Lime slurry distributors shall be equipped with an agitator for maintaining lime and water in a uniform mixture.

3.03 DRY PLACING:

A. Before applying lime, bring the prepared roadway to approximately optimum moister content. Spread lime by an approved screw type spreader box or by bag distribution at the required rate shown in the plans.

B. Distribute lime at a uniform rate with approved equipment and in such a manner as to reduce scattering of lime to a minimum. Lime shall not be applied when wind conditions, in the opinion of the ENGINEER, will cause objectionable blowing of lime to traffic or adjacent properties.

C. Only hydrated lime may be distributed by bag. Motor graders shall not be used to spread hydrated lime.

D. Sprinkle material until required lime content has been secured.

3.04 MIXING:

A. Mixing procedures shall be the same for “Dry Placing” or “Slurry Placing” or lime.

B. Treatment for Materials in Place:
   1. Thoroughly mix material and lime using approved road mixers or other approved equipment, until a homogeneous, friable mixture of material is obtained, free from all clods and lumps.
   2. Mix as thoroughly as possible at the time of lime application of materials containing plastic clay or other materials not readily mixed with lime, bring to proper moisture content, seal with a pneumatic roller, and leave to cure one to four days, as directed by the ENGINEER.
   3. During curing period, material shall be kept moist by method(s) approved by the ENGINEER.
   4. Clods in soil binder - Lime mixture shall be reduced in size by raking, blading, discing, harrowing, and scarifying or by other approved pulverization methods such that nonslaking aggregates obtained on the No. 4 sieve are removed. The remainder of the material shall meet the following requirements when test dry by laboratory sieves:
      a. Minimum Passing 1 3/4 inch 100%
      b. Minimum Passing No. 4 Sieve 60%

C. Treatment of New Material
   1. Thoroughly mix and blend, using approved road mixers or other approved equipment, the base or subbase material, lime and required water until a homogeneous, friable mixture is obtained.
   2. When lime is placed as slurry and mixed by use of blades, the material shall be bladed as the limewater mixture is applied.

D. During the time between application and mixing, hydrated lime that has been exposed to the open air for a period of six hours or more, or to excessive loss due to washing or blowing, shall not be accepted for payment.

3.05 COMPACTION:

A. Compaction of the mixture shall begin immediately after final mixing and in no case later than three calendar days after final mixing.

B. Aerate or sprinkle material as required to provide optimum moisture.

C. Compaction shall begin at the bottom and shall continue until entire depth of mixture is uniformly compacted to 95% of maximum density as determined by AASHTO T-99, Method C.

D. If any portion fails to meet the density specified, it shall be reworked as required to obtain specified density.

3.06 FINISHING, CURING, AND PREPARATION FOR SURFACING:

A. Shape surface after compaction to the required lines, grades, and cross sections, followed by thorough rolling sufficiently light to prevent hair-line cracking.

B. Complete sections shall be moist cured for a minimum of two days before further coursed are added or any traffic permitted, other than sprinkling equipment.

C. The surface or compacted layer shall be kept moist until covered by other base or paving material, or until an application of CSS-1 or 55-1 emulsified asphalt as a curing seal. Curing seal shall be applied as soon as possible after final rolling at a rate of 0.05 to 0.20 gallons per square yard. The exact rate will be as directed by the ENGINEER.

D. No equipment or traffic will be permitted on lime treated materials for 72 hours after application of curing seal.

3.07 MAINTENANCE:

A. Maintain the completed lime treated material within the limits of contract, in condition satisfactory to the ENGINEER as to grade, crown and cross section until surface course is constructed.

B. Immediately repair all irregularities and defects that may occur at no cost to the OWNER and as directed by the ENGINEER.

END OF SECTION

SECTION 02 00 04

FLEXIBLE BASE

200.1 **DESCRIPTION:** This item shall govern a foundation course for surfacing, pavement, or other base courses in conformity with the typical sections shown in the contract documents and to the lines and grades as established by the Engineer.

200.2 **MATERIAL:** The material shall be crushed as necessary to meet the requirements hereinafter specified, and shall consist of durable stone crushed and/or screened to the required particle size, with or without other approved fine- sized material. The material shall be from approved sources.

Testing of flexible base materials shall be in accordance with the following TXDOT standard laboratory test procedures:

Preparation for Soil Constants and Sieve Analysis	Tex-101-E
Liquid Limit	Tex-104-E
Plastic Limit	Tex-105-E
Plasticity Index	Tex-106-E
Linear Shrinkage	Tex-107-E
Sieve Analysis	Tex-110-E
Los Angeles Abrasion	ASTM C131 (Grade A)

Samples for testing the material shall be made available to the Inspector and taken prior to the compaction operations.

The material shall be well graded and, when properly tested, meet the following requirements:

Retained on 1- ¾ inch sieve	0 %
Retained on No. 4 sieve	45 to 75 %
Retained on No. 40 sieve	60 to 85 %

The material passing the No. 40 sieve shall be known as Soil Binder and shall meet the following requirements:

Liquid Limit shall not exceed	40
Plasticity Index shall not exceed	12

The crushed stone shall have an abrasion of not more than 40, when subjected to

the Los Angeles Abrasion Test.

200.3 **CONSTRUCTION METHODS:** The flexible base material shall be placed on the approved subgrade, in courses not to exceed 6 inches compacted depth. It shall be the responsibility of the Contractor that the required amount of material be delivered and uniformly spread and shaped. All material shall be moved from the place where it is dumped by cutting into windrows. It shall be sprinkled, spread, shaped, and rolled in proper sequence to prevent segregation and as necessary for required compaction.

Upon completion, the surface shall be smooth and in conformity with typical sections and to the established lines and grades. Any deviation in excess of ¼ inch in cross section and in length of 16 feet measured longitudinally shall be corrected. All irregularities, depressions, or weak spots which develop shall be corrected.

Flexible base shall be compacted to an apparent dry density of not less than 95% of the maximum dry density as determined in accordance with TXDOT Test Method Tex 113-E. All density tests will be made within 24 hours after compaction operations are completed. If the material fails to meet the density specified, it shall be reworked as necessary to meet the required density. Just prior to the placing of any succeeding course of flexible base or surfacing on a previously completed course, the density and moisture of the top 3 inches of flexible base shall be checked and if the test shows the density to be more than 2% below the specified minimum or the moisture content to be more than 3% above or below the optimum, the course shall be reworked as necessary to obtain the specified compaction and moisture content.

200.4 **MEASUREMENT:** "Flexible Base" will be measured by the square yard, complete in place, for the thickness specified in the contract documents, or by the cubic yard, complete in place as indicated in the contract document bid proposal.

200.5 **PAYMENT: The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used**. When specified as a separate pay item in the contract bid form, this work shall be measured as specified above and paid for at the contract unit bid price for this work. The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

END OF SECTION

SECTION 02 00 05

CRUSHED LIMESTONE FLEXIBLE BASE

PART 1 GENERAL

1.1 DESCRIPTION

This item shall govern the materials, placement compaction of Crushed Limestone Base to the lines and grades that are shown on the construction drawings. Crushed Limestone Base thickness for various pavement types are shown on the plans.

1.2 MATERIAL

The Crushed Limestone materials shall be as specified by “Item 247 Flexible Base”. Texas Department of Transportation, 1993 Standard Specifications for Construction of Highways, Streets, and Bridges shall meet the requirements as follows:

1. Type A: Type A material shall be crushed stone produced from oversize quarried aggregate, sized by crushing and produced from a naturally occurring single source. Crushed gravel or uncrushed gravel shall not be acceptable for Type A material. No blending of sources and/or additive materials will be allowed in Type A material.

2. Triaxial Class 1: Min. compressive strength, 45 at 0 psi lateral pressure and 175 at 15 psi lateral pressure.

RETAINED ON SQUARE SIEVE NUMBER	PERCENT RETAINED
1-3/4” (44mm)	0
7/8” (22.23mm)	10-35
3/8” (9.5mm)	30-50
NUMBER 4 (4.75mm)	45-65
NUMBER 40 (0.425mm)	70-85

Material passing the Number 40 Sieve shall be known as “Binder Materials” and shall meet the following requirements:

Maximum Liquid Limits (L.L)	=	35
Maximum Plasticity Index (P.I.)	=	10
Wet Ball Mill (max)	=	40
California Bearing Ratio (min.)	=	100
Crushed Limestone Base	CLB-1	

All aggregate retained on the Number 10 Sieve shall be comprised of only crushed limestone.

The Contractor shall not place crushed limestone on the road bed until the Engineer has accepted the shaped and compacted subgrade.
The Contractor must maintain the roadbed free of holes, ruts and depressions and in condition to receive the crushed limestone.
The Contractor upon request shall provide certification that the material supplied meets the above requirements prior to delivery to the job site. Samples for testing of the material must be taken prior to the compaction operation.

1.3 CONSTRUCTION METHODS

The flexible base material shall be placed on the approved subgrade in course not to exceed six (6) inches compacted depth. It shall be the responsibility of the contractor that the required amount of material be delivered and uniformly spread and shaped. All materials has been cut into the windows, it shall be sprinkled, spread, shaped, and rolled in proper sequence to prevent segregation and as necessary for required compaction.
The surface on completion shall be smooth and in conformity with typical sections and to the established lines and grades. Any deviation in excess of ¼ inch in cross- section and in length of 16 feet measured longitudinally shall be corrected.
Flexible base shall be compacted to an apparent dry density of not less than 98 percent of the maximum dry density as determined in accordance with A.S.T.M. Test method D698 (Standard Proctor). Tests for density will be made within 24 hours after compaction operations are completed. If the material fails to meet the density specified, it shall be reworked as necessary to meet the density required. Prior to placing any succeeding course of flexible base or surfacing on a previously completed course the density and moisture of the top three (3) inches of flexible base shall be checked and if the tests show the density to be more than 2 percent below the specified compaction and moisture content, it shall be reworked as necessary the density and moisture required.
The first density and depth test at a specific location will be made by commercial testing laboratory designated by the Owner and said tests shall be paid for the Owner. If the test fails, all other tests at the location shall be paid for by the contractor, by deducting from the final payment.

Crushed Limestone Base CLB-2

1.4 MEASUREMENT & PAYMENT

This item; “CRUSHED LIMESTONE BASE”, will be measured by the square yard complete in place as planned and detailed on the cross – section. “CRUSHED LIMESTONE BASE” price shall include full compensation for all materials, for water required and for all equipment, tools, labor and incidentals necessary to complete the work to the required compaction.

The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used. When specified as a separate pay item in the contract bid form, this work shall be measured as specified above and paid for at the contract unit bid price for this work. The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

END OF SECTION

SECTION 02 00 40

ASPHALT CONCRETE PAVEMENT

ASPHALTIC CONCRETE PAVEMENT

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Surface course of compacted mixture of coarse and fine aggregates and asphaltic binder.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for hot-mix asphalt concrete pavement is on a per ton basis. Separate pay items are used for each different required thickness of pavement.

2. Payment for hot-mix asphalt concrete pavement includes payment for associated work performed in accordance with Section Tack Coat.

3. Payment for pavement repair or pavement replacement for utility projects is on a square yard basis and includes surface and base materials.

4. Payment for temporary detour pavement or temporary roadway and shoulder is on a square yard basis and includes surface and base materials, associated grading, maintenance and removal as well as restoration of ditches.

5. Payment for speed humps is on linear foot basis, and includes milling of existing pavement, tack coat, and placement and compaction of asphalt. Measurement of speed hump is along length of 12-foot-wide speed hump, measured transverse to centerline of road.

1.3 REFERENCES

A. ASTM C 33 - Standard Specification for Concrete Aggregates.

B. ASTM C 131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

C. TxDOT Tex-106-E - Calculating the Plasticity Index of Soils

D. TxDOT Tex-126-E - Molding, Testing, and Evaluating Bituminous Black Base Material.

E. TxDOT Tex-200-F - Sieve Analysis of Fine and Course Aggregates.

F. TxDOT Tex-203-F - Sand Equivalent Test.

G. TxDOT Tex-204-F - Design of Bituminous Mixtures.

H. TxDOT Tex 206-F - Compacting Test Specimens of Bituminous Mixtures.

I. TxDOT Tex-207-F - Determining Density of Compacted Bituminous Mixtures.

J TxDOT Tex-208-F - Test for Stabilometer Value of Bituminous Mixtures.

K. TxDOT Tex-217-F - Determining Deleterious Material and Decantation Test for Coarse Aggregates.

L. TxDOT Tex-227-F - Theoretical Maximum Specific Gravity of Bituminous Mixtures.

M. TxDOT Tex-530-C - Effect of Water on Bituminous Paving Mixtures.

N. TxDOT Tex-531-C - Prediction of Moisture Induced Damage to Bituminous Paving Materials Using Molded Specimens.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 - Submittal Procedures.

B. Submit certificates that asphalt materials and aggregates meet requirements of Paragraph 2.01, Materials.

C. Submit proposed design mix and test data for surface course.

D. Submit manufacturer's description and characteristics of spreading and finishing machine for approval.

PART 2 P R O D U C T S

2.1 MATERIALS

A. Coarse Aggregate:

1. Use gravel, crushed stone, or combination thereof, that is retained on No. 10 sieve, uniform in quality throughout and free from dirt, organic or other injurious matter occurring either free or as coating on aggregate. Use aggregate conforming to ASTM C 33 except for gradation. Furnish rock or gravel with Los Angeles abrasion loss not to exceed 40 percent by weight when tested in accordance with ASTM C 131.

2. Aggregate by weight shall not contain more than 1.0 percent by weight of fine dust, clay- like particles, or silt when tested in accordance with Tex-217-F, Part II.

B. Fine Aggregate: Sand, stone screenings or combination of both passing No. 10 sieve. Use aggregate conforming to ASTM C 33 except for gradation. Use sand composed of sound, durable stone particles free from loams or other injurious foreign matter. Furnish screenings of same or similar material as specified for coarse aggregate. Plasticity index of that part of fine aggregate passing No. 40 sieve shall be not more than 6 when tested by TxDOT Tex-106-E. Sand equivalent shall have minimum value of 45 when tested by TxDOT Tex-203-F.

C. Composite Aggregate: Conform to following limits when graded in accordance with TxDOT Tex-200-F. Use type specified on Drawings:

GRADATION OF COMPOSITE AGGREGATE

GRADATION OF COMPOSITE AGGREGATE		
	PERCENT	
SIEVE SIZE	Course Surface (TxDOT Type C)	Fine Surface (TxDOT Type
-	-	-
3/4 “	95 to 100	-
1/2"	-	98.0-100.0
3/8"	70.0-85.0	85.0-100.0
#4	43 to 63	50.0 to 70.0
#8	32.0-44.0	35.0-46.0
#30	14.0-28.0	15.0-29.0
# 50	7.0-21.0	7.0-20.0
#200	2.0-7.0	2.0-7.0
VMA %	14.0	15.0

* 2 to 8 when Test Method Tex-200-F, Part II (Washed Sieve Analysis) is used.

SIEVE SIZE PERCENT PASSING

	Course Surface (TxDOT Type C)	Fine Surface (TxDOT Type D)
-	-	-
3/4 “	95 to 100	-
1/2"	-	98.0-100.0
3/8"	70.0-85.0	85.0-100.0
#4	43 to 63	50.0 to 70.0
#8	32.0-44.0	35.0-46.0
#30	14.0-28.0	15.0-29.0
# 50	7.0-21.0	7.0-20.0
#200	2.0-7.0	2.0-7.0
VMA % minimum	14.0	15.0

* 2 to 8 when Test Method Tex-200-F, Part II (Washed Sieve Analysis) is used.

D. Asphalt Binder: Moisture-free homogeneous material which will not foam when heated to 347 F, meeting the following requirements. .

PERFORMANCE GRADED BINDER	
CRITERIA / TEST	PERFORMANCE GRADE (PG64-22)
Average 7-day Maximum Pavement Design Temperature, C	< 64
Minimum Pavement Design Temperature, C	> -22
ORIGINAL BINDER	
Flash Point Temperature, T48; Minimum C	230
Viscosity, ASTM D 4402; Maximum, 3Pa*s (3000 cP) Test Temperature, C	135
Dynamic Shear, TP5; G*/sin[ ], Minimum, 1.00 kPa Test Temperature @ 10 rad/sec., C	64
ROLLING THIN FILM OVEN (T240) OR THIN FILM OVEN (T179) RESIDUE	
Mass Loss, Maximum , %	1.00
Dynamic Shear, TP5; G*/sin [ ], Minimum, 2.20 kPa Test Temperature @ 10 rad/sec., C	64

PRESSURE AGING VESSEL RESIDUE (PP1)	
PAV Aging Temperature, C	100
Dynamic Shear, TP5; G*/sin [ ], Minimum, 5000 kPa Test Temperature @ 10 rad/sec., C	25
Physical hardening	Report
Creep Stiffness, TP1; S, Maximum, 300 Mpa -value, Minimum, 0.300 Test Temperature @ 60 sec., C	-12
Direct Tension, TP3; Failure Strain, Minimum, 1.0% Test Temperature @ 1.0 mm/min, C	-12

E. Anti-stripping Agent:

1. Evaluate mixture of aggregate, asphalt, and additives proposed for use for moisture susceptibility and requirement for anti-stripping agents. To substantiate mix design, produce and test trial mixtures using proposed project materials and equipment prior to placement. Test for susceptibility to moisture and trial mixture may be waived by Project Manager when similar designs using same material have previously proven satisfactory.

2. Liquid Anti-stripping Agent. Use anti-stripping agent with uniform liquid with no evidence of crystallization, settling, or separation of components. Submit sample of anti-stripping agent proposed for use and manufacturer's product data, including recommended dosage range, handling and storage, and application instructions.

F. Pavement markings for speed humps: Conform to requirements of Section 02767 - Thermoplastic Pavement Markings.

2.2 EQUIPMENT

A. Mixing Plant: Weight-batching or drum mix plant with capacity for producing continuous mixtures meeting specifications. With exception of a drum mix plant, plant shall have satisfactory conveyors, power units, aggregate handling equipment, hot aggregate screens and bins, and dust collectors.

B. Provide equipment to supply materials adequately in accordance with rated capacity of plant and produce finished material within specified tolerances. Following equipment is essential:

1. Cold aggregate bins and proportioning device

2. Dryer

3. Screens

4. Aggregate weight box and batching scales

5. Mixer

6. Asphalt storage and heating devices

7. Asphalt measuring devices

8. Truck scales

C. Bins: Separate aggregate into minimum of four bins to produce consistently uniform grading and asphalt content in completed mix. Provide one cold feed bin per stockpile.

2.3 MIXES

A. Employ certified testing laboratory to prepare design mixes. Test in accordance with TxDOT Tex-126-E or Tex-204-F, Tex-206-F, Tex-208-F, Tex-530-C and Tex-531-C.

B. Density, Stability and Air Void Requirements:

Percent Density		Percent Optimum	HVEEM Stability Percent
Min.	Max.		Not Less Than
94.5	97.5	96	35

PART 3 E X E C U T I O N

3.1 EXAMINATION

A. Verify compacted base course is ready to support imposed loads.

B. Verify lines and grades are correct.

3.2 PREPARATION

A. Tack Coat: Conform to requirements of Section 02743 - Tack Coat. Where mixture will adhere to surface on which it is to be placed without use of tack coat, tack coat may be eliminated when approved by Project Manager.

B. Prepare subgrade in accordance with requirements of Section 02711 - Hot Mix Asphalt Base Course, Section 02712 - Cement Stabilized Base Course, or Section 02713 - Recycled Crushed Concrete Base Course.

C. Prepare subgrade in advance of asphalt concrete paving operation.

D. Perform pavement repair and resurfacing as indicated in Section 02951 - Pavement Repair and Resurfacing.

E. Do not use cutback asphalt.

F. Milling of pavement for speed humps: Mill pavement (concrete or asphalt) to depth of one inch and width between 18 and 24 inches around entire perimeter of proposed hump, as shown in detail for speed hump design.

3.3 PLACEMENT

A. Do not place asphalt pavement less than 2 inches thick when surface temperature taken in shade and away from artificial heat is below 50 F and falling. Asphalt may be placed when temperature is above 40 F and rising.

B. Haul prepared and heated asphaltic concrete mixture to project in tight vehicles previously cleaned of foreign material. Mixture temperature shall be between 250 F and 325 F when laid.

C. Spread material into place with approved mechanical spreading and finishing machine of screening or tamping type.

D. Surface Course Material: Surface course 2 inches or less in thickness may be spread in one lift. Spread lifts in such a manner that, when compacted, finished course will be smooth, of uniform density, and will be to section, line and grade as shown. Place construction joints on surface courses to coincide with lane lines or as directed by Project Manager.

E. Joints: Pass roller over unprotected ends of freshly laid mixture only when mixture has cooled. When work is resumed, cut back laid material to produce slightly beveled edge for full thickness of course. Remove old material which has been cut away and lay new mix against fresh cut.

F. When new asphalt is laid against existing or old asphalt, saw cut existing or old asphalt to full depth to provide straight smooth joint.

G. In smaller restricted areas where use of paver is impractical spread material by hand. Compact asphalt by mechanical means. Carefully place materials to avoid segregation of mix. Do not broadcast material. Remove lumps that do not break down readily.

3.4 COMPACTION

A. Construct test strip to identify correct type, number, and sequence of rollers necessary to obtain specified in-place density or air-voids when directed by the Project Manager. Prepare test strip at least 1,000 feet in length, comparable to placement and compaction conditions for Project.

B. Begin rolling while pavement is still hot and as soon as it will bear roller without shoving, displacement or hair cracking. Keep wheels properly moistened with water to prevent adhesion of surface mixture. Do not use excessive water or petroleum by-products.

C. Compact surface thoroughly and uniformly, first with power-driven, 3-wheel, or tandem rollers weighing a minimum of 8 tons. Obtain subsequent compression by starting at side and rolling longitudinally toward center of pavement, overlapping on successive trips by at least one-half width of rear wheels. Make alternate trips slightly different in length.

Continue rolling until no further compression can be obtained and rolling marks are eliminated. Complete rolling before mat temperature drops below 185 F.

D. Use tandem roller for final rolling. Double coverage with approved pneumatic roller on asphaltic concrete surface is acceptable after flat wheel and tandem rolling has been completed.

E. Along walls, curbs, headers and similar structures, and in locations not accessible to rollers, compact mixture thoroughly with lightly oiled tamps.

F. Compact binder course and surface course to a minimum density of 91 percent of maximum possible density of voidless mixture composed of same materials in like proportions.

3.5 TOLERANCES

A. Furnish templates for checking surface in finished sections. Maximum deflection of templates, when supported at center, shall not exceed 1/8 inch.

B. Completed surface, when tested with 10 foot straightedge laid parallel to center line of pavement, shall show no deviation in excess of 1/8 inch in 10 feet. Correct surface not meeting this requirement.

C. Dimensions of speed humps shall conform to details for speed hump design and speed hump height tolerances.

3.6 QUALITY CONTROL

A. Testing will be performed under provisions of Section 01454 - Testing Laboratory Services.

B. For in-place depth and density, take minimum of one core at random locations for each 1000 feet of single lane pavement. On a 2-lane pavement, take samples at random every 500 feet from alternating lanes. Take cores for parking lots every 500 square yards of base to determine in-place depth and density. If cul-de sac or streets are less than 500 feet, minimum of 2 cores (one per lane) will be procured. On small projects, take a minimum of two cores for each day's placement. For first days placement and prior to coring, minimum of 5 nuclear gauge readings will be performed at each core location to establish correlation between nuclear gauge (wet density reading) and core (bulk density). This process will continue for each day's placement until engineer determines that a good bias has been established for that nuclear gauge.

C. Determine in-place density in accordance with TxDOT Tex-207-F and Tex-227-F from cores or sections. Other methods of determining in-place density, which correlate satisfactorily with results obtained from roadway specimens, may be used when approved by Project Manager. Average densities for each street placed in a single day to determine compliance.

D. Contractor may request three additional cores in vicinity of cores indicating nonconforming in-place depths or density at no additional cost to OWNER. In-place depth and density at these locations shall be average of four cores.

E. Fill cores and density test sections with new compacted asphaltic concrete.

3.7 NONCONFORMING PAVEMENT

A. Recompact and retest nonconforming street sections not meeting surface test requirements or having unacceptable surface texture. Patch asphalt pavement sections in accordance with procedures established by Asphalt Institute. Retesting is at no cost to the OWNER.

B. Remove and replace areas of asphalt surface found deficient in thickness by more than 10 percent. Use new asphaltic surface of thickness shown on Drawings. Remove and replace areas of asphalt surface found deficient in average density.

C. Replace speed humps which do not conform to requirements of details, or which are rejected by Project Manager.

3.8 PROTECTION

A. Do not open pavement to traffic until completion of rolling and temperature has cooled to set asphaltic concrete surface, or as shown on Drawings.

B. Maintain asphalt pavement in good condition until completion of Work.

C. Repair defects immediately by replacing asphalt pavement to full depth.

3.9 PAVEMENT MARKINGS FOR SPEED HUMPS

A. Apply pavement markings to speed humps in conformance with dimensions shown on detail for speed hump design.

END OF SECTION

SECTION 02 00 41
PRIME COAT

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Prime coat for asphalt concrete paving

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No separate payment will be made for prime coat under this Section. Include payment in unit price for material being primed.

2. Refer to Measurement and Payment for unit price procedures.

3. **The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used.** When specified as a separate pay item in the contract bid form, this work shall be measured as specified above and paid for at the contract unit bid price for this work. The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

1.3 SUBMITTALS

A. Conform to requirements of Submittal Procedures section.

B. Submit product data for proposed prime coat.

C. Submit report of recent calibration of distributor.

PART 2 P R O D U C T S

2.1 CUTBACK ASPHALT

A. Provide moisture-free homogeneous material which will not foam when heated to 347 degrees F and which meets following requirements:

B. Asphalt material for prime coat shall be MC-30 or MC-70 and shall meet following requirements:

PROPERTIES	TYPE - GRADE			
	MC-30		MC-70	
	MIN	MA	MIN.	MA
Water, Percent	---	0.2	---	0.2
Flash Point, T.O.C., □F	100	---	100	---
Kinematic Viscosity at 140□F, cst	30	60	70	140

1. Distillate shall be as follows, expressed as percent by volume of total distillate to 680 degrees F:

TEMPERATURE	TYPE-GRADE			
	MC-30		MC-70	
	MIN	MA	MIN.	MA
to 437□F	---	25	---	20
to 500□F	40	70	20	60
to 600□F	75	93	65	90
Residue from 680□F Distillation, Volume, Percent	50	---	55	---

2. Tests on Distillation Residue:

TEST	TYPE-GRADE			
	MC-30		MC-70	
	MIN	MA	MIN.	MAX.
Penetration at 77□F, 100g, 5 sec.	120	250	120	250
Ductility at 77□F, 5 cm/min. cms	100*	---	100*	---
Solubility in Trichloroethylene, %	99	---	99	---
Spot Test	All Negative			

* If penetration of residue is more than 200 and ductility at 77 degrees F is less than 100 cm, material will be acceptable when its ductility at 60 degrees F is more than 100.

2.2 EMULSIFIED PETROLEUM RESIN

A. EPR-1 Prime: Slow curing emulsion of petroleum resin and asphalt cement conforming to following requirements:

PROPERTIES	MIN.	MAX.
Fural Viscosity at 77□F, Sec	14	40
Residue by Evaporation, % by Weight	60	-
Sieve Test, %	-	0.1
Particle Charge Test	Positive	
Tests on Distillation Residue:		
Flash Point, COC (F)	400	-
Kinematic Viscosity @ 140 F (cst)	190	350

B. For use, EPR-1 may be diluted with water up to maximum three parts water to one part EPR-1 in order to achieve desired concentration of residual resin/asphalt to facilitate application.

PART 3 E X E C U T I O N

3.1 EXAMINATION

A. Verify base is ready to support imposed loads.

B. Verify lines and grades are correct.

3.2 PREPARATION

A. Thoroughly clean base course surface of loose material by brooming prior to application of tack coat.

B. Prepare sufficient base in advance of paving for efficient operations.

3.3 APPLICATION, BASIC

A. Apply prime coat with approved type of self-propelled pressure distributor. Distribute prime coat evenly and smoothly under pressure necessary for proper distribution.

B. Keep storage tanks, piping, retorts, booster tanks, and distributors used in handling asphalt materials clean and in good operating condition. Conduct operations so asphalt material does not become contaminated.

C. If yield of asphaltic material appears to be in error, recalibrate distributor prior to continuing Work.

D. Maintain surface until Work is accepted by City.

3.4 APPLICATION, CUTBACK ASPHALT

A. Do not use cutback asphalt during period of April 16 through September 15.

B. Do not place prime coat when air temperature is below 60 degrees F and falling. Materials may be placed when air temperature taken in shade and away from artificial heat is above 50 degrees F and rising.

C. Distribute at rate of 0.25 to 0.35 gallons per square yard.

D. Equipment shall accurately determine temperature of asphaltic material in heating equipment and in distributor, for determining rate of application, and for obtaining uniformity at junction of two distributor loads. Maintain in accurate working order, including recording thermometer at storage heating unit.

E. Base temperature of application on temperature-viscosity relationship that will permit application of asphalt with viscosity of 100 to 125 centistokes. Maintain asphalt within 15 degrees F of temperature required to meet viscosity. Selected temperature shall be within following range.

Prime Coat Type	Minimum (□F)	Maximum (□F)
MC-30	70	150
MC-70	125	175

F. Do not allow temperature of MC-30 to exceed 175 degrees F.

G. Do not allow temperature of MC-70 to exceed 200 degrees F.

3.5 APPLICATION, EMULSIFIED PETROLEUM RESIN

A. Do not place prime coat when air temperature is below 36 degrees F and falling.

B. Distribute at rate of 0.15 to 0.25 gallons per square yard.

3.6 PROTECTION

A. Prevent traffic or placement of subsequent courses over freshly applied prime coat until authorized by Project Manager.

END OF SECTION

SECTION 02 00 42
TACK COAT

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Tack coat for asphalt concrete paving.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No separate payment will be made for tack coat under this Section. Include payment in unit price for asphaltic pavements.

2. Refer to Measurement and Payment for unit price procedures.

3. **The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used**. When specified as a separate pay item in the contract bid form, this work shall be measured as specified above and paid for at the contract unit bid price for this work. The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

1.3 REFERENCES

A. ASTM D 244 - Standard Test Methods for Emulsified Asphalts.

1.4 SUBMITTALS

A. Conform to requirements of Submittal Procedures.

B. Submit product data for proposed tack coat.

C. Submit report of recent calibration of distributor.

PART 2 P R O D U C T S

2.1 EMULSION

A. Provide homogeneous material which shows no separation of asphalt after mixing and meets viscosity requirements within 30 days after delivery.

B. Emulsion material for tack coat.

1. Emulsified asphalt: SS-1 or SS-1h meeting following criteria:

PROPERTIES	SS-1		SS-1h	
	MIN.	MAX.	MIN.	MAX.
Furol Viscosity at 77°F, sec.	20	100	20	100
Residue by Distillation, %	60	--	60	--
Oil Portion of Distillate, %	--	1/2	--	1/2
Sieve Test, %	--	0.10	--	0.10
Miscibility (Standard Test)	Passing			
Cement Mixing, %	--	2.0	--	2.0
Storage Stability, 1 Day, %	--	1	--	1
Test on Residue: Penetration at 77°F, 100g, 5 sec. Solubility in Trichloroethylene, % Ductility at 77°F, 5 cm/min., cms	 120 97.5 100	 160 -- --	 70 97.5 80	 100 -- --

2. Polymer Modified Emulsion, SS-1P, for use where thin overlays (less than or equal 2 inches) are placed on collector or arterial streets and for speed humps, especially over existing Portland cement concrete pavement.

PROPERTIES	SS-1P	
	MIN.	MAX.
Furol Viscosity at 77 F, sec.	30	100
Residue by Distillation, %	60	--
Oil Portion of Distillate, %	--	1/2
Sieve Test, %	--	0.10
Miscibility (Standard Test)	Passing	
Cement Mixing, %	--	2.0

Storage Stability, 1 Day, %	--	1
Test on Residue: Penetration at 77°F, 100g, 5 sec.; Solubility in Trichloroethylene, %Ductility at 77°F, 5 cm/min., cms; Viscosity at 140 F, poises	100 97 50 1300	140 -- -- --

3. For emulsions used for tack coats during period of April 16 through September 15,volatile organic compound solvents (VOC) shall not exceed 12 percent by weight when tested in accordance with ASTM D 244.

PART 3 E X E C U T I O N

3.1 EXAMINATION

A. Verify compacted base is ready to support imposed loads.

B. Verify lines and grades are correct.

3.2 PREPARATION

A. Thoroughly clean base course or concrete surface of loose material by brooming prior to tack coat application.

3.3 APPLICATION

A. Apply tack coat uniformly by use of approved distributor at rate not to exceed 0.05 gallons per square yard of surface depending on texture of underlying surface. Select an application rate that will provide appropriate asphalt residual.

B. Paint contact surfaces of curbs, structures, and joints with thin uniform coat of tack coat.

3.4 PROTECTION

A. Prevent traffic or placement of subsequent courses over freshly applied tack coat until authorized by Project Manager.

END OF SECTION

SECTION 02 00 60
PAVEMENT MARKING PAINT

SUBSECTION 860S

860*S*.1 Description

This item shall govern the installation of reflectorized paint pavement marking. The width of the line shall be 4 inches (100 millimeters) and the color as indicated on the Drawings.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

860S.2 Submittals

The submittal requirements of this specification item include:

A. Proposed paint color(s), brand names, raw materials and products for traffic paint.

B. Sampling and testing procedures and specific test results for pigment, calcium carbonate, acrylic resins and other materials used in the traffic paints.

C. Proposed shipping requirements including container type(s) (drums and/or buckets), and labeling.

D. Manufacturer's recommendations for mixing, storage and application of the traffic glass beads and traffic paint.

E. All applicable Materials Safety data Sheets for the traffic paint.

860S.3 Materials

A. Traffic Stripe Reflective Glass Traffic Beads

1. The glass spheres shall not contain more than 30 percent (by weight □mass□) irregular shaped particles when tested in accordance with TxDoT Test Method-832-B. The no. 20 (850 □m) sieve shall have a maximum of 35% by weight (mass) allowed irregular particles, based on a visual inspection.

   Unless noted otherwise on the Drawings or designated in writing by the Engineer or designated representative, the application rate of the glass traffic beads shall not be less than 6 pounds per gallon (0.7 kilograms per liter). Glass traffic beads shall be essentially free of sharp angular particles and particles showing milkiness or surface scarring or scratching. Glass traffic beads shall be water white in color.

2. The glass traffic beads shall meet the following graduation requirements when tested in accordance with TxDoT Test Method Tex-831-B:

US Sieve	SI Sieve	% weight (mass) retained
# 20	(850	3 to 10
# 30	(600	20 to 40
# 40	(425	30 to 50
# 50	(300	15 to 35
# 80	(180	0 to 10

3. Index of Refraction: The glass traffic beads, when tested by the liquid immersion method at 77^0F (25^0C), shall show an index of refraction within the range of 1.50 to 1.53.

4. Wetting: The glass traffic beads shall be capable of being readily wet with water, when tested according to TxDOT Test Method Tex-826-B.

5. Stability: The glass traffic beads shall show no tendency toward decomposition, surface etching, change in retroreflective characteristics or change in color after

   (a) One-hour exposure to concentrated hydrochloric acid at 77^oF (25^oC),

   (b) 24 hours exposure to weak acids, weak alkali, and

   (c) 100 hours of weather-o-meter (Atlas, Sunshine Type) exposure, ASTM G-23, Method 1, Type EH.

6. Contaminants: Glass traffic beads shall:

   (a) contain less than 1/4 of 1 percent moisture by weight (mass).

   (b) free of trash, dirt, etc.

   (c) show no evidence of objectionable static electricity when flowing through a regular traffic bead dispenser.

7. Sampling and Testing (TxDoT Test Method Tex-801-B) shall be in accordance with the latest applicable procedures included in the TxDOT Manual on Testing. Applicable test methods include but are not limited to the following:

   Tex 806-B, "Method for Determining Grind and Oversize Pigment Particles"
   Tex-810-B, "Test Method for Color and Color Stability of Opaque Colored Pigments"
   Tex-811-B, "Skinning Characteristics of Coatings"
   Tex-822-B, "Method for Determining Refractive Index of Glass Beads" Tex-826-B, "Water Absorption Test of Beads"
   Tex-828-B, "Determining Functional Characteristics of Pavement Markings"
   Tex-830-B, "Method for Sampling Traffic Stripe Beads"
   Tex-831-B, "Method for Determining The Gradation of Glass Traffic-Stripe Beads"
   Tex-832-B, "Methods for Determining the Roundness of Glass Spheres"

B. Pavement Marking Paint

1. Functional Requirements

(a) All paint-type materials that are applied at ambient or slightly elevated temperatures shall conform to TxDoT Departmental Materials Specifications DMS-8200, YPT 10 and/or WPT-10 and DMS-8290.

(b) The paint shall be homogenous, well ground to a uniform and smooth consistency and shall not skin nor settle badly nor cake, liver, thicken, curdle or gel in the container.

(c) The paint, when applied to a bituminous pavement surface under normal field conditions at the required rate of .015 inch (0.4 mm) wet film thickness, shall have a maximum "no pickup" drying time of 15 minutes to prevent displacement or discoloration under traffic.

(d) In preparation of the paint, the pigments shall be dispersed in the vehicle by appropriate methods so that a fineness reading of not less than 4 is obtained with a Hegman grind gauge.

(e) Consistency viscosity, measured with a Krebs-Modified-Stormer Viscometer at $77^{O}F$ ($25^{O}C$), shall be from 80-90 K.U (with water deleted).

(f) A thin film of paint spread on a glass plate and allowed to dry thoroughly shall not darken or show any discoloration when subjected to ultraviolet rays for a period of 5 minutes.

2. Material Requirements

(a) Raw Materials

(1) The exact brands and types of raw materials used in the wet standards are listed for the purpose of facilitating the selection of parallel materials that are equal, not only in quality and composition but also in physical and chemical behavior after aging in the finished product.

(2) After proposed brand names and types of raw materials, no substitution will be allowed during the manufacture without prior agreement with the OWNER.

(3) It shall be the responsibility of the Contractor to utilize materials that not only meet the individual raw material specification, but that also produce a coating that meets the specific formula requirements.

(4) All materials required to meet TxDoT, Federal and ASTM specifications must meet the latest specification as indicated on the Drawings in effect on the date of the proposal or invitation to bid.

(b) Pigments

(1) Titanium Dioxide:

Titanium Dioxide shall meet ASTM D-476, Type II requirements.

(2) Yellow Pigment:

Yellow Pigment CI 65 (Reddish Yellow)	
Characteristic	Values

Specific Gravity	1.74 to 1.76
Oil Absorption	20 to 30 %
Moisture	0.5 % maximum
Pigment retained on #325 (45 □m) sieve	0.1 % maximum
C.I. Number	11740
Heat Stability	266^{o}F

In addition to the requirements identified above, evidence shall be provided that the infrared spectrum matches the standard spectrum on file with TxDoT's Construction Division, Materials Section (CSTM)

(3) Calcium Carbonate: Calcium Carbonate shall conform to ASTM D-1199, Type GC, Grade I, with a minimum of 95% $CaCO_3$ and Type PC, with a minimum of 98% $CaCO_3$.

(c) Acrylic Traffic Resins: The acrylic traffic resin shall be similar and equal to the standard sample submitted by the manufacturer. The resin shall be approved prior to the contract award for the proposed use of the pavement paint.

Acrylic Traffic Emulsion

Characteristic	Values
Solids Content	49.5 to 50.5
Viscosity, #2 Spindle, 60 rpm, 77^{o}F (25^{o}C),	250 maximum
pH	10.0 to 10.6
Film appearance, 3 mil (75 □m) dry	Smooth, clear, continuous

In addition to the requirements identified above, evidence shall be provided that the infrared spectrum matches the standard spectrum on file with TxDot's Construction Division, Materials Section (CSTM)

(d) Miscellaneous Materials: These materials shall be similar and equal to the standard sample submitted by the vendor. The specific materials shall be approved prior to the contract award for the proposed use of the pavement paint.

1) Dispersant
   Byk 156
   Tamol
   850
   Colloids 226/35
2) Surfactant
   Triton X-
   405
   Colloids CA-407
3) Defoamer
   Foamaster 111
   Drew 493
   Colloids 654
4) Hydroxy Ethyl

Cellulose Natrosol 250 HBR Bermocoll E431FQ Cellosize QP - 30,000

5) Coalescent
   Texanol
   Exxate 1200
6) Preservative
   Troysan
   Dowicil 75
   Nuosept 101
7) Methyl Alcohol
   ASTM D-1152, 1.3320 maximum

(e) Standard Formulae:

The following tables represent the Standard Formulae to be followed by the manufacturer when manufacturing paint to be used by the Contractor on City of Brownsville paint striping contracts.

Formula: White Traffic Paint

WPT-11 - LEAD FREE WHITE TRAFFIC PAINT		
Component	Pounds	Kilograms
Acrylic Emulsion, 50% Solids, Fastrack 2706	540.	245.
Coalescent, Texanol	20.	9.1
Titanium Dioxide, Rutile, Type II, Tiona RCL-9	100.	45.4
Calcium Carbonate, Type PC, Mississippi M-60	150.	68.
Calcium Carbonate, Type GC, Hubercarb M-4	440.	199.6
Hydroxy Ethyl Cellulose, Natrosol 250 HBR (*)	0.5	0.2
Defoamer, Foamaster 111	5.	2.3
Disapersant, Colloids 226/35	9.	4.1
Surfactant, Triton X-405	2.	0.9
Methyl Alcohol	30.	13.6
Preservative, Troysan 192	2.	0.9
Water, Potable (**)	18.**	8.1**
TOTALS	1316.5	597.2

(*) The Hydroxy Ethyl Cellulose amount may be varied up to two (2) pounds [0.9 kilograms].

(**) Only 10 pounds (4.5 kilograms) shall be used in the actual manufacture of the pavement paint. The remaining 8 pounds (3.6 kilograms) shall be used as a drum float.

Formula: Yellow Traffic Paint

YPT-11 - LEAD FREE YELLOW TRAFFIC PAINT		
Component	Pounds	Kilograms
Acrylic Emulsion, 50% Solids, Fastrack 2706	540	245.
Coalescent, Texanol	20	9.1
C.I. Pigment Yellow 65, Sunglow Yellow 1244	30.	13.6
Titanium Dioxide, Rutile, Type II, Tiona RCL-	20.	9.1
Calcium Carbonate, Type PC, Mississippi M-60	150	68.
Calcium Carbonate, Type GC, Hubercarb M-4	450	204.1
Hydroxy Ethyl Cellulose, Natrosol 250 HBR (*)	0.5	0.2
Defoamer, Foamaster 111	5.	2.3
Dispersant, Colloids 226/35	9.	4.1
Surfactant, Triton X-405	2.	0.9
Methyl Alcohol	30.	13.6
Preservative, Troysan 192	2.	0.9
Water, Potable (**)	18.**	8.1**
TOTALS	1276.5	579.0

Additional Criteria for Pavement Paint

Item	Requirements
Grind	4 minimum, 8 maximum (TxDoT Test Method Tex-806-B)
Gallon	± 0.10 lbs. of theoretical gallon weight
(Liter mass:)	(± 0.012 kilograms of theoretical liter mass)
Consistency:	80 to 90 K.U.
PH:	a minimum of 9.6
Skinning:	No skinning within 48 hours (TxDoT Test Method Tex-811-

(*) The Hydroxy Ethyl Cellulose amount may be varied up to two (2) pounds [0.9 kilograms]

(**) Only 10 pounds (4.5 kilograms) shall be used in the actual manufacture of the pavement paint. The remaining 8 pounds (3.6 kilograms) shall be used as a drum float.

(***) Titanium Dioxide, Rutile, Special, Hilox will be allowed as a substitute in the YPT-11 formula only.

(f) Container and Marking

1) Shipment: Shipment shall be made in suitable, strong, well-sealed containers that meet this specification, State of Texas, and federal requirements and are sufficiently sturdy to withstand normal shipping and handling.

2) Drum Package Requirements. The paint shall be provided in a new, serviceable, non-leaking, 55 gallon (209 liter) lined, steel drum meeting all applicable federal regulations. Drums are to be non-returnable with full removable heads, three (3) rolling hoops and 12 gauge locking rings with 5/8 inch (15.9 millimeter) locking nut bolt. The nominal metal thickness is to be 0.044 inch (1.1 mm). Each drum is to be equipped with a natural

sponge-rubber cord, high-density gasket. The rubber shall be approximately 0.4375 inch (10.9 mm) thick. The gasket, when compressed, shall produce an airtight closure when the drum is sealed.

When a locking nut is used on drum rings, the locking nut shall be in a non-locking position while tightening the ring. After the ring is tight, the locking nut shall be secured in the locking position.

A seal shall be affixed to each drum in a manner that the contents of the drum cannot be adulterated without destroying the seal.

3) Bucket Packaging Requirements: Paint is to be furnished in new 5 gallon (19 liter) lined, 24 gauge steel, non-leaking buckets.

4) Filling Instructions: The paint drums will be filled at 54.5 gallons (206.4 liters) by weight (mass) with a water float of 0.53 gallons (2.0 liters).

The paint buckets will be filled at 4.95 gallons (18.75 liters) by weight (mass) with a water float of 0.05 gallons (0.18 liters).

5) Labeling: Finished paint product containers and cases shall be plainly and securely labeled with:
   a) City of Brownsville
   b) Name and designation of the product,
   c) Requisition number,
   d) Batch number,
   e) Manufacturing date,
   f) Gross weight, and
   g) Manufacturer's name.

Labeling shall be prominently displayed on the sides of containers and cases and must be moisture resistant to withstand outdoor storage for a minimum of one year. When the finished product is palletized for shipment, the labels shall be displayed on the outside fore easy identification. Once the finished product has been labeled properly, the label shall not be modified or changed in any manner without specific approval from the OWNER. (Note: The material manufacturer shall supply a Materials Safety Data Sheet to comply with OSHA's "Hazard Communication Standard 29 CFR □ 1910.1200").

860S.4 Construction Methods

The Contractor shall use a crew, that is experienced in the work of installing pavement markings and in the necessary traffic control for such operations on the roadway surface, and shall supply all the equipment, personnel, traffic control and materials necessary for the placement of the pavement markings as indicated on the Drawings or directed by the Engineer or designated representative. All work shall conform to the current edition of the Texas Manual of Uniform Traffic Control Devices (TMUTCD), and this standard specification item.

The pavement surface to receive the pavement markings shall be thoroughly cleaned of all dirt, organic growth or other material that will prevent adhesion of the paint to the roadway surface.

The pavement markings shall be placed in the proper alignment with guides established on the roadway. Deviation from the alignment established shall not exceed 2 inches (50 millimeters) and in addition, the deviation in alignment of the markings being placed shall not exceed 1 inch per 200 feet (25 millimeters per 30 meters) of roadway nor shall any deviation be abrupt.

When deemed necessary by the Engineer or designated representative, the Contractor, at the Contractor's expense, shall place any additional pilot markings required to facilitate the placement of the permanent markings in the alignment specified. Any and all additional markings placed on the roadway for alignment purposes shall be temporary in nature and shall not establish a permanent marking on the roadway.

Materials used for pilot markings and equipment used to place such markings shall be approved by the Engineer or designated representative.

Paint markings on the roadway that are not in alignment or sequence as indicated shall be totally and completely removed by any effective method approved by the Engineer or designated representative, except that grinding will not be permitted.

Paint shall be applied at a rate of not less than 15 gallons nor more than 20 gallons per mile of solid 4 inch stripe (not less than 35 liters nor more than 45 liters per kilometer of solid 100-mm stripe). Application rate for solid 8-inch (200-mm) stripe shall be between 30 and 40 gallons per mile (between 70 and 90 liters per kilometer). (These rates yield wet film thickness from 15 to 20 mils □ 0.4 to 0.5 mm□.)

Beads shall be applied to the paint markings at a uniform rate sufficient to achieve the retroreflective characteristics specified when observed conforming to TxDoT Test Method Tex-828-B. All markings placed shall have uniform and distinctive retroreflective characteristics.

Applied markings shall be protected from traffic until they have dried sufficiently so as not to be damaged or tracked by normal traffic movements.

860S.5 Equipment

Paint striping equipment used to place 4 inch (100 mm) solid or broken lines shall have the capability of placing a minimum of 60,000 linear feet (18 300 lineal meters) of marking per working day. Equipment used for placing markings in widths other than 4 inches (100 mm) shall have capabilities similar to 4 inch (100 mm) marking equipment and shall be capable of placing linear markings up to 8 inches (200 mm) in width in 1 pass.

The equipment shall be maintained in satisfactory operating condition. The equipment shall be equipped so that one 4-inch (100-mm) broken line and either 1 or 2 solid lines can be placed at the same time in alignment and spacing as indicated on the drawings. Four inch (100 mm) marking equipment will be considered as unsatisfactorily maintained if it fails to attain an average hourly placement rate of 7000 linear feet (2 100 linear meters) in any 5 consecutive working days of 7 hours or more.

The equipment shall be equipped with an automatic cutoff device (with manual operating capabilities) to provide clean, square marking ends and to provide a method of applying broken line in a stripe to gap ratio of 15 to 25. The length of the stripe shall not be less than 15 feet nor longer than 15.5 feet (less than 4.5 meters nor longer than 4.7 meters). The total

length of the stripe-gap cycle shall not be less than 39.5 feet nor longer than 40.5 feet (less than 12 meters nor longer than 12.3 meters) in variance from one cycle to the next nor shall the average total length of a cycle for a road mile (1.6 kilometer) of broken line exceed 40.5 feet or be less than 39.5 feet (exceed 12.3 meters or be less than 12 meters).

The equipment shall be capable of placing lines of all widths with clean edges and of uniform cross section. Four-inch (100-mm) lines shall be 4 inches (100 mm) plus or minus 1/8 inch (3 mm). Eight inch (200 mm) lines shall be 8 inches (200 mm) minimum and 8 1/4 inches (210 mm) maximum in width.

The equipment shall be equipped with an outrigger or outriggers as required to place edge-lines as called for in the plans.

The equipment shall be equipped with traffic glass bead dispensers, 1 for each paint spray gun, placed on the equipment so that beads are applied to the paint almost instantly as the marking is being placed on the roadway surface. The traffic glass bead dispensers shall be designed and aligned so that the beads are applied uniformly to the entire surface of the marking. The traffic glass bead dispensers shall be equipped with automatic cutoff controls, synchronized with the cutoff of the marking equipment. Paint pots or tanks shall be equipped with an agitator that will keep the paint thoroughly mixed and may be either a pressurized or non-pressurized type.

860S.6 Measurement

Work for Pavement Marking Paint lines will be measured by the lineal foot (lineal meter: 1 meter equals 3.28 feet) of the various widths. Work for pavement marking, paint letter or figures will be measured by the square foot (square meter: 1 square meter equals 10.76 square feet).

860S.7 Payment

The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used. When specified as a separate pay item in the contract bid form, this work shall be measured as specified above and paid for at the contract unit bid price for this work. The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

END OF SECTION

SECTION 02 00 61

SPRINKLING FOR DUST CONTROL

SUBSECTION 220S

220S.1 Description

This item shall govern the authorized application of water for dust control on specified streets, detours, haul routes or construction sites, as shown on the Drawings or directed by the Engineer or designated representative, for the purpose of maintaining these areas relatively free of dust.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text, inch-pound units are given preference with SI units shown within parentheses.

220S.2 Submittals

The submittal requirements of this specification item include

A. The manufacturer, model and description of the proposed dust control equipment,

B. The sprinkling plan including application rate, pattern of sprinkling and scheduled times of application.

220S.3 Materials

Water shall be furnished by the Contractor and shall be clean and free from industrial wastes and other objectionable matter.

220S.4 Construction Methods

Dust control shall only be conducted when directed by the Engineer or designated representative. The Contractor shall furnish and operate an approved sprinkler, equipped with positive and rapidly working cut-off valves and approved spray bars to insure the distribution of water in a uniform and controllable rate of application over the entire width sprinkled. The Contractor shall apply the water in the quantity specified on the Drawings or as directed by the Engineer or designated representative.

It shall be the Contractor's continuous responsibility at all times, including nights, holidays and weekends until acceptance of the project by the City, to

maintain the specified areas relatively free of dust in a manner that will cause the least inconvenience to the public.

220S.5 Measurement

Sprinkling for dust control will be included in the unit price bid for other items of the contract unless included as a separate pay item in the contract. When included for payment in the contract as a separate contract pay item, it will be measured in units of 1,000 gallons (3.785 kiloliters) actually placed as authorized by the Engineer or designated representative.

220S.6 Payment

The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used. When specified as a separate pay item in the contract bid form, this work shall be measured as specified above and paid for at the contract unit bid price for this work. The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

END OF SECTION

SECTION 02 00 80

FLEXIBLE BASE COURSE FOR TEMPORARY DRIVEWAYS

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Foundation course of crushed concrete or stone.

1.2 MEASUREMENT AND PAYMENT

A. UNIT PRICES

1. Measurement for flexible base course payment is on each driveway basis. To maintain access or temporary driveway, separate measurement will be made for each different type of driveway (residential, commercial, or custom properties) or as identified on the construction drawings.

2. Payment limits for temporary driveways are based upon the width of the driveway access (not to exceed 12-feet for residential, 24-feet for commercial, or custom dimensioned properties) and the length from permanent or temporary roadway to the remaining permanent driveway or street right-of-way, as necessary to maintain access to properties.

3. No separate payment will be made for flexible base course for temporary roads, detour pavements, and shoulder under this Section unless it is included as an extra unit bid and as approved for payment by the project manager. Flexible base course for temporary driveways or access if included under the extra unit bid item is on a cubic yard basis.

4. Temporary driveways will be paid only once per driveway location shown to be replaced on the drawing and payment shall be made based upon actual installation.

5. Refer to Payment Procedures for unit price procedures.

1.3 REFERENCES

A. ASTM D 1556 - Density of Soil in Place by the Sand-Cone Method.

B. ASTM D 698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12.44 ft-lbf/ft3).

C. ASTM D 2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

D. ASTM D 361 - Test Method for Water Content of Soils and Rock in Place by Nuclear Methods (shallow depth).

E. ASTM D 3017 - Test Method for Water Content of Soils and Rock in Place by Nuclear Methods.

F. ASTM D 4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

G. TxDOT Tex-101-E - Preparation of Soil and Flexible Base Materials for Testing.

H. TxDOT Tex-110-E - Determination of Particle Size Analysis of Soils.

1.4 SUBMITTALS

A. Submittals shall conform to requirements of Section 01330 - Submittals Procedures.

B. Submit samples of flexible base course and soil binder for testing.

1.5 TESTS

A. Tests and analysis of soil materials will be performed in accordance with ASTM C 131, ASTM D 698, ASTM D 4318, Tex-101-E, and Tex-110-E under provisions of Section 01454 - Testing Laboratory Services.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Provide materials from stockpiles that are protected during storage from contaminates that would be detrimental to the flexible base course.

B. Load materials from same area of stockpile to maintain uniformity of each successive delivery to the project site.

PART 2 P R O D U C T S

2.1 MATERIALS

A. Crushed Stone or Concrete: Material retained on the No. 40 sieve meeting the following requirements:

1. Durable particles of crusher-run broken limestone, crushed concrete, crushed sandstone, or granite obtained from an approved source.

B. Soil Binder: Material passing the No. 40 sieve meeting the following requirements when tested in accordance with ASTM D 4318:

1. Maximum Liquid Limit: 40

2. Maximum Plasticity Index: 12

3. Maximum Lineal Shrinkage: 7 (when calculated from volumetric shrinkage at liquid limit).

C. Mixed Materials shall meet the following requirements:

1. Minimum compressive strength of 35 psi at 0 psi lateral pressure and 175 psi at 15 psi lateral pressure using triaxial testing procedures.

2. Grading in accordance with Tex-101-E and Tex-110-E within the following limits:

Sieve	Percent Retained
1-3/4 inch	0 to 10
No. 4	45 to 75
No. 40	60 to 85

PART 3 E X E C U T I O N

3.1 EXAMINATION

A. Verify compacted subgrade is ready to support imposed loads.

B. Verify lines and grades are correct.

3.2 PREPARATION

A. Complete backfill of new utilities below future grade.

B. Prepare subgrade in accordance with requirements of Section 02315 - Roadway Excavation or Sections 02336 - Lime Stabilized Subgrade and 02337 - Lime/Fly-ash Stabilized Subgrade.

C. Correct subgrade deviations in excess of plus or minus 1/2 inch in cross section, or in 16 foot length by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

D. Prepare sufficient subgrade in advance of base course operations.

3.3 PLACEMENT

A. Spread and shape in lifts to compacted thickness not to exceed 6 inches in depth. Complete spreading, shaping, and compacting on same day material is deposited.

B. Place base so that projecting reinforcing steel from curbs remain at approximate center of base. Secure a firm bond between reinforcement and base.

C. Start rolling operations as soon as possible after placement. Use sheepfoot, steel, or pneumatic rollers as approved. Roll longitudinally with subgrade starting from sides. Overlap successive strips by one-half width of each rear wheel.

D. Maintain moisture between optimum and 3 percent above optimum moisture.

E. Compact to 95 percent of Proctor density in accordance with ASTM D 698, unless otherwise indicated on the Drawings.

F. Finish to grade and compact lift before placing successive lift.

G. Maintain shape by grading throughout operation.

H. Provide total thickness indicated on Drawings.

3.4 TOLERANCES

A. Completed surface shall be smooth and conform to typical section and established lines and grades.

3.5 FIELD QUALITY CONTROL

A. Testing will be performed under provisions of Section 01454 - Testing Laboratory Services.

B. Compaction Testing will be performed in accordance with ASTM D 698 or ASTM D 2922 and ASTM 3017 at a random location near each depth determination core. Rework and recompact areas that do not conform to compaction requirements.

3.6 PROTECTION

A. Sprinkle to prevent excessive loss of moisture.

B. Restrict construction traffic on finished base to equipment required to complete the work.

END OF SECTION

SECTION 02 00 94

REMOVING EXISTING PAVEMENTS AND STRUCTURES

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Removing concrete paving, asphaltic concrete pavement, brick pavement and base courses.

B. Removing concrete curbs, concrete curbs and gutters, sidewalks and driveways.

C. Removing pipe culverts, sewers, and sewer leads.

D. Removing waterlines and water services lines including asbestos cement pipe per OSHA guidelines.

E. Removing existing inlets and manholes.

F. Removing and disposing of pre-stressed concrete beams and drill shafts.

G. Removing miscellaneous structures of concrete or masonry.

H. Removing existing bridge.

I. Removing existing wood and demolition debris.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used. When specified as a separate pay item in the contract bid form, this work shall be measured as specified below and paid for at the contract unit bid price for this work. The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

1. Payment for removing and disposing of asphaltic surfacing with or without base, regardless of thickness encountered, is on square yard basis measured between lips of gutters.

2. Payment for removing and disposing of reinforced concrete pavement, with or without asphalt overlay, regardless of its thickness, is on square yard basis measured from back- to-back of curbs. Payment includes concrete pavement, esplanade curbs, curbs and gutters, and paving headers.

3. Payment for removing and disposing of cement stabilized shell base course, with or without asphaltic surfacing, is on square yard basis.

4. Payment for removing and disposing of concrete sidewalks and driveways is on square yard basis.

5. Payment for removing asphaltic pavement surface by milling shall be in accordance with the Technical Specifications when applicable.

6. Payment for removing and disposing of miscellaneous concrete and masonry is on cubic yard basis of structure in place.

7. Payment for removing and disposing of pipe culverts, sewers, and sewer leads, is on linear foot basis for each diameter and each material type of pipe removed.

8. Payment for removing and disposing of waterlines and water service lines including asbestos cement pipe is on linear foot basis for each diameter pipe and each material type of pipe removed.

9. Payment for removing and disposing of existing inlets is on unit price basis for each inlet removed.

10. Payment for removing and disposing of prestressed concrete piles and drill shafts is on linear foot basis.

11. Payment for removing and disposing of existing bridge, including piles and abutments to minimum of 4 feet below ground level, is on a lump sum basis.

12. Payment for removing and disposing of existing manholes is on unit price basis for each manhole removed.

13. Payment for removing and disposing of miscellaneous wood and demolition debris is on cubic yard basis.

14. No payment for saw cutting of pavement, curbs, or curbs and gutters will be made under this section. Include cost of such work in unit prices for items listed in bid form requiring saw cutting.

15. No payment will be made for work outside maximum payment limits indicated on Drawings, or for pavements or structures removed for Contractor's convenience.

a. For utility installations: Match actual pavement replaced but no greater than maximum pavement replacement limits shown on Drawings. Limits of measurement will be as shown on Street Cut Pavement Replacement Rules.

16. Refer to Measurement and Payment for unit price procedures

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable codes for disposal of debris.

B. Coordinate removal work with utility companies.

C. For removal of asbestos containing materials, or material that could potentially contain asbestos, comply with applicable provisions of OSHA 29 CFR 1926.1101 – Asbestos, OSHA 29 CFR 1926.32 – General Safety and Health Provisions, and EPA 40 CFR 61 Subpart M – National Emission Standard for Asbestos.

PART 2 P R O D U C T S - Not Used

PART 3 E X E C U T I O N

3.1 PREPARATION

A. Obtain advance approval from Project Manager for dimensions and limits of removal work.

B. Identify known utilities below grade. Stake and flag locations.

C. For removal of asbestos-containing materials, or materials that could potentially contain asbestos, comply with the following:

1. Crew members must be trained in accordance with OSHA 29 CFR 1926.1101 – Asbestos.

2. Conduct negative exposure assessment to demonstrate asbestos exposure below permissible exposure limit (PEL) in accordance with OSHA 29 CFR 1926.1101 – Asbestos and EPA 40 CFR 763 – Asbestos.

3. If negative exposure assessment not conducted, or if results are above PEL, provide respiratory protection in accordance with Paragraph 3.02 of this Section.

3.2 PROTECTION

A. Protect following from damage or displacement:

1. Adjacent public and private property.

2. Trees, plants, and other landscape features designated to remain.

3. Utilities designated to remain.

4. Pavement and utility structures designated to remain.

4. Bench marks, monuments, and existing structures designated to remain.

B. When required, provide respiratory protection in accordance with OSHA 29 CFR 1910.134 – Respiratory Protection, and National Institute of Occupational Safety and Health (NIOSH).

3.3 REMOVALS

A. Remove pavements and structures by methods that will not damage underground utilities. Do not use drop hammer near existing underground utilities.

B. Minimize amount of earth loaded during removal operations.

C. Where existing pavement is to remain, make straight saw cuts in existing pavement to provide clean breaks prior to removal. Do not break concrete pavement or base with drop hammer unless concrete or base has been saw cut to minimum depth of 2 inches.

D. When street and driveway saw cut location is greater than one-half of pavement lane width, remove pavement for full lane width or to nearest longitudinal joint as directed by Project Manager.

E. Remove sidewalks and curbs to nearest existing dummy, expansion, or construction joint.

F. Where existing end of pipe culvert or end of sewer is to remain, install 8-inch-thick masonry plug in pipe end prior to backfill in accordance with requirements of Section 02316 - Excavation and Backfill for Structures.

G. Labeling of Asbestos Cement (AC) Pipe:

1. Label leak-tight container with warning statement of hazardous asbestos content in accordance with OSHA 29 CFR 1926.1101 and as noted below.

2. Label waste material with following warning:

DANGER CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER CAUSES DAMAGE TO LUNGS DO NOT BREATHE DUST AVOID CREATING DUST

3. Neatly print labels in letters of sufficient size and contrast so label is easily visible and legible.

3.4 BACKFILL

A. Backfill of removal areas shall be in accordance with requirements of Section 02316 - Excavation and Backfill for Structures.

3.5 DISPOSAL

A. Inlet frames, grates, and plates; and manhole frames and covers, may remain City property. Disposal shall be in accordance with requirements of Section 01576 - Waste Material Disposal.

B. Remove from site, debris resulting from work under this section in accordance with requirements of the Technical Specifications, Waste Material Disposal.

C. For asbestos-containing materials:

1. Comply with 40 CFR Part 61 and 30 TAC Sections 330.137(b) for Industrial Class 1 waste.

2. Inspect load to ensure correct packaging and labeling.

3. Line vehicles with two layers of 6-mil polyethylene sheeting.

4. Remove asbestos-containing waste from site daily.

END OF SECTION

SECTION 02 00 95

PAVEMENT REPAIR AND RESTORATION

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Repairing and replacing streets, highways, and other pavements as required per street cut ordinance that have been cut, broken, or damaged due to utility excavation.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for pavement repair and replacement for utility projects is on a square yard basis and includes surface and base materials as required.

2. Measurement for utility projects: Match actual pavement replaced but no greater than maximum pavement replacement limits in accordance with the drawings.

3. The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used. When specified as a separate pay item in the contract bid form, this work shall be measured as specified above and paid for at the contract unit bid price for this work. The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

3. Refer to Measurement and Payment for other unit price procedures.

PART 2 P R O D U C T S

2.1 MATERIALS

A. Subgrade:

1. Provide backfill material as required by applicable excavation and fill sections.

2. Provide material for stabilization as required by applicable portions of the Technical Specifications referring to subgrade stabilization.

B. Base: Provide base material as required by applicable portions of the Technical Specifications referring to base course.

C. Pavement: Provide paving materials as required by applicable portions of the Technical Specifications referring to pavement.

PART 3 E X E C U T I O N

3.1 PREPARATION

A. Notify City prior to commencement of excavation in pavement for which an Excavation in Public Way permits has been obtained. Follow directions contained in the permit.

B. Conform to requirement of Removing Existing Pavements and Structures, for removals.

C. Saw cut pavement 18 inches wider than width of trench needed to install utilities unless otherwise indicated on Drawings.

D. When removing pavement to existing deformed metal strip (i.e. dummy joint), saw cut pavement minimum 2 inches deep on opposite side of deformed metal strip. Place saw joint far enough behind deformed metal strip to obtain continuously straight joint. Remove damaged portion of deformed metal strip as required to provide proper joint. Saw cut and remove metal strip before placement of new concrete pavement.

E. Protect edges of existing pavement to remain from damage during removals, utility placement, backfill, and paving operations. For concrete pavement, protect undisturbed subgrade that is to remain to support replacement slab.

F. Dowel in existing pavement where no reinforcement is found or is broken due to construction activities. Unless otherwise directed by Project Manager, provide No. 6 bars 24 inches long, drilled and embedded 8 inches into center of existing slab with 'PO-ROC' epoxy grout or approved equal. Space dowels to match new pavement reinforcement spacing.

G. Provide transitional paving and earthwork as required to tie proposed pavement to existing pavement when unable to dowel new pavement into existing pavement.

3.2 INSTALLATION

A. Parking Areas, Service Drives, Driveways, and Sidewalks: Replace with material equal to or better than existing or as indicated on Drawings. Conform to applicable requirements of sections referenced in Paragraph 2.01, Materials.

B. Street Pavements and Curbs, Curbs and Gutters: Replace subgrade, base, and surface course with like materials or as indicated on Drawings and Standard Details. Curbs and curbs and gutters shall match existing. Conform to requirements of sections referenced in Paragraph 2.01, Materials.

C. For concrete pavement, install size and length of reinforcing steel and pavement thickness indicated on Drawings and Standard Details. Place types and spacing of joints to match existing or as indicated on Drawings.

D. Where existing pavement consists of concrete pavement with asphaltic surfacing, resurface with minimum 2 inch depth asphaltic pavement.

E. Repair state highway and county crossings in accordance with TxDOT permit or county requirements as appropriate and within 1 week after utility work is installed.

3.3 WASTE MATERIAL DISPOSAL

A. Dispose of waste material in accordance with requirements of Waste Material Disposal.

3.4 PROTECTION

A. Maintain pavement in good condition until completion of Work.

B. Replace pavement damaged by Contractor's operations at no cost to OWNER.

END OF SECTION

SECTION 02 01 01

POLYVINYL CHLORIDE PIPE

POLYVINYL CHLORIDE PIPE

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Polyvinyl chloride pressure pipe for water distribution, in nominal diameters 4 inches through 20 inches.

B. Polyvinyl chloride sewer pipe for gravity sewers in nominal diameters 4 inches through 60 inches.

C. Polyvinyl chloride pressure pipe for gravity sewers and force mains in nominal diameters 4 inches through 20 inches.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No separate payment will be made for PVC pipe under this Section. Include cost in unit price for work included as specified in the following sections:

a. Water Lines

b. Gravity Sanitary Sewers

A. Sanitary Sewer Force Mains

B. Storm Sewers

2. Refer to Measurement and Payment for unit price procedures.

1.3 REFERENCES

A. ANSI A 21.16 (AWWA C 116) - Protective Fusion Bonded Epoxy Coating for the Interior and Exterior Surfaces of Ductile Iron and Grey Iron Fittings for Water Supply Service.

B. ASTM D 1248 - Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.

C. ASTM D 1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

D. ASTM D 2122 – Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.

E. ASTM D 2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

F. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

G. ASTM 2412 – Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel Plate Loading

H. ASTM D 2444 - Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight).

I. ASTM D 2680 - Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

J. ASTM D 3034 - Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

K. ASTM D 3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

L. ASTM D 3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

M. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

N. ASTM F 679 - Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

O. ASTM F 794 - Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

P. ASTM F 949 - Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with Smooth Interior and Fittings.

Q. AWWA C 110 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 Inches Through 48 Inches for Water.

R. AWWA C 111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

S. AWWA C 900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 60 Inches for Water Transmission and Distribution.

T. AWWA C 909 - Standard for Molecularly-Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 Inches through 12 Inches (100mm through 300 mm), for Water Distribution.

U. AWWA M23 – PVC Pipe – Design and Installation

V. PPI TR3 - Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials.

W. UNI-B-13 - Recommended Standard Performance Specification for Joint Restraint Devices for Use with Polyvinyl Chloride Pipe.

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 - Submittal Procedures.

B. Submit shop drawings showing design of new pipe and fittings indicating alignment and grade, laying dimensions, fabrication, fittings, flanges, and special details.

C. Contractor to review and submit PVC pipe manufacturers recommended installation procedures.

D. Calculations and limits of thrust restraint shall be based on AWWA M23, latest edition.

1.5 QUALITY CONTROL

A. Submit manufacturer's certifications that PVC pipe and fittings meet requirements of this Section and AWWA C 900, AWWA C 909 and AWWA C 905 for pressure pipe applications, or appropriate ASTM standard specified for gravity sewer pipe.

B. Submit manufacturer's certification that PVC pressure pipe for water lines and force mains has been hydrostatically tested at factory in accordance with AWWA C 900, AWWA C 909, and this Section.

C. When foreign manufactured material is proposed for use, have material tested for conformance to applicable ASTM requirements by certified independent testing laboratory

located in United States. Certification from other source is not acceptable. Furnish copies of test reports to Project Manager for review. Cost of testing paid by Contractor.

PART 2 P R O D U C T S

2.1 MATERIAL

A. Use PVC compounds in manufacture of pipe that contain no ingredient in amount that has been demonstrated to migrate into water in quantities considered to be toxic.

B. Furnish PVC pressure pipe manufactured from Class 12454 virgin PVC compounds as defined in ASTM D 1784. Use compounds qualifying for rating of 4000 psi for water at 73.4 F per requirements of PPI TR3. Provide pipe which is homogeneous throughout, free of voids, cracks, inclusions, and other defects, uniform as commercially practical in color, density, and other physical properties. Deliver pipe with surfaces free from nicks and scratches with joining surfaces of spigots and joints free from gouges and imperfections which could cause leakage.

C. PVC Restrained Pipe: Must be listed on City's current Product Approval List.

1. Pipe Material:

a. DR 18: For restrained joints where shown on Drawings.

b. DR 14: For alternate to offset pipe sections shown on Drawings. Do not use PVC for offset sections with depth of cover greater than 20 feet or less than 4 feet. Do not use PVC in potentially petroleum contaminated areas.

D. Water Service.

1. Provide self-extinguishing PVC pipe that bears Underwriters' Laboratories mark of approval and is acceptable without penalty to Texas State Fire Insurance Committee for use in fire protection lines.

2. Bear National Sanitation Foundation Seal of Approval (NSF-PW).

E. Gaskets:

1. Gasket materials shall meet requirements of ASTM F 477. Use elastomeric factory- installed gaskets to make joints flexible and watertight.

2. Flat Face Mating Flange: Full faces 1/8-inch-thick ethylene propylene (EPR) rubber.

3. Raised Face Mating Flange: Flat ring 1/8-inch ethylene propylene (EDR) rubber, with filler gasket between OD of raised face and flange OD to protect flange from bolting moment.

F. Lubricant for rubber-gasketed joints: Water soluble, non-toxic, non-objectionable in taste and odor imparted to fluid, non-supporting of bacteria growth, having no deteriorating effect on PVC or rubber gaskets.

G. Do not use PVC in potentially or known contaminated areas.

H. Do not use PVC in areas exposed to direct sunlight.

2.2 WATER SERVICE PIPE

A. Pipe 4 inch through 60 inch: AWWA C 900, AWWA C 909, Class 150, DR 18; AWWA C 900, Class 200, DR 14 as alternate to offset pipe sections; nominal 20-foot lengths; cast-iron equivalent outside diameters.

B. Provide Polyvinyl Chloride Pipe from approved manufacturers.

C. Make curves and bends by offsetting (i.e., deflecting joints). Do not exceed maximum offset recommended by pipe manufacturer or the City, whichever is less.

D. Hydrostatic Test: AWWA C 900, AWWA C 909, ANSI A 21.10 (AWWA C 110); at point of manufacture; submit manufacturer's written certification.

2.3 GRAVITY SEWER PIPE

A. PVC gravity sanitary sewer pipe shall be in accordance with provisions in following table:

WALL CONSTRUCTION	**STANDARD REQUIREMENT**	**SDR (MAX.) / STIFFNESS (MIN.)**	**DIAMETER SIZE RANGE**
Solid	ASTM D3034	SDR 26 / PS 115	6" to 10"
	ASTM D3034	SDR 35 / PS 46	12" & 15"
	ASTM F679	SDR 35 / PS 46	18" to 60"
	AWWA C900	DR 18 / N/A	4" to 60"
	AWWA C909	DR 18 / N/A	4" to 12"

B. PVC storm sewer pipe shall be in accordance with provisions in following table:

WALL CONSTRUCTION	STANDARD REQUIREMENT	SDR (MAX.) / STIFFNESS (MIN.)	DIAMETER SIZE RANGE
Solid	D3034	SDR 26 / PS 115	6" to 10"
	D3034	SDR 35 / PS 46	12" & 15"
	F679	SDR 35 / PS 46	18" to 27"
	AWWA C900	DR 18 / N/A	4" to 60"
	AWWA C909	DR 18 / N/A	4" to 12"
Truss (Gasketed)	D2680	N/A /200 psi	8" to 15"
Profile	F949 F949	N/A / 46 psi N/A / 115 psi	12" to 36" 8" to 10"
	F794 F794	N/A / 46 psi N/A / 46 psi	8" to 30" 24" to 36"

C. When solid wall PVC pipe 18 inches to 27 inches in diameter is required in SDR 26, provide pipe conforming to ASTM F 679, except provide wall thickness as required for SDR 26 and pipe stiffness of 115 psi.

D. For sewers up to 12-inch diameter crossing over water lines, or crossing under water lines with less than 2-feet separation, provide minimum 150 psi pressure-rated pipe conforming to ASTM D 2241 with suitable PVC adapter couplings.

E. Joints: Spigot and integral wall section bell with solid cross section elastomeric or rubber ring gasket conforming to requirements of ASTM D 3212 and ASTM F 477, or ASTM

D 3139 and ASTM F 477. Gaskets shall be factory-assembled and securely bonded or otherwise held in place to prevent displacement. Manufacturer shall test sample from each batch conforming to requirements ASTM D 2444.

F. Fittings: Provide PVC gravity sewer sanitary bends, tee, or wye fittings for new sanitary sewer construction. PVC pipe fittings shall be full-bodied, either injection molded or factory fabricated. Saddle-type tee or wye fittings are not acceptable.

1. Fittings for straight through and transition connections conform to requirements of Section 02534- Sanitary Sewer Service Stubs or Reconnections.

G. Conditioning. Conditioning of samples prior to and during tests is subject to approval by Project Manager. When referee tests are required, condition specimens in accordance with Procedure A in ASTM D 618 at 73.4 degrees F plus or minus 3.6 degrees F and 50 percent relative humidity plus or minus 5 percent relative humidity for not less than 40 hours prior to test. Conduct tests under same conditions of temperature and humidity unless otherwise specified. This is a brief summary of the test method, and the full current edition of the standard must be followed.

H. Pipe Stiffness. Determine pipe stiffness at 5 percent deflection in accordance with Test Method D 2412. Minimum pipe stiffness shall be 46 psi. For diameters 4 inches through 18 inches, test three specimens, each a minimum of 6 inches (152 mm) in length. For diameters 21 inch through 36 inch, test three specimens, each a minimum of 12 inch (305 mm) in length.

This is a brief summary of the test method, and the full current edition of the standard must be followed.

I. Flattening. Flatten three specimens of pipe, prepared in accordance with Paragraph 2.03F, in suitable press until internal diameter has been reduced to 60 percent of original inside diameter of pipe. Rate of loading shall be uniform. Test specimens, when examined under normal light and with unaided eye, shall show no evidence of splitting, cracking, breaking, or separation of pipe walls or bracing profiles. Perform the flattening test in conjunction with pipe stiffness test. This is a brief summary of the test method, and the full current edition of the standard must be followed.

J. Joint Tightness. Test for joint tightness in accordance with ASTM D 3212, except that joint shall remain watertight at minimum deflection of 5 percent. Manufacturer will be required to provide independent third party certification for joint testing each diameter of storm sewer pipe. This is a brief summary of the test method, and the full current edition of the standard must be followed

K. Purpose of Tests. Flattening and pipe stiffness tests are intended to be routine quality control tests. Joint tightness test is intended to qualify pipe to specified level of performance.

L. Saddle for pipe with 0.5 inch width and greater: Connect side sewer by drilling proper size round hole in wall of the main sewer pipe, inserting an approved pipe compression saddle. The Saddle shall meet requirements of ASTM C-923. Saddles will accept 4", 6", and 8" pipe. The lateral pipe shall be held in place by one stainless steel compression band with stainless steel nut and bolt (any AISI Series 300) type tightening device and meeting requirements of ASTM A240. A stainless steel shear band shall wrap around the pipe a minimum of 380 degrees. Saddle may not protrude into mainline pipe.

2.4 SANITARY SEWER FORCE MAIN PIPE

A. Provide green color-coded approved PVC pressure pipe conforming to requirements for water service pipe.

B. Acceptable pipe joints are integral bell-and-spigot, containing a bonded-in elastomeric sealing ring meeting requirements of ASTM F 477. In designated areas requiring restrained joint pipe and fittings, use approved joint restraint device conforming to UNI-B-13, for PVC pipe 12-inch diameter and less.

C. Fittings: Provide approved ductile iron fittings as per Section 02501 - Ductile Iron Pipe and Fittings, Paragraph 2.04, except furnish fittings with one of following approved internal linings:

1. Nominal 40 mils (35 mils minimum) virgin polyethylene complying with ASTM D 1248, heat fused to interior surface of fitting

2. Nominal 40 mils (35 mils minimum) polyurethane

3. Nominal 40 mils (35 mils minimum) ceramic epoxy

4. Nominal 40 mils (35 mils minimum) fusion bonded epoxy

D. Exterior Protection: Provide polyethylene wrapping of ductile-iron fittings as required by Section 02528 - Polyethylene Wrap.

E. Hydrostatic Tests: Hydrostatically test pressure rated pipe in accordance with Paragraph 2.02E.

2.5 BENDS AND FITTINGS FOR PVC PRESSURE PIPE

A. Bends and Fittings: ANSI A 21.10 or ANSI A 21.53, ductile iron; ANSI A 21.11 single rubber gasket push-on type joint; minimum 150 psi pressure rating. Approved restrained joints, 250 200 psi, may be provided for up to 12 inches in diameter (water or sanitary).

B. Provide approved restrained joint fittings: Integral restrained joint fittings and pipe do not require secondary restraint.

PART 3 E X E C U T I O N

3.1 PROTECTION

A. Store pipe under cover out of direct sunlight and protect from excessive heat or harmful chemicals in accordance with manufacturer’s recommendations.

3.2 INSTALLATION

A. Conform to requirements of Section 02511 - Water Lines, Section 02531 - Gravity Sanitary Sewers, and Section 02532 - Sanitary Sewer Force Mains, as applicable.

B. Install PVC pipe in accordance with Section 02317 - Excavation and Backfill for Utilities, ASTM D 2321 for Sewer Pipe, and manufacturer's recommendations.

C. Install PVC water service pipe to clear utility lines with minimum 6-inch separation, unless otherwise shown on Drawings:

D. Avoid imposing strains that will overstress or buckle pipe when lowering pipe into trench.

E. Hand shovel pipe bedding under pipe haunches and along sides of pipe barrel and compact to eliminate voids and ensure side support. Ensure barrel is fully supported along entire length of pipe, prior to backfilling.

F. For PVC pipe installed by trenchless methods, provide integral restrained joints and pull pipe through hole or casing. For PVC pipe pushed through hole or casing, provide approved bell insertion protection system.

G. Store PVC pipe under cover out of direct sunlight. Protect pipe from excessive heat or harmful chemicals. Prevent damage by crushing or piercing.

H. Allow PVC pipe to cool to ground temperature before backfilling when assembled out of trench to prevent pullout due to thermal contraction.

I. Pipe Assembly Procedures

1. Do not remove gasket from pipe.

2. Lay pipe by inserting spigot end into bell flush with the insertion line or as recommended by pipe manufacturer.

3. Do not assemble joint by swinging or stabbing.

4. Do not assemble joint using machinery or equipment such as backhoe bucket.

5. At no time shall spigot go past insertion line or homing mark. Continuously observe and check each homing mark for proper length, and install pipe with home mark visible.

3.3 PVC RESTRAINED MECHANISM

A. For low-profile coupling with spline-type joints:

1. Do not apply lubricant to spline or pipe or coupling spline grooves.

2. Do not use excessive force while inserting the spline through coupling.

3. Insert spline until it is fully seated around circumference of pipe.

B. Field Cutting of Pipe Ends:

1. Perform by workers certified by manufacturer.

2. Use a PVC pipe cutter and provide square ends.

3. Follow manufacturer’s recommendation to disassemble restrained joint after it has been locked in place.

4. For low-profile coupling with spline-type joints, use manufacturer approved power routing and grooving tool to field fabricate required pipe groove.

END OF SECTION

SECTION 02 01 10

WATER LINES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Installation of water lines.

B. Specifications identify requirements for both small diameter water lines and large diameter water lines. When specifications for large diameter water lines differ from those for small diameter water lines, large diameter specifications will govern for large diameter pipe.

1.2 MEASUREMENT AND PAYMENT

A. The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used. **When specified as a separate pay item in the contract bid form, this work shall be measured as by the linear foot and paid for at the contract unit bid price for this work**. The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

1.3 REFERENCES

A. ANSI A 21.11/AWWA C111 – Standard for Rubber-Gasket Joints for Ductile - Iron Pressure Pipe and Fittings.

B. ANSI/NSF Standard 61 – Drinking Water System -Health Components.

C. ASTM A 36 – Standard Specification for Carbon Structural Steel

D. ASTM A 536 – Standard Specification for Ductile Iron Castings

E. ASTM A 126 – Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

F. ASTM B 21 – Standard Specification for Naval Brass Rod, Bar, and Shapes.

G. ASTM B 98 – Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes.

H. ASTM B 301 – Standard Specification for Free-Cutting Copper Rod and Bar.

I. ASTM B 584 – Standard Specification for Copper Alloy Sand Casting for General Application.

J. ASTM E 165 – Standard Test Method for Liquid Penetrant Examination

K. ASTM E 709 – Standard Guide for Magnetic Particle Examination

L. ASTM F 1674 – Standard Test Method for Joint Restraint Products for Use with PVC Pipe

M. AWWA C 206 – Standard for Field Welding of Steel Water Pipe.

N. AWWA C 207 – Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 Inches through 144 Inches.

O. NACE RP0274 – High-Voltage Electrical Inspection of Pipeline Coatings Prior to Installation.

P. NACE RP0188 – Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.

1.4 SUBMITTALS

A. Conform to requirements of Submittals.

B. Conform to submittal requirements of applicable Section for type of pipe used.

C. Photographs: Submit photographs conforming to requirements of Construction Photographs prior to commencement of construction.

D. Submit Lone Star notification transmittal number prior to beginning excavation.

E. Submit, a minimum of 15 days before beginning pipe laying operations, layout drawing identifying proposed sections for disinfecting, hydrostatic testing and site restoration for entire project for review and approval. Layout drawing to identify sequence of sections for:
   1. Disinfection; not to exceed 4,000 linear feet per section.
   2. Hydrostatic testing and transfer of services; to immediately follow sequence of disinfected section.
   3. Site restoration; not to exceed limits specified; sequence in order of disturbance.

F. For pipe with bell-and-spigot ends with rubber gaskets, submit complete joint details with dimensions and tolerances and performance history indicating the proposed joint has performed satisfactorily under similar conditions.

PART 2 - PRODUCTS

2.1 PIPE MATERIALS

A. Install pipe materials which conform to following:
   1. Polyvinyl Chloride Pipe.
   2. Fusible Polyvinyl Chloride Pipe.
   3. Ductile Iron Pipe and Fittings.

B. Conform to American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 61 and have certified by an organization accredited by ANSI.

C. Type of pipe materials used are CONTRACTOR’s option unless specifically identified on Drawings.

D. Provide minimum of ⅜ inch inside joint recess between ends of pipe in straight pipe sections.

E. Pipe Manufacturer: Performance history shall be minimum 5 years of successful field installations with proposed pipe diameter and proposed type of pipe joint. In absence of 5-year performance history for proposed pipe diameter, the following items shall be required for review by OWNER or its designated representative prior to approval:
   1. Quality Assurance Program. Submit certified quality assurance program addressing all aspects of pipe manufacturing process, including coating and lining applications. Certified program shall be ISO 9001; 2000 or other equivalent industry standard nationally recognized program.
   2. Hydrostatic Joint Test. Perform hydrostatic test of proposed joint at proposed pipe diameter in presence of OWNER or its designated representative. Test duration shall be minimum 8 hours at 150 psi with no leakage, with pipe cylinder deflected at joint to 3 percent of nominal diameter, with maximum allowable joint engagement deflection.
   3. Provide minimum four (4) weeks notice to OWNER or its designated representative for hydrostatic joint test. Submit test procedures to OWNER or its designated representative for approval.
   4. OWNER or its designated representative's decision as to acceptability of joint is final.

2.2 WELDED JOINT PROTECTION FITTING FOR SMALL DIAMETER STEEL PIPE

A. Cylindrical Corrosion Barrier: Provide approved cylindrical corrosion barrier.

B. O-rings: Conform to National Sanitary Foundation requirements.

2.3 RESTRAINED JOINTS

A. Ductile-Iron Pipe: See Ductile Iron Pipe and Fittings.

B. PVC Pipe: See Polyvinyl Chloride Pipe. Perform hydrostatic testing in accordance with ASTM F 1674 and Hydrostatic Tests for Pressure Mains.

C. As an alternative to pipe with an integral restrained joint system, restrained joint fittings maybe provided where required on DIP and PVC pipe meeting the following requirements:
   1. Restraint devices: Manufacture of high strength ductile iron, ASTM A 536 up to 24 inches, and ASTM A 36 for sizes greater than 30 inches. Working pressure rating twice that of design test pressure.
   2. Bolts and connecting hardware: High strength low alloy material in accordance with ANSI A21.11/AWWA C111.

D. Ductile Iron Pipe in auger holes must be provided with integral restrained joints at both the bell and the spigot.

2.4 COUPLINGS AND APPURTENANCES FOR LARGE DIAMETER WATERLINE

A. Flexible (Dresser-type) Couplings.
   1. Install where shown on Drawings or where allowed by OWNER or its designated representative for CONTRACTOR's convenience. Use galvanized flexible couplings when installed on galvanized pipe which is cement lined, or when underground. Provide gaskets manufactured from Neoprene or Buna-N.

2. For steel pipe; sleeve-type flexible couplings. Thickness of middle ring equal to or greater than thickness of pipe wall.
3. Provide approved flanged adapter couplings for steel pipe.
4. Use Type 316 stainless steel bolts, nuts, and washers where flexible couplings are installed underground. Coat entire coupling with 20-mil of bitumastic 300m as manufactured by Carboline or approved equal.

B. Flap Valves: Provide on discharge of manhole drainline as shown on Drawings.
1. Body and Flap: ASTM A 126-B cast iron.
2. Seats: ASTM B 21-CA482 or ASTM B 301-CA145 bronze.
3. Resilient Seat: Buna-N.
4. Hinge Arms: ASTM B 584-CA865 high tensile bronze.
5. Hinge pins: ASTM B 98-CA655 silicon bronze.

PART 3 - EXECUTION

3.1 PREPARATION

A. Conform to applicable installation specifications for types of pipe used.

B. Employ workmen who are skilled and experienced in laying pipe of type and joint configuration being furnished. Provide watertight pipe and pipe joints.

C. Lay pipe to lines and grades shown on Drawings.

D. Confirm that 9 feet minimum separation from gravity sanitary sewers and manholes or separation of 4 feet minimum from force mains as specified in this Section in all directions unless special design is provided on Drawings.

E. Where above clearances cannot be attained, and special design has not been provided on Drawings, obtain direction from OWNER or its designated representative before proceeding with construction.

F. Inform OWNER or its designated representative if unmetered sprinkler or fire line connections exist which are not shown on Drawings. Make transfer only after approval by OWNER or its designated representative.

G. For projects in existing subdivisions, limit water line installation to maximum of two project site locations. Maximizing two pipe installation crews shall be permitted, unless otherwise approved by OWNER or its designated representative.

H. CONTRACTOR is responsible for handling necessary installations and removal of chlorination and testing taps and risers.

I. If asbestos-cement (A.C.) pipe is encountered, follow safety practices outlined in American Water Works Association's publication, "Work Practices for A/C Pipe." Strictly adhere to "recommended practices" contained in this publication and make them "mandatory practices" for this Project.

J. For pipe diameters 36 inches and greater, clearly mark each section of pipe and fitting with unique designation on inside of pipe. Locate unique identifying mark minimum of 5 feet away from either end of each section of pipe. Provide one unique identifying mark in middle of each fitting. Place markings at consistent locations. Use permanent black paint and minimum letter height of 4 inches to mark designations.

K. Contractor is responsible for assuring chosen manufacturer fulfills requirements for extra fittings and, therefore, is responsible for costs due to downtime if requirements are not met.

L. Do not remove plugs or clamps during months of peak water demands; June, July, and August, unless otherwise approved by OWNER or its designated representative.

3.2 HANDLING, CLEANING AND INSPECTION

A. Handling:

1. Place pipe along project site where storm water or other water will not enter or pass through pipe.
2. Load, transport, unload, and otherwise handle pipe and fittings to prevent damage of any kind. Handle and transport pipe with equipment designed, constructed and arranged to prevent damage to pipe, lining and coating. Do not permit bare chains, hooks, metal bars, or narrow skids or cradles to come in contact with coatings. Where required, provide pipe fittings with sufficient interior strutting or cross bracing to prevent deflection under their own weight.
3. Hoist pipe from trench side into trench by means of sling of smooth steel cable, canvas, leather, nylon, or similar material.
4. For large diameter water lines, handle pipe only by means of sling of canvas, leather, nylon, or similar material. Sling shall be minimum 36 inches in width. Do not tear or wrinkle tape layers.
5. Use precautions to prevent injury to pipe, protective linings, and coatings.
   a. Package stacked pipe on timbers. Place protective pads under banding straps at time of packaging.
   b. Pad fork trucks with carpet or other suitable material. Use nylon straps around pipe for lift when relocating pipe with crane or backhoe.
   c. Do not lift pipe using hooks at each end of pipe.
   d. Do not place debris, tools, clothing, or other materials on pipe.
6. Repair damage to pipe or protective lining and coating before final acceptance.
7. For cement mortar line and coated steel pipe and PCCP, permit no visible cracks longer than 6 inches, measured within 15 degrees of line parallel to pipe longitudinal axis of finished pipe, except:
   a. In surface laitance of centrifugally cast concrete.
   b. In sections of pipe with steel reinforcing collars or wrappers.
   c. Within 12 inches of pipe ends.
8. Reject pipe with visible cracks (not meeting exceptions) and remove from project site.

B. Cleaning: Thoroughly clean and dry interior of pipe and fittings of foreign matter before installation, and keep interior clean until Work has been accepted. Keep joint contact surfaces clean until jointing is completed. Do not place debris, tools, clothing, or other materials in pipe. After pipe laying and joining operations are completed, clean inside of pipe and remove debris.

C. Inspection: Before installation, inspect each pipe and fitting for defects. Reject defective, damaged or unsound pipe and fittings and remove them from site.

3.3 EARTHWORK

A. Conform to applicable provisions of Excavation and Backfill for Utilities and Horizontal Directional Drilling.

B. Bedding: Use bedding materials in conformance with Utility Backfill Materials.

C. Backfill: Use bank run sand or earth or native soil as specified in Utility Backfill Materials. Backfill excavated areas in same day excavated. When not possible, cover excavated areas using steel plates on paved areas and other protective measures elsewhere.

D. Place material in uniform layers of prescribed maximum loose thickness and wet or dry material to approximately optimum moisture content. Compact to prescribed density. Water tamping is not allowed.

E. Pipe Embedment: Including 6-inch pipe bedding and backfill to 12 inches above top of pipe.

3.4 PIPE CUTTING

A. Cut pipe 12 inches and smaller with standard wheel pipe cutters. Cut pipe larger than 12 inches in manner approved by OWNER or its designated representative. Make cuts smooth and at right angles to axis of pipe. Bevel plain end with heavy file or grinder to remove sharp edges.

3.5 PIPING INSTALLATION

A. General Requirements:
   1. Lay pipe in trench free of water.
   2. Make adjustments of pipe to line and grade by scraping away subgrade or filling in with granular material.
   3. Properly form bedding to fully support bell without wedging or blocking up bell.
   4. Open Cut Construction: Keep pipe trenches free of water which might impair pipe laying operations and/or contaminate the inside of the pipe. Grade pipe to provide uniform support along bottom of pipe. Excavate for bell holes after bottom has been graded and in advance of placing pipe. Lay not more than 300 feet of pipe in trench ahead of backfilling operations. Cover or backfill laid pipe if pipe laying operations are interrupted and during non-working hours. Place backfill carefully and simultaneously on each side of pipe to avoid lateral displacement of pipe and damage to joints. If adjustment of pipe is required after it has been laid, remove and re-lay as new pipe.

B. Install pipe continuously and uninterrupted along each street on which work is to be performed. Obtain approval of OWNER or its designated representative prior to skipping any portion of Work.

C. Protection of Pipeline: Securely place stoppers or bulkheads in openings and in end of line when construction is stopped temporarily and at end of each day's work.

D. Perform critical location Refer to Excavation and Backfill for Utilities for additional requirements at critical locations.

E. Laying Large Diameter Water Line
   1. Lay not more than 50 feet of pipe in trench ahead of backfilling operations.
   2. Dig trench proper width as shown. When trench width below top of pipe becomes 4 feet wider than specified, install higher class of pipe or improved bedding, as determined by OWNER or its designated representative. No additional payment will be made for higher class of pipe or improved bedding.
   3. Use adequate surveying methods and equipment; employ personnel competent in use of this equipment. Horizontal and vertical deviations from alignment as indicated on Drawings shall not exceed 0.10 feet. Measure and record "as-built" horizontal alignment and vertical grade at maximum of every 100 feet on record drawings.
   4. Prevent damage to coating when placing backfill. Use backfill material free of large rocks or stones, or other material which could damage coatings.
   5. Perform holiday test to detect coating voids in accordance with NACE RP0274.
   6. Repair detected holidays in accordance with manufacturer's recommendations.
   7. Before assembling couplings, lightly coat pipe ends and outside of gaskets with cup grease or liquid vegetable soap to facilitate installation.
   8. Prior to proceeding with critical tie-ins submit sequence of work based on findings from "critical location" effort.

3.6 JOINTS AND JOINTING

A. Rubber Gasketed Bell-and-Spigot Joints for Concrete Cylinder Pipe, Bar Wrapped Pipe, PVC, Steel, and DIP:
   1. After rubber gasket is placed in spigot groove of pipe, equalize rubber gasket cross section by inserting tool or bar recommended by manufacturer under rubber gasket and moving it around periphery of pipe spigot.
   2. Lubricate gaskets with nontoxic water-soluble lubricant before pipe units are joined.
   3. Fit pipe units together in manner to avoid twisting or otherwise displacing or damaging rubber gasket.
   4. After pipe sections are joined, check gaskets to ensure that no displacement of gasket has occurred. If displacement has occurred, remove pipe section and remake joint as for new pipe. Remove old gasket, inspect for damage and replace if necessary before remaking joint.
   5. Where preventing movement of 16-inch diameter or greater pipe is necessary due to thrust, use restrained joints as shown on Drawings.
      a. Include buoyancy conditions for soil unit weight when computing thrust restraint calculations.
      b. Do not include passive resistance of soil in thrust restraint calculations.

6. Except for PVC pipe, provide means to prevent full engagement of spigot into bell. Means may consist of wedges or other types of stops as approved by OWNER or its designated representative.
7. Use feeler gauge to verify water-tightness of each pipe joint prior to application of joint grout. Perform feeler gauge test from interior of pipe, immediately after installation and after backfilling and compaction. Perform feeler gauge test in accordance with manufacturer's recommendations to determine if the joint is within tolerance. Provide results to OWNER or its designated representative. Notify OWNER or its designated representative immediately when a joint is found to be out of tolerance or fails feeler gauge test, and submit repair plan for approval by OWNER or its designated representative.

B. Flanged joints where required on concrete cylinder pipe, bar wrapped pipe, ductile iron pipe, or steel pipe:
1. AWWA C 207. Prior to installation of bolts, accurately center and align flanged joints to prevent mechanical prestressing of flanges, pipe, and equipment. Align bolt holes to straddle vertical, horizontal, or north-south center line. Do not exceed 3/64 inch per foot inclination of flange face from true alignment.
2. Use full-face gaskets for flanged joints. Provide ⅛-inch-thick cloth inserted rubber gasket material. Cut gaskets at factory to proper dimensions.
3. Use Stainless Steel 316 nuts and bolts. Tighten bolts progressively to prevent unbalanced stress. Maintain at all times approximately same distance between two flanges at points around flanges. Tighten bolts alternately (180° apart) until all are evenly tight. Draw bolts tight to ensure proper seating of gaskets. Provide Densco petroleum based tape as manufactured by Carboline or approved equal for all exposed portions of nuts, bolts, and pipe.
4. Full length bolt isolating sleeves and washers shall be used with flanged connections.
5. For in-line flange joints 30 inches in diameter and greater and at butterfly valve flanges, provide Pyrox G-10 with nitrite seal, Type E LineBacker gasket as manufactured by Pipeline Seal and Insulator, Inc., or approved equal conforming to ANSI A 21.11 mechanical joint gaskets. For in-line flange joints sized between 12 inches in diameter and greater and 24 inches in diameter and smaller, provide Phenolic PSI with nitrite seal, Type E LineBacker gasket as manufactured by Pipeline Seal and Insulator, Inc., or approved equal conforming to ANSI A 21.11 mechanical joint gaskets.

C. Welded joints (concrete cylinder pipe, bar wrapped pipe, steel pipe):
1. Prior to starting work, provide certification of qualification for welders employed on project for type of work procedures and positions involved.

2. Joints: AWWA C 206. Full-fillet, single lap-welded slip-type either inside or outside, or double butt-welded type; use automatic or hand welders; completely penetrate deposited metal with base metal; use filler metal compatible with base metal; keep inside of fittings and joints free from globules of weld metal which would restrict flow or become loose. Do not use mitered joints. For interior welded joints, complete **welding before** backfilling . For exterior field-welded joints, provide adequate working room under and beside pipe. Use exterior welds for 30-inch and smaller.
3. Furnish welded joints with trimmed spigots and interior welds for 36-inch and larger pipe.
4. Bell-and-spigot, lap-welded slip joints: Deflection may be taken at joint by pulling joint up to ¾ inch as long as 1½-inch minimum lap is maintained. Spigot end may be miter cut to take deflections up to 5 degrees as long as joint tolerances are maintained. Miter end cuts of both ends of butt-welded joints may be used for joint deflections of up to 5 degrees.
5. Align piping and equipment so that no part is offset more than ⅛ inch. Set fittings and joints square and true, and preserve alignment during welding operation. For butt welded joints, align abutting ends to minimize offset between surfaces. For pipe of same nominal wall thickness, do not exceed 1/16 inch offset. Use line-up clamps for this purpose; however, take care to avoid damage to linings and coatings.
6. Protect coal-tar-epoxy lining during welding by draping an 18-inch-wide strip of heat resistant material over top half of pipe on each side of lining holdback to avoid damage to lining by hot splatter. Protect tape coating similarly if external welding is required.
7. Welding rods: Compatible with metal to be welded to obtain strongest bond, E-70XX.
8. Deposit metal in successive layers to provide at least two passes or beads for automatic welding and three passes or beads for manual welding in completed weld.
9. Deposit no more than ¼ inch of metal on each pass. Thoroughly clean each individual pass with wire brush or hammer to remove dirt, slag, or flux.
10. Do not weld under weather condition that would impair strength of weld, such as wet surface, rain or snow, dust or high winds, unless work is properly protected.
11. Make tack weld of same material and by same procedure as completed weld. Otherwise, remove tack welds during welding operation.
12. Remove dirt, scale, and other foreign matter from inside piping before tying in sections, fittings, or valves.
13. Welded joints for large diameter water lines:
    a. Furnish pipe with trimmed spigots and interior welds for 36-inch and larger pipe.
    b. Use exterior welds for 30-inch and smaller.
    c. Only one end may be miter cut. Miter end cuts of both ends of butt-welded joints may be used for joint deflections of up to 2½ degrees.

d. For large diameter water lines, employ an independent certified testing laboratory, approved by OWNER or its designated representative, to perform weld acceptance tests on welded joints. Include cost of such testing and associated work to accommodate testing in contract unit price bid for water line. Furnish copies of all test reports to OWNER or its designated representative for review. OWNER or its designated representative has final decision as to suitability of all welds tested.
   1) Weld acceptance criteria:
      a) Conduct in accordance with ASTM E 165- Standard Test Method for Liquid Penetrant Examination and ASTM E 709 Standard Guide for Magnetic Particle Examination. Use X-ray methods for butt welds, for 100 percent of joint welds.
      b) Examine welded surfaces for the following defects:
         (1) Cracking.
         (2) Lack of fusion/penetration.
         (3) Slag which exceeds one-third (t) where (t) equals material thickness.
         (4) Porosity/Relevant rounded indications greater than 3/16 inch; rounded indication is one of circular or elliptical shape with length equal to or less than three times its width.
         (5) Relevant linear indications in which length of linear indication exceeds three times its width.
         (6) Four or more relevant 1/16-inch rounded indications in line separated by 1/16 inch or less edge to edge.

14. After pipe is joined and prior to start of welding procedure, make spigot and bell essentially concentric by jacking, shimming or tacking to obtain clearance tolerance around periphery of joint except for deflected joints.
15. Furnish each welder employed steel stencil for marking welds, so work of each welder can be identified. Mark pipe with assigned stencil adjacent to weld. When welder leaves job, stencil must be voided and not duplicated. Welder making defective welds must discontinue work and leave project site. Welder may return to project site only after recertification.
16. Provide cylindrical corrosion barriers for epoxy or mortar lined steel pipe 24-inch diameter and smaller unless minimum wall thickness is 0.5 inches or greater.
    a. In addition to welding requirements contained here in paragraph 3.6, conform to protection fitting manufacturer's installation recommendations.
    b. Provide services of technical representative of manufacturer available on site at beginning of pipe laying operations. Representative to train welders and advise regarding installation and general construction methods. Welders must have 12 months prior experience installing protection fittings.
    c. All steel pipe is to have cutback ¾ inch to no greater than 1 inch of internal diameter coating from weld bevel.
    d. Furnish steel fittings with cylindrical corrosion barriers with shop welded extensions to end of fittings. Extension length to measure no less than diameter of pipe. Shop apply lining in accordance with AWWA C 210 or AWWA C 213.

e. All steel pipe receiving field adjustments are to be cold cut using standard practices and equipment. No cutting using torch is to be allowed.

17. For steel pipe 30-inch diameter and greater, after welding of joint, provide mortar coating for internal joint surfaces of mortar lined pipe, and epoxy for internal surfaces of epoxy lined pipe.

D. Harnessed joints (concrete cylinder pipe, bar wrapped pipe):
   1. Use of snap-ring type restrained joints on pipe is limited to 20-inch through 48-inch diameters.
   2. Position snap-ring joint bolt on top (12 o'clock portion). Provide minimum ½-inch joint recess. Use joint "diapers" minimum of 12 inches wide.
   3. For field adjustments with deflections beyond manufacturer's recommendations:
      a. Field trim spigot.
      b. Do not engage ring.
   4. Harnessed joints are not permitted in areas defined on Drawings as potentially petroleum contaminated material, in tunnels, or at bend greater than 5 degrees.
   5. Install harness type joints including snap rings at straight sections of pipe.

E. Restrained Joints
   1. For existing water lines and water lines less than 16 inches in diameter, restrain pipe joints with concrete thrust blocks or provide restrained joints.
   2. Thrust restraint lengths shown on Drawings are minimum anticipated lengths. These lengths are based on deflections indicated and on use of prestressed concrete cylinder pipe. Adjustments in deflections or use of other pipe material may result in reduction or increase of thrust lengths. Perform calculations by pipe manufacturer to verify proposed thrust restraint lengths. Submit calculations for all pipe materials sealed by a registered Professional Engineer in State of Texas for review by OWNER or its designated representative. Make adjustments in thrust restraint lengths at no additional cost.
   3. Passive resistance of soil will not be permitted in calculation of thrust restraint.
   4. For 16-inch lines and larger use minimum 16-foot length of pipe in and out of joints made up of beveled pipe where restraint joint lengths are not identified on Drawings. Otherwise, provide restraint joints for a minimum length of 16 feet on each side of beveled joints.
   5. Installation
      a. Install restrained joints mechanism in accordance with manufacturer's recommendations.
      b. Examine and clean mechanism; remove dirt, debris and other foreign material.
      c. Apply gasket and joint NSF 61 FDA food grade approved lubricant.
      d. Verify gasket is evenly seated.
      e. Do not over stab pipe into mechanism.
   6. Prevent any lateral movement of thrust restraints throughout pressure testing and operation.

7. Place 3,000 psi concrete conforming to Concrete, Materials and Proportioning, for blocking at each change in direction of existing water lines, to brace pipe against undisturbed trench walls. Finish placement of concrete blocking, made from Type I cement, 4 days prior to hydrostatic testing of pipeline. Test may be made 2 days after completion of blocking if Type II cement is used.

F. Joint grout (concrete cylinder pipe, bar wrapped pipe, steel pipe):
   1. Use non shrink grout
   2. Mix cement grout mixture by machine except when less than ½ cubic yard is required. When less than ½ cubic yard is required, grout may be hand mixed. Mix grout only in quantities for immediate use. Place grout within 20 minutes after mixing. Discard grout that has set. Retempering of grout by any means is not permitted.
   3. Prepare grout in small batches to prevent stiffening before it is used. Do not use grout which has become so stiff that proper placement cannot be assured without retempering. Use grout for filling grooves of such consistency that it will adhere to ends of pipe.
   4. Surface Preparation: Remove defective concrete, laitance, dirt, oil, grease, and other foreign material from concrete surfaces with wire brush or hammer to sound, clean surface. Remove rust and foreign materials from metal surfaces in contact with grout.
   5. Follow established procedures for hot and cold weather concrete placement.
   6. Complete joint grout operations and backfilling of pipe trenches as closely as practical to pipe laying operations. Allow grouted exterior joints to cure at least 24 hour before compacting backfill.
   7. Grouting exterior joint space: Hold wrapper in place on both sides of joint with minimum ⅝-inch-wide steel straps or bands. Place no additional bedding or backfill material on either side of pipe until after grout band is filled and grout has mechanically stiffened. Pull ends of wrapper together at top of pipe to form access hole. Pour grout down one side of pipe until it rises on other side. Rod or puddle grout to ensure complete filling of joint recess. Agitate for 15 minutes to allow excess water to seep through joint band. When necessary, add more grout to fill joint completely. Protect gap at top of joint band from backfill by allowing grout to stiffen or by covering with structurally protective material. Do not remove band from joint. Proceed with placement of additional bedding and backfill material.
   8. Interior joints for pipe 24 inches and smaller: Circumferentially butter bell with grout prior to insertion of spigot, strike off flush surplus grout inside pipe by pulling filled burlap bag or inflated ball through pipe with rope. After joint is engaged, finish off joint grout smooth and clean. Use swab approved by OWNER or its designated representative for 20-inch pipe and smaller.
   9. Protect exposed interior surfaces of steel joint bands by metallizing, by other approved coatings, or by pointing with grout. Joint pointing may be omitted on potable water pipelines if joint bands are protected by zinc metallizing or other approved protective coatings.
   10. Remove and replace improperly cured or otherwise defective grout.
   11. Strike off grout on interior joints and make smooth with inside diameter of pipe.

12. When installed in tunnel or encasement pipe and clearance within casing does not permit outside grout to be placed in normal manner, apply flexible sealer, such as Flex Protex by Gifford-Hill America, or equal, to outside joint prior to joint engagement. Clean and prime surfaces receiving sealer in accordance with manufacturer's recommendations. Apply sufficient quantities of sealer to assure complete protection of steel in joint area. Fill interior of joint with grout in normal manner after joint closure.
13. Interior joints for water lines 30 inches and larger: Clean joint space, wet joint surfaces, fill with stiff grout and trowel smooth and flush with inside surfaces of pipe using steel trowel so that surface is smooth. Accomplish grouting at end of each work day. Obtain written acceptance from OWNER or its designated representative of inside joints before proceeding with next day's pipe laying operation. During inspection, insure no delamination of joint mortar has occurred by striking joint mortar lining with rubber mallet. Remove and replace delaminated mortar lining.
14. Work which requires heavy equipment to be over water line, must be completed before mortar is applied to interior joints.
15. Do not apply grout to joints that are out of tolerance until acceptable repairs are made.

G. Large diameter water main joint testing: In addition to testing individual joints with feeler gauge approximately ½ inch wide and 0.015-inch thick, use other joint testing procedure approved or recommended by pipe manufacturer which will help ensure watertight installation prior to backfilling. These tests shall be made at no additional cost.

H. Make curves and bends by deflecting joints or other method as recommended by manufacturer and approved by OWNER or its designated representative. Submit details of other methods of providing curves and bends which exceed manufacturer's recommended deflection prior to installation.
1. Deflection of pipe joints shall not exceed maximum deflection recommended by pipe manufacturer, unless otherwise indicated on Drawings.
2. If deflection exceeds that specified but is less than 5 percent, repair entire deflected pipe section such that maximum deflection allowed is not exceeded.
3. If deflection is equal to or exceeds 5 percent from that specified, remove entire portion of deflected pipe section and install new pipe.
4. Replace, repair, or reapply coatings and linings as required.
5. Assessment of deflection may be measured by OWNER or its designated representative at location along pipe. Arithmetical averages of deflection or similar average measurement methods will not be deemed as meeting intent of standard.
6. When rubber gasketed pipe is laid on curve, join pipe in straight alignment and then deflect to curved alignment.

I. Closures sections and approved field modifications to steel, concrete cylinder pipe, bar wrapped pipe and fittings:

1. Apply welded-wire fabric reinforcement to interior and exterior of exposed interior and exterior surfaces greater than 6 inches in diameter. Welded-wire fabric: minimum W1; maximum spacing 2 inches by 4 inches; ⅜ inch from surface of steel plate or middle third of lining or coating thickness for mortar thickness less than ¾ inch.
2. Fill exposed interior and exterior surfaces with nonshrink grout.
3. For pipe diameters 36 inches and greater, perform field welds on interior and exterior of pipe.
4. For large diameter water lines, provide minimum overlap of 4 inches of butt strap over adjacent piece on butt-strap closures.

3.7 SECURING, SUPPORTING, AND ANCHORING

A. Support piping as shown on Drawings and as specified in this Section, to maintain line and grade and prevent transfer of stress to adjacent structures.

B. Where shown on Drawings, anchor pipe fittings and bends installed on water line by welding consecutive joints of pipe together to distance each side of fitting. Restrained length, as shown on Drawings, assumes that installation of pipe and subsequent hydrostatic testing begins upstream and proceed downstream, with respect to normal flow of water in pipe. If installation and testing differs from this assumption, submit for approval revised method of restraining pipe joints upstream and downstream of device used to test against (block valve, blind flange or dished head plug).

C. Use adequate temporary blocking of fittings when making connections to distribution system and during hydrostatic tests. Use sufficient anchorage and blocking to resist stresses and forces encountered while tapping existing water line.

3.8 POLYETHYLENE WRAP FOR DUCTILE IRON PIPE

A. Conform to requirements of Polyethylene Wrap.

3.9 CLEANUP AND RESTORATION

A. Provide cleanup and restoration crews to work closely behind pipe laying crews, and where necessary, during chlorination, testing, service transfers, abandonment of old water lines, backfill and surface restoration.

3.10 CLEANING PIPING SYSTEMS

A. Remove construction debris or foreign material and thoroughly broom clean and flush piping systems. Provide temporary connections, equipment, and labor for cleaning.

3.11 DISINFECTION OF WATER LINES

A. Piping and In-Line Equipment:
   1. Applies to piping and inline equipment such as pumps and valves that are not covered under other disinfection provisions.
   2. Disinfect in accordance with ANSI/AWWA C651.
   3. Utilize any of the two disinfection procedures.
      a. Tablet Method.
      b. Continuous Feed Method.

4. Provide signage and tagging at all outlets from the piping being disinfected to prevent discharge of highly chlorinated water.
5. After applicable retention period, flush piping at a velocity of not less than 2.5 feet per second.
    a. Flush water shall be Filtered Effluent with a minimum free chlorine residual of 0.5 milligram per liter.

3.12 DISPOSAL OF FLUSHING AND DISINFECTION WATER

A. Disposal of flushing and disinfection water is the responsibility of the Contractor.

B. Heavily chlorinated water must be dechlorinated in accordance with ANSI/AWWA C651, ANSI/AWWA C652, and ANSI/AWWA C653 prior to release.
    1. See appendix of ANSI/AWWA standards for additional information.

3.13 VERIFICATION TESTING

A. Upon completion of flushing, provide verification in the form of bacteriological sampling meeting the requirements of applicable ANSI/AWWA standard.

B. Collection of Samples:
    1. Contractor shall collect samples and deliver to Owner for laboratory analysis.
    2. Coordinate activities to allow samples to be taken in accordance with this Section.
    3. Provide valves at sampling points.
    4. Provide access to sampling points.

C. Testing Equipment:
    1. Clean containers, equipment, and connections used in sampling to make sure they are free of contamination.
    2. Obtain laboratory sampling bottles with instructions for handling from Owner.

D. Chlorine Sampling and Analysis:
    1. Collect samples in accordance with applicable ANSI/AWWA standard.
    2. Samples of disinfecting solution:
        a. One sample per batch of disinfecting solution mixed and injected into pipe or vessel.
        b. If mixed solution not used, sample structure or pipe being disinfected during or immediately after filling.
    3. Free chlorine residual samples:
        a. As required to establish concentrations at the beginning and end of retention period.
    4. Sampling locations and intervals:
        a. Sampling points shall be representative and accepted by Owner.
    5. Laboratory analysis to be performed by Owner. Samples will be analyzed for disinfectant residual concentration.
    6. If chlorine concentration testing results in disinfection concentrations not meeting the required standard, disinfecting procedures and verification testing shall be repeated until specified limits are met.

E. Bacteriological Sampling and Analysis:

1. Collect samples in accordance with applicable ANSI/AWWA standard.
2. Sampling locations and intervals:
   a. In accordance with applicable ANSI/AWWA Standard.
   b. Sampling points shall be representative and accepted by Owner.
   c. If ANSI/AWWA Standard is not applicable or does not fully describe sampling procedure, utilize the following minimum requirements:
      1) A minimum of two (2) samples on two (2) consecutive days from each separable structure and every 1,000 FT of pipeline.
3. Laboratory analysis to be performed by Owner. Samples will be analyzed for disinfectant residual and coliform concentrations using methods as described in the latest edition of Standard Methods for Examination of Water and Wastewater.
4. If verification testing results in bacterially positive samples or disinfection concentrations not meeting the required standard, disinfecting procedures and verification testing shall be repeated until specified limits are met.

F. Documentation:
   1. Secure from Owner's laboratory and submit certified bacteriological reports on samples taken from system. Certify that sampling and testing procedures/results are in full compliance with ANSI/AWWA standards and **Texas Commission on Environmental Quality** regulations.

3.14 . FIELD HYDROSTATIC TESTS

A. Conform to requirements of Hydrostatic Tests for Pressure Mains.

END OF SECTION

SECTION 02 01 12
WATER TAP AND SERVICE LINE INSTALLATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tapping existing mains and furnishing and installing new service lines for water.

B. Relocation of existing small water meters.

C. Specifications identify requirements for both small-diameter (less than or equal to 20 inches) water lines and large-diameter (greater than 20 inches) water lines. When specifications for large-diameter water lines differ from those for small- diameter water lines, paragraphs for large-diameter water lines will govern for large-diameter pipe.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for water taps and service lines 3/4 inch through 1 inch is on unit price basis for each installation. Separate measurements will be made for "short side" and "long side" connections as defined in Paragraph 1.04, Definitions.
2. Payment for water taps and service lines 1 1/2 inch through 2 inch is on unit price basis for each installation. Separate measurements will be made for "short side" and "long side" connections as defined in Paragraph 1.04, Definitions.
3. Payment for "short side" and "long side" includes locating water line, tap installation and connection to meter and restoring site.
4. Payment for each small meter includes labor, materials, and equipment to relocate existing small meter.
5. No additional payment will be made for bedding, backfill, compaction, push under pavement, etc.
6. Refer to Measurement and Payment for unit price procedures

1.03 REFERENCES

A. AWWA C 800 - Standard for Underground Service Line Valves and Fittings.

B. AWWA C 900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. Through 12 in., for Water Distribution.

C. AWWA C904 – Crosslinked Polyethylene (PEX) Pressure Pipe, 1/2 in. Through 3 in., for Water Service.

D. AWWA C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems.

1.04 DEFINITIONS

A. Short Side Connection: Service line connecting proposed curb stop, located inside water meter box, to water line on same side of street.

B. Long Side Connection: Service line connecting proposed curb stop, located inside water meter box, to water line on opposite side of street or from center of streets where supply line is located in street center such as boulevards and streets with esplanades.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crosslinked Polyethylene (PEX) Piping: AWWA C904 as modified in this section:

1. Pipe shall be rated for continuous operation of 100 psi gauge pressure at 180°F temperature and 160 psi gauge pressure at 73.4°F temperature.
2. Pipe to be tested for resistance to hot chlorinated water in accordance with ASTM F2023. Pipe to have a minimum Class 3 chlorine resistance rating when evaluated to F876 and tested in accordance to F2023.
3. Pipe to have a co-extruded UV Shield made from UV-resistant polyethylene, color blue. Pipe to have minimum recommended UV exposure time of 12 months when tested in accordance with ASTM F2657 and evaluated in accordance with ASTM F876.
4. Bend Radius: The minimum bend radius for cold bending of PEX pipe shall be not more than five (5) times the outside diameter.

B. Corporation Stops: AWWA C 800 as modified in this Section:

1. Inlet End: AWWA standard thread.
2. Valve Body: Tapered plug type, O-ring seat ball type, or rubber seat ball type.
3. Outlet End: Compression type fitting.

C. Dual Strap Saddles: Red brass body and straps; ductile-iron; vinyl-coated body and straps; or ductile-iron, vinyl-coated body and stainless-steel straps.

D. Taps for PVC Water Lines: Use AWWA C 800 compliant dual-strap or single, wide-

band strap saddles which provide full support around circumference of pipe and bearing area of sufficient width along axis of pipe, 2 inches minimum, ensuring that pipe will not be distorted when saddle is tightened. Provide approved stainless-steel tapping saddle with AWWA standard thread.

E. Taps for Steel Pipe: Not allowed, unless specifically approved by Project Manager. Use saddle only when tap is approved on steel pipe.

F. Curb Stops and Brass Fittings: AWWA C 800 as modified in this Section.

1. Inlet End: Compression-type fitting
2. Valve Body: Straight-through or angled, meter-stop design equipped with following:
   a. O-ring seal straight plug type.
   b. Rubber seat ball type.
3. Outlet End: Female, iron-pipe thread or swivel-nut, meter-spud thread on 3/4-inch and 1-inch stops and 2-hole flange on 1 1/2 and 2-inch sizes.
4. Fittings: Provide approved fittings. Use same size open end wrenches and tapping machines as used with respective Mueller fittings.
5. Factory Testing of Brass Fittings:
   a. Submerge in water for 10 seconds at 85 psi with stop in both closed and open positions.
   b. Reject fitting that shows air leakage. Project Manager may confirm tests locally. Entire lot from which samples were taken will be rejected when random sampling discloses unsatisfactory fittings.

G. Angle Stops: In accordance with AWWA C 800; ground-key, stop type with bronze lock- wing head stop cap; inlet and outlet threads conform to application tables of AWWA C 800; and inlets flared connection or compression.

1. Outlet for 3/4-inch and 1-inch size: Meter swivel nut with saddle support.
2. Outlet for 1 1/2-inch through 2-inch size: O-ring sealed meter flange, iron pipe threads.

H. Fittings: In accordance with AWWA C 800 and following:

1. Castings: Smooth, free from burrs, scales, blisters, sand holes, and defects which would make them unfit for intended use.
2. Nuts: Smooth cast and has symmetrical hexagonal wrench flats.
3. Flare-Joint Fittings: Smooth cast. Machine seating surfaces for metal-to-metal seal to proper taper or curve, free from pits or protrusions.
4. Thread fittings, of all types, shall have NPT or AWWA threads, and protect male threaded ends in shipment by plastic coating, or approved equal.
5. Compression joint fittings shall be manufactured in accordance with AWWA C800. Fittings must meet the pressure requirements of the PEX pipe at 73°F (23°C) when used with stainless steel or plastic inserts.

6. Stamp of manufacturer's name or trademark and of fitting size on body.

PART 3 EXECUTION

3.01 GENERAL

A. Tapped collars of appropriate sizes: Approved in new construction only provided they are set at right angles to proposed meter location.

B. Use tapping machine manufactured for pressure tapping purposes for 2-inch and smaller service taps on pressurized water lines.

C. For new meter or when existing meter is in conflict with proposed pavement improvements, locate water meters one foot inside street right-of-way, or when this is not feasible, one foot on curb side of sidewalk. Contact Project Manager when major landscaping or trees conflict with service line and meter box location. No additional payment will be made for work on customer side of meter.

D. New location and installation of existing small meter shall conform to requirements of this Section.

E. Successfully perform hydrostatic and disinfection testing prior to installing service taps and lines.

3.02 SERVICE INSTALLATION

A. Set service taps at right angles to proposed meter location and locate taps in upper pipe segment within 45 degrees of pipe spring line.

B. Install service lines in accordance with Section 02317 - Excavation and Backfill for Utilities.

C. Lay service lines with minimum of 30 inches of cover as measured from top of curb or, in absence of curbs, from centerline elevation of crowned streets or roads. Provide minimum of 18 inches of cover below flow line of ditches to service lines.

D. Service lines across existing street (push-unders): Pull service line through prepared hole under paving. Use only full lengths of tubing. Take care not to damage tubing when pulling it through hole. Compression-type union is only permitted when span underneath pavement cannot be accomplished with a full standard length of tubing. Use one compression-type union for each full length of tubing.

E. Maintain service lines free of kinks, dirt and foreign matter.

F. Install service lines so that top of meter will be 4 to 6 inches below finished grade.

3.03 CURB STOP INSTALLATION

A. Set curb stops or angle stops at outer end of service line inside of meter box. Secure opening in curb stop to prevent unwanted material from entering. In close quarters, make S curve in field. Do not flatten tube. In 3/4-inch and 1-inch services, install meter coupling, swivel-nut, or curb stop ahead of meter. Install straight meter coupling on outlet end of meter.

3.04 SEQUENCE OF OPERATIONS

A. Open trench for proposed service line in accordance with Excavation and Backfill for Utilities.

B. Install curb stop on meter end of service line.

C. With curb stop open and prior to connecting service line to meter in slack position, open corporation stop and flush service line thoroughly. Close curb stop, leaving corporation stop in full-open position.

D. Check service line for apparent leaks and kinks. Repair leaks and kinks before proceeding.

E. Schedule inspection with Field Technician prior to backfilling. After inspection, backfill in accordance with Excavation and Backfill for Utilities.

F. Install meter box centered over meter with top of lid flush with finished grade.

END OF SECTION

SECTION 02 01 13

WET CONNECTIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wet connections for new water lines and service lines to existing water lines.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for wet connections shown on Drawings is on unit price basis for each wet connection. Separate payment will be made for each size of water line.
2. No compensation will be given for extra work or for damages occurring as result of incomplete shutoff.
3. Refer to Measurement and Payment for unit price procedures.
4. **The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used**. When specified as a separate pay item in the contract bid form, this work shall be measured as specified above and paid for at the contract unit bid price for this work. The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

1.03 REFERENCES

A. AWWA C 800 - Standard for Underground Service Line Valves and Fittings.

B. OSHA 29 CFR 1926.1101 - Asbestos.

1.04 DEFINITIONS

A. Wet connections consist of isolating sections of pipe to be connected with existing valves, draining isolated sections, and completing connections.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pipe shall conform to requirements of applicable portions of Sections 02501 through 02528 related to piping materials and to water distribution.

B. Corporation cocks and saddles shall conform to requirements of Water Tap and Service Line Installation.

C. Valves shall conform to requirements of Gate Valves.

D. Brass fittings shall conform to requirements of AWWA C 800.

PART 3 - EXECUTION

3.01 CONNECTION OPERATIONS

A. Plan wet connections in manner and at hours with least inconvenience public. Notify Project Engineer at least 72 hours in advance of making connections.

B. Do not operate valves on water lines in use by City. BPUB Operations Division will handle, at no cost to Contractor, operations involving opening and closing valves for wet connections.

C. Conduct connection operations when Field Technician is at job site. Connection work shall progress without interruption until complete once existing water lines have been cut or plugs have been removed for making connections.

3.02 2-INCH WET CONNECTIONS

A. Tap water line. Use corporation cocks, saddles, copper tubing as required for line and grade adjustment, and brass fittings necessary to adapt to existing water line. Use 2-inch valves when indicated on Drawings for 2-inch copper gooseneck connections.

3.03 PROTOCOL:

1. Mechanically excavate to no more than 6 in. of AC Pipe. Carefully uncover the remainder of pipe by hand or with shovel.
2. Keep pipe adequately wet before and during work.
3. Place 2 layers of 6 mil polyethylene sheeting under the asbestos pipe to prevent soil contamination.
4. Use hand tools to remove collars. Replace minimum 6 ft. section of pipe. Use

of power tools is prohibited.

5. Do not crush AC pipe in place. Remove waste AC pipe.

END OF SECTION

SECTION 02 01 15

DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

1. Ductile iron pipe and fittings for water lines, wastewater force mains, gravity sanitary sewers, and storm sewers.

1.02 MEASUREMENT AND PAYMENT

1. Measurement:
   a. This Item will be measured by the foot along the centerline of the installed pipe of the nominal size shown on the plans or as indicated on the bid proposal.

2. Payment:
   a. The work performed and materials furnished in accordance with this Section and measured as provided under "Measurement" will be paid for at the unit price bid for "Ductile Iron Pipe and Fittings" of the sizes and types specified. This price will be full compensation for furnishing and installing the Ductile Iron pipe and or fittings, pipe supports, hangers, clamps, straps, anchors, guard plates, painting, equipment, labor, tools, and incidentals. Excavation and backfill will not be paid for directly but will be considered subsidiary to this item.

1.03 REFERENCES

1. ANSI A 21.4 (AWWA C 104) – Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings, for Water.
2. ANSI A 21.10 (AWWA C 110) – Standard for Ductile-Iron and Gray-Iron Fittings, 3-in. through 48-in.
3. ANSI A 21.11 (AWWA C 111) – Standard for Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. ANSI A 21.15 (AWWA C 115) – Standard for Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges.
5. ANSI A21.16 (AWWA C 116) – Protective Fusion Bonded Epoxy Coating for the Interior and Exterior Surfaces of Ductile Iron and Grey iron Fittings for Water Supply Service.
6. ANSI A 21.50 (AWWA C 150) – Standard for Thickness Design of Ductile-Iron Pipe.
7. ANSI A 21.51 (AWWA C 151) – Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water and Other Liquids.
8. ANSI A 21.53 (AWWA C 153) – Standard for Ductile Iron Compact Fittings, 3 inches through 24 inches and 54 inches through 64 inches for Water Service.
9. ASME B 16.1 – Cast Iron Pipe Flanges and Flanged Fittings.

10. ASTM D 1248 – Standard Specification Polyethylene Plastics Molding and Extrusion Materials for Wire and Cable.
11. ASTM F 477 – Elastomeric Seals (gaskets) for Joining Plastic Pipe.
12. ASTM G 62 – Standard Test Methods for Holiday Detection in Pipeline Coatings.
13. AWWA C 105 Polyethylene encasement for Ductile-Iron Pipe Systems.
14. AWWA C 300 – Standard for Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, for Water and other Liquids.
15. AWWA C 600 – Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.
16. SSPC-SP 6 – Steel Structures Painting Council, Commercial Blast Cleaning.
17. American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering.
18. American Association of State Highway Transportation Officials (AASHTO).

1.04 SUBMITTALS

1. Conform to requirements of Submittals.
2. For pipes 6 inches and greater submit shop drawings
   a. Manufacturer's pipe design calculations.
   b. Provide lay schedule of pictorial nature indicating alignment and grade, laying dimensions, fitting, flange, and special details, with plan and profile view of each pipe segment sketched, detailing pipe invert elevations, horizontal bends, restrained joints, and other critical features. Indicate station numbers for pipe and fittings corresponding to Drawings. Do not start production of pipe and fittings prior to review and approval by Engineer. Provide final approved lay schedule on CDROM in Adobe portable document format (*.PDF).
   c. Calculations and limits of thrust restraint.
   d. Class and length of joint.
3. Submit manufacturer's certifications that ductile iron pipe and fittings meet provisions of this Section and have been hydrostatically tested at factory and meet requirements of ANSI A 21.51.
4. Submit certifications that pipe joints have been tested and meet requirements of ANSI A 21.11.
5. Submit affidavit of compliance in accordance with ANSI A21.16 for fittings with fusion bonded epoxy coatings or linings.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE

1. Ductile Iron Pipe Barrels: Shall conform to AWWA C115, C150, and C151 and bear mark of Underwriters' Laboratories approval. Unless otherwise shown on Drawings, use minimum Pressure Class 250 for water lines and thickness Class 52 for sanitary sewers. Provide minimum Pressure Class 350 for flanged pipe.
2. Provide pipe sections in standard lengths, not less than 18 feet long, except for special fittings and closure sections as indicated on shop drawings.
3. Pipe Manufacturer for large diameter water lines: Minimum of 5 years of successful pipe installations in continuous service. Manufacturer must maintain on site or in plant enough fittings to satisfy the following requirements:

Line Diameter	**Required Bends***
20 and 24 inches	Four 45° bends per 5,000 LF of water line
> 24 inches	Four 22.5° bends per 10,000 LF of water line

*Based on total length of contract (minimum of four). Any combination of bends may be substituted at manufacturer's option (i.e. two 22.5° bends are equivalent to one 45° bend) and will be counted as one fitting.

Manufacturer or supplier must be capable of delivering bends to job site within 12 hours of notification. Use fittings at direction of Engineer where unforeseen obstacles are encountered during construction. These fittings are in addition to any fittings called out in construction documents and must be available at all times.

4. Provide flange adapter with insulating kit as required when connecting new piping to existing piping and piping of different materials, unless otherwise approved by Engineer.
5. Clearly mark pipe section to show location and thickness/pressure class color coded.
6. No welding will be permitted on Ductile Iron Pipe except at restrained joint spigots. No field welding is allowed.

2.02 JOINTS

1. Joint Types: ANSI A 21.11 push-on; ANSI A 21.11 mechanical joint; or ANSI A 21.16 flanged end. Provide push-on joints unless otherwise indicated on the Drawings or required by these specifications. For bolted joints, conform to requirements of AWWA C111; provide minimum 316 stainless steel bolts for restraint joints.
2. Where required by Drawings, provide approved restrained joints for buried service.
3. Threaded or grooved-type joints which reduce pipe wall thickness below minimum required are not acceptable.
4. Provide for restrained joints designed to meet test pressures. Provide restrained joints for test pressure or maximum surge pressure as specified, whichever is greater for water lines. Do not use passive resistance of soil in determining minimum restraint lengths.

5. Electrical Bond Wires: Use stranded, copper cable furnished with high molecular weight polyethylene insulation (HMWPE). Use wire gauge (AWG) as shown on Drawings.

6. Make curves and bends by deflecting joints. Do not exceed maximum deflection recommended by pipe manufacturer for pipe joints or restraint joints. Submit details of other methods of providing curves and bends for consideration by Engineer. When other methods are deemed satisfactory, install at no additional cost.

2.03 GASKETS

1. Furnish, when no contaminant is identified, plain rubber (SBR) gasket material in accordance with ANSI A21.11 or ASTM F 477 (One Bolt only); for flanged joints ⅛-inch-thick gasket in accordance with ANSI A 21.15.

2.04 FITTINGS

1. Use fittings of same size as pipe. Reducers are not permitted to facilitate an off-size fitting. Reducing bushings are also prohibited. Make reductions in piping size by reducing fittings. Line and coat fittings as specified for pipe they connect to.

2. Push-on Fittings: ANSI A 21.10; ductile iron ANSI A 21.11 joints, gaskets, and lubricants; pressure rated at 250 psig.

3. Flanged Fittings: ANSI 21.10; ductile iron ANSI A 21.11 joints, gaskets, and lubricants; pressure rated at 250 psig.

4. Mechanical Joint Fittings: ANSI A 21.11; pressure rated at 250 psi.

5. Ductile Iron Compact Fittings: Shall conform to AWWA C153 and shall be:
   a. fusion bonded epoxy lined or
   b. cement mortar lined

6. For tangential flanged outlets shown on Drawings, substitute with a tee with an equivalent sized outlet unless otherwise approved by Engineer.

2.05 COATINGS AND LININGS

1. Water line Interiors: ANSI A21.4, cement lined with seal coat; ANSI A 21.16 fusion bonded epoxy coating for interior; comply with NSF 61.

2. Sanitary Sewer and Force Main Interiors:
   a. Preparation: Commercial blast cleaning conforming to SSPC-SP6.
   b. Liner thickness: Nominal 40 mils, minimum 35 mils, for pipe barrel interior; minimum 6 to 10 mils at gasket groove and outside spigot end to 6 inches back from end.
   c. Testing: ASTM G 62, Method B for voids and holidays; provide written certification.
   d. Acceptable Lining Materials:
      a. Provide approved virgin polyethylene conforming to ASTM D 1248, with inert fillers and carbon black to resist ultraviolet degradation during storage; heat bonded to interior surface of pipe and fittings.
      b. Ceramic Epoxy - Protecto 401 or approved equal

3. Sanitary Sewer Point Repair Pipe: For pipes which will be lined with high density polyethylene liner pipe or cured-in-place liner, provide cement-lined with seal coat in accordance with ANSI A 21.4. For pipes which will not be provided with named liner, provide pipe as specified in Paragraph 2.05B, Sanitary Sewer and Force Main Interiors.

4. Encasement and coating requirements:
   a. Open cut construction method:
      a. Provide single wrap polyethylene encasement in accordance with AWWA C105 or
      b. Provide Polyurethane coating in accordance with Section 09905-Painting and Protective Coatings on Steel and Ductile Iron Pipe.
   b. Auger or casing construction method: Provide Polyurethane coating in accordance with Section 09905-Painting and Protective Coatings on Steel and Ductile Iron Pipe.

5. Polyethylene Wrap: For buried water lines not cathodically protected provide polyethylene wrap unless otherwise specified or shown. Conform to requirements of AWWA C105.

6. For flanged joints in buried service, provide petrolatum wrapping system, Denso, or equal, for the complete joint and alloy steel fasteners.

PART 3 EXECUTION

3.01 INSTALLATION

1. Install in accordance with AWWA C 600 and manufacturer's recommendations.

2. Install single wrap Polyethylene encasement in conformance with requirements of AWWA C105.

3. Provide electrical continuity bonding across buried mechanical and push-on joint assemblies, except where insulating flanges are required by Drawings.
   a. Provide minimum number of bond wires shown on Drawings. Remove one inch of HMWPE insulation from each end of bond wire prior to attaching.
   b. Secure wire onto pipe using approved Thermite Welding procedures.
   c. Coat bare metal and weld metal after weld is secure. Use coal-tar compound or other compatible coating. For polyurethane coated pipe, use compatible polyurethane coating.
   d. Visually inspect Thermite Weld connections for electrical continuity, strength and suitable coating prior to backfilling or placing pipe in augered hole or casing.

END OF SECTION

SECTION 02 01 16

CUT, PLUG, AND ABANDONEMENT OF WATER LINES

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Cut, plug and abandonment of water lines.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for cut, plug, and abandonment of water lines is on a unit price basis for each cut, plug, and abandonment performed. Separate payment will be made for each size of water line.

2. Refer to Measurement and Payment for unit price procedures.

1.3 SUBMITTALS

A. Conform to requirements of Submittal Procedures.

B. Submit product data for proposed plugs and clamps for approval.

PART 2 P R O D U C T S

2.1 MATERIALS

A. Concrete for reaction blocks: Class B conforming to requirements of Section 03315 - Concrete for Utility Construction.

B. Plugs and clamps: Applicable for type of pipe to be plugged.

PART 3 E X E C U T I O N

3.1 APPLICATION

A. Do not begin cut, plug and abandonment operations until replacement water line has been constructed, disinfected, and tested, and service lines have been transferred to replacement water line.

B. Install plug, clamp, and concrete reaction block and make cut at location shown on Drawings.

C. Main to be abandoned shall not be valved off and shall not be cut or plugged other than at supply water line or as shown on Drawings.

D. After water line to be abandoned has been cut and plugged, check for other sources feeding

abandoned water line. When sources are found, notify Project Manager immediately. Cut and plug abandoned water line at point of other feed as directed by Project Manager.

E. Plug or cap ends or openings in abandoned water line in manner approved by Project Manager.

F. Remove and dispose of surface identifications such as valve boxes and fire hydrants. Valve boxes in improved streets, other than shell, may be filled with concrete after removing cap.

G. Backfill excavations in accordance with Ecavation and Backfill for Utilities.

H. Repair street surfaces in accordance with Pavement Repair and Restoration.

END OF SECTION

SECTION 02 01 20

FIRE HYRANTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The work under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing fire hydrant assemblies, including the hydrant leg, auxiliary gate valve, valve box, fittings, appurtenances and fire hydrants. The work also includes removing, inspecting, salvaging, and delivering existing fire hydrant to the OWNER.

1.02 REFERENCES

A. American Water Works Association (AWWA)
   1. ANSI/AWWA C502, Dry-Barrel Fire Hydrants

1.03 SUBMITTALS

A. Submit shop drawings and product data.

B. Certified test results as per ANSI/AWWA C502, of latest revision.

C. Submit manufacturer's Affidavit of Compliance stating that the hydrant, hydrant design, and hydrant materials conform to ANSI/AWWA C502, of latest revision.

1.04 MEASUREMENT AND PAYMENT

A. Measurement:
   1. Removing and Replacing Existing Fire Hydrants will be measured for payment by the lump-sum method, acceptably performed and completed.

B. Payment:
   1. The work performed and materials furnished in accordance with this Section and measured as provided under "Measurement" will be paid for at the unit price bid for "Remove and Replace Fire Hydrant". Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.
   2. When submitting a pay request for each completed fire hydrant, the contractor must complete all pay items associated with the fire hydrant including pavement repair, sidewalks, driveway repair, etc. to receive payment on the requested fire hydrant.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Fire hydrants shall conform to the requirements of AWWA C502 for Dry Barrel Fire Hydrants. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Mueller Super Centurion 250 A-423
   2. Clow Medallion
   3. Kennedy Guardian

2.02 DESCRIPTION

A. Fire hydrants shall conform to the latest revision of American Water Works Service, except for supplementary requirements contained herein.

B. Type of Hydrant:
   1. Fire hydrants shall be of the Traffic Model Type equipped with a breakaway traffic flange which allows both barrel and stem to break clean when the hydrant is impacted by a motor vehicle. Traffic flange design must be such that repair and replacement can be accomplished above ground. Weakened Steel or Weakened Cast Iron Bolts, used in Breakable Barrel Couplings will not be acceptable. The hydrant must be of Dry Barrel and Dry Top Type with no part of the threads in the open waterway when the hydrant is pressurized.

C. Design of Hydrant
   1. The main valve of the hydrant shall not be less than five and one-quarter (5-1/4") inches.

D. Valve Facing
   1. The main valve of the hydrant shall be SBR Rubber with 90 Durometer Hardness. The hydrant shall be equipped with a travel stop device located in the top of the hydrant which terminates the downward travel of the main rod. Travel stop devices in the form of a stop in the elbow of the hydrant which could allow the main rod to be put into compression if the hydrant is "over Opened" will not be permitted.

E. Lower Barrel Section
   1. The lower barrel section shall be made to conform to the section thickness requirements of AWWA Specification C502, or the latest revision thereof, and can be furnished in Gray Iron or Ductile Iron. Screwed on flanges are not acceptable.

F. Hydrant Adjustments
   1. The hydrant must be capable of accommodating an extension piece at the ground line without shutting down the hydrant or excavating.

G. Drain Valve Mechanisms
   1. Drain valve mechanisms that include springs or rods are not acceptable.

H. Operating Nut

1. The operating nut shall be a combination weather shield and functional operating device that will be protect all operating parts from excessive moisture and contamination.

I. Seal Plate with Integral Lubrication Chamber
   1. Hydrants shall have a seal plate with an integral lubrication chamber that lubricates the operating threads and bearing surfaces each time the hydrant is operated. The lubrication chamber shall be protected at the top from dirt and moisture intrusion means of an "O" ring seal.

J. Reflective Hydrant Marker
   1. Contractor shall provide and install a Reflective Hydrant Marker directly opposite each Fire Hydrant. Contractor shall coordinate with the Owner for exact roadway placement. Approved manufacture is as follows:
      a. Astro Optics, LLC (Model: Hydrant Lite)

2.03 SUPPLEMENTAL DETAILS

A. Inlet Connection
   1. The inlet shall be six (6") inches as shown on the plans.

B. Hydrant Outlet
   1. Each hydrant shall have two (2) two and one-half (2-1/2") inch hose nozzles and one (1) five and one-quarter (5-1/4") inch pumper with National Standard Threads.

C. Bury Length
   1. Hydrants bury depth shall be indicated on the plans or in the Special Provisions of these specifications.

D. Drain Opening
   1. Each hydrant shall have two (2) external drain ports

E. Direction of Opening
   1. All hydrants shall open left (counter-clockwise)

F. Nozzle Cap Chains
   1. All nozzle caps shall be equipped with chains.

G. Hydrant Operating nut and cap shall be a pentagonal shape 1-1/2" point to flat unless otherwise specified.

PART 3 - EXECUTION

3.01 CONSTRUCTION

A. General:
   1. Hydrants shall be connected to mains as shown on plans or as directed by the Engineer. They shall be installed as indicated on plans. Hydrants shall also be installed in a location where there is accessibility and in a safe location where there is a minimum possibility of damage from vehicles or injury to pedestrians. In situations where hydrants are placed directly behind curbs, hydrant barrels shall be set so that no portion of the hydrant will be less than 12 -inches nor more than 7 feet from the back of the curb. Where hydrants are set in the lawn spaces between the curb and the sidewalk or between the sidewalk and the property line, no portion of the hydrant or nozzle cap shall be within 6 inches of the sidewalk.
   2. Setting Final grade of fire hydrants to match proposed or existing field conditions is the responsibility of the Contractor.
   3. The contractor shall notify the Engineer 72 hours prior to any scheduled tie in and whether any customers will be affected by the scheduled shut down. Any shut downs which affect customers shall be scheduled during off peak times.
   4. The CONTRACTOR shall restore all surface features to preconstruction condition or better, including, but not limited to, sidewalks, curbs, gutters, mailboxes, culverts, and other facilities disturbed by the construction.

B. Removing and Replacing Existing Fire Hydrants:
   1. Contractor shall remove existing fire hydrant assembly and appurtenances up to the water main as indicated on the plans or as directed by the Engineer.

C. Salvaging Existing Fire Hydrants:
   1. The components of the existing fire hydrant assemblies shall be carefully removed.
   2. The Contractor shall salvage the existing fire hydrant and deliver this material to the Brownsville Public Utilities Board storage yard located at 1495 Robinhood Drive, Brownsville TX 78523.
   3. Materials and equipment not designated for reuse or salvage become the CONTRACTOR's property.

3.02 PAINTING

A. The color of the finish paint above the ground line shall be yellow.

B. The interior and exterior of the hydrant shoe shall be coated with a fusion-bonded epoxy having a nominal dry film thickness of 8 mils, conforming to ANSI/AWWA C550, of latest edition, and certified to NSF-61.

C. Coating shall be as close to holiday free as is technologically possible.

D. All fire hydrant barrels to be chrome yellow as per NFPA 291. Use the following color code for field coating of hydrant bonnet and nozzle caps to to indicate size of water line supplying hydrant:

GPM at 20 PSI	Bonnet and Nozzle Caps Color
Greater than 1,500	Light Blue
1,000-1,499	Green
500-999	Orange
Less than 500	Red

In accordance with AWWA M17, this is the calculated flow at a calculated residual of 20 psi and with the actual residual on an adjacent nonflowing hydrant being 40 psi or greater. When the actual observed residual on the adjacent nonflowing hydrant is less than 40 psi, the color scheme should be based on one-half of the observed flow.

J. Remove and dispose of unsuitable materials and debris in accordance with requirements of Waste Material Disposal.

END OF SECTION

SECTION 02 01 23

DIRECTIONAL BORING FOR CUSTOMER WATER YARD PIPE

SUBSECTION 823

823.1 DESCRIPTION: This item shall govern the furnishing and installation of customer yard piping and conduit by the method of directional boring as shown in the contract documents and as directed by the Engineer.

823.2 MATERIALS:

1. The materials for customer yard piping installation and adjustment shall conform to AWWA standards, of latest edition. Refer to Water Lines and Water Tap and Service Line Installation.

823.3 CONSTRUCTION:

1. Determination for Directional Boring Method: Directional boring method shall be used for installations of customer's "short yard piping" or "long yard piping" when open-cut method is not feasible. Directional boring method should be used to avoid disruption to items such as, but not limited to, substantial landscaping, trees, driveways, retaining walls, privacy walls, structures, or sprinkler systems that cannot be economically be replaced, or as directed by the Inspector. The yard piping shall be placed in 2 inch or 4 inch inside diameter (I.D.) PVC conduit as appropriate when directed by the Inspector.

2. Installation: Directional Boring Method machine as manufactured by "Ditch Witch," "Vermeer," or other approved equal, capable of drilling a minimum of a 300 feet continuous bore.

Directional boring shall be completed with the use of a directional boring machine, as manufactured by "Ditch Witch", "Vermeer," or other approved equal. The directional boring machine shall be supplied with an output signal inside the housing of the drill bit. The output signal shall have a constant output signal to allow a person to track the location of the beacon at all times. The drill bit shall be located a maximum of every 5 feet for exact location of the service line to be pulled in. When bore is completed, contractor shall provide OWNER with a pilot of the bore path.

The drilling machine shall be set up at such a location to avoid disruption of private yard and landscaping. The operator of the drilling unit shall check the bore path and position of boring pit at every five feet and make necessary correction to stay along the alignment. The pilot hole shall not be greater than 4 inches in diameter, except when a 4inch PVC conduit is installed. The Contractor shall make necessary provisions to keep water and soil out of the installed yard piping.

The drilling machine shall be equipped with a drilling fluid compatible for the onsite conditions. The fluid, such as bentonite, shall be used for lubricating the pipe during pull-back, forcing spoils out of the pipe pit, assisting in holding the hole open during pull back, and hardening into a clay substance around the outside of the conduit, preventing settlement of the ground. Adequate drilling fluids shall be used to avoid a "hydra-lock" condition. The directional head shall be capable of accepting a variety of cutting bits for varied soil conditions.

Any damage to customer's property, landscaping or trees caused by the Contractor's activities of installing yard piping, shall be replaced to both the inspector's and customer's satisfaction, at no additional cost to OWNER.

Contractor shall take a video DVD recording of the entire project area prior to commencing any work in the area. A DVD video shall be turned into OWNER for review and approval before starting any work, including mobilization and preparation of right-of-way.

823.4 MEASUREMENT: Directional Boring for Customer's Yard Piping" will be measured by the linear foot of the various types and sizes of customer's yard piping or conduit installed.

823.5 PAYMENT: Payment for "Directional Boring for Customer's Yard Piping" will be made at the unit price bid for each linear foot of customer's new yard piping or conduit installed. Payment for customer yard piping shall be made under item "Yard piping – directional bore method". When the yard piping is installed in conduit it shall be paid under items 2 inch I.D. PVC conduit – directional bore method, and "yard piping installed in conduit", or items 4 inch I.D. PVC conduit– directional bore method" and yard piping installed in conduit

Such payment shall include excavation, hauling and disposition or surplus material, approved backfill material, removal and replacement of customer's lawn turf and whatever other surface vegetation and surface structure encountered, copper tubing, PVC conduit, and brass fittings or whatever size necessary to complete the tie at the customer's point of connection.

END OF SECTION

SECTION 02 01 28

POLYETHYLENE WRAP

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Polyethylene encasement that is required to comply with AWWA standards and is part of the corrosion protection system for pipe, valves, fittings, and other appurtenances in ductile or cast iron systems.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. **No separate payment will be made for polyethylene wrap. Include cost of polyethylene wrap in unit price for pipes and fittings to be wrapped.**

2. Refer to Measurement and Payment for unit price procedures.

1.3 REFERENCES

A. ASTM D 149 – Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.

B. ASTM D 882 – Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

C. ASTM D 1709 – Standard Test Methods for Impact Resistance of Plastic Film by the Free- Falling Dart Method.

D. ASTM D 1922 – Standard Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method.

E. ASTM D 4976 – Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.

F. ANSI/AWWA C600 – Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.

G. ANSI/AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.

1.4 SUBMITTALS

A. Submittal Procedures: Submit product data in accordance with Section - Submittal Procedures.

B. Product Data: Submit product data for proposed film, and tape or plastic tie straps for approval. All film to be used in accordance with this standard specification will be manufactured from virgin polyethylene, will not be recycled and shall be purchased new for the project, clean, sound and without defects.

C. Samples: Submit samples of polyethylene tube and/or sheet for approval. Provide one sample of tube for each pipe diameter and one sample of each sheet material to be used. Samples will be a minimum of 40 square feet of standard production material.

D. Quality Assurance Plan: Submit quality assurance plans for film manufacturing and field application.

1. Film Manufacturing: The manufacturer of polyethylene film for corrosion protection encasement of ductile iron pipe will have a verifiable quality control system to assure that film is produced from only virgin polyethylene and that it complies with all requirements of this specification. Documentation of Quality Control procedures and test results will be submitted and will be made available for inspection for at least one year subsequent to delivery to job site.

2. Field Application: The contractor will develop, and submit for approval, a comprehensive Quality Assurance Plan for installation of polyethylene encasement. Address all aspects of material and pipe handling, bedding, preparation of pipe surface, film installation and anchoring, service taps and backfill. Include written procedures to be used by installers.

E. Manufacturer’s Certification: Submit polyethylene film manufacturer's certification of compliance with this Section. The polyethylene film manufacturer will provide a notarized statement from an officer of the company that the film meets the inspection and all applicable material specifications of this specification. The manufacturer’s statement of compliance must be verifiable. Statements from distributors or contractors will not be accepted in lieu of a statement from the original manufacturer of the polyethylene film.

F. Installer Qualifications: Polyethylene encasement will only be installed by qualified persons who have been trained in the proper procedures described in Part 3 of these specifications.

Qualified Persons: Qualified persons shall be those that have had training and experience in the installation of polyethylene encasement for corrosion protection of ductile iron pipe. Such persons may be qualified by the Ductile Iron Pipe Research Association, ductile iron pipe manufacturers or engineering/inspection firms who offer training courses in the proper.

G. Method(s) of installation. Proof of qualifications shall be submitted with the shop drawings and shall be provided to project inspectors upon request.

PART 2 PRODUCTS

2.1 MATERIALS

A. Polyethylene Film: Tubular or sheet form without tears, breaks or defects, conforming to the following requirements.

1. High-Density, Cross-Laminated, Polyethylene: High–density, cross-laminated polyethylene film manufactured from virgin polyethylene material conforming to the following:

a. Raw Material. Raw materials to meet the requirements of ASTM D 4976:

1. Group: 2 (Linear)

2. High-density: 0.940 to 0.960 g/cm3

3. Volume resistivity: 1015 ohm-cm, minimum

b. Physical Properties. Physical properties of finished film to be as follows:

1. Tensile Strength: 6,300 psi, minimum in machine and transverse direction (ASTM D 882).

2. Elongation: 100 percent, minimum in machine and transverse direction (ASTM D 882) as measured using rubber lined grips.

3. Dielectric Strength: 800 volts/mil thickness, minimum (ASTM D 149)

4. Impact Resistance: 800 grams, minimum (ASTM D 1709 Method B)

5. Propagation Tear Resistance: 250 grams force, minimum in machine and transverse direction (ASTM D1922)

c. Thickness: High-density, cross-laminated polyethylene film shall have a nominal thickness of 0.004 in. (4 mils) with a minus 10% tolerance. No where shall the film be less than 0.0036 (3.6 mils).

d. Color: Supply white polyethylene film with a minimum 2 percent hindered-amine ultraviolet inhibitor.

e. Polyethylene Tube and Sheet Size: For push-on joint pipe, polyethylene tube and sheet sizes to conform to the following:

Nominal Pipe Diameter	Minimum Polyethylene Width – Inches	
	Flat Tube	Sheet
Inches		
3	14	28
4	14	28
6	16	32
8	20	40
10	24	48
12	27	54
14	30	60
16	34	68
18	37	74
20	41	82
24	54	108
30	67	134
36	81	162

42	81	162
48	95	190
54	108	216
60	108	216
64	121	242

2. Large Bell Circumferences: Where bell ends of the pipe are larger than the sheet sizes listed above, use sufficiently large tubes or sheets to cover the joints

3. Marking: The polyethylene film will be clearly marked every two feet with the following information:

a. Manufacturer's name or trademark

b. Year of manufacture

c. ANSI/AWWA C105/A21.5

d. Minimum film thickness and material type (HDCLPE)

e. Applicable range of nominal pipe diameter size(s)

f. Warning – Corrosion Protection – Repair Any Damage

Letters and numerals used for marking items "a" through "e" shall not be less than 1 inch in height and item "f" shall not be less than 1 1/2 inches in height.

B. Plastic Tape: Provide 1 ½-inch wide, 6 mil thick, PVC tape with 5 mils of PVC backing and 1 mil of rubber adhesive for fitting, anchoring and repairing the encasement.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove lumps of clay, mud, and cinders from pipe surface prior to installation of polyethylene encasement. Prevent soil or embedment material from becoming trapped between pipe and polyethylene.

B. Fit polyethylene film to contour of pipe to effect a snug, but not tight fit; encase with minimum space between polyethylene and pipe. Allow sufficient slack in contouring to prevent stretching polyethylene where it bridges irregular surfaces, such as bell-spigot interfaces, bolted joints, or fittings, and to prevent damage to polyethylene due to backfilling operations. Secure overlaps and ends with adhesive tape to hold polyethylene encasement in place until backfilling operations are complete.

C. For installations below water table or in areas subject to tidal actions, seal both ends of polyethylene tube with adhesive tape at joint overlap. Circumferentially wrap with tape, every two feet along the barrel.

3.2 INSTALLATION

A. Tubular Type (Method A):

1. Cut polyethylene tube to a length approximately 2 feet longer than pipe section. Slip tube around pipe, centering tube to provide 1-foot overlap on each adjacent pipe section. Bunch accordion-fashion lengthwise until it clears pipe ends.

2. Make shallow bell hole at joints to facilitate installation of polyethylene tube completely around pipe. Lower pipe into trench and make up pipe joint with preceding section of pipe. Methods other than bell holes shall be allowed, provided the polyethylene tube completely encases the pipe joints, including a minimum overlap of 1-foot.

3. After assembling pipe joint, make overlap of polyethylene tube. Pull bunched polyethylene from preceding length of pipe, slip it over end of adjoining length of pipe, and secure in place. Then slip end of polyethylene from adjoining pipe section over end of first wrap until it overlaps joint at end of preceding length of pipe. Secure overlap in place.

4. For each pipe length, take up slack width at top of pipe to make a snug, but not tight, fit along barrel of pipe, securing fold with tape at quarter points. Avoid a tight fit to prevent stretching the polyethylene where it bridges irregular surfaces, such as bell and spigot

joints, restrained and bolted joints, and fittings; and to prevent damage to film during backfilling. The length of tape to secure wrap shall be no less than 1-foot.

5. Repair cuts, tears, punctures, or other damage to polyethylene. Proceed with installation of next section of pipe in same manner.

B. Tubular Type (Method B):

1. Cut polyethylene tube to a length approximately 1 foot shorter than pipe section. Slip tube around pipe, centering it to provide 6 inches of bare pipe at each end.

2. Make shallow bell hole at joints to facilitate installation of polyethylene tube completely around pipe. Lower pipe into trench and make up pipe joint with preceding section of pipe. Methods other than bell holes shall be allowed, provided the polyethylene tube completely encases the pipe joints, including a minimum overlap of 1-foot.

3. Take up slack width at top of pipe to make a snug, but not tight, fit along barrel of pipe, securing fold with tape at quarter points. Avoid a tight fit to prevent stretching the polyethylene where it bridges irregular surfaces, such as bell and spigot joints, restrained and bolted joints, and fittings; and to prevent damage to film during backfilling. The length of tape to secure wrap shall be no less than 1-foot.

4. Before making up joint, slip 4-foot length of polyethylene tube over end of preceding pipe section, bunching in accordion-fashion lengthwise. After completing joint, pull 4- foot length of polyethylene over joint, overlapping polyethylene previously placed on each adjacent section of pipe by at least 1 foot; make each end snug and secure.

5. Repair cuts, tears, punctures, or other damage to polyethylene. Proceed with installation of next section of pipe in same manner.

C. Sheet Type (Method C) – Applicable to Valves, Tees, Elbows and Other Fittings Only:

1. Cut polyethylene sheet to a length approximately 2 feet longer than pipe section. Center length to provide 1-foot overlap on each adjacent pipe section, bunching sheet until it clears pipe ends. Wrap polyethylene around pipe so that sheet circumferentially overlaps top quadrant of pipe. Secure cut edge of polyethylene sheet at intervals of approximately 3 feet.

2. Lower wrapped pipe into trench and make up pipe joint with preceding section of pipe. Make shallow bell hole at joints to facilitate installation of polyethylene. After completing joint, make overlap and secure ends.

3. Repair cuts, tears, punctures, or other damage to polyethylene. Proceed with installation of next section of pipe in same manner.

D. Installation in Augured Hole or Directional Drilled Bore:

E. Install as described in 3.02A. Tubular Type (Method A) with the exception that the polyethylene encasement overlap must face away from the pull direction to avoid the under film accumulation of drilling mud and other foreign matter.

F. Attach pulling head to spigot end of the leading pipe length.

G. Securely anchor the polyethylene tube to the end of the barrel of the leading pipe length by continuously taping the leading two feet of the barrel with overlapping tape wrap. Anchor the first wraps of tape directly on to the barrel of the pipe and extend the continuous taping on to the polyethylene encasement. For the remainder of the leading pipe length, overlap circumferential wraps of tape every one foot.

H. The drilling fluid and cuttings shall not enter under the polyethylene tube during the pull back or other operations. At assembled joints, the polyethylene overlap shall always have the forward pipe's polyethylene tube overlap the next following pipe's tube. The polyethylene on both sides of the joint shall be secured with circumferential wraps of tape or plastic tie straps.

I. Continue process by wrapping tape on each side of successive joints and every two feet along barrel.

E. Pipe-shaped Appurtenances: Cover bends, reducers, offsets, and other pipe-shaped appurtenances with polyethylene in same manner as pipe.

F. Odd-shaped Appurtenances: When it is not practical to wrap valves, tees, crosses, and other odd- shaped pieces in tube, wrap with flat sheet or split length of polyethylene tube by passing sheet around appurtenance and encasing it. Make seams by bringing edges together, folding over twice, and taping down. At valve stems and other penetrations, secure polyethylene film with tape.

G. Openings in Encasement: Create openings for branches, saddles, service taps, blowoffs, air valves, and similar appurtenances by making an X-shaped cut in polyethylene and temporarily folding back film. After appurtenance is installed, tape slack securely to appurtenance and repair cut, as well as other damaged area in polyethylene, with tape.

H. Hydrant Drain Relief: For hydrant relief holes and similar orifices, apply 3 wraps of tape completely around the polyethylene encased pipe, then, with a utility knife, cut a hole in the tape and polyethylene that is 1-inch larger in diameter than the orifice/opening.

I. Direct Service Taps: For direct service taps, apply 3 wraps of tape completely around the polyethylene encased pipe to cover the area where the tapping machine and chain will be mounted. After the tapping machine is mounted, install the corporation stop directly through the tape and polyethylene. After the direct tap is completed, the entire circumferential area shall be closely inspected and repaired as needed.

J. Service Connections: Wrap service lines of copper and other dissimilar metals with polyethylene or suitable dielectric tape for a minimum clear distance of 3 feet away from the cast or ductile iron

pipe. Surface preparation and method of application shall follow tape manufacturer's written instructions.

K. Junctions between Wrapped and Unwrapped Pipe: Where polyethylene-wrapped pipe joins an adjacent pipe that is not wrapped, extend polyethylene wrap to cover adjacent pipe for at least 3 feet. Secure end with circumferential turns of tape.

L. Installation of Pipe through Casings: Polyethylene encasement shall be used for pipe through casings. Use a single layer of polyethylene film. Casing spacers (insulated type) and casing end seals shall be installed. Do not damage the polyethylene film where these devices are attached to the pipe, over the encasement.

3.3 REPAIRS

Repair any cuts, tears, punctures, or damage to polyethylene with adhesive tape or with short length of polyethylene sheet or cut open tube, wrapped around pipe to cover damaged area, and secured in place.

3.4 BACKFILL

Use the same backfill material as that specified for pipe without polyethylene wrap. Prevent damage to the polyethylene wrap when placing backfill. Assure backfill material is free from cinders, refuse, boulders, rocks, stones, or other material that could damage the polyethylene. Follow AWWA C600 for backfilling.

3.5 QUALITY ASSURANCE

A. Freedom from Defects: All polyethylene film shall be clean, sound and free from defects.

B. Inspection: All parts of this Section are subject to inspection by the OWNER or its designated representative.

C. Non-Compliance: The Contractor will correct any deficiencies in materials or installation at his expense, including excavating the pipe subsequent to backfilling and re-installing the polyethylene wrap.

END OF SECTION

SECTION 02 01 31

CUT-IN-TEE

SUBSECTION 831

831.1 DESCRIPTION: This item shall consist of cut-in tees (various types and sizes) installed in accordance with these specifications and as directed by the Engineer.

831.2 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.

831.3 MATERIALS: The materials for cut-in tees shall conform to AWWA standards, of latest edition.

831.4 CONSTRUCTION: The work involved in cutting in a tee shall consist of the following: excavation, shutdown and isolation of existing main to which the new main is to be connected, cutting pipe for the connection, dewatering the excavation, customer notification of service interruption where required, installation of all pipe used to complete the connection, all necessary tie-ins (connections to existing or new main), fittings, approved reaction blocking required and backfilling the excavation with approved selected materials or flowable backfill, if required. Where the installation of a valve is required, payment will be made in accordance with, Item No. 828, “Gate Valves.”

The processes associated with disturbing and restoring pavements (any type), curbs, sidewalks, backfilling to final grade, flowable backfill (if required) and sodding for the installation of a cut-in tee will be considered subsidiary to the work and must comply with the applicable TxDOT Specification or City of Brownsville Specifications for Public Works Construction, any other governing entity’s specifications, and applicable street cut policies, ordinances, or permits.

831.5 MEASUREMENT: Cut-in tees will be measured by the unit of each such assembly of the various sizes of tee installed.

831.6 PAYMENT: Payment for cut-in tees will be made at the unit price bid for each assembly of the various types and sizes of tees to be installed. Such payment shall also include; all necessary tie-ins, protective coating materials for bolts, nuts, ferrous surfaces, polyethylene sleeve, where required, and any necessary hauling and disposition of surplus excavated materials.

TAPPING SLEEVES AND VALVES

SUBSECTOIN 832

832.1 DESCRIPTION: This item shall consist of tapping sleeves and valves installed in accordance with these specifications and as directed by the Engineer. The use of size on size taps shall not be permitted. Only cut-in tees shall be used within the system, unless otherwise approved.

832.2 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.

832.3 MATERIALS: The materials for tapping sleeves and valves shall conform to AWWA standards, of latest edition.

832.4 CONSTRUCTION: The installation work involved in tapping sleeves and valves shall consist of: excavation, backfilling the excavation with approved selected material, tapping sleeve, approved reaction blocking conforming to Standard Drawing DD-839, tapping valve, valve box assembly, concrete collar (where subjected to street traffic), and cast iron lid. New taps will not be permitted closer than 2 feet of a joint or existing tap. The use of a shell-type cutter shall be required when tapping sleeves and valves. Whenever working on potable or recycle water systems, the shell cutter shall be disinfected with bleach prior to the start of work. The cutting edge shall be sharp and round. Any defective cutters shall be rejected by the Inspector.

All the tapping sleeves shall be air tested to 50 psi prior to tapping the main line.

The valve box shall be placed in such a manner to prevent shock or stress from being transmitted to the valve. Valve boxes shall be centered over the valve’s operating nut with the box cover flush with the finished pavement surface or located at another level as directed by the Inspector. Valve boxes located in streets or other areas subject to vehicular traffic shall be provided with concrete collars as shown in the accompanying standard drawings. Collars around such valve boxes shall be formed and finished off neatly and in a sound workmanlike manner.

832.5 MEASUREMENT: Tapping Sleeves, Valves, and Boxes will be measured by the unit of each such assembly of the various sizes of tapping sleeves, valves and boxes approved and installed.

832.6 PAYMENT: Payment for Tapping Sleeves and Valves, complete with boxes, will be made at the unit price bid for each such assembly of the various types and sizes of valves and valve boxes installed and approved. Such payment shall also include: excavation, selected embedment material, anti-corrosion embedment when specified, hauling, and disposition of surplus excavated material, backfill, concrete collar at the valve box where subjected to vehicular traffic, ductile iron riser pipe, cast iron boot, packing, tar paper, concrete grout, concrete reaction blocking, protective coating material for bolts, nuts, and ferrous surfaces, and polyethylene sleeve, where required.

END OF SECTION

SECTION 02 01 39

THRUST BLOCKING AND JOINT RESTRAINT

SUBSECTION 839

839.1 DESCRIPTION: This item shall consist of anchorage/thrust blocking installation and adjustment, in accordance with these specifications and as directed by the Engineer. Pipe restraint devices shall be installed according to the lengths prescribed herein or as noted in the contract documents, whichever is more restrictive.

839.2 MATERIALS: The materials for anchorage/thrust blocking installation shall conform to the appropriate AWWA standards and design manuals, of latest edition.

839.3 CONSTRUCTION: Suitable anchorage/thrust blocking or joint restraint shall be provided at all of the following main locations: dead ends, plugs, caps, tees, crosses, valves, and bends, in accordance with the Drawings. All mechanical (joint) restraints shall be bidirectional. Anchor blocks shall be constructed solidly behind the fitting and symmetrical with the axis of resultant thrust, except where this is not possible as in the case of gravity anchorage for vertical bends. Special ties and anchor fittings may be utilized in conjunction with blocking when shown in the contract documents or as directed by the Engineer.

All thrust blocking shall be a minimum of 3,000 psi concrete placed between solid ground and the fitting except as otherwise shown in the contract documents. The area of bearing in contact with solid ground shall be that shown in the contract documents or as directed by the Engineer.

The design of thrust blocking shall be of sufficient size to withstand an assumed soil lateral load bearing capacity of 3,000 psf, unless specified otherwise in the contract documents. When specifically requested by the Contractor and approved by the Engineer, the maximum soil lateral load bearing capacity that will be allowed for the design of thrust blocking shall be 5,000 psf. When soil lateral load bearing capacities of 4,000 psf or 5,000 psf are recorded for design of thrust blocks, copies of soil tests made for determining the lateral load bearing capacity of the subject soil shall be submitted to the Engineer for approval.

The blocking shall be placed so that pipe and fitting joints will be accessible.

Pipe polywrap shall be placed between the pipe or fitting and the concrete.

The reaction block on the unused branch of a fitting shall be poured separately from the block across the back of the fitting. If they are poured simultaneously, a rigid partition shall be placed between the blocks.

Valves 12 inches or larger in size shall be supported on a concrete pad extending vertically from 12 inches below the bottom of the valve to the lower quarter point of the hub and laterally from face to face of hubs and transversely from wall to wall of the trench.

839.4 MEASUREMENT: Anchorage/Thrust Blocking or Joint Restraints are considered subsidiary to the work and no separate payment will be made to the Contractor for this work.

839.5 PAYMENT: **Anchorage/Thrust Blocking or Joint Restraints are considered subsidiary to the work and no separate payment will be made to the Contractor for this work.**

END OF SECTION

SECTION 02 01 40

WATER TIE-INS

SUBSECTION 840

840.1 DESCRIPTION: This item shall consist of water main tie-ins installed in accordance with these specifications and as directed by the Engineer.

840.2 MATERIALS: The materials for water main tie-ins shall conform to AWWA standards, of latest edition.

840.3 CONSTRUCTION: The Contractor shall make tie-ins from new water mains to existing water mains as shown in the contract documents or as directed by the Engineer. The Contractor shall be responsible for cutting pipe for the connection; dewatering the excavation; customer notification of the shutdown; and all other requirements as directed by the Inspector in order to provide completion of this effort in a safe and secure manner. Work performed by the Contractor will require water main isolation and operation of valves by OWNER crews. Therefore, ample coordination beforehand (2 work days) shall be provided by the Contractor for this interaction to occur. All tie-ins shall be done after normal work hours, (8am-5pm). During construction, the planned shutdown and tie-in work shall be coordinated through and approved by the Inspector with a minimum of two weeks' prior notice of such activity and accomplished at a time which will be at the least inconvenience to the customers. No additional compensation will be provided for tie-ins accomplished after normal working hours.

840.4 MEASUREMENT: Tie-ins will be measured by the unit of each such assembly of the various sizes of tie-ins installed at the proposed main to be accepted.

840.5 PAYMENT: **Payment for "Tie-ins" will be made at the unit price bid for each tie- in of the various types and sizes completed from an existing main to the proposed main to be accepted.** Such payment shall include; shut-down and isolation of the existing main to which the new main is to be connected, cutting pipe for the connection, dewatering the excavation, and customer notification of service interruption where required. **Connections between new and existing mains which are made with tapping sleeves and valves and by cutting-in tees will be processed as a no separate pay item.**

END OF SECTION

SECTION 02 01 50

VALVES

PART 1 - GENERAL

1.01 SUMMARY

A. Furnish and install valves as shown on PLANS and as specified herein.

1.02 RELATED REQUIREMENTS

A. PLANS indicate sizes, working pressures, type operator, and operating conditions for sizing operators.

B. Related work as called for on PLANS or specified in this or other TECHNICAL SPECIFICATION sections.

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
   1. American National Standards Institute (ANSI)
      a. ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings
   2. American Society For Testing And Materials (ASTM)
      a. ASTM A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
      b. ASTM A276, Standard Specification for Stainless Steel Bars and Shapes
      c. ASTM A351, Standard Specification for Castings Austenitic, Austenitic-Ferritic (Duplex), for Pressure Containing Parts
      d. ASTM A536, Standard Specification for Ductile Iron Castings
      e. ASTM A582, Standard Specification for Free-Machining Stainless Steel Bars
      f. ASTM 0429, Standard Test Methods for Rubber Property - Adhesion to Rigid Substrates
      g. ASTM 01784 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
      h. ASTM 02000, Standard Classification System for Rubber Products in Automotive Applications
   3. American Water Works Association (AWWA)
      a. AWWAC500, Metal-Seated Gate Valves for Water Supply Service
      b. AWWAC504, Rubber-Seated Butterfly Valves
      c. AWWAC508, Swing-Check Valves for Waterworks Service
      d. AWWAC509, Resilient-Seated Gate Valves for Water Supply Service
      e. AWWAC511, Reduced-Pressure Principle Backflow-Prevention Assembly
      f. AWWAC540, Power-Actuating Devices for Valves and Sluice Gates
      g. AWWAC550, Protective Epoxy Interior Coatings for Valves and Hydrants
      h. AWWAC606, Grooved and Shouldered Joints
      i. AWWAC110/A21.1, Ductile-Iron and Gray-Iron Fittings
   4. American Society of Sanitary Engineers (ASSE)

a. ASSE Standard 1011, Performance Requirements for Hose Connection Vacuum Breakers

5. Manufacturers Standardization Safety of the Valve And Fittings Industry (MSS)
   a. MSS SP-81, Stainless Steel, Bonnetless, Flanged Knife Gate Valves

1.04 SUBMITTALS

A. Furnish in accordance with Specifications Section 01300, "Submittals" and Section 01782, "Operation and Maintenance Data".
   1. Shop Drawings. In addition to the items specified in Section 01300, "Submittals", furnish the following:
      a. Product data sheets for make and model.
      b. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
      c. Power and control wiring diagrams, including terminals and numbers.
      d. Complete motor nameplate data.
      e. Sizing calculations for open-close/throttle and modulating.
   2. Operation and Maintenance Manuals.
   3. Certifications:
      a. Certificate of Compliance for:
         1) Electric operators; full compliance with AWWA C540.
         2) Butterfly valves; full compliance with AWWA C504.
      b. Tests and inspection data.
      c. Manufacturer's Certificate of Proper Installation.

1.05 QUALITY ASSURANCE

A. Standardization: All like equipment to be obtained from single manufacturer.

B. System Coordination: CONTRACTOR is responsible for all details necessary to properly install, adjust, and place in operation working systems.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, unload and store products on site in manner that prevents damage. Use special care to prevent damage from temperature and condensation.

B. Flanges to be protected by wooden blank flange protectors, strongly built and securely bolted thereto, or otherwise attached.

1.07 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

PART 2 - PRODUCTS

2.01 GENERAL

A. Valve to include operator, actuator, hand wheel, chain wheel, extension stem, floor stand, worm and gear operator, operating nut, chain, wrench, and accessories for a complete operation.

B. Valve to be suitable for intended service. Renewable parts not to be of a lower quality than specified.

C. Valve same size as adjoining pipe.

D. Valve ends to suit adjacent piping.

E. Size operator to operate valve for the full range of working pressures indicated on applicable schedules.

F. Valve to open by turning counterclockwise.

G. Factory mount operator, actuator, and accessories.

2.02 FACTORY FINISHING

A. Epoxy Lining and Coating:
   1. Use where specified for individual valves described herein.
   2. In accordance with AWWA C550 unless otherwise specified.
   3. Either two-part liquid material or heat-activated (fusion) material except only heat activated material if specified as "fusion" or "fusion bonded" epoxy.
   4. Minimum 7-mil dry film thickness except where limited by valve operating tolerances.

B. Exposed Valves: In accordance with Section 09902, "Painting and Protective Coatings".

C. Buried Valves: In accordance with Section 09902, "Painting and Protective Coatings".

2.03 VALVES

A. Gate Valves:
   1. Type V1 00 Gate Valve, 3-lnch and Smaller: All-bronze, union bonnet, single solid wedge gate, non-rising stem, rated 125-pound SWP, 200-pound WOG.
      a. Manufacturers and Products:
         1) Stockham; B115, threaded end, union bonnet.
         2) Crane; 426, threaded end, union bonnet.
         3) Stockham; B104, soldered end. (Plumbing Service Only.)
         4) Crane; 1324, soldered end. (Plumbing Service Only.)
   2. Type V108 Gate Valve, 2-lnch and Larger: Iron body, bronze mounted, flanged ends, solid wedge gate, non-rising bronze stem, rated 125-pound SWP, 200-pound WOG.
      a. Manufacturers and Products:
         1) Stockham; Figure G612.
         2) Walworth; W719F.
         3) Crane; Figure No. 461.
   3. Type V110 Gate Valve, 2-lnch and Larger: Iron body, bronze mounted, flanged ends, solid wedge gate, outside screw and yoke, rated 125-pound SWP, 200-pound WOG.
      a. Manufacturers and Products:
         1) Stockham; Figure G623.
         2) Walworth; Figure W726F.
         3) Crane; Figure No. 465-1/2.
   4. Type V120 Gate Valve, 3-lnch to 48-lnch, Double Disc Gate Valve, Iron body, Bronze mounted:

a. AWWAC500.
b. Iron body, bronze mounted, flanged ends, double disc gate, non-rising bronze stem.
c. Bonnets: Bolted.
d. Body-seat Rings: Grade A bronze, replaceable.
e. Disc-spreading Device: Bronze.
f. Stem Seal: Stuffing box or chevron V-packing.
g. Roller and Tracks: Equip valves in horizontal pipes 16-inch and larger with horizontal stem with bronze roller, tracks, and scrapers.
h. Face Tracks (Slides): Equip valves in vertical pipes 16-inch and larger with face tracks to provide reliable operation in vertical pipe configuration. As an alternate to face tracks, a resilient seated gate valve, (AWWA C509) is acceptable provided that the valve manufacturer certifies in writing that the valve will provide smooth reliable operation in a vertical pipe with the specified working pressure applied at the top of the disc.
i. Fully enclosed gear cases, unless noted otherwise.
j. Manufacturers and Products
    1) Ludlow Rensselaer
    2) M&H Valve
    3) American Flow Control
    4) Clow

5. Type V124 Gate Valve, 16-lnch and Larger, AWWA C500 Valves for Buried Water Service:
    a. Ductile or Cast Iron body, bronze mounted cast iron discs, replaceable bronze seat rings, flanged ends, bolted bonnets, double disc gate, non-rising bronze stem, rated for 150 psi, working water pressure, 125 psi ANSI B16.1 drilling.
    b. Operator:
        1) Wrench nuts or Pedestal Operator per Valve Schedule.
        2) Steel Bevel or Spur gear with bronze pinion shaft and bronze bearings.
        3) Grease packed gear case enclosing gears and stuffing box.
        4) Bypass valve.
        5) Bronze Roller tracks and Scrappers for valves with horizontal stems.
    c. Manufacturer and Products:
        1) Mueller Co.; A-2330
        2) M&H Valve; Style 67
        3) Clow Corp; List 14
        4) Kennedy Valve Div.; AWWA 200-W
        5) US Pipe & Foundry Co.; 16-36 Metropolitan
        6) American RID Valve Co., 50 Line
6. Type V130 Resilient Seated Gate Valve, 3-lnch to 20-lnch:
    a. Iron body, resilient seat, bronze mounted, flanged ends, non-rising stem in accordance with AWWA C509, rated 200 psi cold water, full port, fusion epoxy-coated inside and outside.
    b. Coating to meet requirements of AWWA C550.
    c. Manufacturers and Products:
        1) Clow; RIW(4"-12")

2) Mueller Co.; Series A-2360
3) U.S. Pipe & Foundry Co.; Metroseal 250 (4"-16")
4) American Flow Control; AFC-500 Series (4"-12")
5) American Avk Co.; RIW (4"-12")
6) Kennedy Valve; (4"-12")
7) M&H Valve; (4"-12")

7. Type V132 Resilient Seated Gate Valve, 3-lnch to 20-lnch, for Buried Service:
   a. Iron body, resilient seat, bronze mounted, mechanical joint ends, non-rising stem in accordance with AWWA C509, rated 200 psi cold water, full port, fusion epoxy-coated inside and outside.
   b. Coating in accordance with AWWA C550.
   c. Manufacturers and Products:
      1) Clow; RIW (4"-12")
      2) Mueller Co.; Series A-2360
      3) U.S. Pipe & Foundry Co.; Metroseal250 (4"-16")
      4) American Flow Control; AFC-500 Series (4"-12")
      5) American Avk Co.; RIW (4"-12")
      6) Kennedy Valve; (4"-12")
      7) M&H Valve; (4"-12"), Style 4067 or 4068

B. Plug Valves:
   1. Type V406 Eccentric Plug Valve, 4-lnch to 48-lnch
      a. Non-lubricated type rated 150 psig CWP, drip-tight shutoff with pressure from either direction, cast iron body with flanged ends in accordance with AWWA C606 for rigid joints, mechanical joints where shown, plug cast iron with round or rectangular port of no less than 80 percent of connecting pipe area and coated with Buna-N or Hycar, seats welded nickel, stem bearing self-lubricating stainless steel or reinforced Teflon, stem seal multiple V-rings, U-cups, or a-rings of nitrite rubber, grit seal on stem.
      b. Operator: Totally enclosed, geared, manual with hand wheel, 2-inch nut, chain wheel or electric operator.
      c. Manufacturers and Products:
         1) DeZurik; Style PEC Series 100.
         2) Clow; F-5400 Series (24" only).
         3) Milliken; Millcentric Series 600.

C. Check and Flap Valve:
   1. 1. Type V600 Check Valve, 2-lnch and Smaller:
      a. All-bronze, threaded ends and cap, swing type replaceable Buna-N disc, rated 125-pound SWP, 200-pound WaG.
      b. Manufacturers and Products:
         1) Stockham; Figure 3208.
         2) Milwaukee; Figure 510.
   2. Type V604 Check Valve, 2%-lnch to 12-lnch:
      a. Flanged end, cast iron body, bronze mounted swing type, solid bronze hinges, stainless steel hinge shaft, rated 125-pound SWG, 200-pound WOG.
      b. Manufacturers and Products:

1) Stockham G-931; List 37, Clearway check valve.
2) Crane Co.; Cat. No. 373.

3. Type V606 Check Valve, 2%-lnch to 12-lnch:
   a. Flanged end, cast iron body, bronze mounted swing type, solid bronze hinges, stainless steel hinge shaft, outside lever and weight, rated 125-pound SWP, 200-pound WOG.
   b. Manufacturers and Products:
      1) Stockham; G-931.
      2) Crane Co.; Cat. No. 383.
4. Type V608 Swing Check Valve, 2-lnch to 36-lnch:
   a. AWWA C508, flanged end, cast iron body, bronze mounted valve, solid bronze hinges, stainless steel hinge shaft.
   b. Valve, 2-inch through 12-inch rated 175-pound and 14-inch through 36-inch rated 150-pound cold water, non-shock. Valve fitted with adjustable outside lever and weight. Increasing-pattern body valve may be used where increased outlet piping size is shown.
   c. Manufacturers and Products:
      1) M&H Valve; Style 59, 159, or 259.
      2) American-Darling; No. 50 Line.
5. Type V690 Flap Gate:
   a. Cast iron body, bronze mounted, flanged frame type, dual pivot-point hinge arms, hinge arms bronze, hinge pins Type 304 stainless steel, seat bronze and impacted into grooves in body and cover flap, lubrication fittings for each pivot, Type 316 stainless steel anchor bolts or cast iron wall thimble.
   b. Shop coat embedded surfaces of thimble as specified in Section 09902, "Painting and Protective Coatings" for submerged surfaces.
   c. Manufacturers and Products:
      1) Rodney Hunt Co.; Series FV-AC or FV-AR, Orange, MA.
      2) Waterman Industries, Inc.; Model F-20.
6. Type V692 Flap Valve, 4-lnch to 16-lnch:
   a. Flanged frame, iron body, fully bronze mounted with bronze hinge pin and seat.
   b. Manufacturers and Products:
      1) Waterman; PF-25.
      2) Clow; No. F-3012.

2.04 OPERATORS

A. Manual Operator:
   1. 1. General:
      a. Operator force not to exceed 40 pounds under any operating condition, including initial breakaway. Gear reduction operator when force exceeds 40 pounds.
      b. Operator self-locking type or equipped with self-locking device.
      c. Position indicator on quarter-turn valves.
      d. Worm and gear operators one-piece design worm-gears of gear bronze material. Worm hardened alloy steel with thread ground and polished. Traveling nut type operators threader steel reach rods with internally threaded bronze or ductile iron nut.

2. Exposed Operator:
    a. Galvanized and painted hand wheels.
    b. Lever operators allowed on quarter-turn valves 8-inch and smaller.
    c. Cranks on gear type operators.
    d. Chain wheel operator with tiebacks, extension stem, floor stands, and other accessories to permit operation from normal operation level.
    e. Valve handles to take a padlock, and wheels a chain and padlock.

2.05 ACCESSORIES

A. Limit Switches for Manual Valves:
1. Provide for the manual valves as listed on Valve Schedule in Drawings.
2. Factory installed limit switches to be installed on the valve by valve manufacturer.
3. Provide two SPDT switches one for the valves fully OPEN and one for fully CLOSED position. Provide each assembly with two 5-amp, 125V AC switches. Switches shall be actuated by a position indicator mechanism.
4. Valve shall also be provided with local position indication.
5. Limit switches shall be provided standard with NEMA 4X enclosure. Where Class I, Group C and D, Division I and II areas are indicated on the schedule provide suitable enclosures.
6. Limit switches shall be valve manufacturer standard.

B. Extension Bonnet for Valve Operator: Complete with stem and accessories for valve and operator.
1. Manufacturers and Products:
    a. Pratt.
    b. Allis-Chalmers.

C. Floor Stand and Extension Stem:
1. Non rising, indicating type.
2. Complete with stem, coupling, hand wheel, stem guide brackets, and yoke attachment.
3. Stem Guide: Space such that stem L1R ratio does not exceed 200.
4. Anchor Bolts: Type 304 SST.
5. Manufacturers and Products:
    a. Clow; Figure F-5515.
    b. Mueller, Figure A-26426.

D. Floor Box and Stem:
1. Plain type, for support of non-rising type stem.
2. Complete with stem, operating nut, and stem guide brackets.
3. Stem Guide: Space such that stem L1R ratio does not exceed 200.
4. Anchor Bolts: Type 304 SST.
5. Manufacturers and Products:
    a. Neenah Foundry; R 7506.
    b. Clow; No. F5690.

E. Chain Wheel and Guide:
1. Hand wheel direct-mount type.

2. Complete with chain.
3. Galvanized or cadmium-plated.
4. Manufacturers and Products:
    a. Clow Corp.; Figure F-5680.
    b. Walworth Co.; Figure 804.
    c. DeZurik Corp.; Series W or LWG.

F. Cast Iron Valve Box: Provide per details on Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Flange Ends:
1. Flanged valve bolt holes shall straddle vertical centerline of pipe.
2. Clean flanged faces, insert gasket and bolts, and tighten nuts progressively and uniformly.
3. Orient all bolts and nuts in same direction to provide an orderly installation.
4. Provide threaded bolts or threaded rod of size, length and materials as recommended by the valve manufacturer where required to connect flange piping or fittings to valve. Threaded rods or studs shall be installed in the valve before connecting the valve to pipe or fitting where required to install the valve. (Example: Bolts on the inside of a 90-bend when bolted to a plug valve.)

B. Threaded Ends:
1. Clean threads by wire brushing or swabbing.
2. Apply joint compound.

C. Valve Orientation:
1. Install operating stem vertical when valve is installed in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above finished floor, unless otherwise shown.
2. Install operating stem horizontal in horizontal runs of pipe having centerline elevations between 4 feet 6 inches and 6 feet 6 inches above finish floor, unless otherwise shown.
3. Orient butterfly valve shaft so that unbalanced flows or eddies are equally divided to each half of the disc, i.e., shaft is in the plane of rotation of the eddy.
4. If no plug valve seat position is shown, locate as follows:
    a. Horizontal Flow: The flow shall produce an "unseating" pressure, and the plug shall open into the top half of valve.
    b. Vertical Flow: Install seat in the highest portion of the valve.

D. Locate valve to provide accessibility for control and maintenance. Install access doors in finished walls and plaster ceilings for valve access.

E. Extension Stem for Operator: Where the depth of the valve is such that its centerline is more than 3 feet below grade, furnish an operating extension stem with 2-inch operating nut to bring the operating nut to a point 6 inches below the surface of the ground and/or box cover.

F. Torque Tube: Where operator for quarter-turn valve is located on floor stand, furnish extension stem torque tube of a type properly sized for maximum torque capacity of the valve.

G. Floor Box and Stem: Steel extension stem length shall locate operating nut in floor box.

H. Chain Wheel and Guide: Install chain wheel and guide assemblies or chain lever assemblies on manually operated valves over 6 feet 6 inches above finished floor. Where chains hang in normally traveled areas, use appropriate "L" type tie-back anchors.

3.02 TESTS AND INSPECTION

A. Valve may be either tested while testing pipelines, or as a separate step.

B. Test that valves open and close smoothly with operating pressure on one side and atmospheric pressure on the other, in both directions for two-way valve and applications.

C. Inspect air and vacuum valves as pipe is being filled to verify venting and seating is fully functional.

D. Count and record number of turns to open and close valve; account for any discrepancies with manufacturer's data.

E. Set, verify, and record set pressures for all relief and regulating valves.

F. Automatic valve to be tested in conjunction with control system testing.

G. Test hydrostatic relief valve seating; record leakage. Adjust and retest to maximum leakage of 0.1 gpm per foot of seat periphery.

3.03 MANUFACTURER'S FIELD SERVICES

A. Provide manufacturer's field services as described herein.

B. Manufacturer's Services and Certificate of Proper Installation: Provide Manufacturer's Services and Manufacturer's Certificate of Proper Installation. Manufacturer’s representation shall provide supervision of equipment installations, field inspection of equipment before startup and the executed copies Manufacturers Services and Certificate of Proper Installation.

C. Provide a minimum of 1/2 person-day and 1 trip for CONTRACTOR assistance for installation assistance, startup assistance, functional and/or performance testing, and completion of Manufacturer's Certificate of Proper Installation.

D. Provide a minimum of 1/2 person-day and 1 trip for OWNER training at OWNER's request.

E. The person days and trips provided by the manufacturer shall be provided for each valve type and operator that requires routine maintenance beyond scheduled exercising of the unit.

END OF SECTION

SECTION 02 01 51
BUTTERFLY VALVES

PART 1 - GENERAL

1.01 SECTION INCLUDES

1. Butterfly valves

1.02 REFERENCES

1. ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
2. ASTM A 126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
3. AWWA C 504 - Standard for Rubber-Seated Butterfly Valves.
4. AWWA C 550 - Standard for Protective Interior Coatings for Valves and Hydrants.

1.03 MEASUREMENT AND PAYMENT

1. Measurement:
   a. The Butterfly Valve shall be measured complete in place and the quantity shall be computed for payment per each.
2. Payment:
   a. This work performed and materials furnished in accordance with this Section will be paid for at the unit price bid for Butterfly Valve of the sizes and type specified.

1.04 SUBMITTALS

1. Conform to requirements of Section 01300 - Submittals.
2. Submit manufacturer's product data for proposed valves and actuators for approval.
3. Submit manufacturer's affidavit for proposed valves and actuators certifying compliance with specifications.
4. Submit manufacturer's affidavit that butterfly valves were manufactured in the United States, and conform to applicable requirements of AWWA C 504 and that they have been satisfactorily tested in the United States in accordance with AWWA C 504 using test pressure of 150 psi in both directions. Submit Proof-of-Design and hydrostatic testing procedure in accordance with AWWA C 504.
5. Submit manufacturer's affidavit that coating for interior surfaces of valves conform to applicable requirements of AWWA C 550. Submit results of holiday test and thickness measurements of coatings.
6. Furnish, at time of delivery, affidavit of compliance, as specified in Section 6.3 of AWWA C 504 certifying compliance with applicable portion of AWWA C 504 and modification or supplements herein. Furnish certified drawings and material test records by manufacturer covering items included in Section 4.3 of AWWA C 504, for review. Furnish certified copies of test reports covering items in Sections 4.5.8.5.5, 4.5.8.5.8, and 5.2.1 through 5.2.4.3 of AWWA C 504 for review.

7. Submit data indicating maximum torque required to open valve, maximum torsional strength of shaft and torque output of actuator.
8. Include number of turns to operate valves to fully open/closed.

1.05 QUALITY CONTROL

1. Perform valve leakage tests in both directions at 150 psi in factory and field. Hydrostatic field tests of 150 psi shall be made against dished head plug or similar arrangement.
2. For purposes of interpreting referenced AWWA tests, the following shall apply: Shutoff pressure is 150 psi; cycle consists of rotating disc from fully opened to fully closed position, for valves larger than 72 inches, proof of design shall require 1,000 cycles and shall be performed on valve greater than 72 inches of like design and construction. When proof of design tests are performed on valve delivered to job site, replace disc, bushing, shaft and seals with new and unused items, and test and certify as described above.
3. Hydrostatic Testing by Manufacturer:
   a. Hydrostatic testing to be performed prior to shipment of valves. Provide minimum 4 weeks' notice to Owner or Owner's Representative for optional witness testing. When possible, maximize number of valves to be tested during a plant visit. Expenses for visits by Owner or Owner's Representative for defective valves, improper scheduling, or valve failures are to be paid by Contractor. Witness of hydrostatic testing by Owner or Owner's Representative will only be in regards to compliance with this specification and will not constitute approval by Owner or Owner's Representative nor relieve Contractor of obligations to comply with contract documents.
   b. Document serial number on valve at time of testing and reflect in certified test records furnished to Owner or Owner's Representative. Identification plate must be permanently affixed to valve and actuator prior to hydrostatic testing.
   c. Hydrostatic testing to conform to AWWA C504 except as modified below:
      i. Install actuator prior to hydrostatic testing. Test actuator to verify actual number of turns match manufacturer's published number of turns. Verify valve stops are in correct positions.
      ii. Fully open and close valve prior to performing shell test and prior to each leakage test.
      iii. Perform shell test first.
      iv. When tested with water, adequately dry seat and disc.
      v. When tested with air, fill top of valve with water to aid in viewing possible leakage.
      vi. Pressure Gauges: Calibrated within past 12 months; 0-500 psi range in increments of 5 psi, present calibration certificates prior to hydrostatic testing.
      vii. If seat adjustment is required during hydrostatic testing, perform valve leakage test again in both directions. Once seat adjustment is made, fully open and fully close valve three (3) times, and repeat leakage test.
   d. Field Testing
      i. When valve arrives at the job site, Contractor is to operate valve fully open and closed twice in presence of Owner or Owner's Representative. Document number of turns to open and close each time.
      ii. Install operator nut plum.

iii. After valve is installed, repeat the operation test and document number of turns in presence of Owner or Owner's Representative.

iv. Manufacturer's representative must be present to witness the operation test again at the substantial walk thru. Verify valve operate fully open/closed twice at the appropriate number of turns.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURES

1. Manufacturers: One of the following or equal:
   a. Mueller Co.
   b. Dezurik Water Products.
   c. Crispin K-FLO
   d. GA Industries
   e. ValMatic

2.02 VALVES

1. Butterfly Valves: Conform to AWWA C 504, except as modified or supplemented herein.
2. If type of valve is not indicated on Drawings, use butterfly valves for line valve sizes 24-inch and larger. When type of valve is specified on Drawings, no substitute will be allowed, unless otherwise approved by Engineer.
3. Butterfly valves shall be short-body, flanged design, and installed at locations as shown on Drawings.
4. Direct-bury valves and valves in subsurface vaults shall open clockwise. Above-ground and plant valves shall open counterclockwise.
5. Provide flanged joints when valve is connected to steel or PCCP.

2.03 VALVE CONSTRUCTION

1. Valves: AWWA C 504, Class 150B. Body: Cast iron, ASTM A 126, Class B. Flanges: ASME B 16.1, Class 125 lb.
2. Discs for Butterfly Valves: Either cast iron or ductile iron. Valves greater than 54" in. diameter must utilize flow through disc.
3. Seats: Buna-N or neoprene, and may be applied to disc or body. Seats shall be mechanically secured and may not rely solely on adhesive properties of epoxy or similar bonding agent to attach seat to body. Seats on disc shall be mechanically retained by stainless steel (18-8) retaining ring held in place by stainless steel (18-8) cap screws that pass through rubber seat for added retention. When seat is on disc, seat shall be retained in position by shoulders located on both disc and stainless-steel retaining ring. Mating surfaces for seats: Type 304 or 316, stainless steel and secured to disc by mechanical means. Sprayed-on or plated mating surfaces will not be allowed. Seat must be replaceable in field for valves greater than 30 inches in diameter. Valves with segmented retaining rings will not be accepted.

4. Coat interior wetted ferrous surfaces of valve, including disc, with epoxy suitable for potable water conditions. Epoxy, surface preparation, and epoxy application: In accordance with AWWA C 550 and coating manufacturer's recommendations. Provide three coats of two component, high-build epoxy with minimum dry film thickness of 12 mils. Provide approved epoxy coating. Coatings shall be holiday tested and measured for thickness.

5. Valve shaft and keys: 24 inches in diameter and greater valves require a minimum of two (2) taper pins used for attaching valve shaft to valve disc, use of torque plug for purposes of attaching valve shaft to valve disc is not permitted: Type 316 stainless steel. Shaft Bearings: Stainless steel, bronze, nylon, or Teflon (supported by fiberglass mat or backing material with proven record of preventing Teflon flow under load) in accordance with AWWA C 504. Sinter stainless steel bearing material. Design valve shaft to withstand 3 times amount of torque necessary to open valve.

6. Packing: Self adjusting and wear compensating, full or split ring V-type, and replaceable without removing actuator assembly.

7. Retaining Hardware for Seats: Type 316 stainless steel. Nuts and screws used with clamps and discs for rubber seats shall be held securely with lock tight, or other approved method, to prevent loosening by vibration or cavitational effects.

8. Valve disc shall seat in position at 90 degrees to pipe axis and shall rotate 90 degrees between full-open and tight-closed position. Install valves with valve shafts horizontal and convex side of disc facing anticipated direction of flow, except where shown otherwise on Drawings.

9. For valves utilizing retaining rings, tighten bolts to a uniform torque. Measure torque prior to testing valve.

2.04 VALVE SERVICE MANHOLES

1. For large diameter water lines, provide manholes to dimensions shown on Drawings conforming to requirements of Section 02515 - Precast Concrete Manhole Structures.

PART 3 - EXECUTION

3.01 EARTHWORK

1. Conform to applicable provisions of Section 02317 - Excavation and Backfill for Utilities.

3.02 SETTING VALVES AND VALVE BOXES

1. Prior to Hydrostatic testing of water line and valve:
   a. Test valve by opening and closing valve at a minimum of two times to verify valve seats properly.
   b. Verify number of turns from fully open to fully closed position is same as identified in manufacturer's submittal.
   c. Adjust valve as required if number of turns do not match.
   d. Remove foreign matter from within valves.

2. Install valves where shown on Drawings or as located by Owner or Owner's Representative. Use valve boxes for 16 inch and 24 inch valves. Set valves plumb and as detailed. Center valve boxes on valves. Carefully tamp earth around each valve box for minimum radius of 4 feet, or to undisturbed trench face when less than 4 feet.

3. Avoid disturbing or overstressing valve body when installing valves. Perform field adjustment of valves under pressure to ensure shutoff occurs in number of rotations as described in valves operation and maintenance manual.

4. Attach two four (4) foot lengths of pipe to each side of valve prior to installation in line.

5. Submit certification that large diameter valve was installed, adjusted, and exercised in accordance with manufacturer's instructions. Manufacturer's certification shall state that all performance characteristics of large diameter valves, as installed, have been met. Adjustments made to valve, for any reason, must be made by manufacturer's representative.

3.03 DISINFECTION AND TESTING

1. Contractor to disinfect valves and appurtenances as required by Section 02511 – Water Lines and Section 02227 - Hydrostatic Tests for Pressure Mains. Do not use valves for throttling without prior approval of manufacturer.

3.04 COATING OF PIPING

1. Coat valves located in vaults, stations, and above ground using ACRO Paint No. 2215, or approved equal. Minimum of two (2) coats shall be applied with minimum of three (3) mil thickness. Apply coating in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 02 01 52

AIR RELEASE AND VACUUM RELIEF VALVES

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Air release and vacuum relief valves.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for air release and vacuum relief valves is on unit price basis for each valve installed.

2. Payment includes manhole or vault (when required), fittings, vent piping and bollard(s) and appurtenances necessary for complete installation of valve.

3. Payment for valve assembly on aerial crossing includes fittings, anti-vandalism protection, freeze protection, vent piping and appurtenances necessary for complete installation of valve.

4. Refer to Measurement and Payment for unit price procedures.

1.3 REFERENCES

A. ASTM A 48 - Standard Specification for Gray Iron Castings.

B. ASTM A 126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

C. ASTM A 240 - Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels.

D. ASTM A 276 - Standard Specification for Stainless Steel Bars and Shapes.

E. ASTM A 313 - Standard Specification for Stainless Steel Spring Wire.

F. ASTM B 584 - Standard Specification for Copper Alloy Sand Castings for General Applications.

1.4 SUBMITTALS

A. Conform to requirements of Submittal Procedures.

B. Submit manufacturer's product data for proposed valves for approval.

PART 2 P R O D U C T S

2.1 DESCRIPTION

A. Provide combination air valves designed to fulfill functions of air release (permit escape of air accumulated in line at high point of elevation while line is under pressure) and vacuum relief.

B. Provide inlet and outlet connections, and orifice as shown on Drawings.

1. Valve exterior: Painted with shop-applied primer suitable for contact with potable water.

2.2 MATERIALS

A. Air Release Valves: Provide approved air release valves ASTM A 48, Class 30, cast iron; float and leverage mechanism with body and cover, ASTM A 240 or ASTM A 276 stainless steel; orifice and seat, stainless steel against Buna-N or Viton mechanically retained with hex head nut and bolt. Other valve internals shall be stainless steel or bronze.

B. Air Release and Vacuum Relief Valves: Provide single-body, standard combination valves or duplex-body custom combination valves as indicated on Drawings.

1. For 2 inch and 3 inch, single-body valves, provide inlet and outlet size as shown on Drawings and orifice sized for 100 psi working pressure.

a. Valve materials: body, cover, and baffle, ASTM A 48, Class 35, or ASTM A 126, Grade B cast iron; plug or poppet, ASTM A 276 stainless steel; float, ASTM A 240 stainless steel; seat, Buna-N; other valve internals, stainless steel.

2. For 3 inch and larger duplex body valves as shown on Drawings, provide approved air release valve.

a. Air and vacuum valve materials: body and cover, ASTM A 126, Class B, cast iron; float, ASTM A 240 stainless steel; seat, Type 304, stainless steel and Buna-N, for sanitary sewer, Garlock #3000 (non-asbestos),for water lines; other valve internals, stainless steel or bronze (for sanitary sewer).

b. Air release valve: Constructed as specified in paragraph above on Air Release Valves.

C. Vacuum Relief Valves: Provide approved air inlet vacuum relief valves with flanged inlet and outlet connections as shown on Drawings. Provide air release valves in combination with inlet and outlet, and orifice as shown on Drawings. Valve shall open under pressure differential not to exceed 0.25 psi.

1. Materials for vacuum relief valves: valve body, ASTM A 48, Class 35, cast iron; seat and plug, ASTM B 584 bronze, copper alloy 836; spring, ASTM A 313, Type 304, stainless steel; bushing, ASTM B 584 bronze, copper alloy 932; retaining screws, ASTM A 276, Type 304, stainless steel.

D. Additional Requirements for Wastewater Applications:

1. Air Release/Vacuum Relief Valves shall have a minimum seating pressure of 0 psi through a maximum operating pressure of 250psi

2. Valve bodies shall be constructed of 316Ti stainless steel.

3. The valves shall have an internal debris shield and debris screen or an alternative mechanism to prevent clogging of the orifice.

4. Rubber components used shall be suitable for wastewater application

D. Manholes: As shown on Drawings conforming to requirements of Precast Concrete Manholes.

PART 3 E X E C U T I O N

3.1 EARTHWORK

A. Conform to applicable provisions of Excavation and Backfill for Utilities.

3.2 SETTING VALVES IN MANHOLES AND VAULTS

A. If required by Project Manager, provide services of technical representative of valve manufacturer available on site during installation of valves.

B. Prior to installing valves, remove foreign matter from within valves. Inspect valves in open and closed position to verify that parts are in satisfactory working condition.

C. Install valves and valve manholes and vaults where indicated on Drawings or as located by Project Manager. Set manholes and vaults plumb and as detailed. Center manholes on valves. Compact cement-stabilized sand around each manhole and vault for minimum radius

of 4 feet, or to undisturbed trench face when less than 4 feet. Provide above-ground vents for manholes and vaults as indicated on Drawings.

3.3 DISINFECTION AND TESTING

A. Assist City with disinfection of valves and appurtenances as required by Disinfection of Waterlines and test as required by Hydrostatic Testing of Pipelines.

3.4 PAINTING OF PIPING AND VALVES

A. Paint piping and valves located in manholes, stations, and above ground using approved paint.

END OF SECTION

SECTION 02 01 90

DISINFECTION OF POTABLE WATER FACILITIES

PART 1 – GENERAL

1.1 SUMMARY

A. The disinfection method employed is surface contact with a high-strength chlorine solution for a specific time period. The absence of microbiological contamination in addition to the use of proper disinfection practices is confirmation that the disinfection process has been accomplished in compliance with the specifications.

B. New water facilities, piping, appurtenances, and equipment must be disinfected prior to placing into service.

C. Water facilities, piping, appurtenances, and equipment that are disturbed during the process of completing the scope of this project or any other event causing potential contamination must be disinfected prior to returning to service.

D. This specification describes standards and methods of disinfecting new water facilities, piping, appurtenances, and equipment.

E. Furnish all labor and materials required and disinfect the potable water facilities, piping, appurtenances, and equipment.

F. The potable water facilities include, but are not limited to, the following:

1. Piping which is designated to carry either Potable Water (PW) or Service Water (SRW)
2. Unless specifically noted otherwise, all new water piping and appurtenances such as valves, fittings, hydrants, pumps, etc. shall be disinfected
3. Water treatment plants, or portions of plants such as water tanks, mixers, filters, wells, etc.
4. All existing potable water facilities that will be disturbed for purposes of construction.

1.2 REFERENCES

The following publications, standards, and regulations form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Compliance with the listed publications is required.

TCEQ	Texas Commission on Environmental Quality
ANSI / AWWA C651	Disinfecting Water Mains, of latest edition.
ANSI / AWWA C652	Disinfection of Water Storage Facilities, of latest edition.
ANSI / AWWA C653	Disinfection of Water Treatment Plants, of latest edition.
ANSI / AWWA C654	Disinfection of Wells, of latest edition.
ANSI / AWWA C655	Field Dechlorination, of latest edition.
ANSI / AWWA B301	Liquid Chlorine, of latest edition.
ANSI / AWWA B300	Hypochlorites, of latest edition.

PART 2 – PRODUCTS

2.1 CHLORINE

A. Liquid chlorine shall meet the requirements of ANSI/AWWA B301, of latest edition.

B. Calcium hypochlorite shall meet the requirements of ANSI/AWWA B300, of latest edition.

PART 3 – EXECUTION

3.1 GENERAL

A. Standards developed by The American Water Works Association allow for four methods of disinfecting water facilities: the tablet method, the continuous-feed method, the slug method, and the spray method. The Contractor should decide which of these methods is most suitable for a given situation. Factors to consider when choosing a method should include the type of facility needing disinfection, availability of materials, equipment required for disinfection, training of personnel who will perform disinfection, and safety. After choosing one or more disinfection methods the Contractor shall perform them in full compliance with the applicable AWWA standards.

B. Disinfecting chemicals shall meet ANSI/NSF 60 and shall fully comply with ANSI/AWWA B300 and ANSI/AWWA B301 of latest edition.

C. If the initial disinfection fails to produce satisfactory bacteriological results,

or if other results indicate unacceptable water quality, the water facilities may be re-flushed and shall be resampled. If check samples fail to produce acceptable results, the water facilities shall be re-chlorinated.

D. The water facilities temporarily taken out of service for inspection, construction, repair, or any other activity that might lead to contamination shall be thoroughly cleaned and disinfected before returned to service.

E. Water being flushed from structures or piping after disinfection, with a chlorine residual of 1 mg/L or greater, shall be treated with a dechlorination solution or otherwise treated and/or used in a method approved by the ENGINEER, prior to discharge.

3.2 PROCEDURES

A. Piping and Inline Valves

1. The following is a detailed description of only one of the available methods the Contractor can use for disinfecting water mains. Detailed procedures for other disinfecting methods can be found in the applicable AWWA standards.

2. This project involves the supply and installation of sanitized materials and equipment that will be used to convey potable water for public use. Sanitary practices during construction are required to protect public health and safety.

3. Keep material and equipment clean and dry, and protect from contamination at all times. Follow sanitary practices for material and equipment transportation, storage, handling, and installation, coupled with adequate flushing. Spraying and swabbing with a 1% chlorine disinfecting solution shall be used to aid in keeping pipe appurtenances clean when necessary.

4. Tablet method of chlorination. The tablet method consists of placing calcium hypochlorite granules or tablets in the water main during installation and then filling the main with potable water to create a chlorine solution. This method may be used only if pipes and appurtenances are kept clean and dry during construction. Warning: This procedure must not be used on solvent-welded plastic or on screwed-joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite.

5. Calcium hypochlorite. Calcium hypochlorite shall conform to ANSI/AWWA B300 and must contain approximately 65 percent available chlorine by weight. This material should be stored in a cool, dry, and dark environment to minimize its deterioration. Caution: Do not use calcium hypochlorite intended for swimming pool disinfection, as this material is

detrimental to pipes and extremely difficult to eliminate from the pipes after the desired contact time has been achieved.

6. Placement of calcium hypochlorite granules during construction. Calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-ft intervals. The quantity of granules at each location shall be as shown in Table 1.

Table 1 - Weight of calcium hypochlorite granules to be placed at beginning of main and at each 500-ft interval

Pipe Diameter (d)		Calcium Hypochlorite Granules	
in	mm	oz	g
4	100	1.7	48
6	150	3.8	108
8	200	6.7	190
10	250	10.5	298
12	300	15.1	428
14 and larger	350 and larger	D^2 x 15.1	D^2 x 428

7. Placement of calcium hypochlorite tablets during construction. Calcium hypochlorite tablets (5-grams) shall be placed in the upstream end of each section of pipe to be disinfected, including branch lines. Also, at least one tablet shall be placed in each hydrant branch and in other appurtenances.

8. Calcium hypochlorite tablets shall be attached by an adhesive meeting the requirements of NSF/ANSI 61. Attach tablets inside and at the top of the main.

9. The number of 5-g tablets required for each pipe section shall be $\mathbf{0.0012d^2L}$ rounded to the next higher integer, where d is the inside pipe diameter, in inches, and L is the length of the pipe section, in feet. Table 2 shows the number of tablets required for commonly used sizes of pipe.

Table 2 - Number of 5-g calcium hypochlorite tablets required for dose of 25 mg/L						
Pipe Diameter		Length of Pipe Section, ft (m)				
		13 (4.0) or less	18 (5.5)	20 (6.1)	30 (9.1)	40 (12.2)
in	mm					
4	100	1	1	1	1	1
6	150	1	1	1	2	2
8	200	1	2	2	3	4
10	250	2	3	3	4	5
12	300	3	4	4	6	7
16	400	4	6	7	10	13

*Based on 3.25 g of available chlorine per tablet

10. Filling and contact time. When installation has been completed, the water main shall be filled with water such that the full pipe velocity is no greater than 1 ft/sec. Fill rate must be carefully controlled to ensure tablets do not come loose from pipe. **Precautions shall be taken to ensure that air pockets are eliminated**. Water used to fill the new main shall be supplied through a temporary connection that shall include an appropriate cross-connection control device, consisting with the degree of hazard, for backflow protection of the active distribution system.

11. The chlorinated water shall remain in the pipe for at least 24 hrs. If the water temperature is less than 41°F (5°C), the water shall remain in the pipe for at least 48 hrs.

12. A detectable free chlorine residual (≥0.2 mg/L) shall be found at each sampling point after the 24 or 48-hr period.

13. Hydrostatic test. The water main shall be hydrostatically tested for 2 hours as per the applicable specification for this project.

14. Flushing. After the hydrostatic test has passed, the water main shall be flushed at a flushing velocity of 3 ft/sec whenever feasible. Where such flow rates are not possible, flushing at the maximum expected flow rate for the line for at least 2 to 3 volumes and until flushed water is clear and has a turbidity of less than 5 NTU is acceptable. Contractor shall comply with ANSI/AWWA C655 Field Dechlorination.

15. Bacteriological testing. After completion of flushing, the water main flushing shall be stopped and bacteriological testing shall be performed and the first set of samples shall be taken in accordance with the procedures outlined in ANSI/AWWA C651 Section 5 and any other applicable standards and regulations.

16. Water in the water main shall be allowed to stand for 16 hours and a second set of samples taken. Both sets of samples must pass for the water main to be approved for release.

B. Treatment Facilities

1. Prior to disinfection, all foreign materials shall be removed from inside the affected facility. All floor, wall, and other surfaces normally in contact with treated water shall be thoroughly cleaned using a high-pressure water jet, sweeping, scrubbing, or equally effective means. Water, dirt, sludge, and foreign material accumulated in this cleaning operation shall be discharged from the treatment facility or otherwise removed.

2. A solution of at least 200 mg/L available chlorine shall be applied directly to the surfaces of parts of the treatment facility that would be in contact with water when the treatment facility is full to the overflow elevation or maximum capacity.

3. The chlorine solution may be applied with suitable brushes or spray equipment. The solution shall thoroughly coat surfaces to be treated, including the inlet and outlet piping, and shall be applied to any separate drain piping such that it will have available chlorine of not less than 10 mg/L when filled with water.

4. The disinfected surfaces shall remain in contact with the strong chlorine solution for at least 30 min., after which potable water shall be admitted, the drain piping purged of the 10 mg/L chlorinated water, and the storage facility then filled to its overflow level. Following this procedure and subject to satisfactory bacteriological testing, appropriate chlorine residual, and acceptable aesthetic water quality, the facility may be commissioned and put into service.

3.3 WATER SOURCE

The water source comes from plant water.

3.4 BACTERIOLOGICAL SAMPLING AND TESTING

The OWNER will perform all sampling for bacteriological tests. The OWNER shall cover the costs of all initial testing. All subsequent testing, should the initial test fail, shall be paid for by the CONTRACTOR.

3.5 MEASUREMENT AND PAYMENT

No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

SECTION 02 02 01

WASTEWATER PIPE AND FITTINGS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section includes requirements for the installation and adjustment of sewer mains, service connections, accessories and associated appurtenances specified here, shown on the Drawings, or directed by the Engineer / Owner's Representative.

1.02 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Control of Ground Water and Surface Water

B. Excavation, Trenching and Backfilling

C. Concrete

D. Testing of Installed Piping Systems

1.03 REFERENCES

A. ASTM D 3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

B. ASTM D 2412 -Standard Test Method for Determination of External Load Characteristics of Plastic Pipe by Parallel Plate Loading

C. ASTM F 679 - Standard Specification for Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings

D. ASTM D 3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes for Flexible Elastomeric Seals

E. ASTM D 1784 Standard Specification for Rigid PVC Compounds and Chlorinated PVC Compounds

F. ASTM F 1336 - Standard Specification for Poly(Vinyl Chloride) (PVC) Gasketed Sewer Fittings

G. ASTM F 477 Standard Specification for Elastometric Seals (Gaskets) for Joining Plastic Pipe

H. ASTM C 1173 - Standard Specification for Flexible Transition Couplings for Underground Piping Systems

I. Follow the latest edition of the above references

1.04 SUBMITTALS

A. Reference - Section 01300 - for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.

B. The Contractor must give notice, in writing to the Owner, sufficiently in advance of the intention to commence the purchase and/or manufacture of the pipe for use under this contract.

C. Before starting fabrication of the pipe and fittings, the Contractor must submit fully dimensioned drawings or catalogs to the Owner showing the pipe, joints and fittings to be used in the Work in full detail.

D. Submit a copy of sewage bypass plan to the Owner.

E. The Contractor must submit to the Owner certified copies of all test reports.

F. The Contractor must provide the Owner with a notarized statement that all tests have been made and met as specified.

1.05 QUALITY ASSURANCE

A. The contractor must furnish all facilities, personnel, and materials to conduct tests required as applicable to the type of pipe being supplied. The cost of all plant tests required as proof of the acceptability of the material will be considered incidental to the Work and no additional payment will be allowed.

B. All pipe and fittings must be inspected for soundness and damage due to handling, immediately before being laid, and any not conforming to these requirements of this Section is rejected and must be immediately removed from the site.

1.06 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. PVC PIPE
   1. PVC sewer and wastewater pipe and fittings 6 through 15 inch diameter shall conform to ASTM D 3034. Pipe shall have minimum cell classification of 12364 or 12454. Fittings shall have cell classification of 12454 or 13343. Pipe stiffness shall be at least 115 psi as determined by ASTM D 2412.
   2. PVC sewer and wastewater pipe and fittings 18 through 30 inch diameter shall conform stiffness shall be at least 46 psi as determined by ASTM D 2412.

B. YELLOWMINE PIPE

C. DUCTILE IRON PIPE
   1. In accordance with Section 15062

2.02 PIPE JOINTS

A. Pipe joints must be elastomeric gasket joints conforming to ASTM D3212 with gaskets conforming to ASTM F477.

B. JOINING PIPE OF DISSIMILAR MATERIALS

1. For pipes 15-inches and smaller in diameter, connect pipe of dissimilar material together with manufactured flexible transition couplings specifically made for this purpose, conforming to ASTM C 1173. Transition couplings are to be molded from synthetic elastomeric materials fitted with attached adjustable stainless steel band type clamps to stabilize and seal the joint. Acceptable products are "Band Seal Couplings made by Naylor Inc., "Mission Couplings" made by Mission Rubber Co, .or "Femco Couplings" made by Fernco Systems, Inc.
2. For sewer pipes larger then 15-inches in diameter, transitions between different pipe materials must be as directed by the Owner.

2.03 SEWER CLEANOUTS

A. At grade cleanouts must be as shown on Plans.

2.04 PIPE BEDDING AND BACKFILL

A. Pipe bedding must conform to requirements set forth in Section 02315 - Excavation, Trenching, and Backfill, of these specifications.

PART 3 - EXECUTION

3.01 GENERAL

A. All pipe, fittings, and appurtenances must be installed in accordance with the manufacturer's recommendations and requirements.

B. All pipe, fittings, and accessories must be delivered, unloaded, strung, and laid as specified here.

3.02 TRANSPORTATION AND DELIVERY OF PIPE, FITTINGS AND STRUCTURES

A. All recommendations of the manufacturer shall be carefully observed during handling and installation of each material. Unless otherwise indicated, all materials shall be delivered to the project by the manufacturer or agent and unloaded as directed by the Contractor. Each piece shall be placed facing the proper direction near to where it will be installed.

B. Every precaution must be taken to prevent damage to the pipe during transportation and delivery. Extreme care must be taken in loading and unloading the pipe and fittings. Such work must be done with the pipe under complete control at all times. Under no conditions may the pipe be dropped, bumped, dragged, pushed, or moved in any way that will cause damage to the pipe.

C. If in the process of transportation, handling, or installation, any pipe or fitting is damaged, such pipe or fitting must be replaced by the Contractor and be considered incidental to the construction and no additional payment will be allowed.

3.03 SEWAGE DIVERSION

A. The Contractor must include in his construction procedure adequate means for pumping and diverting all sewage flow around the work area to keep the trench free of water and sewage until all structures, pipe, and connections have been completed. During heavy rains, the Contractor must anticipate additional flow from surface runoff and in existing sewers. The Contractor must be prepared to handle the increased flow under these conditions and protect the new work from damage while keeping all excavations as dry as possible and existing sewers in operation. Any additional pumping needed during times of heavy rainfall will be considered incidental to the cost of the by-pass pumping and will not be considered for additional payment.

B. No open pumping or discharge of water will be allowed onto City streets. All discharge flows must be discharged via pumping through a closed system of pipelines to an approved discharge point. It is part of the work of this section for the Contractor to submit a bypass pumping plan for the review and comment before starting any work. The Contractor must provide all temporary flumes or pipe lines and pumping equipment required for the proper diversion of sewage and removal of drainage from the work. Contractor must remove any temporarily-installed dams or bulkheads after completion of the work.

C. Whenever the Contractor, at the downstream end of his Contract, removes an existing bulkhead which was placed as part of a previous contract, he must install a screen suitable for the purpose of preventing his construction debris from floating into the completed portions of the sewer system. As his work progresses, he must also clean the completed portions of the sewer by removing rails, jacks, lumber, sandbags and all other construction equipment, excess material and debris.

D. The Contractor must place and maintain all temporary dams, flumes, bulkheads or other structures necessary to prevent water from adjacent sections of the sewer system from entering the work under this Contract in such a manner as to injure it, and must completely remove all such temporary structures from the completed portion of the work as rapidly as practicable. The Contractor must not place a dam, flume or bulkhead in any sewer without first obtaining the approval of the Owner. The Contractor must ascertain the possibility of sewage backing up into basements and causing damage and he will be held responsible for any such damage.

E. The City does not assume responsibility for providing the Contractor with an outlet for any storm water or sewage which must be disposed of during the construction work under this Contract. Until the acceptance of the work, the Contractor will, if so ordered by the Owner's Representative, keep the entire work pumped free of water and sewage and before the acceptance of any part of the work, must clean the entire length of such finished part of the work to the satisfaction of the Owner.

F. Water must not be allowed to flow over or stand on the invert in such a manner as to cause scouring of the concrete surface.

G. Water pumped from trenches or other excavations must be routed to settling basins before entering the existing sewer system.

3.04 PREPARATION FOR LAYING PIPE

A. Materials, coatings, and linings must be as specified and as shown. Installation must be in accordance with standards as recommended by the pipe manufacturer, and as specified here.

B. Proper and suitable tools and appliances for the safe and convenient cutting, handling, and laying of the pipe and fittings must be used.

C. Before lying, all pipe and fittings must be thoroughly examined for defects and no piece may be installed which is known to be defective. If defects are discovered after pipe or fittings have been installed, the Contractor must remove the defective pipe or fitting and replace it with a sound one in a satisfactory manner.

D. The pipe and fittings must be thoroughly cleaned before they are laid and must be kept clean until they are accepted in the finished work. Care must be exercised to avoid leaving bits of wood, dirt, rock and other foreign particles in the pipe. If any such materials are discovered before the final acceptance of the work, they must be removed and the pipe and fittings replaced, if necessary. All pipes must be kept absolutely clean during construction and must be stopped off with night plugs at the end of each day's work.

E. Excavate pipe trenches as specified in Section 02315 - Excavation, Trenching and Backfilling. Hand trim bottom of trench to six (6) inches below bottom of pipe.

F. Place and compact pipe bedding as specified in Section 02315 Excavation, Trenching and Backfilling.

G. Keep trench bottom free from excess water. Groundwater or water from other sources must be removed as per Section 02240 - Dewatering Excavations. If the trench bottom is unsuitable for the pipes foundation, the kind of stabilization to be utilized will be ordered in writing.

H. If, in the opinion of the Owner's Representative, the Contractor has failed to obtain an acceptably dry trench bottom using conventional methods of dewatering, the Contractor must excavate below the intended grade and place sufficient sub-grade material as may be suitable over the trench bottom in accordance with Section 02315 - Excavation, Trenching and Backfilling.

3.05 LAYING PIPE

A. Excavation, bedding and backfilling must be in accordance with Specification 02315.

B. Lay pipe to line and grade in prepared bedding as indicated on the Drawings. The pipe must be properly secured against movement and pipe joints must be made in the excavation as required. Pipe must have compacted bearing along its entire length. When completed, the sewer must have a smooth and uniform invert.

C. The pipe laying must begin at the downstream end of the pipe. Install pipe so that bells and grooves are on the upstream end.

D. Prevent dirt, rock and other foreign particles from getting into the open end of the pipe and any pipe joints.

E. Clean interior of pipe of cement, dirt and extraneous material as the work progresses.

F. Lateral and service connections are to be made with manufactured wye fittings.

3.06 PIPE JOINTS

A. Pipe joints must be made secure and watertight.

B. Just before making a joint the ends of the pipe shall be clean, dry, free of any foreign matter, lump blisters, excessive coating and grease or oil and shall be wire brushed. The gasket and the inside surface of the bell shall be lubricated with a light film of soft vegetable soap compound (Flax Soap) to facilitate telescoping the joints. The rubber gasket if not factory installed shall be stretched uniformly as it is placed in the spigot groove to insure a uniform volume of rubber around the circumference of the groove. The spigot shall be centered in the bell, the pipe pushed home uniformly and brought into true alignment. Bedding material shall be placed and tamped against pipe to secure the joint. Care should be taken to prevent dirt or foreign matter from entering the joint space.

C. Joints, which have been placed, but not joined, backfilled, etc., shall be protected in a manner satisfactory to the Owner's Representative.

D. Inspect each joint for proper assembly prior to backfilling.

3.07 CONNECTING EXISTING SERVICES TO NEW WASTEWATER MAINS.

A. Where wastewater services currently exist and are being replaced from the main to the property line, those services shall be physically located at the property line prior to installing any new mains into which the services will be connected. Where wastewater services currently exist but are not being replaced to the property line, those services shall be physically located at the point of connection between the new and existing pipes prior to installing any new mains into which the services will be connected.

3.08 CLEANOUTS

A. Risers must be the same size as the pipe, and must consist of a wye or 1/8 bend extended to another 1/8 bend to the cleanout housing.

3.09 TEMPORARY BULKHEADS

A. At ends of constructed sections where adjoining mains or structures have not been completed and are not ready to be connected, construct temporary bulkheads.

3.10 SHORT TUNNEL CONSTRUCTION

A. A. Pipes to be placed in short tunnels must be jointed prior to being pulled into position. Pipe must be pushed or pulled into position in a manner arranged to keep joints tight and to prevent deflection.

3.11 ABANDONMENT OF EXISTING SEWERS

A. A. Abandoned sewer structures and sewers and drains larger than 15-inch diameter must be filled with fine aggregate backfill. All openings on abandoned pipe or conduit are to be sealed with a concrete mortar plug of a minimum of one (1) foot in length within the pipe.

3.12 WASTEWATER SYSTEM TESTING

A. Testing of wastewater system must include low pressure air testing and mandrel deflection testing in accordance with TCEQ regulations and the requirements of Section 02687 Testing of Installed Piping Systems.

END OF SECTION

SECTION 02 02 08

FIBERGLASS WASTEWATER MANHOLES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section includes requirements for the installation of fiberglass sewer manholes placed on cast-in-place or precast bases.

1.02 REFERENCES

A. ANSI B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

B. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

C. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.

D. ASTM C 1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).

E. ASTM D 698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft3 (600kN-m/m3).

F. ASTM D 2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings.

G. ASTM D 2996 - Standard Specification for Filament-Wound AFiberglass@ (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.

H. ASTM D 2997 - Standard Specification for Centrifugally Cast AFiberglass@ (Glass-Fiber-Reinforced Thermosetting Resin) Pipe.

I. ASTM D 3753 - Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells.

J. American Association of State Highway and Transportation Officials (AASHTO).

1.03 SUBMITTALS

A. Conform to requirements of Submittal Procedures.

B. Submit manufacturer's data and details of following items for approval:
   1. Design and fabrication details of fiberglass manhole components
   2. Installation instruction for fiberglass manholes
   3. Certifications for 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

1.04 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

PART 2 - PART 2 - PRODUCTS

2.01 FIBERGLASS MANHOLES AND BASE SECTIONS

A. 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.

B. Acceptable Manufacturer: Provide fiberglass manholes manufactured by Containment Solutions, Inc., or L.F. Manufacturing, Inc., or equal or as approved by OWNER.

C. Mark date of manufacture and name or trademark of manufacturer in 1-inch high stenciled letters on inside of barrel.

D. Provide 48-inch, 50-inch or 72-inch diameter barrels for fiberglass manholes as shown on PLANS. Provide wall section thickness for depth of manhole according to ASTM D 3753, but not less than 0.48 inches in thickness.

E. Provide fabricated reducer bonded at factory to form one continuous unit at top of manhole barrel to accept concrete grade rings and cast iron frame and cover. **Reducer design shall meet or exceed the American Association of State Highways and Transportation Officials (AASHTO) standard M-306, of latest edition.**

2.02 CONCRETE

A. Conform to requirements of Concrete Structures.

B. 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.

C. Concrete Foundation: Use Class A concrete with minimum compressive strength of 4000 psi for cast-in-place base and for foundation slab under manhole base section where indicated on Drawings.

2.03 REINFORCING STEEL

A. Provide reinforcing steel conforming to requirements of Concrete Structures.

2.04 MORTAR

A. Conform to requirements of ASTM C 270, Type S using Portland cement.

2.05 MISCELLANEOUS METALS

A. Provide City of Brownsville Public Utility Board standard cast-iron frames, rings, and covers meeting or exceeding AASHTO M-306, of latest edition.

2.06 DROP CONNECTIONS AND STUBS

A. Provide drop connections and stubs conforming to same pipe material requirements used in main pipe, unless otherwise indicated on Drawings.

2.07 PIPE CONNECTIONS FOR SANITARY SEWERS

A. Provide pipe connections conforming to requirements of Precast Concrete Manholes.

B. For drop, provide manufactured connector, such as Insert-a-Tee or equal, which provides positive seal between pipe and to wall.

2.08 SEALANT MATERIALS

A. Provide sealing materials between precast concrete adjustment ring and manhole cover frame, such as Adeka Ultraseal P201, or approved equal.

B. Butyl Sealant: Provide Press-Seal EZ Stick, or equal, for HDPE rings.

2.09 BACKFILL MATERIALS

A. Backfill materials shall conform to requirements of Trenching Excavation and Backfill.

2.10 NON-SHRINK GROUT

A. Provide prepackaged, inorganic, f1owable, non-gas-Iiberating, nonmetallic, cementbased grout requiring only addition of water.

B. Grout shall meet requirements of ASTM C 1107 and shall have minimum 28-day compressive strength of 7000 psi.

2.11 VENT PIPES

A. Provide external vent pipes for manholes, where indicated on Drawings.

B. Buried Vent Pipes: Provide 3-inch or 4-inch PVC DWV pipe conforming to ASTM D 2655. Alternately, provide FRP pipe as specified for vent outlet assembly.

C. Vent Outlet Assembly: Provide vent outlet assembly as shown on Drawings, constructed of following specified materials:
   1. FRP Pipe: Provide filament-wound FRP conforming to ASTM D 2996 or centrifugally cast FRP conforming to ASTM D 2997. Seal cut ends in accordance with manufacturer's recommendations
   2. Joints and Fittings: Provide epoxy bodied fittings and join pipe to fittings with epoxy adhesive, according to pipe manufacturer's instructions
   3. Flanges: Provide socket-flange fittings for epoxy adhesive bonding to pipe ends where shown on Drawings. Flanges shall meet bolt pattern and dimensions for ANSI B16.1, 125-pound flanges. Flange bolts shall be hot-dip zinc coated, conforming to ASTM A 307, Class A or B.
   4. Coating: 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 City Engineer from manufacturer's standard colors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that lines and grades are correct.

B. Determine if sub grade, when scarified and re-compacted, can be compacted to 95 percent of maximum Standard Proctor Density according to ASTM D 698 prior to placement of foundation material and base section. When it cannot be compacted to that density, moisture condition sub grade until that density can be reached or treat as an unstable sub grade.

C. Do not build manholes in ditches, swales, or drainage paths unless approved by the Owner's Representative.

3.02 PLACEMENT

A. Install fiberglass manholes to conform to locations and dimensions shown on Drawings.

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 required in Section - Precast Concrete Utility Structures.

3.04 CAST-IN-PLACE FOUNDATION

A. Place concrete as shown on Drawings on 4-inch (minimum) layer of either crushed stone, cement stabilized sand, or seal slab. When unstable sub grade is identified, over-excavate sub grade to allow for placement of 12-inch thick layer of crushed stone wrapped in filter fabric.

3.05 MANHOLE INVERTS

A. Manhole inverts must be in accordance with TCEQ regulations.
   1. The bottom of manhole must contain a U-shaped channel that is a smooth continuation of the inlet and outlet pipe
   2. A manhole connected to a pipe less than 15 inches in diameter must have a channel depth equal to at least half the largest pipe's diameter.
   3. A manhole connected to a pipe at least 15 inches in diameter but not more than 24 inches in diameter must have a channel depth equal to at least three-fourths of the largest pipe's diameter.
   4. A manhole connected to a pipe greater than 24 inches in diameter must have a channel depth equal to at least the largest pipe's diameter.
   5. A manhole with pipes of different sizes must have the tops of the pipes at the same elevation and flow channels in the invert sloped on an even slope from pipe to pipe.
   6. A bench provided above a channel must slope at a minimum of 0.5 inch per foot.

7. An invert must be filleted to prevent solids from being deposited if a wastewater collection system pipe enters a manhole higher than 24 inches above a manhole invert.
8. A wastewater collection system pipe entering a manhole more than 24 inches above an invert must have a drop pipe.

3.06 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.

3.07 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.

3.08 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.

3.09 INVERTS FOR SANITARY SEWERS

A. Construct invert channels as required in Precast Concrete Manholes.

3.10 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.

3.11 STUBS FOR FUTURE CONNECTIONS

A. Where future connections are indicated on Drawings, install resilient connectors and pipe stubs with approved watertight plugs in manholes.

B. At cast-in-place base, where future connections are indicated on Drawings, install section of pipe extending no further than 12 inches from edge of foundation, ending in bell and provided with rubber-gasket watertight plug.

3.12 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 2-inch and 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.

3.13 BACKFILL

A. After leakage testing, place and compact backfill material in area of excavation surrounding manholes in accordance with requirements of Excavation, trenching and Backfilling.

B. In unpaved areas, provide positive drainage away from manhole frame to natural grade. Provide minimum of 4-inches of topsoil, seed and hydromulch or sod conforming to requirements of Landscape Restoration.

3.14 ACCEPTANCE TESTING

A. Conduct leakage testing of manholes in accordance with TCEQ regulations 217.58.

B. Manholes must be tested separately and independently of the wastewater lines.

C. Test by the Vacuum Method A vacuum test shall be performed by the Contractor prior to backfilling those manholes that fall within the right-of-way that require detouring of vehicular traffic. A second vacuum test will not be required after backfilling and compaction is complete unless there is evidence that the manhole has been damaged or disturbed subsequent to the initial vacuum test.
   1. Equipment
      a. The manhole vacuum tester shall be a device approved for use by the Engineer or designated representative.
      b. Pipe sealing plugs shall have a load resisting capacity equal to or greater than that required for the size of the connected pipe to be sealed.
   2. Procedures - applicable to new 48-inch diameter manholes
      a. Manhole section interiors shall be carefully inspected; units found to have through-wall lift holes, or any penetration of the interior surface by inserts provided to facilitate handling, will not be accepted. Coating shall be applied after the testing unless coating is applied before installation or unless it is applied at the factory. All lift holes and exterior joints shall be plugged with an acceptable non-shrink grout. No grout shall be placed in horizontal joints. Tests shall be performed before grouting the invert or around pipe penetrations and before coating the interior surfaces of the manhole or junction box.
      b. After cleaning the interior surfaces of the manhole, the Contractor shall place and inflate pneumatic plugs in all of the connecting pipes to isolate the manhole; sealing pressure within the plugs shall be as recommended by the plug manufacturer. Plugs and the ends of pipes connected by flexible boots shall be blocked to prevent their movement during the vacuum test.
      c. The vacuum test head shall be placed on the top of the cone section or, inside of the top of the manhole cone section, and the compression seal band inflated to the pressure recommended by its manufacturer. The vacuum pump shall be connected to the outlet port with the valve open. When a vacuum of 10 inches of mercury (-5 psig) has been attained, the valve shall be closed and the time noted. Tampering with the test equipment will not be allowed.
      d. The manhole shall have passed the test if the vacuum does not drop below 9 inches of mercury (-4.5 psig) within 3 minutes of the time the valve was closed. The actual vacuum shall be recorded at the end of the 3 minutes during which the valve was closed.

e. When the standard vacuum test cannot be performed because of design or material constraints (examples: T-Type manholes, T-Lock Liners, or other reasons acceptable to the Engineer or designated representative), testing of individual joints shall be performed as directed by the Engineer or designated representative.

3.15 PROTECTION

A. Protect manholes from damage until work has been finally accepted. Repair damage to manholes at no additional cost to OWNER.

END OF SECTION

SECTION 02 02 10

GRAVITY SANITARY SEWERS

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Gravity sanitary sewers and appurtenances, including stacks and service connections.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for gravity sanitary sewers by open-cut or within Potentially Petroleum Contaminated Area (PPCA) is on linear foot basis, complete in place, including sewer pipe, connections to existing manholes, post installation television inspection and testing. Measurement will be taken along centerline of pipe from centerline to centerline of manholes.

2. Refer to Measurement and Payment for unit price procedures.

1.3 SUBMITTALS

A. Conform to requirements of Submittal Procedures.

B. Submit proposed methods, equipment, materials and sequence of operations for sewer construction. Plan operations so as to minimize disruption of utilities to occupied facilities or adjacent property.

C. Test Reports: Submit test reports and inspection videos as specified in Part 3 of this Section. Videos become property of City.

1.4 QUALITY ASSURANCE

A. Qualifications. Install sanitary sewer that is watertight both in pipe-to-pipe joints and in pipe-to- manhole connections. Perform testing in accordance with Acceptance Testing for Sanitary Sewers.

B. Regulatory Requirements.

1. Install sewer lines to meet minimum separation distance from potable water line, as scheduled below. Separation distance is defined as distance between outside of water pipe and outside of sewer pipe. When possible, install new sanitary sewers no closer to water lines than 9 feet in all directions. Where this separation distance cannot be achieved, new sanitary sewers shall be installed as specified in this section.

2. Make notification to Project Manager when water lines are uncovered during sanitary sewer installation where minimum separation distance cannot be maintained.

3. Lay gravity sewer lines in straight alignment and grade.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Inspect pipe and fittings upon arrival of materials at job site.

B. Handle and store pipe materials and fittings to protect them from damage due to impact, shock, shear or free fall. Do not drag pipe and fittings along ground. Do not roll pipe unrestrained from delivery trucks.

C. Use mechanical means to move or handle pipe. Employ acceptable clamps, rope or slings around outside barrel of pipe and fittings. Do not use hooks, bars, or other devices in contact with interior surface of pipe to lift or move lined pipe.

PART 2 P R O D U C T S

2.1 PIPE

A. Provide piping materials for gravity sanitary sewers of sizes and types indicated on Drawings or as specified.

B. Unlined reinforced concrete pipe is not acceptable.

C. Pipe shall be color coded green.

2.2 PIPE MATERIAL SCHEDULE

A. Unless otherwise shown on Drawings, use pipe materials that conform to requirements specified in one or more of following Sections:

1. Plastic Liner for Large-Diameter Concrete Sewers and Structures.

2. Ductile Iron Pipe and Fittings.

3. Fiberglass Reinforced Pipe.

4. High Density Polyethylene (HDPE) Solid and Profile Wall Pipe.

5. Polyvinyl Chloride Pipe.

6. Extra Strength Clay Pipe.

7. Reinforced Concrete Pipe.

8. Sanitary Sewer Force Mains.

B. Where shown on Drawings, provide pipe meeting minimum class, dimension ratio, or other criteria indicated.

C. Pipe materials other than those listed above shall not be used for gravity sanitary sewers.

2.3 APPURTENANCES

A. Stacks. Conform to requirements of Sanitary Sewer Service Stubs or Reconnections.

B. Service Connections. Conform to requirements of Sanitary Sewer Service Stubs or Reconnections.

C. Roof, street or other type of surface water drains shall not be connected or reconnected into sanitary sewer lines.

2.4 BEDDING, BACKFILL, AND TOPSOIL MATERIAL

A. Bedding and Backfill: Conform to requirements of Excavation and Backfill for Utilities, Utility Backfill Materials, and Cement Stabilized Sand.

B. Topsoil: Conform to requirements of Topsoil.

PART 3 E X E C U T I O N

3.1 PREPARATION

A. Prepare traffic control plans and set up street detours and barricades in preparation for excavation when construction will affect traffic. Conform to requirements of Traffic Control and Regulation.

B. Provide barricades, flashing warning lights, and warning signs for excavations. Conform to requirements of Traffic Control and Regulation. Maintain barricades and warning lights where work is in progress or where traffic is affected by work.

C. Perform work in accordance with OSHA standards. Employ trench safety system as specified in Trench Safety System for excavations over 5 feet deep.

D. Immediately notify agency or company owning utility line which is damaged, broken or disturbed. Obtain approval from Project Manager and agency or utility company for repairs or relocations, either temporary or permanent.

E. Remove old pavements and structures including sidewalks and driveways in accordance with requirements of Removing Existing Pavements and Structures.

F. Install and operate dewatering and surface water control measures in accordance with Control of Ground Water and Surface Water.

G. Do not allow sand, debris or runoff to enter sewer system.

3.2 DIVERSION PUMPING

A. Install and operate required bulkheads, plugs, piping, and diversion pumping equipment to maintain sewage flow and to prevent backup or overflow. Obtain approval for diversion pumping equipment and procedures from Project Manager.

B. Design piping, joints and accessories to withstand twice maximum system pressure or 50 psi, whichever is greater.

C. No sewage shall be diverted into area outside of sanitary sewer.

D. In event of accidental spill or overflow, immediately stop overflow and take action to clean up and disinfect spillage. Promptly notify Project Manager so that required reporting can be made to Texas Natural Resources Conservation Commission and Environmental Protection Agency by Project Manager.

3.3 EXCAVATION

A. Earthwork. Conform to requirements of Excavation and Backfill for Utilities. Use bedding as indicated on Drawings.

B. Line and Grade. Establish required uniform line and grade in trench from benchmarks identified by Project Manager. Maintain this control for minimum of 100 feet behind and ahead of pipe-laying operation. Use laser beam equipment to establish and maintain proper line and grade of work. Use of appropriately sized grade boards which are substantially supported is also acceptable. Protect boards and location stakes from damage or dislocation.

C. Trench Excavation. Excavate pipe trenches to depths shown on Drawings and as specified in Excavation and Backfill for Utilities.

3.4 PIPE INSTALLATION BY OPEN CUT

A. Install pipe in accordance with pipe manufacturer's recommendations and as specified in following paragraphs.

B. Install pipe only after excavation is completed, bottom of trench fine graded, bedding material is installed, and trench has been approved by Project Manager.

C. Install pipe to line and grade indicated. Place pipe so that it has continuous bearing of barrel on bedding material and is laid in trench so interior surfaces of pipe follow grades and alignment indicated. Provide bell holes where necessary.

D. Install pipe with spigot ends toward downstream end of flow such that water flows into bell and out the spigot.

E. Form concentric joint with each section of adjoining pipe so as to prevent offsets.

F. Keep interior of pipe clean as installation progresses. Remove foreign material and debris from pipe

G. Provide lubricant, place and drive home newly laid sections with come-a-long winches so as to eliminate damage to sections. Install pipe to "home" mark where provided. Use of back hoes or similar powered equipment will not be allowed unless protective measures are provided and approved in advance by Project Manager.

H. Keep excavations free of water during construction and until final inspection.

I. When work is not in progress, cover exposed ends of pipes with approved plug to prevent foreign material from entering pipe.

J. Where gravity sanitary sewer is to be installed under existing water line with separation distance of at least 2 feet and less than 9 feet, install new sewer pipe so that one full18 foot long pipe is centered on water line crossing. Embed sewer pipe in cement stabilized sand for minimum distance of 9 feet on each side of crossing.

K. Where gravity sanitary sewer is to be installed under existing water line with separation distance of less than 2 feet, install new sewer using pressure-rated pipe as shown on Drawings. Maintain minimum 1 foot separation distance.

L. Where the length of the stub is not indicated, install the stub to the right-of-way line and seal the free end with an approved plug.

3.5 PIPE INSTALLATION OTHER THAN OPEN CUT

A. For installation of pipe by augering, jacking, or tunneling, conform to requirements of specification sections on tunneling augering, jacking and microtunneling work as appropriate.

B. For rehabilitation of existing sewer lines, conform to requirements of specification Sliplining, Cured-In-Place Pipe or Pipe Bursting.

3.6 INSTALLATION OF APPURTENANCES

A. Service Connections. Install service connections to conform to requirements of Sanitary Sewer Service Stubs or Reconnections.

B. Stacks. Construct stacks to conform to requirements of Sanitary Sewer Service Stubs or Reconnections.

C. Construct manholes to conform to requirements of Cast-in-Place Concrete Manholes, Precast Concrete Manholes, and Fiberglass Manholes, as applicable. Install frames, rings, and covers to conform to requirements of Frames, Grates, Rings, and Covers.

3.7 INSPECTION AND TESTING

A. Visual Inspection: Check pipe alignment in accordance with Acceptance Testing for Sanitary Sewers.

B. Mandrel Testing. Use Mandrel Test to test flexible pipe for deflection. Refer to Acceptance Testing for Sanitary Sewers.

C. Pipe Leakage Test. After backfilling line segment and prior to tie-in of service connections, visually inspect gravity sanitary sewers where feasible, and test for leakage in accordance with Acceptance Testing for Sanitary Sewers. Maintain piezometer installed to conform with Control of Ground Water and Surface Water, until acceptance testing is completed.

3.8 BACKFILL AND SITE CLEANUP

A. Backfill and compact soil in accordance with Excavation and Backfill for Utilities.

B. Backfill trench in specified lifts only after pipe installation is approved by Project Manager.

C. Repair and replace removed or damaged pavement, curbs, gutters, and sidewalks as specified in Pavement Repair and Resurfacing.

D. Provide hydromulch seeding in areas of commercial, industrial or undeveloped land use over surface of ground disturbed during construction and not paved or not designated to be paved. Grade surface at uniform slope to natural grade as indicated on Drawings. Provide minimum of 4 inches of topsoil as specified in Topsoil and apply hydromulch according to requirements of Hydromulch Seeding.

E. Provide sodding in areas of residential land use over surface of ground disturbed during construction and not paved or not designated to be paved. Grade surface at uniform slope to natural grade as

indicated on Drawings. Provide minimum of 4 inches of topsoil per Topsoil. Sod disturbed areas in accordance with Sodding.

3.9 POST-INSTALLATION TELEVISION INSPECTION

A. Prior to final acceptance of newly constructed gravity sanitary sewers, perform cleaning and OWNER will perform closed circuit television inspection. Post installation television inspection shall be performed.

C. Upon completion of video review, Contractor will be notified regarding final acceptance of sewer segment.

END OF SECTION

SECTION 02 02 11
SANITARY SEWER PIPE WORK

PART 1 GENERAL

1.01 DESCRIPTION

Under this section consist of 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.

1.02 WORK INCLUDED BY OTHER SECTIONS

A. Control of Ground Water and Surface Water

B. Excavation, Trenching and Backfilling

C. Concrete

D. Testing of Installed Piping Systems

1.03 REFERENCES

A. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

B. ASTM D2412 -Standard Test Method for Determination of External Load Characteristics of Plastic Pipe by Parallel Plate Loading

C. ASTM F679 - Standard Specification for Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings

D. ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes for Flexible Elastomeric Seals

E. ASTM 1784 Standard Specification for Rigid PVC Compounds and Chlorinated PVC Compounds

F. ASTM F1336 - Standard Specification for Poly(Vinyl Chloride) (PVC) Gasketed Sewer Fittings

G. ASTM F477 Standard Specification for Elastometric Seals (Gaskets) for Joining Plastic Pipe

H. ASTM C1173 - Standard Specification for Flexible Transition Couplings for Underground Piping Systems

I. Follow the latest edition of the above references

1.02 SUBMITTALS

A. Reference - Section 01300 - for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.

B. The Contractor must give notice, in writing to the Owner, sufficiently in advance of the intention to commence the purchase and/or manufacture of the pipe for use under this contract.

C. Before starting fabrication of the pipe and fittings, the Contractor must submit fully dimensioned drawings or catalogs to the Owner showing the pipe, joints and fittings to be used in the Work in full detail.

D. Submit a copy of sewage bypass plan to the Owner.

E. The Contractor must submit to the Owner certified copies of all test reports.

F. The Contractor must provide the Owner with a notarized statement that all tests have been made and met as specified.

1.03 QUALITY ASSURANCE

A. The contractor must furnish all facilities, personnel, and materials to conduct tests required as applicable to the type of pipe being supplied. The cost of all plant tests required as proof of the acceptability of the material will be considered incidental to the Work and no additional payment will be allowed.

B. All pipe and fittings must be inspected for soundness and damage due to handling, immediately before being laid, and any not conforming to these requirements of this Section is rejected and must be immediately removed from the site.

1.04 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

PART 2 PRODUCTS

2.01 MATERIAL

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 BPUB and the Engineer once the Contractor discovers that field conditions cannot meet the TCEQ Chapter 217 Separation Distance Requirements.

(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 PUB.

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.

(B) Force Mains

1. Pressure sewer pipe shall be color coded green and shall be the following classification. 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 PUB.

   a. Polyvinyl chloride pipe for force mains shall conform to AWWA Standard "Polyvinyl Chloride (PVC) Pressure Pipe" C-900 - 750 Class 100 DR25 latest revision. Fittings for polyvinyl chloride (PVC) pipe shall be Ductile Iron Class 125 "Compact Fittings" short body, tar coated (not cement lined). Transition gaskets shall also be included, unless otherwise noted on the contract bid document or drawings.
   b. Polyvinyl chloride pipe for directional bored force mains shall conform to Fusible AWWA C-900 DR-25 PVC.

(C) Watertight Joint Materials

1. 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. To achieve this, joint material shall be made of the materials as specified herein, unless otherwise set forth in Special Provisions or Proposal. 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 PUB.

(D) Pipe Jointing

1. In laying the sewer pipe to line and grade, the pipe shall be jointed in accordance with one of the approved jointing methods. PUB reserves the right, before construction is in progress, to change the type of joints if it’s Engineer so directs.

(E) Polyvinyl Chloride Pipe (PVC) Jointing

1. 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 rubber ring or the ring groove in the bell because such lubricant could cause 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 up. 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.

2. Water stop joints shall be Polyvinyl Chloride (PVC) or other similar approved joint materials.

(F) SERVICE CONNECTIONS

1. Property service connections shall be installed using Polyvinyl Chloride Pipe (PVC). The pipe type shall be specified in the service line detail shown in the design plans. 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 regards 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.

(G) 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 ultrahigh-build epoxy system manufactured by Raven Lining Systems, Broken Arrow, Oklahoma or approved equal.

PART 3 EXECUTION

3.1 CONSTRUCTION METHODS

1. After the trench is excavated to a subgrade as specified, it shall be filled to grade with a minimum 6-inch gravel layer. 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. Ditching 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. When the pipe is installed, metallic tape shall be buried as directed by the PUB inspector, but no greater than 4' below the finished grade or less than 2' above the top of the pipe for location purposes.

2. 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.

3. 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.

4. 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 PUB 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.

5. 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.

6. 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.

7. Cleanouts - Cleanouts on all service laterals shall be installed at the location shown on the plans and in accordance with the Design Plans.

8. Manholes - Manholes shall be constructed as shown in Design Plans to the elevations shown on the plan-profile sheets, or as directed. The manholes

specified shall be Fiberglass-Reinforced Polyester Manholes 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 so as to facilitate 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. The main line over which the manhole cut-out will be set shall be fitted with a seal ring as manufactured by Johns-Manville Manufacturing or equal (as per ASTM C-923 requirements). 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.

9. 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 BPUB Engineering Staff.

10. 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.

3.2 WASTEWATER SYSTEM TESTING

A. Testing of wastewater system must include low pressure air testing and mandrel deflection testing in accordance with the specification below and TCEQ regulations and the requirements of Testing of Installed Piping Systems.

B. TESTING METHODS

1. Air Testing - This shall cover the testing of completed sections of installed sewer pipe using low air pressure. The contractor shall conduct low air pressure tests on completed sections of sewer mains. The air test results will be used to evaluate materials and construction methods on the pipe line sections, and successful air tests shall be mandatory for the acceptance of the lines. The Contractor shall furnish all labor and material required to complete all testing required by this specification.

2. Material for Air Testing - The following materials will be furnished by the contractor and utilized for air testing sewer mains:

   a. 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.

   b. 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:

      1. hose connection
      2. shut off valve
      3. throttle valve
      4 pressure reduction valve
      5. gauge cock
      6. monitoring pressure gauge

3. Test Procedures - The following procedures will be utilized for air testing sewer mains:

   a. Determine section of line to be tested.

   b. Apply air pressure until the pressure inside the pipe reaches 4 psig.

   c. Allow the pressure inside the pipe to stabilize, then bleed back to 3.5 psig.

   d. 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 effect such

repairs as may be required to accomplish a successful air test.

Table 1 Minimum Test Time for Various Pipe Sizes

Nominal Pipe Size, (inch)	T(time) min/100 ft.	Nominal Pipe Size, (inch)	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
15	2.1	39	6.6
18	2.4	42	7.3

4. Leakage Test - A leakage test may be requested by the engineer at any time to determine whether or not there is 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 of time with no reduction in the rate of leakage.

   a. 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 PUB. 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.

   b. Leakage out of Sewer - Where the ground water 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. The rate of leakage from the sewers may be determined by either the amount of subsidence in the water surface level of the amount of water required to maintain the original water surface level above the top of the pipe. Leakage from the sewers under test shall not exceed the requirement of leakage into sewers as specified in Section 6.f, 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.

c. 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.

5. Deflection Testing for Gravity PVC Sewer Lines

a. 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 engineer, shall be used. The testing shall consist of the following:

1. 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.
2. 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.
3. 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.
4. Connect a retrieval rope to the back of the mandrel to pull it back if necessary.
5. 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.
6. 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.
7. If an obstructed or over-deflected section is found, locate it; dig down and uncover pipe; inspect the pipe; if any

damaged pipe is found, replace it. If pipe is not damaged, re-round the pipe, replace and thoroughly tamp the embedment and initial backfill; replace remainder of backfill.

8. Re-test this entire section for deflection.
9. Any pipe removed shall be replaced by use of gasket repair couplings. Each and every deflection test shall be conducted in the presence of the owner's or engineer's representative.

b. The Contractor shall furnish all labor and material required to clean and flush and complete all testing required by this specification. The owner, at their discretion, may televise the sewer lines. Televising equipment will be furnished by the owner. The contractor shall furnish labor to assist PUB inspectors to operate televising equipment. Labor shall consist of a minimum of 2 persons. Televising work will normally be performed during other than normal working hours, including Saturdays and after 5 PM on weekdays. If there is insufficient roadways within the project area, the contractor will furnish the equipment necessary to gain full access to the site.

6. Force Main Hydrostatic Testing

a. After the pipe and appurtenance have been installed, test line and drain. Prevent damage to the Work or adjacent areas. Use clean water to perform tests.

b. The Utility Owner may direct tests of relatively short sections of completed lines to minimize traffic problems or potential public hazards.

c. Test pipe in the presence of the Utility Owner.

d. Test pipe at 150 psig or 1.5 times design pressure of the pipe, whichever is greater. Design pressure of the force main shall be the rated total dynamic head of the lift station pump.

e. Test pipe at the required pressure for a minimum of 2 hours according to requirements of Uni-B-3.

f. Maximum allowable leakage shall be as calculated by the following formula:

$$L = (S)\ (D)\ (P^{0.5}) / 133{,}200$$

L = Leakage in gallons per hour
S = Length of pipe in feet

D = Inside pipe diameter in inches
P = Pressure in pounds per square inch (psi)

g. Correct defects, cracks, or leakage by replacement of defective items or by repairs as approved by the Utility Owner.

h. Plug openings in the force main after testing and flushing. Use cast iron plugs or blind flanges to prevent debris from entering the tested pipeline.

7. 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 02 02 16

TRENCH EXCAVATION AND SHORING SAFETY PLAN

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the furnishing of a Trench Excavation and Shoring Safety Plan, including detailed plans and specifications for a trench safety system and requirements for a safety program for the trench system (including a plan for ingress and egress of the trenches, manholes and structures), to be incorporated into the bid documents and the Construction Contract, and all labor and materials for installation, inspection, and maintenance of trench safety system.

B. Application: For any trench excavation at a depth of 5 feet or greater, or where shown on PLANS, provide trench safety system. Trench safety system is not required when:
   1. CONTRACTOR's geotechnical engineer determines that the trench excavation is to be made in stable rock.
   2. Excavations are less than five (5) feet in depth and examination of the ground by a competent person on behalf of the CONTRACTOR provides no indication that a cave-in should be expected. Trench safety system to be in accordance with details shown on CONTRACTOR's Trench Excavation and Shoring Safety Plan.

C. Amendment to Contract: All modifications to the CONTRACTOR's Trench Excavation and Shoring Safety Plan after acceptance and approval or the detailed plans and specifications necessitated by the site conditions, CONTRACTOR's trench construction means, methods, techniques or procedures and CONTRACTOR's equipment to be used in construction of project facilities are to be communicated to OWNER in writing. All such modifications are to be signed and sealed by a Registered Professional Engineer licensed in the State of Texas and a statement provided stating that the modified plan and/or the modified detailed plans and specifications for the trench safety system are designed in a good and workmanlike manner and is in conformance with appropriate OSHA standards. Such modifications to CONTRACTOR's plan and/or the CONTRACTOR's detailed plans and specifications for the trench safety system to thereafter be incorporated into the Construction Contract.

1.02 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
   1. American Society for Testing And Materials (ASTM)
      a. ASTM A36/A36M, Standard Specification for Structural Steel
      b. ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
      c. ASTM A328/A328M, Standard Specification for Steel Sheet Piling
      d. ASTM A572/A572M, Standard Specification for High-Strength LOW-Alloy ColumbiumVanadium Steels of Structural Quality

e. ASTM A588/A588M, Standard Specification for High-Strength Low-Alloy Structural Steel With 50 ksi (345 MPa) Minimum Yield Point to 4 in. (100 mm) Thick
f. ASTM A690/A690M, Standard Specification for High-Strength Low-Alloy Steel H-Pipes and Sheet Piling for Use in Marine Environments

2. American Welding Society (AWS)
   a. AWS D1.1, Structural Welding Code - Steel
3. Occupational Safety And Health Administration (OSHA)
   a. 29 CFR Part 1926, Subpart P Excavations and Applicable Subparts

1.03 SUBMITTALS

A. The successful bidder to provide the OWNER with its Proposed Trench Excavation and Shoring Safety Plan within 21 days after the date of the Notice of Award. The plan to incorporate detailed plans and specifications for a trench safety system conforming to OSHA standards that accounts for project site conditions, CONTRACTOR's trench construction means, methods, techniques or procedures, the relationship of spoil to edge of trench, and CONTRACTOR's equipment to be used in construction of project facilities requiring trench system(s). CONTRACTOR to provide a statement signed and sealed by a Registered Professional Engineer licensed in the State of Texas stating that the Trench Excavation and Shoring Safety Plan and the detailed plans and specifications for the trench safety system are designed in a good and workmanlike manner and is in conformance with appropriate OSHA standards. CONTRACTOR's plan and the detailed plans and specifications for the trench safety system to be incorporated into the bid documents and the Construction Contract.

1.04 QUALITY ASSURANCE

A. Trench safety systems to be accomplished in accordance with the detailed Specifications set out in the provisions 29 CFR, Part 1926, Subpart P. Legislation that has been enacted by the Texas Legislature (H.B. No. 1569) with regard to Trench Safety Systems, is also hereby incorporated, by reference, into these Specifications.

1.05 MEASUREMENT AND PAYMENT

A. No separate measurement and payment for work performed under this section. Include cost of same in Contract price bid for work of which this is a component part.

PART 2 - PRODUCTS

2.01 MATERIALS AND/OR EQUIPMENT

A. Materials
   1. Timber: Trench sheeting materials to be full size, a minimum of 2 inches in thickness, solid and sound, free from weakening defects such as loose knots and splits.
   2. Sheet Piling: Steel sheet piling to conform to one or more of ASTM A328/328M, ASTM A572/A572M/ ASTM A690/690M material requirements.
   3. Steel for stringers (wales) and cross braces to conform to ASTM A588.
   4. Steel trench Boxes to be constructed of steel conforming to ASTM A36. Connecting bolts used to conform to ASTM A307. Welds to conform to the requirements of AWS 01.1.

5. Miscellaneous Materials: Miscellaneous materials to be utilized to conform to applicable ASTM standards.

PART 3 - EXECUTION

3.01 GENERAL

A. Trench safety system shall be constructed, installed, and maintained in accordance with the Trench Excavation and Shoring Safety Plan as outlined in Paragraph 1.03 of this Section.

3.02 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. Timber Sheeting: Timber sheeting and size of uprights, stringers (wales), and cross bracing to be installed in accordance with CONTRACTOR's plan. Place cross braces in true horizontal position, spaced vertically, and secured to prevent sliding, falling, or kickouts. Cross braces to be placed at each end of stringers (wales), in addition to other locations required. Cross braces and stringers (wales) to be placed at splices of uprights, in addition to other locations required.

B. Steel Sheet Piling: Steel sheet piling of equal or greater strength may be used in lieu of timber trench shoring shown in the OSHA tables (proposed standards). Drive steel sheet piling to a least minimum depth below trench bottom as recommended by CONTRACTOR's Registered Professional Engineer providing design. Place cross braces in true horizontal position, spaced vertically and secured to prevent sliding, falling, or kickouts. Cross braces to be placed at each end of stringers (wales), in addition to other locations required.

C. Trench Boxes: Portable trench box may be used in lieu of timber trench shoring shown in the OSHA tables (proposed standards) and shall be designed to provide equal or greater protection than timber trench shoring shown in the OSHA tables. In cases where top of portable trench box will be below top of trench, the trench must be sloped to the maximum allowable slope for the soil conditions existing on the Project. In areas where a sloped trench will affect the integrity of existing structures, CONTRACTOR to protect structures prior to sloping trench.

D. Trench Jacks: When trench jacks are used for cross bracing and/or stringers (wales), the trench jacks shall provide protection greater than or equal to the timber cross bracing shown in the OSHA tables (proposed standards). Trench jacks to be placed at each end of stringers (wales) in addition to other locations required.

3.03 REPAIR/RESTORATION

A. Bed and backfill pipe to a point at least one (1) foot above top of pipe or other embedded items prior to removal of any portion of trench safety system. Bedding and backfill to be in accordance to other applicable SPECIFICATION Sections. Backfilling and removal of trench supports to be in accordance with CONTRACTOR's Trench Excavation and Shoring Safety Plan. Removal of trench safety system to be accomplished in such a manner to cause no damage to pipe or other embedded items. Remove no braces or trench supports until all personnel have evacuated the trench. Backfill trench to within 5 feet of natural ground prior to removal of entire trench safety system.

3.04 FIELD QUALITY CONTROL

A. Supervision: Provide competent supervisory personnel at each trench while work is in progress to ensure CONTRACTOR's methods, procedures, equipment, and materials pertaining to the safety systems in this Section are sufficient to meet requirements of OSHA Standards.

B. Inspection: CONTRACTOR to make daily inspection of trench safety system to ensure that the system meets OSHA requirements. Daily inspection to be made by competent personnel. If evidence of possible cave-ins or slides is apparent, all work in the trench is to cease until necessary precautions have been taken to safeguard personnel entering trench. CONTRACTOR to maintain permanent record of daily inspections.

3.05 PROTECTION

A. Maintenance of Safety System: The safety system to be maintained in the condition as shown on the Trench Excavation and Shoring Safety Plan as designed by the CONTRACTOR's Registered Professional Engineer. The CONTRACTOR to take all necessary precaution to ensure the safety systems are not damaged during their use. If at any time during its use a safety system is damaged, personnel to be immediately removed from the trench excavation area and the safety system repaired. The CONTRACTOR to take all necessary precautions to ensure no loads, except those provided for in the plan, are imposed upon the trench safety system.

END OF SECTION

SECTION 02 02 17
TRENCH SAFETY SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

1. This section shall cover CONTRACTOR'S furnishing a Safety System Plan, and all labor and materials for installation and maintenance of the Trench Safety System.

2. For any trench excavation at a depth of five (5) feet or greater, or where shown on plans, provide trench safety system. Trench safety system shall be in accordance with details shown on CONTRACTOR's Trench Excavation and Shoring Safety Plan.

1.2 DEFINITIONS

1. A trench shall be defined as a narrow excavation (in relation to its depth) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet.

2. The trench safety system requirements will apply to larger open excavations if the erection of structures or other installations limits the space between the excavation slope and these installations to dimensions equivalent of a trench as defined.

3. Trench Safety Systems include but are not limited to sloping, sheeting, trench boxes or trench shields, sheet piling, cribbing, bracing, shoring, dewatering or diversion of water to provide adequate drainage.

1.3 SUBMITTALS

A. The CONTRACTOR shall provide Trench Safety System Plan for Project prior to commencement of work. The Plan shall incorporate the detailed plans and specifications for a Trench Safety system conforming to OSHA standards. The Plan shall account for project site conditions, CONTRACTOR's trench construction means, methods, techniques or procedures, the relationship of spoil to edge of trench, and CONTRACTOR's equipment to be used in construction of project facilities requiring trench Safety System(s). CONTRACTOR shall submit a certificate signed and sealed by a Registered Professional Engineer licensed in the State of Texas stating that CONTRACTOR's Trench Safety System Plan has been designed in conformance with appropriate OSHA standards and applicable specifications as required by this item. CONTRACTOR's Trench Safety System Plan shall demonstrate the type(s) of Trench Safety System to be used on the project.

B. Submittals shall conform to requirements of Submittal Procedures.

C. Submit a safety program specifically for the construction of trench excavation. Design the trench safety program to be in accordance with OSHA 29CFR standards governing the presence and activities of individuals working in and around trench excavations.

D. Construction and shop drawings containing deviations from OSHA standards or special designs shall be sealed by a licensed Engineer retained and paid by the Contractor.

E. Review of the safety program by the Owner or Engineer will only be in regard to compliance with this specification and will not constitute approval by the Owner or Engineer nor relieve Contractor of obligations under State and Federal trench safety laws.

1.4 REGULATORY REQUIREMENTS

A. Install and maintain trench safety systems in accordance with the detail specifications set out in the provision of Excavations, Trenching, and Shoring, Federal Occupation Safety and Health Administration (OSHA) Standards, 29CFR, Part 1926, Subpart P, as amended, including Final Rule, published in the Federal Register Vol. 54, No. 209 or most recent edition. The sections that are incorporated into these specifications by reference include Sections 1926-650 through 1926-652.

B. It is the responsibility of the Contractor to obtain a reproduction of the OSHA standards included in "Subpart P - Excavations" from the Federal Register Vol. 54, No. 209.

C. Legislation that has been enacted by the Texas Legislature with regard to Trench Safety Systems, is hereby incorporated, by reference, into these specifications. Refer to Texas Health and Safety Code Ann., §756.021 (Vernon 1991).

D. Trench safety system to meet appropriate requirements established in Section 756.022 of the Texas Health and Safety Code and Occupational Safety and Health Administration (OSHA) Safety & Health Regulations, 29 CFR 1926, Subpart P - Excavations, Trenching and Shoring, as may be amended, and OSHA's proposed standards on trenching excavation published in Volume 54, No. 209 of the Federal Register, October 31, 1989; Pages 45959-45991. Those standards are incorporated into these specifications by reference. Should the applicable OSHA standards be modified or amended, the more stringent standards shall apply.

1.5 INDEMNIFICATION

A. Contractor shall indemnify and hold harmless the Owner and the Engineer, its employees and agents, from any and all damages, costs (including, without limitation, legal fees, court costs, and the cost of investigation), judgments or claims by anyone for injury or death of persons resulting from the collapse or failure of

trenches constructed under this Contract.

B. Contractor acknowledges and agrees that this indemnity provision provides indemnity for the Owner and Engineer in case the Owner or Engineer is 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.

PART 2 PRODUCTS

The materials used in the Trench Safety System shall be furnished by the CONTRACTOR, as approved by the OWNER, to comply with the requirements of the work of the CONTRACTOR as specified therein.

a. Timber - Trench sheeting materials to be full size, a minimum of two inches in thickness, solid and sound, free from weakening defects such as loose knots and splits.

b. Steel Sheet Piling - Steel sheet piling shall at a minimum conform to one of the following specifications:

1. ASTM A328.
2. ASTM A572, Grade 50.
3. ASTM A690.
4. Steel for stringers (wales) and cross braces shall conform to ASTM A588.

c. Steel Trench Boxes - Portable steel trench box shall at a minimum be constructed of steel conforming to ASTM Specification A-36. Connecting bolts used shall conform to Specifications ASTM A-307. Welds to conform to requirements of AWS Specification D1.1.

d. Other Materials. Other materials to be utilized shall at a minimum conform to applicable ASTM standards.

PART 3 EXECUTION

3.1 INSTALLATION

1. Install and maintain trench safety systems in accordance with provisions of OSHA 29CFR.

2. Install specially designed trench safety systems in accordance with the Contractor's trench excavation safety program for the locations and conditions identified in the program.

3. A competent person, as identified in the Contractor's Trench Safety Program, shall verify that trench boxes and other pre-manufactured systems are certified for the actual installation conditions.

4. Trench safety system shall be constructed, installed, and maintained in accordance with the Trench Safety System Plan prepared by the CONTRACTOR's Registered Professional Engineer.

A. Timber Sheeting - Timber sheeting and size of uprights, stringers (wales), and cross bracing to be installed in accordance with CONTRACTOR's plan. Place cross braces in true horizontal position, spaced vertically, and secured to prevent sliding, falling, or kick-outs. Cross braces to be placed at each end of stringers (wales), in addition to other locations required. Cross braces and stringers (wales) to be placed at splices of uprights, in addition to other locations required.

B. Steel Sheet Piling - Steel sheet piling of equal or greater strength may be used in lieu of timber trench shoring shown in the OSHA tables (proposed standards). Drive steel sheet piling to at least minimum depth below trench bottom as recommended by CONTRACTOR's Registered Professional Engineer providing design. Place cross braces in true horizontal position, spaced vertically and secured to prevent sliding, falling, or kick-outs. Cross braces to be placed at each end or stringers (wales), in addition to other locations required.

C. Trench Boxes - Portable trench box may be used in lieu of timber trench shoring shown in the OSHA tables (proposed standards) and shall be designed to provide equal or greater protection than timber trench shoring shown in the OSHA tables. In cases where top of portable trench box will be below top of trench, the trench must be sloped to the maximum allowable slope for the soil conditions existing on the Project. In areas where a sloped trench will affect the integrity of existing structures, CONTRACTOR to protect structures prior to sloping trench.

D. Trench Jacks - When trench jacks are used for cross bracing and/or stringers (wales), the trench jacks shall provide protection greater than or equal to the timber cross bracing shown in the OSHA tables (proposed standards). Trench jacks to be placed at each end of stringers (wales) in addition to other locations required.

5. REMOVAL. Bed and backfill pipe to a point at least one (1) foot above top of pipe or other embedded items prior to removal of any portion of trench safety system. Bedding and backfill to be in accordance to other applicable specification items. Backfilling and removal of trench supports shall be in accordance with CONTRACTOR's Trench Excavation and Shoring Safety Plan. Removal of trench safety system to be accomplished in such a manner to cause no damage to pipe or other embedded items. Remove no braces or trench supports until all personnel have

evacuated the trench. Backfill trench to within five (5) feet of natural ground prior to removal of entire trench safety system.

3.2 INSPECTION

1. Contractor, or Contractor's independently retained consultant, shall make daily inspections of the trench safety systems to ensure that the installed systems and operations meet OSHA 29CFR and other personnel protection regulations requirements.

2. If evidence of possible cave-ins or slides is apparent, Contractor shall immediately stop work in the trench and move personnel to safe locations until the necessary precautions have been taken by Contractor to safeguard personnel entering the trench.

3. Maintain a permanent record of daily inspections.

4. CONTRACTOR shall make daily inspection of trench safety system to ensure that the system meets OSHA requirements. Daily inspection to be made by competent personnel. If evidence of possible cave-ins or slides is apparent, all Work in the trench shall cease until necessary precautions have been taken to safeguard personnel entering trench. CONTRACTOR to maintain permanent record of daily inspections.

3.3 FIELD QUALITY CONTROL

1. Contractor shall verify specific applicability of the selected or specially designed trench safety systems to each field condition encountered on the project.

2. SUPERVISION. CONTRACTOR must provide competent supervisory personnel at each trench while Work is in progress to ensure CONTRACTOR's methods, procedures, equipment, and materials pertaining to the safety systems in this Item are sufficient to meet requirements of current Texas Law and OSHA Standards.

3. MAINTENANCE OF SAFETY SYSTEM. The safety system shall be maintained in the condition as shown on the Trench Excavation and Shoring Safety Plan as designed by the CONTRACTOR's Registered Professional Engineer. The CONTRACTOR shall take all necessary precaution to ensure the safety systems are not damaged during their use. If at any time during its use a safety system is damaged, personnel shall be immediately removed from the trench excavation area and the safety system repaired. The CONTRACTOR shall take all necessary precautions to ensure no loads, except those provided for in the plan, are imposed upon the trench safety system.

END OF SECTION

SECTION 02 02 23

CEMENT STABILIZED SAND BACKFILL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope: Furnish all plant, labor, equipment, supervision, and tools for the furnishing and installation of Cement-Stabilized Sand Backfill as shown on PLANS and as indicated in other Sections of the TECHNICAL SPECIFICATIONS.

B. Work Specified Elsewhere: Related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.02 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

PART 2 - PART 2 - PRODUCTS

2.01 MATERIALS

A. Aggregate: Deleterious materials in sand not to exceed the following limits, by weight:
   1. Material removed by decantation 5.0%
      a. Clay lumps 0.5%
      b. Other deleterious substances (e.g. coal, shale, coated grains of soft flaky particles) 2.0%
   2. Gradation Requirements:

Sieve Size	% Retained
1/4"	0-5
No. 40	0-40
No. 100	70-100
No. 200	95-100

   3. Color test ASTM C40. Color is not to be darker than standard color.

B. Plasticity Index: 10 or less when tested in accordance with ASTM 04318.

C. Cement: ASTM C150, Type I.

D. Water: Fresh and clean.

PART 3 - EXECUTION

3.01 MIXING

A. Use not less than 1% sacks of cement per cubic yard of mixture. Use amount of water required to provide mix suitable for mechanical hand tamping and mix in mixer to obtain specified results. Material not in place within 1% hours after mixing or that has obtained an initial set will be rejected and removed from the site.

3.02 PLACING

A. Place at locations indicated on PLANS and in TECHNICAL SPECIFICATIONS. Place in maximum 8" lifts and compact each lift with power-driven mechanical tampers. Compact to a minimum dry density of 102 pounds per cubic foot. Place around cast-in-place concrete structures only after they have cured for at least four days.

END OF SECTION

SECTION 02 02 25
CONTROL OF GROUND WATER AND SURFACE WATER

PART 1 GENERAL

1.1 SECTION INCLUDES

1. Dewatering, depressurizing, draining, and maintaining trenches, shaft excavations, structural excavations, and foundation beds in a stable condition, and controlling ground water conditions for tunnel excavations.

2. Protecting work against surface runoff and rising flood waters.

3. Disposing of removed water.

1.2 REFERENCES

1. ASTM D 698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49 kg) Rammer and 12-inch (304.8 mm) Drop.

2. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).

3. Federal Register 40 CFR (Vol. 55, No. 222) Part 122, EPA Administered Permit Programs (NPDES), Para.122.26 (b) (14) Storm Water Discharge.

1.3 DEFINITIONS

1. Ground water control includes both dewatering and depressurization of water-bearing soil layers.

   a. Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from slopes or bottoms of excavations, or into tunnels and shafts, and disposing of removed water. The intent of dewatering is to increase stability of tunnel excavations and excavated slopes; prevent dislocation of material from slopes or bottoms of excavations; reduce lateral loads on sheeting and bracing; improve excavating and hauling characteristics of excavated material; prevent failure or heaving of the bottom of excavations; and to provide suitable conditions for placement of backfill materials and construction of structures and other installations.

   b. Depressurization includes reduction in piezometric pressure within strata not controlled by dewatering alone, as required to prevent failure or heaving of

excavation bottom or instability of tunnel excavations.

2. Excavation drainage includes keeping excavations free of surface and seepage water.

3. Surface drainage includes use of temporary drainage ditches and dikes and installation of temporary culverts and sump pumps and well point systems with discharge lines as required to protect the Work from any source of surface water.

4. Equipment and instrumentation for monitoring and control of the ground water control system includes piezometers and monitoring wells, and devices, such as flow meters, for observing and recording flow rates.

1.4 PERFORMANCE REQUIREMENTS

1. Conduct subsurface investigations to identify groundwater conditions and to provide parameters for design, installation, and operation of groundwater control systems.

2. Design a ground water control system, compatible with requirements of Federal Regulations 29 CFR Part 1926 and Section 02260 - Trench Safety Systems, to produce the following results:

    1. Effectively reduce the hydrostatic pressure affecting:
        1. Excavations.
        2. 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.

3. Provide ground water control systems may include single-stage or multiple-stage well point systems, eductor and ejector-type systems, deep wells, or combinations of these equipment types.

4. 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 44pumping.

5. Provide ditches, berms, pumps and other methods necessary to divert and drain surface water from excavation and other work areas.

6. Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.

7. 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. 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. Repair damage caused by ground water control systems or resulting from failure of the system to protect property as required.

8. 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.

9. 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.

10. Decommission piezometers and monitoring wells installed during design phase studies and left for Contractors monitoring and use.

1.5 SUBMITTALS

1. Submittals shall conform to requirements of Section 01300 - Submittals.

2. Submit a Ground Water and Surface Water Control Plan for review by the Owner and Engineer prior to start of any field work. The Plan shall be signed by a Professional Engineer registered in the State of Texas. Submit a plan to include the following:

    1. Results of subsurface investigation and description of the extent and characteristics of water bearing layers subject to ground water control.

    2. Names of equipment suppliers and installation subcontractors.

    3. A description of proposed ground water control systems indicating arrangement, location, depth and capacities of system components, installation details and criteria, and operation and maintenance procedures.

4. A description of proposed monitoring and control system indicating depths and locations of piezometers and monitoring wells, monitoring installation details and criteria, type of equipment and instrumentation with pertinent data and characteristics.

5. A description of proposed filters including types, sizes, capacities and manufacturer's application recommendations.

6. Design calculations demonstrating adequacy of proposed systems for intended applications. Define potential area of influence of ground water control operation near contaminated areas.

7. Operating requirements, including piezometric control elevations for dewatering and depressurization.

8. Excavation drainage methods including typical drainage layers, sump pump application and other necessary means.

9. Surface water control and drainage installations.

10. Proposed methods and locations for disposing of removed water.

3. Submit the following records upon completed initial installation:

1. Installation and development reports for well points, eductors, and deep wells.

2. Installation reports and baseline readings for piezometers and monitoring wells.

3. Baseline analytical test data of water from monitoring wells.

4. Initial flow rates.

4. Submit the following records on a weekly basis during operations:

1. Records of flow rates and piezometric elevations obtained during monitoring of dewatering and depressurization. Refer to Paragraph 3.02, Requirements for Eductor, Well Points, or Deep Wells.

2. Maintenance records for ground water control installations, piezometers, and monitoring wells.

5. Submit the following records at end of work. Decommissioning (abandonment) reports for monitoring wells and piezometers installed by other during the design phase and left for Contractor's monitoring and use.

1.6 ENVIRONMENTAL REQUIREMENTS

1. Comply with requirements of agencies having jurisdiction.

2. Comply with Texas Commission on Environmental Quality regulations and Texas Water Well Drillers Association for development, drilling, and abandonment of wells used in dewatering system.

3. Obtain a TCEQ GENERAL PERMIT TO DISCHARGE WASTE, under provisions of Section 402 of the Clean Water Act and Chapter of the Texas Water Code (TPDES), for storm water discharge from construction sites. Refer to Section 02370 - TPDES Permit Requirements.

4. 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.

5. Monitor ground water discharge for contamination while performing pumping in the vicinity of potentially contaminated sites.

PART 2 P R O D U C T S

1.7 EQUIPMENT AND MATERIALS

1. Equipment and materials are at the option of Contractor as necessary to achieve desired results for dewatering. Selected equipment and materials are subject to review by the Owner and Engineer through submittals required in Paragraph 1.6, Submittals.

2. Eductors, well points, or deep wells, where used, must be furnished, installed and operated by an experienced contractor regularly engaged in ground water control system design, installation, and operation.

3. All equipment must be in good repair and operating order.

4. Sufficient standby equipment and materials shall be kept available to ensure continuous operation, where required.

PART 3 E X E C U T I O N

1.8 GROUND WATER CONTROL

1. 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 in the Ground Water and Surface Water Control Plan (See Paragraph 1.06.2.1).

2. Provide labor, material, equipment, techniques and methods to lower, control and handle ground water in a manner compatible with construction methods and site conditions. Monitor effectiveness of the installed system and its effect on adjacent property.

3. Install, operate, and maintain ground water control systems in accordance with the Ground Water and Surface Water Control Plan. Notify the Engineer in writing of any changes made to accommodate field conditions and changes to the Work. Provide revised drawings and calculations with such notification.

4. Provide for continuous system operation, including nights, weekends, and holidays. Arrange for appropriate backup if electrical power is primary energy source for dewatering system.

5. Monitor operations to verify that the system lowers ground water piezometric levels at a rate required to maintain a dry excavation resulting in a stable subgrade for prosecution of subsequent operations.

6. Where hydrostatic pressures in confined water bearing layers exist below excavation, depressurize those zones to eliminate risk of uplift or other instability of excavation or installed works. Allowable piezometric elevations shall be defined in the Ground Water and Surface Water Control Plan.

7. Remove ground water control installations.

    1. Remove pumping system components and piping when ground water control is no longer required.

    2. Remove piezometers, including piezometers installed during the design phase investigations and left for Contractor's use, upon completion of testing.

    3. Remove monitoring wells when directed by the Engineer.

    4. Grout abandoned well and piezometer holes. Fill piping that is not removed with cement-bentonite grout or cement-sand grout.

8. 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 hour after placement.

9. Provide a uniform diameter for each pipe drain run constructed for dewatering. Remove pipe drain when it has served its purpose. If removal of pipe is impractical, provide grout connections at 50-foot intervals and fill pipe with cement-bentonite grout or cement-sand grout when pipe is removed from service.

10. Extent of construction ground water control for structures with a permanent perforated underground drainage system may be reduced, such as for units designed to withstand hydrostatic uplift pressure. Provide a means of draining the affected portion of underground system, including standby equipment. Maintain drainage system during operations and remove it when no longer required.

11. Remove system upon completion of construction or when dewatering and control of surface or ground water is no longer required.

12. Compact backfill to not less than 95 percent of the maximum dry density in accordance with ASTM D 698.

1.9 REQUIREMENTS FOR EDUCTOR, WELL POINTS, OR DEEP WELLS

1. 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.

2. Install sufficient piezometers or monitoring wells to show that all trench or shaft excavations in water bearing materials are pre-drained 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.

3. Install piezometers or monitoring wells not less than one week in advance of beginning the associated excavation.

4. 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 predrained by an existing system such that the criteria of the ground water control plan are satisfied.

5. Replace installations that produce noticeable amounts of sediments after development.

6. 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 1.06.2.

1.10 EXCAVATION DRAINAGE

1. 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.

1.11 MAINTENANCE AND OBSERVATION

1. Conduct daily maintenance and observation of piezometers or monitoring wells while the ground water control installations or excavation drainage are operating in an area or seepage into tunnel is occurring. Keep system in good condition.

2. Replace damaged and destroyed piezometers or monitoring wells with new piezometers or wells as necessary to meet observation schedule.

3. Cut off piezometers or monitoring wells in excavation areas where piping is exposed, only as necessary to perform observation as excavation proceeds. Continue to maintain and make observations, as specified.

4. Remove and grout piezometers inside or outside the excavation area when ground water control operations are complete. Remove and grout monitoring wells when directed by the Engineer.

1.12 MONITORING AND RECORDING

1. Monitor and record average flow rate of operation for each deep well, or for each well point or eductor header used in dewatering system. Also monitor and record water level and ground water recovery. These records shall be obtained daily until steady conditions are achieved, and twice weekly thereafter.

2. Observe and record elevation of water level daily as long as ground water control system is in operation, and weekly thereafter until the Work is completed or piezometers or wells are removed, except when Owner or Engineer determines that more frequent monitoring and recording are required. Comply with Engineer's direction for increased monitoring and recording and take measures as necessary to ensure effective dewatering for intended purpose.

1.13 SURFACE WATER CONTROL

1. Intercept surface water and divert it away from excavations through use of dikes, ditches, curb walls, pipes, sumps or other approved means. The requirement includes temporary works required to protect adjoining properties from surface drainage caused by construction operations.

2. Divert surface water and seepage water into sumps and pump it into drainage channels or storm drains, when approved by agencies having jurisdiction. Provide settling basins when required by such agencies.

END OF SECTION

SECTION 02 02 27

HYDROSTATIC TESTS FOR PRESSURE MAINS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section includes hydrostatic testing for pressure mains.

1.02 UNIT PRICES

A. No separate payment will be made for work performed under this Section. Include cost of work performed under this Section in pay items of which this work is a component.

1.03 QUALITY ASSURANCE

A. Contractor shall perform hydrostatic tests on water lines in accordance to ANSI/AWWA C600 and ANSI/AWWA C605, of latest edition, as applicable, and these specifications. Hydrostatic test must be performed in the presence of the Brownsville Public Utilities Board Field Technician.

1.04 SUBMITTALS

A. Submit in accordance with the Standard General Conditions and Supplementary Conditions.

B. Copies of all testing results shall be submitted to the Engineer prior to acceptance of piping system.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

A. Water
   1. Water used to fill proposed lines, for flushing, for disinfection, and testing of lines shall be potable water from the Brownsville Public Utilities Board. Contractor shall coordinate and contract with the City for a temporary construction meter to be located off an existing fire hydrant, if available; otherwise a temporary fire hydrant shall be furnished to the Contractor.

B. General
   1. Conduct pressure and leakage tests in accordance with ANSI/AWWA C600 or ANSI/AWWA C605 as applicable. Contractor must notify Brownsville Public Utilities Board Engineer 48 hours prior to pressure and leakage testing.
   2. Commence test procedures when following conditions met.
      a. Pipe section to be tested is clean and free of dirt, sand, or other foreign material.
      b. Pipe outlets plugged with test plugs. Plugs, pipes, fittings, and valves secured to prevent blowouts.

c. Value of applied test pressure checked at each point in test section to ensure it does not exceed maximum allowable pressure of pipes, valves, fittings, and appurtenances.

3. Safety: Perform pressure testing in accordance with OSHA requirements and in manner protecting worker, bystanders, and adjacent property.
4. Correct leaks defects, and retest until acceptable results obtained.

C. Pressure Tests
   1. Test pressures shall be as follows:
      a. Water Main Test Pressure: 150 psi at lowest elevation in test section.
   2. Test Procedure:
      a. Add water to expel air.
      b. Pressurizing equipment shall include regulator set to avoid over pressurizing and damaging otherwise acceptable line.
      c. Make test connection, subject main to nominal water pressure, and examine for leaks.
      d. Apply test pressure by means of force pump of design and capacity that required pressure can be applied and maintained without interruption for duration of test.
      e. Measure test pressure by means of tested and properly calibrated pressure gauge.
      f. Maintain initial test pressure for sufficient length of time to permit inspecting piping under test, but not less than 30 min.
      g. In case repairs are required, repeat pressure test until pipe installation conforms to specified requirements.
      h. Perform final test at required test pressure for 2 hrs.
   3. Water main considered to have failed pressure test if applied pressure drop exceeds 5 psi.
   4. Test Procedure:
      a. Submit test section to approximately 150 psi gauge pressure at highest elevation of water main under test.
      b. Conduct final leakage test for 4 hours.
      c. Repair defects and retest until acceptable results obtained.

END OF SECTION

SECTION 02 02 31

EXCAVATION, TRENCHING, AND BACKFILLING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This specification includes the requirements for excavation, bedding, backfilling and compaction, of utility trenches for water and sewer mains and associated appurtenances.

1.02 WORK OF THIS SECTION SPECIFIED ELSEWHERE

A. Trench Excavation and Shoring Safety Plan

B. Dewatering Excavations

C. Vegetation Restoration

1.03 REFERENCES

A. . ASTM D1557 - Laboratory Compaction Characteristics of Soil.

B. Department of Labor, Occupational Safety and Health Administration 29 CFR Part 1926, Occupational Safety and Health Standards - Excavations; Final Rule (OSHA).

C. Follow the latest edition of the above references.

1.04 DEFINITIONS

A. Soil types are defined as follows.

1. Trench Excavation. Excavation of soil for the purpose of installing water and sewer mains, their appurtenances, and for the restoration of surface features. The excavated material may be classified as either clay or sandy soil, a mixture of each, and may contain varying amounts of loam, silt, gravel, organic material, or rock fragments less than one (1) cu yd in volume. Trench excavation excludes all material defined as Rock Excavation and Unsuitable Soil.
2. Rock Excavation. Excavation of naturally occurring deposits of limestone, sandstone, shale or other indigenous rock occurring as bedrock, rock ledges, outcroppings, or boulders, one (1) cu yd or larger in volume necessitating removal by the use of systematic drilling, expansive jacks, or backhoe mounted pneumatic hole punchers or rock breakers.
3. Unsuitable Soil Materials. This soil material includes varying amounts of material classified as slag, cinders, trash, debris and rubble; organic or contaminated soil and material; asphalt and concrete pavements (including aggregate sub-base); sidewalks and curbs; concrete slabs concrete or masonry foundations; metal beams, bracing, and sheet piling; or similar matter.

1.05 SUBMITTALS

A. Submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples must be submitted in accordance with Section 01300.

B. Provide to the Owner copies of all contractual agreements, permits and/or licenses for proposed disposal sites for all material and waste removed from the job site.

C. Provide to the Owner, prior to the use of any materials in this Section, certified test and inspection reports that all materials to be utilized in this work are in accordance with the Contract Documents.

D. Shop Drawings:
   1. Plating of Excavations: When requested submit design calculations stamped by a Professional Engineer licensed in the State of Texas as proof of the structural integrity of the plating provided.
   2. Calculations: Submit appropriate design calculations to support Shop Drawings. Include maximum theoretical deflections of supporting members. Include calculations indicating the expected magnitude of vertical and lateral movement.

E. The Contractor, before starting work, must submit to the Owner for approval, a layout of his construction procedures and the equipment to be used in maintaining the trees in place without damage.

1.06 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

PART 2 - PART 2 - PRODUCTS

2.01 BEDDING AND BACKFILL

A. Bedding Stone
   1. Pipe bedding stone shall be clean gravel, crushed gravel or crushed limestone, free of mud, clay, vegetation or other debris, conforming to ASTM C 33 for stone quality. Size gradation shall conform to ASTM C-33 No. 57 or No. 67 or the following Table:

SIEVE SIZE	% RETAINED BY WEIGHT
1-1/2”	0
1”	0-10
1/2”	40-85
#4	90-100
#8	95-100

B. Bedding and Backfill Sand
   1. Sand for pipe bedding and backfill must be clean, granular and homogeneous material composed mainly of mineral maUer, free of mud, silt, clay lumps or clods, vegetation or debris. The material removed by decantation TxDOT Test Method Tex406- A, plus the weight of any clay lumps, must not exceed 4.5 percent by weight.
   2. The resistivity must not be less than 3000 ohms-em as determined by TxDOT Test Method Tex-129-E. Size gradation of sand for bedding must be as follows:

GRADATION TABLE	
SIEVE SIZE	% RETAINED BY WEIGHT
1/4”	0
#60	75-100
#100	95-100

2.02 CONTROLLED LOW STRENGTH MATERIAL, CLSM (FLOWABLE FILL MATERIAL)

A. Contractor must provide CLSM mix design prepared by a qualified commercial laboratory and reviewed and signed by a licensed Texas Professional Engineer.

2.03 AGGREGATE FOR STABILIZATION OF TRENCH BOTTOMS

A. When required aggregate used to stabilize trench bottoms must have an aggregate such that the majority of the material passes a 1 ½ to 2 ½ -inch sieve, with no more than 10% of the material passing the No. 16 sieve.

PART 3 - PART 3 - EXECUTION

3.01 WORK AREA PREPARATION

A. Existing Work Area Condition
   1. All information on subsurface exploration available to the Owner, if any, will be made available to the Contractor for examination. However, the Owner in no way takes responsibility for, the interpretation, accuracy, or thoroughness of the information. It will be the responsibility of the Contractor to make such subsurface explorations as deemed necessary, to supplement information provided by the Owner, at no additional cost to the Owner.
   2. Prior to excavating, thoroughly investigate the limits of the proposed trench to ascertain the existence and location of any underground structures, existing utilities or other items that might interfere with the pipe installation. Notify the Owner of any obstructions that will prevent the installation of the pipe or appurtenances as indicated on the Drawings.

B. Prior to commencing this Work, all erosion control and tree protection measures required shall be in place and all utilities located and protected as set forth in "General Conditions".

C. Clearing Work Area
   1. Before starting trench excavation, all obstructions, which must be removed or relocated, must be cleared. Pavement, curbs, walks, trees, shrubs, utility poles, and other structures, which are to be preserved, must be properly braced and protected. Unless otherwise shown or directed by the Owner, all trees and large shrubs must be preserved with minimal damage inflicted on the root structure. When required, small trees and shrubs may be removed and replaced with equivalent specimens if approved in advance by the
   2. Owner.

D. Segregation and Disposal of Soil Material
   1. Topsoil suitable for final grading and landscaping, and excavated material suitable for backfilling, as described in Section 02360, - Vegetation Restoration, may be stockpiled separately within the Work Area if approved by the Owner.
   2. Surplus excavated material and excavated material unsuitable for backfilling, final grading, and landscaping, must be transported off of the Site and disposed of in disposal areas obtained by the Contractor and approved by the Owner.
   3. Excavated material must not be stockpiled along the route of the work unless authorized beforehand by the Owner.

E. Pavement Removal
   1. The Contractor must saw cut all concrete and asphalt pavements to their full depth prior to breaking and removing the pavement. On pavements consisting of an asphalt overlay on a concrete base, the Owner reserves the right to order the removal of up to 6 additional inches beyond the edge of the concrete base. This additional asphalt removal must be removed to a neat saw cut edge and will be considered incidental to the Work.
   2. 2. Utilizing drop weight equipment for the purpose of breaking the pavement is not permitted.

F. Protection or Removal of Existing Trees
   1. The Contractor is not permitted to remove trees beyond the limits of the trench excavation except as specified in these Specifications, or as shown on the Plans, or as ordered by the Owner.
   2. The Contractor must arrange his construction operations and use the necessary equipment required, so as not to remove or damage any existing trees due to the Work to be performed under this Contract.
   3. To protect the trunks of existing trees from damage, the Contractor must place 2" x 4" boards, six (6) feet long, vertically and about 6 inches apart around all trees located in the parkways along the route of the work. The boards must be held in place by wire looped around the circumference of the tree trunk. After completion of all work, the protective boards and wires must be carefully removed.

4. Any pruning of trees and roots required to permit the operation of the Contractor's equipment must be kept to a minimum, subject to the approval of the Owner, and must be done symmetrically by a licensed arborist. The arborist is required to obtain any necessary permits to trim and spray or in any way affect the general health or structure of trees in the public way.

G. Excavating Over or Adjacent to Existing Utilities
   1. The Contractor must verify the location of existing utilities in the vicinity of the work before starting construction. The Contractor is responsible for protecting, and repairing utilities damaged by the work under of this contract, at no additional cost to the Owner. The Contractor must coordinate all work with the owner of the utility.
   2. The Contractor shall conduct his Work such that a reasonable minimum of disturbance to existing utilities will result. Particular care shall be exercised to avoid the cutting or breakage of all existing utilities. If at any time the Contractor damages the utilities in place through his operations, the Contractor shall immediately notify the owner of the utility to make the necessary repairs. When active wastewater sewer lines are cut in the trenching operations, temporary flumes shall be provided across the trench while open and the lines shall be restored when the backfilling has progressed to the original bedding lines of the sewer so cut.
   3. The Contractor shall inform utility owners sufficiently in advance of the Contractor's operations to enable such utility owners to reroute, provide temporary detours or to make other adjustments to utility lines in order that the Contractor may proceed with his Work with a minimum of delay and expense. The Contractor shall cooperate with all utility owners concerned in effecting any utility adjustments necessary and shall not hold the City liable for any expense due to delay or additional Work because of conflicts arising from existing utilities.
   4. Wherever existing utility branch connections, sewers, storm drainage structures, drains, conduits, ducts, pipes or structures present obstructions to the grade and alignment of the pipe, they shall be permanently supported, removed, relocated or reconstructed by the Contractor through cooperation with the owner of the utility, structure or obstruction involved. In those instances where their relocation or reconstruction is impractical, a deviation from line and grade may be ordered by the Engineer and the change shall be made in the manner directed.
   5. Adequate temporary support, protection and maintenance of all underground and surface utility structures, drains, sewers and other obstructions encountered in the progress of the Work shall be furnished by the Contractor, at his expense and as approved by the Engineer.

H. Plating of Excavations
   1. Unattended excavations in public streets, alleys, driveways, and walkways necessitated by the work must be plated, if the excavation has not been backfilled, or a temporary paved surface has been provided, or specifically authorized otherwise by the Owner.

2. Steel Plate(s) must be large enough to safely span the excavation with sufficient overlap beyond the edge of the excavation to provide firm support as appropriate for the type of pavement and soil encountered. Plate(s) must be firmly bedded and secured to the adjacent pavement to prevent rocking or movement, and of adequate thickness to carry anticipated loads. When plating is left in place during off-work periods, or if the Owner feels vehicular or pedestrian safety may be compromised, a bituminous ramp is to be provided at the perimeter of the plate(s) as appropriate to provide a smooth transition between the surface of the plate(s) and the adjacent pavement or walkway.
3. Plating subjected to vehicular traffic must be capable of carrying AASHTO H20 traffic loading without movement or excessive deflection. The plating must be secured to the adjacent paved surface in such manner so as to prevent rocking or other movement which could expose the excavation. The name of the Contractor must be indicated on both sides of the plating.
4. When steel plates are used and left in place beyond normal working periods, a bituminous ramp must be provided at the perimeter of the plate(s), to provide a smooth transition between the surface of the plate(s) and the adjacent street pavement or walkway, unless authorized otherwise.
5. Plating of excavations is not intended as a substitution for providing traffic control, which must be provided in accordance with Contract Documents.

3.02 EXCAVATION PROTECTION

A. General Requirements
1. Excavations must be protected in accordance with applicable rules, laws and regulations of Federal, State and City ordinances applicable to underpinning, shoring of excavations, and other work affecting adjoining property and the safety of worker, but must not be less than the standards and regulations established by OSHA. Provide trench protection and excavation safety systems in accordance with Section 02161.
2. Structural support systems are required for all excavations exceeding five (5) feet in depth. Structural support systems are to be used in all excavations in soils that are determined to be unstable or subject to cave-ins, regardless of the depth of the excavation.
3. The Contractor must remove and replace, or provide the means to support any surface features when their location poses a hazard to workers in the excavation.
4. Whenever excavations cross the location of an existing underground utility, the Contractor must proceed with caution and use appropriate methods of excavation to avoid damaging the utility. The Contractor is responsible for coordinating all work with the owner of the utility.
5. Ramps, runways or ladders must be provided for ingress and egress by workers from excavations exceeding four (4) feet in depth in accordance with OSHA.
6. Surface or ground water entering excavations must be controlled by the use of appropriate equipment. If the trench interrupts the natural flow of surface water, diversion ditches or dikes must be used.

B. Protection of Adjacent Structures
   1. When the stability of adjoining buildings, walls, sidewalks, pavements or other structures are endangered by the excavation operations, structural support systems such as shoring, bracing or underpinning must be used to ensure the stability of the structure.
   2. The Contractor is responsible for posting and issuing all notices required to inform adjacent or adjoining property owners or other parties and such notice or notices must be served in sufficient time as not to delay the progress of the Work under this Contract.
   3. 3. Excavation below the foundation of an adjacent structure requires either of the following:
      a. A Professional Engineer licensed in the state of Texas has determined that the structure is located far enough away from the excavation so as to be unaffected, or
      b. A Professional Engineer licensed in the state of Texas has designed and approved a structural support system to provide adequate protection to the existing structure.

C. Structural Support Systems
   1. Structural support systems may consist of pre-engineered systems such as aluminum hydraulic shoring, trench shields, trench boxes, or systems constructed on the job site such as timber or steel shoring or steel sheet piling. Provide trench excavation safety system and shoring in accordance with OSHA and Specification Section 02161 - Trench Excavation and Shoring Safety Plan.

3.03 EXCAVATION

A. Trench Excavation (Open Cut)
   1. The width of the trenches must provide adequate space for workers to place and join the pipe properly, and must be kept to the minimum practical width. Trenches for water, reclaimed, and wastewater lines shall have a clear width on each side beyond the outside surfaces of the pipe bell or coupling of not less than 6 inches nor more than 12 inches.
   2. The Contractor must excavate a minimum of 6-inches below the bottom of the pipe unless otherwise shown, specified, or directed, so bedding material can be placed in the bottom of the trench and shaped to provide a continuous firm bearing for the pipe barrel. Bell holes must be provided for proper make-up of the joints.
   3. The open excavated trench preceding the pipe laying operation and the unfilled trench with pipe in place must be kept to a minimum length causing the least disturbance. The maximum length of open trench must not exceed 100-feet unless otherwise directed by the Owner.
   4. Contractor must saw cut existing pavement prior to excavating. Width of saw cut pavement must be such that any sheeting provided for excavation protection is not in contact with the pavement.

5. Before attempting to lay pipe, all water, debris, loose material, etc, encountered in trench must be pumped or bailed out and the trench must be kept clean and dry while the pipe is laid and backfilled. Where water is encountered in the excavation, the excavation must be dewatered in accordance with Section 02240 - Dewatering Excavation of these specifications.

B. Rock Excavation (open cut)
   1. Whenever rock, stone, masonry or other hard, unyielding material is encountered at or above the required trench bottom elevation, remove it to provide a clearance of no less that 8-inches below and 6-inches on each side of pipes and associated fittings, valves and other appurtenances. Backfill the over excavated area with granular bedding material.
   2. Removal of Rock by blasting or by use of a drop hammer is not permitted under this contract.
   3. Excavate rock as near as practicable to the outside shape of the work as shown on the Plans. Solid rock, not loosened from the adjacent solid rock, may extend within the neat outside surfaces of these shapes no more than two (2) inches, provided that on any ten (10) foot section of the excavation the total area of such projection at the neat outside surface of the sections does not exceed twenty (20) percent of the area of that section
   4. The Contractor is required to remove all loose rock and other material from the excavation. In the event that the excavation is enlarged beyond the outside shape of the sewer or sewer structures as shown on the Plans, the Contractor will not be entitled to any payment for the additional concrete needed to fill the voids caused by such over-breakage.

C. Trench Excavation (Short Tunnel Construction)
   1. In some instances, trees, fire hydrants, sidewalks, and other obstructions may be encountered, the proximity of which may be a hindrance to open cut excavation. In such cases, the Contractor must excavate by means of short tunnels in order to protect such obstructions against damage. Short tunnel work will be considered incidental to the construction and no additional payment will be allowed.

D. Additional Trench Excavation
   1. If the soils encountered at the elevations specified are not suitable, or it is determined necessary to go to an additional width and depth the excavation must be carried to such additional width and/or depth. Contractor must fill such excavated areas with approved backfill material as required or directed by the Owner.

E. Unauthorized Excavation
   1. Wherever the excavation is carried beyond or below the lines and grades shown on the Drawings all such excavated space must be refilled with select fill materials and in such manner as may be directed in order to insure the stability of all affected structures. Beneath all structures, space excavated without authority must be refilled by the Contractor with approved backfill materials and will be considered incidental to the construction and no

additional payment will be allowed.

F. Trenching Across or Over Existing Excavations or Utility Trenches
   1. In the event that the trench passes over or through a previous excavation, carefully compact and stabilize the bottom of the new trench or excavation to a density equal to or greater than 95% of the maximum dry density as determined by ASTM 01557. Perform this compaction carefully to avoid damaging the existing utility or structure.

G. Special Excavation
   1. 1. Remove unsuitable materials to provide 2-feet minimum horizontal and vertical clearance around water mains or related structures as applicable, unless otherwise directed by the Owner.

3.04 PLACEMENT OF PIPE BEDDING

A. Pipe Bedding
   1. Pipe laid in trenches must be bedded in accordance with the details shown on the Drawings.
   2. Existing underground structures, tunnels, conduits, and pipes crossing the excavation must be bedded with compacted sand. Bedding material must be placed under and around each existing underground structure, tunnel, conduit, or pipe as required to stabilize the excavation.
   3. At each joint, enough depth and width must be provided around the pipe so that joints can be properly made up.

B. Bedding Placement - Vaults and Structures
   1. Pipe bedding beneath precast bases, cast-in-place bases and other foundations must be 6-inches in thickness and thoroughly compacted in place to not less than 95% of the maximum dry density as determined by ASTM 01557.

C. Bedding and Backfill for Short Tunnel
   1. Pipes placed in short tunnels must be bedded in sand. The annular space between the pipe and undisturbed earth must be completely filled with compacted sand fill material. Pipelines in short tunnels must be supported to permit the placement of backfill.

3.05 BACKFILLING EXCAVATIONS

A. General
   1. All excavations must be backfilled to the original surface of the ground or to such other grades shown on the Drawings or as directed by the Owner. For areas to be covered by topsoil, backfill must be left 6-inches below the finished grade or as shown on the Drawings, or directed by the Owner. All backfilling must be done as soon as possible after water main piping has been installed and inspected, and as soon as mortar for masonry or thrust blocks have sufficiently set, unless directed otherwise by the Owner.
   2. Unsuitable material and material rejected by the Owner must immediately be removed from the Site and disposed of by the Contractor at his expense.

3. Construction equipment used to backfill against and over cast-in-place concrete structures must not be permitted to travel over these structures until the designated concrete strength has been obtained, as verified by concrete test cylinders. In special cases where conditions warrant, as determined by the Owner, the above restriction may be modified if the concrete has gained sufficient strength, as determined from test cylinders, to satisfy design requirements for the removal of forms and the application of load.

B. Backfill Procedure
   1. Sand fill material must be used for backfill where roadways, driveways, sidewalks, or other pavements are to be placed on the backfill or where the edge of the trench excavation is 5-feet or less from any roadway pavement, and in trenches crossing pavements or sidewalks for a distance beyond the edge of the pavement or sidewalk equal to the depth of the trench. Sand fill material must be used as backfill in trenches parallel to roadways, driveways, or other pavements from the top of the bedding to a depth below the ground surface equal to the distance between the inner face of the trench and the closest edge of the pavement.
   2. Where pavements and appurtenances for streets are to be placed over the trenches, the backfill material must be placed in uniform layers not greater than 6-inches in thickness and compacted in place. Each layer must be compacted to or not less than 95% of the maximum dry density as determined by ASTM 01557.
   3. All pipe sewers must be surrounded and covered by trench backfill above the granular embedment as soon as they are laid. The trench backfill must be properly compacted and tamped to a depth of at least one foot above the top of the pipe prior to placing the remainder of backfilling.
   4. Excavated material can be re-used as backfill only if directed or approved by the Owner.
   5. Where railroad tracks or pavements for highways are to be placed over trenches, the backfill must be placed in conformance with the standards set forth by the respective agency having jurisdiction over the railroad or highway.
   6. Trench backfilling work must be done in such a way so as to prevent damage to any pipe, utility, or structure.
   7. On monolithic concrete sewers and structures cast-in-place, trench backfill must not be placed until the concrete has attained a compressive strength of 2,000 psi.

C. Backfill under a Supported Water Main
   1. Backfill the open trench under the water main and 10-feet beyond the water main sides with approved material up to a level of 1-foot below the invert of the supported water main. The backfill material must be placed in layers of 12-inches with each layer mechanically compacted to 95% of the maximum dry density as determined by ASTM 01557.
   2. Place pipe bedding material from 1-foot below the water main invert to the water main centerline and compact to achieve 95% of the maximum dry density as determined by ASTM 01557.

3. Remove the water main pipe support systems, supporting beams, and pipe support straps; and cut-off and remove soldier piles to a level at least 4-feet below finished grade.
4. The water main pipe must be inspected for leakage and joint integrity and repaired if necessary, prior to backfilling above the water main.
5. After approval by the Owner, continue backfilling with approved material. The open trench must be backfilled up to the required sub grade level. The backfill material must be placed in layers of 12-inches with each layer mechanically compacted to 95% of the maximum dry density as determined by ASTM 01557.

D. Backfilling with Controlled Low Strength Material (CLSM) - Flowable Fill
1. Do not place the mix on frozen ground, in standing water, or during wet weather conditions. Mixing and placing may begin only if the air temperature is 35ºF minimum and rising. At time of placement, the material temperature must be 40 º F minimum. Mixing and placing must stop when the air temperature is 40 ºF and falling.
2. Place the mix directly from the chute into the space to be filled. Other placement methods may be approved by the Owner if the mix design is appropriate.
3. When backfilling against structures, place the mix in layers to prevent damage by lateral pressures. Side slopes must be stepped or serrated to prevent wedging action of the backfill against the structure. Allow each layer to harden prior to placing the next layer.
4. When backfilling pipe trench, distribute the mix evenly on each side of the pipeline to prevent movement.
5. The mix must not be exposed to freezing temperatures or wet weather conditions during the first 24 hours after placement.
6. The mix may be subjected to loading upon approval by the Owner, or when a penetration of 39 mm/blow or less has been obtained with the Dynamic Cone Penetrometer test.

E. Utility Line Abandonment with GROUT / CLSM Backfill
1. Do not place the mix in frozen pipe or in standing water. Mixing and placing may begin only if the ground temperature is 35ºF minimum and rising. At time of placement, the material temperature must be 40 ºF minimum. Mixing and placing must stop when the air temperature is 40 ºF and falling.
2. Place the mix directly from the chute into a pump to discharge into the pipe being filled. Other placement methods may be approved by the Owner if the mix design is appropriate.
3. Provide openings into the pipe being filled to allow air to escape and to monitor filling progress.
4. The mix must not be exposed to freezing temperatures or wet weather conditions during the first 24 hours after placement.

3.06 FINISH GRADING

A. Finish grading must be performed in accordance with the completed contour elevations and grades shown and must be made to conform to the existing ground surface. All finished graded surfaces must be left smooth and firm and graded to permit positive drainage.

END OF SECTION

SECTION 02 02 32

UTILITY BACKFILL MATERIALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Material Classifications.

B. Utility Backfill Materials:
   1. Bank run sand
   2. Select backfill
   3. Random backfill
   4. Pea gravel
   5. Crushed Aggregate

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 due to either gradation, plasticity, or moisture content.
   3. Materials that contain large clods, aggregates, 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 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. Secondary Backfill/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 course 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 02317 - 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 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 2.03, 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 2.03B.

B. Verification tests of backfill materials may be performed by the OWNER.

C. Random fill obtained from the project excavation as source is exempt from prequalification requirements by CONTRACTOR but must be inspected by OWNER's 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 2.01B, or by product descriptions, as given in Paragraph 2.02.

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: D_{60}/D_{10} - greater than 4 percent; amount passing No. 200 sieve - less than or equal to 5 percent.
   2. Class II: Poorly graded gravel and gravel-sand mixtures, little or no fines, poorly graded sands and gravely sands, little or no fines (GP, SP):
      a. Plasticity index: nonplastic to 4.
      b. Gradations: (GP, SP): amount passing No. 200 sieve - less than 5 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. Refer to Section 02317 - Excavation and Backfill for Utilities.

B. Provide backfill material that is free of stones greater than 6 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 OWNER, provided that the physical property criteria are determined to be satisfactory by testing.

D. Bank Run Sand Backfill: 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.

E. Cement Stabilized Sand Backfill.

F. 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 02951 - Pavement Repair and Resurfacing, to meet plasticity criteria.

G. Random Backfill: Any suitable soil or mixture of soils within Classes I, II, III and IV; or fat clay (CH) where allowed by the applicable backfill installation specification. Refer to Section 02317 - Excavation and Backfill for Utilities.

H. 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 to10
No.16	0 to 5

I. 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 wear 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 are not acceptable materials 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

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. Tests 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 wear of material retained on the No. 4 sieve.
   4. Clay lumps.
   5. Lightweight pieces
   6. Organic impurities

C. Production Testing. Provide reports to the OWNER from an independent testing laboratory that backfill materials to be placed in the Work meet applicable specification requirements.

D. Assist the OWNER in obtaining material samples for verification testing at the source or at the production plant.

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 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 requirements of 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 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 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 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 OWNER. Samples may be taken at the source or at the production plant, as applicable.

END OF SECTION

SECTION 02 02 33

ACCEPTANCE TESTING FOR SANITARY SEWERS

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Acceptance testing of sanitary sewers including:

1. Visual inspection of sewer pipes

2. Mandrel testing for flexible sewer pipes.

3. Leakage testing of sewer pipes.

4. Leakage testing of manholes.

5. Smoke testing of point repairs.

6. Television and Video Inspection.

B. All tests listed in this Section are not necessarily required on this Project. Required tests are named in other Sections which refer to this Section for testing criteria and procedures.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No payment will be made for acceptance testing under this Section. Include payment in unit price for work requiring acceptance testing.

2. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ASTM C 828 - Standard Test Method for Low Pressure Air Test of Vitrified Clay Pipe Lines.

B. ASTM C 924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.

C. ASTM D 3034 - Standard Specification for Type PSM Polyethylene (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

D. ASTM F 794 - Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

E. ASTM F 1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air.

F. ASTM C 1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.

1.4 PERFORMANCE REQUIREMENTS

A. Gravity flow sanitary sewers are required to have straight alignment and uniform grade between manholes.

B. Flexible pipe, including "semi-rigid" pipe, is required to show no more than 5 percent deflection. Test pipe no sooner than 30 days after backfilling of line segment but prior to final acceptance using standard mandrel to verify that installed pipe is within specified deflection tolerances.

C. Must meet Texas Commission on Environmental Quality (TCEQ) Testing Requirements Chapter-217-57.

1.5 SUBMITTALS

A. Conform to requirements of Section 01330 - Submittal Procedures.

B. Test Plan: Before testing begins and in adequate time to obtain approval through submittal process, prepare and submit test plan for approval by Project Manager. Include testing procedures, methods, equipment, and tentative schedule. Obtain advance written approval for deviations from Drawings and Specifications.

C. Test Reports: Submit test reports for each test on each segment of sanitary sewer.

1.6 GRAVITY SANITARY SEWER QUALITY ASSURANCE

A. Repair, correct, and retest manholes or sections of pipe which fail to meet specified requirements when tested.

B. Provide testing reports and video tape of television inspection as directed by Project Manager.

C. Upon completion of tape reviews by Project Manager, Contractor will be notified regarding final acceptance of sewer segment.

1.7 SEQUENCING AND SCHEDULING

A. Perform testing as work progresses. Schedule testing so that no more than 1000 linear feet of installed sewer remains untested at one time.

B. Coordinate testing schedules with Project Manager. Perform testing under observation of Project Manager.

PART 2 P R O D U C T S

2.1 DEFLECTION MANDREL

A. Mandrel Sizing. Rigid mandrel shall have outside diameter (O.D.) equal to 95 percent of inside diameter (I.D.) of pipe. Inside diameter of pipe, for purpose of determining outside diameter of mandrel, shall be average outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and average inside diameter for I.D. controlled pipe, dimensions shall be per appropriate standard. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.

B. Mandrel Design. Rigid mandrel shall be constructed of metal or rigid plastic material that can withstand 200 psi without being deformed. Mandrel shall have nine or more "runners" or "legs" as long as total number of legs is odd number. Barrel section of mandrel shall have length of at least 75 percent of inside diameter of pipe. Rigid mandrel shall not have adjustable or collapsible legs which would allow reduction in mandrel diameter during testing. Provide and use proving ring for modifying each size mandrel.

C. Proving Ring. Furnish "proving ring" with each mandrel. Fabricate ring of 1/2-inch-thick, 3-inch-wide bar steel to diameter 0.02 inches larger than approved mandrel diameter.

D. Mandrel Dimensions (5 percent allowance). Average inside diameter and minimum mandrel diameter are specified in Table 02533-5, Pipe vs. Mandrel Diameter, at end of this Section. Mandrels for higher strength, thicker wall pipe or other pipe not listed in table may be used when approved by Project Manager.

2.2 EXFILTRATION TEST

A. Water Meter: Obtain transient water meter from City for use when water for testing will be taken from City system. Conform to City requirements for water meter use.

B. Test Equipment:

1. Pipe plugs.

2. Pipe risers where manhole cone is less than 2 feet above highest point in pipe or service lead.

2.3 INFILTRATION TEST

A. Test Equipment:

1. Calibrated 90 degree V-notch weir.

2. Pipe plugs.

2.4 LOW PRESSURE AIR TEST

A. Minimum Requirement for Equipment:

1. Control panel

2. Low-pressure air supply connected to control panel.

3. Pneumatic plugs: Acceptable size for diameter of pipe to be tested; capable of withstanding internal test pressure without leaking or requiring external bracing.

4. Air hoses from control panel to:

a. Air supply.

b. Pneumatic plugs.

c. Sealed line for pressuring.

d. Sealed line for monitoring internal pressure.

B. Testing Pneumatic Plugs: Place pneumatic plug in each end of length of pipe on ground. Pressurize plugs to 25 psig; then pressurize sealed pipe to 5 psig. Plugs are acceptable when they remain in place against test pressure without external aids.

2.5 GROUND WATER DETERMINATION

A. Equipment: Pipe probe or small diameter casing for ground water elevation determination.

2.6 SMOKE TESTING

A. Equipment:

1. Pneumatic plugs.

2. Smoke generator as supplied by Superior Signal Company, or approved equal.

3. Blowers producing 2500 scfm minimum.

PART 3 E X E C U T I O N

3.1 PREPARATION

A. Provide labor, equipment, tools, test plugs, risers, air compressor, air hose, pressure meters, pipe probe, calibrated weirs, or any other device necessary for proper testing and inspection.

B. Determine selection of test methods and pressures for gravity sanitary sewers based on ground water elevation. Determine ground water elevation using equipment and procedures conforming to Section 01578 - Control of Ground Water and Surface Water.

3.2 VISUAL INSPECTION OF GRAVITY SANITARY SEWERS

A. Check pipe alignment visually by flashing light between structures. Verify if alignment is true and no pipes are misplaced. In case of misalignment or damaged pipe, remove and re- lay or replace pipe segment.

3.3 MANDREL TESTING FOR GRAVITY SANITARY SEWERS

A. Perform deflection testing on flexible and semi-rigid pipe to confirm pipe has no more than 5 percent deflection. Mandrel testing shall conform to ASTM D 3034. Perform testing no sooner than 30 days after backfilling of line segment, but prior to final acceptance testing of
line segment.

B. Pull approved mandrel by hand through sewer sections. Replace any section of sewer not passing mandrel. Mandrel testing is not required for stubs.

C. Retest repaired or replaced sewer sections.

3.4 LEAKAGE TESTING FOR GRAVITY COLLECTION SYSTEM PIPES

A. For a collection system pipe that will transport wastewater by gravity flow, test gravity sanitary sewer pipes for leakage by either exfiltration or infiltration methods, as appropriate, or with low pressure air testing.

B. Compensating for Ground Water Pressure:

1. Where ground water exists, install pipe nipple at same time sewer line is placed. Use 1/2-inch capped pipe nipple approximately 10 inches long. Make installation through manhole wall on top of sewer line where line enters manhole.

2. Immediately before performing line acceptance test, remove cap, clear pipe nipple with air pressure, and connect clear plastic tube to nipple. Support tube vertically and allow water to rise in tube. After water stops rising, measure height in feet of water over invert of pipe. Divide this height by 2.3 feet/psi to determine ground water pressure to be used in line testing.

C. Exfiltration test:

1. Determine ground water elevation.

2. Plug sewer in downstream manhole.

3. Plug incoming pipes in upstream manhole.

4. Install riser pipe in outgoing pipe of upstream manhole when highest point in service lead (house service) is less than 2 feet below bottom of manhole cone.

5. Fill sewer pipe and manhole or pipe riser, when used, with water to point 2-1/2 feet above highest point in sewer pipe, house lead, or ground water table, whichever is highest.

6. Allow water to stabilize for one to two hours. Take water level reading to determine drop of water surface, in inches, over one-hour period, and calculate water loss (1 inch of water in 4 feet diameter manhole equals 8.22 gallons) or measure quantity of water required to keep water at same level. Loss shall not exceed that calculated from allowable leakage according to Table 02533-1 at end of this Section.

D. Infiltration test: Ground water elevation must be not less than 2.0 feet above highest point of sewer pipe or service lead (house service).

1. Determine ground water elevation.

2. Plug incoming pipes in upstream manhole.

3. Insert calibrated 90 degree V-notch weir in pipe on downstream manhole.

4. Allow water to rise and flow over weir until it stabilizes.

E. Low Air Pressure Test: When using this test conform to ASTM C 828, ASTM C 924, or ASTM F 1417, as applicable, with holding time not less than that listed in Table 02533-2.

1. Low Pressure Air testing for sections of pipe shall be limited to lines less than 36-inch average inside diameter. Refer to charts 02533-2 and 02533-3.

2. Lines 36-inch average inside diameter and larger shall be tested at each joint. Minimum time allowable for pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch during joint test shall be 10 seconds, regardless of pipe size.

F. Retest: Repair and retest any section of pipe which fails to meet requirements.

3.5 TEST CRITERIA TABLES

A. Exfiltration and Infiltration Water Tests: Refer to Table 02533-1, Water Test Allowable Leakage, at end of this Section.

B. Low Pressure Air Test:

1. Times in Table 02533-2, Time Allowed for Pressure Loss from 3.5 psig to 2.5 psig, at end of this Section, are based on equation from Texas Commission on Environmental Quality (TCEQ) Design Criteria 217.57

		$T = 0.0850(D)(K)/(Q)$
where:	T =	time for pressure to drop 1.0 pounds per square inch gauge in
	K =	0.000419 DL, but not less than 1.0
	D =	average inside diameter in inches
	L =	length of line of same pipe size in feet
	Q =	rate of loss, 0.0015 ft^3/min./sq. ft. internal surface

2. Since K value of less than 1.0 shall not be used, there are minimum testing times for each pipe diameter as given in Table 02533-3, Minimum Testing Times for Low Pressure Air Test.

Notes: 1. when two sizes of pipe are involved, compute time by ratio of lengths involved.

2. Lines with 27-inch average inside diameter and larger may be air tested at each joint.

3. Lines with average inside diameter greater than 36 inches must be air tested for leakage at each joint.

4. If joint test is used, perform visual inspection of joint immediately after testing.

5. For joint test, pipe is to be pressurized to 3.5 psi greater than pressure exerted by groundwater above pipe. Once pressure has stabilized, minimum times allowable for pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be 10 seconds.

3.6 LEAKAGE TESTING FOR MANHOLES

A. After completion of manhole construction, wall sealing, or rehabilitation, but prior to backfilling, test manholes for water tightness using hydrostatic or vacuum testing procedures.

B. 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 minimum of 6 inches outside of manhole walls. Brace inverts to prevent lines from being dislodged when lines entering manhole have not been backfilled.

C. Vacuum testing:

1. Install vacuum tester head assembly at top access point of manhole and adjust for proper seal on straight top section of manhole structure. Following manufacturer's instructions and safety precautions, inflate sealing element to recommended maximum inflation pressure; do not over-inflate.

2. Evacuate manhole with vacuum pump to 10 inches mercury (Hg), disconnect pump, and monitor vacuum for time period specified in Table 02533-4, Vacuum Test Time Table.

3. A manhole passes the test if after 2.0 minutes and with all valves closed, the vacuum is at least 9.0 inches of mercury (Hg).

D. Perform hydrostatic exfiltration testing as follows:

1. Seal wastewater lines coming into manhole with internal pipe plug. Then fill 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 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.

3.7 SMOKE TEST PROCEDURES FOR POINT REPAIRS (WHEN REQUIRED BY OWNER)

A. Application: Perform smoke test to:

1. Locate points of line failure for point repair.

2. Determine when point repairs are properly made.

3. Determine when service connections have been reconnected to rehabilitated sewer.

4. Check integrity of connections to newly replaced service taps to liners and to existing private service connections.

B. Limitations: Do not backfill service taps until completion of this test. Test only those taps in single manhole section at one time. Keep number of open excavations to minimum.

C. Preparation: Prior to smoke testing, give written notices to area residents no fewer than 2 days, nor more than 7 days, prior to proposed testing. Also give notice to City of Brownsville Police and Fire Departments 24 hours prior to actual smoke testing.

D. Isolate Section: Isolate manhole section to be tested from adjacent manhole sections to keep smoke localized. Temporarily seal annular space at manhole for sliplined sections.

E. Smoke Introduction:

1. Operate equipment according to manufacturer's recommendation and as approved by Project Manager.

2. Conduct test by forcing smoke from smoke generators through sanitary sewer main and service connections. Operate smoke generators for minimum of 5 minutes.

3. Introduce smoke into upstream and downstream manhole as appropriate. Monitor tap/connection for smoke leaks. Note sources of leaks.

F. Repair and Retest: Repair and replace taps or connections noted as leaking and then retest. Taps and connections may be left exposed in only one manhole section at time. When repair or replacement, testing or retesting, and backfilling of excavation is not completed within one work day, properly barricade and cover each excavation as approved by Project Manager.

G. Service Connections: On houses where smoke does not issue from plumbing vent stacks to confirm reconnection of sewer service to newly installed liner pipe, perform dye test to confirm reconnection. Introduce dye into service line through plumbing fixture inside structure or sewer cleanout immediately outside structure and flush with water. Observe flow at service reconnection or downstream manhole. Detection of dye confirms reconnection.

3.8 TELEVISION AND VIDEO INSPECTION PROCEDURE

A. Refer to Document 02588- Cleaning and Television Inspection

Table 02533-1
WATER TEST ALLOWABLE LEAKAGE

DIAMETER OF RISER OR STACK IN INCHES	VOLUME PER INCH OF DEPTH		ALLOWANCE LEAKAGE*	
	INCH	GALLONS	PIPE SIZE IN INCHES	GALLONS/MINUTE PER 100 FT.
1	0.7854	.0034	6	0.0039
2	3.1416	.0136	8	0.0053
2.5	4.9087	.0212	13	0.0066
3	7.0686	.0306	12	0.0079
4	12.5664	.0306	15	0.0099
5	19.6350	.0544	18	0.0118
6	28.2743	.1224	21	0.0138
8	50.2655	.2176	24	0.0158
			27	0.0177
			30	0.0197
			36	0.0237
			42	0.0276
For other diameters, multiply square of diameters by value for 1" diameter.			Equivalent to 50 gallons per inch of inside diameter per mile per 24 hours.	

* Allowable leakage rate must not exceed 10 gallons per inch of inside diameter per mile per 24 hours, when sewer is identified as located within 25-year flood plain.

Table 02533-2 ACCEPTANCE TESTING FOR
SANITARY SEWERS

TIME ALLOWED FOR PRESSURE LOSS FROM 3.5 PSIG TO 2.5 PSIG														
Pipe Diam. (in)	Min. Time (min: sec)	Length for Min. Time (ft)	Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)										
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	500 ft	550 ft	600 ft
6	5:40	398	0.8548	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:25	7:07	7:50	8:33
8	7:33	298	1.5196	7:33	7:33	7:33	7:33	7:36	8:52	10:08	11:24	12:40	13:56	15:12
10	9:27	239	2.3743	9:27	9:27	9:27	9:54	11:52	13:51	15:50	17:48	19:47	21:46	23:45
12	11:20	199	3.4190	11:20	11:20	11:20	14:15	17:06	19:57	22:48	25:39	28:30	31:20	34:11
15	14:10	159	5.3423	14:10	14:10	17:48	22:16	26:43	31:10	35:37	40:04	44:31	48:58	53:25
18	17:00	133	7.6928	17:00	19:14	25:39	32:03	38:28	44:52	51:17	57:42	64:06	70:31	76:56
21	19:50	114	10.4708	19:50	26:11	34:54	43:38	52:21	61:05	69:48	78:32	87:15	95:59	104:42
24	22:40	99	13.6762	22:48	34:11	45:35	56:59	68:23	79:47	91;10	102:34	113:58	125:22	136:46
27	25:30	88	17.3089	28:51	43:16	57:42	72:07	86:33	100:58	115:24	129:49	144:14	158:40	173:05
30	28:20	80	21.3690	35:37	53:25	71:14	89:02	106:51	124:39	142:28	160:16	178:05	195:53	213:41
33	31:10	72	25.8565	43:06	64:38	86:11	107:44	129:17	150:50	172:23	193:55	215:28	237:01	258:34

Table 02533-3
MINIMUM TESTING TIMES FOR LOW PRESSURE AIR TEST

PIPE DIAMETER ***(INCHES)***	**MINIMUM TIME** ***(SECONDS)***	**LENGTH FOR MINIMUM TIME** ***(FEET)***	**TIME FOR LONGER LENGTH** ***(SECONDS/FT***
6	340	398	0.855
8	454	298	1.520
10	567	239	2.374
12	680	199	3.419
15	850	159	5.342
18	1020	133	7.693
21	1190	114	10.471
24	1360	100	13.676
27	1530	88	17.309
30	1700	80	21.369
33	1870	72	25.856

Table 02533-4 VACUUM TEST TIME TABLE

DEPTHIN FEET	TIME IN SECONDS BY PIPE DIAMETER		
	48"	60"	72"
4	10	13	16
8	20	26	32
12	30	39	48
16	40	52	64
20	50	65	80
24	60	78	96
*	5.0	6.5	8.0
*Add T times for each additional 2-foot depth. (The values listed above have been extrapolated from ASTM C 1244			

Table 02533-5
PIPE VS. MANDREL DIAMETER

Material and Wall Construction	Nominal Size (Inches)	Average I.D. (Inches)	Minimum Mandrel Diameter (Inches)
PVC-Solid (SDR 26)	6	6	5.764
5.476			
	8	7.715	7.329
	10	9.646	9.162
PVC-Solid (SDR 35)	12	12	11.737
11.150			
	15	14.374	13.655
	18	17.629	16.748
	21	20.783	19.744
	24	23.381	22.120
	27	26.351	25.033
PVC-Truss		8	7.750
7.363			
	10	9.750	9.263
	12	11.790	11.201

	15	14.770	14.032
PVC-Profile (ASTM F 794)	12	11.740	11.153
	15	14.370	13.652
	18	17.650	16.768
	21	20.750	19.713
	24	23.500	22.325
	27	26.500	25.175
	30	29.500	28.025
	36	35.500	33.725
	42	41.500	39.425
	48	47.500	45.125
HDPE-Profile	18	18.000	17.100
	21	21.000	19.950
	24	24.000	22.800
	27	27.000	25.650
	30	30.000	28.500
	36	36.000	34.200
	42	42.000	39.900
	48	48.000	45.600
	54	54.000	51.300
	60	60.000	57.000
Fiberglass		12	12.85
11.822			
(Class SN 46)	18	18.66	17.727
	20	20.68	19.646
	24	24.72	23.484
	30	30.68	29.146
	36	36.74	34.903
	42	42.70	40.565
	48	48.76	46.322
	54	54.82	52.079
	60	60.38	57.361

END OF SECTION

SECTION 02 02 34

SANITARY SEWER SERVICE STUBS OR RECONNECTIONS

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Installation of service stubs in sanitary sewers serving areas where sanitary sewer service did not previously exist.

B. Reconnection of existing service connections along parallel, replacement, or rehabilitated sanitary sewers.

C. Installation of sanitary sewer service stubs, within street right-of-way, terminating with a clean-out and a plug at the right-of-way to allow for future connection of a single service, on at a double-wye fitting plugged at both to allow for future connection to two services.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for sanitary sewer service stubs or service reconnections with stacks located within 5 feet of sanitary sewer main centerline is on unit price basis for each stub or reconnection. Payment will be made for each service stub or reconnection installed complete in place, including service connections, couplings, and adapters disconnecting existing services, reconnecting new service, fittings, excavation, and backfill.

2. Payment for sanitary sewer service stubs or service reconnections without stacks located within 5 feet of sanitary sewer main is on unit price basis for each stub or reconnection. Payment will be made for each service stub or reconnection installed complete in place, including service connections, couplings, and adapters disconnecting existing services, reconnecting new service, fittings, excavation, backfill and testing.

3. Payment for sanitary sewer service leads beyond 5 feet from the right-of-way and clean-outs shall be paid as follows:

a. Payment for sanitary sewer service leads beyond 5 feet from the right-of-way clean-out, connection or reconnection shall be paid for on a linear foot basis. Measurement shall be taken along the centerline of the pipe from the centerline of the lead connection or stack at the sanitary sewer main and shall end 5 foot from the right-of-way. Payment will be made for each linear foot

of pipe installed, complete in place, including sewer pipe, excavation, shoring, bedding, backfill, and accessories. Auger pipe for service stubs will be paid as provided in Section – Pipe and Casing Augering.

b. Payment for standard 6-inch clean-out on service lead assembly for a single or double future service connection installed at end of lead is on a unit price basis for each assembly and shall include all portions of the lead and service connection with clean-out within 5 feet of the right-of-way. Payment will be made for each assembly installed and complete in place, including excavation, fittings, offsets, plugs, pipe sections, valve boxes, bedding, backfill, and testing.

4. Pay estimates for progress payments will be made as measured above according to following schedule:

a. An estimate for 95 percent payment will be authorized when reconnection is completely installed and backfilled.

b. An estimate for 100 percent payment will be authorized when reconnection has been tested as specified in Section - Acceptance Testing for Sanitary Sewers.

5. One or more connections discharging into common point are considered one service connection. Contractor shall not add service reconnections without approval of Project Manager. Project Manager may require connections to be relocated to avoid having more than two service connections per reconnection.

6. Protruding service connections which must be removed to allow liner insertion are paid as service reconnection when connected. If abandoned, they will be paid as abandoned connection.

7. Payment for abandonment of service connection is on unit price basis for each abandoned connection. No separate payment will be made for abandonment of service connection unless excavation is required. No separate payment will be made for excavation of sanitary sewer services within new or replacement sewer trench.

8. No separate payment will be made for removal of existing sanitary sewer service stubs. Include payment in unit price for Section - Sanitary Sewer Service Stubs or Reconnections.

9. No separate payment will be made for abandoned service connection when service to be abandoned is within 4 feet of active connection. Payment for only one abandoned service connection will be allowed when second abandoned connection is within 4 feet of first.

10. If faulty remote cut is later corrected using procedures specified for reconnection by excavation, only one reconnection will be allowed for payment.

11. Sanitary Sewer Cleanout on Service Lateral shall be provided in accordance with detail provided. Payment is on per each basis as indicated in Document 00410B.

12. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ASTM D 1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

B. ASTM D 3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

C. ASTM D 3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

D. ASTM F 477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

1.4 PERFORMANCE REQUIREMENTS

A. Accurately locate in field all proposed service stubs along new sanitary sewer main.

B. Accurately locate in field existing service connections and proposed service stubs along alignment of new parallel or replacement sewer main.

1.5 SUBMITTALS

A. Conform to requirements of Submittal Procedures.

B. Submit product data for each pipe product, fitting, coupling and adapter.

C. Show reconnected services on record drawings. Give exact distance from each service connection to nearest downstream manhole.

PART 2 P R O D U C T S

2.1 PVC SERVICE CONNECTION

A. As stub outs, use PVC sewer pipe of 4-inch through 10-inch diameter, conforming to ASTM D 1784 and ASTM D 3034, with cell classification of 12454. SDR (ratio of diameter to wall thickness) shall be 26 for pipe 10 inches in diameter or less.

B. PVC pipe shall be gasket jointed with gasket conforming to ASTM D 3212.

C. Provide service connection pipe in sizes shown on Drawings. For reconnection of existing services, select service connection pipe diameter to match existing service diameter. Reconnections to rehabilitated sanitary sewer mains shall be limited to following maximum service connection diameter:

Sewer Diameter	Maximum Service Connection Diameter
8" or less	4"
10" or greater	6"

D. Subject to above limits, provide 6-inch service connection when more than one service discharges into single pipe.

E. Connect service pipes to parallel or replacement sewer mains with prefabricated, full-bodied tee or wye fittings conforming to specifications for sewer main pipe material as specified in other Sections for sewers up to 18 inches in diameter.

F. Where sewers are installed using pipe augering or tunneling, or where sewer is greater than 18 inches in diameter, use three-piece service connection or pipe saddle conforming to ASTM C-923to connect service to sewer main.

2.2 PIPE SADDLES

A. Use pipe saddles only on rehabilitated sanitary sewer mains. Comply with Paragraph 2.01E for new parallel and replacement sanitary sewer mains.

B. Supply one-piece prefabricated saddle, either polyethylene or PVC, with neoprene gasket to accomplish complete seal. Use saddle fabricated to fit outside diameter of connecting pipe. Protruding lip of saddle must be at least 5/8-inch long with grooves or ridges to retain stainless steel band clamps.

C. Use 1/2-inch stainless steel band clamps for securing saddles to liner pipe.

2.3 COUPLINGS AND ADAPTERS

A. For connections between new PVC pipe stubouts and existing service, 4-, 6-, or 8-inch diameter, use flexible adapter coupling consisting of neoprene gasket, stainless steel shear rings with 1/2-inch stainless steel band clamps, and two nut and bolt clamps. For connections that are 10- inches or over, use neoprene gasket, with stainless steel shear band, and two stainless steel nut and bolt or T-Bolt clamps. Thermalized plastics are not allowed. Refer to approved couplings and adaptors.

1. Product characteristics, meet ASTM C1173 and requirements for neoprene rubber and metallic components.

2. Shear Band: ½ inch 300 series stainless steel shear band with two molded on worm gear clamps (ASTM A240)

3. Clamps: 300 Series nut and bolt clamp band fabricated from AISI Type 316 stainless steel (ASTM A240)

B. For connections between new PVC pipe stubout and new service, use approved rubber- gasket adapter coupling conforming to requirements of 2.03A.

C. Couplings and Adaptors components will be in accordance with following Requirements:

1. Neoprene Rubber. 100% rubber. Thermalized plastics are not allowed.

a. Compressive Strength/ Tensile Strength, psi min (ASTM D412 Die C, ASTM D638). Initial value: 1000 min. Value after 112 days: 1000 min

b. Elongation at break, % (ASTM D412, ASTM D638). Initial value: 200 Value after 112 days: 200

c. Shore Durometer, Type A, point change max (ASTM D2240). Initial value (1 sec. reading, min): 60. Value point change max: 15

d. Compression Set -- Chemical exposures, % max (ASTM D395 Method B).
Initial Value: 20 max. Value after exposure: 20 max

e. Compression Set -- Bacteriological, unconditioned surface dry, % max (ASTM D395 Method B): Initial value 20. Value after 112 day: 20

f. Water Absorption, % max (ASTM D570). Initial value: 4. Value after 112 days: % max ≥4

g. Aged Tensile (psi) -- Tensile strength (after exposure to 300 psi (2100 kPa) oxygen at 158° ± 1.8°F [70° ± 1°C] for 96 hours), % of initial, min (ASTM D572). Initial: 70 min. After accelerated aging: 70 min.

h. Aged Elongation -- Elongation at break (after exposure to 300 psi (2100 kPa) oxygen at 158° ± 1.8°F [70° ± 1°C] for 96 hours), % of initial, min. (ASTM D572). Initial value: 70 min. Test after accelerated aging: 70 min.

i. Ozone resistance (after exposure to 100 pphm ozone for 50 hours at 104° ± 2°F [40° ± 1°C]), (ASTM D518, procedure C, and ASTM D1149). Initial value: No cracking. After exposure: No cracking

j. Weight Change, % max. (approx. specimen size 1.0 x 3.0 x 0.1 inch) (25 x 75 x 2.5mm), (ASTM D543): value before and after exposure ±1.5 max

2. Stainless Steel components 300 series. (ASTM A240).

3. Components can be factory fabricated or mechanically molded

2.4 STACKS

A. Provide stacks for service connections wherever crown of sewer is 8 feet or more below finished grade.

B. Construct stacks of same material as sanitary sewer and as shown on Drawings.

C. Provide stacks of same nominal diameter at sanitary service line.

2.5 PLUGS AND CAPS

A. Seal upstream end of unconnected sewer service stubs with rubber gasket plugs or caps of same pipe type and size.

2.6. THREE PIECE SERVICE CONNECTION (TEE)

A. The connection is comprised of three parts; PVC hub, stainless steel band and rubber boot.

B. PVC hub and rubber boot shall be engineered to accept the wall thickness and internal radius of the pipe. The PVC hub and rubber boot shall protrude no more than ½" into the sewer pipe.

C. The PVC hub shall be in accordance with ASTM D-3034.

D. The rubber boot shall be in accordance with ASTM F 477.

E. The Tee shall be sized to accept 4" or 6" service lines, as required.

F. The Tee shall only be used when approved by the Project Manager.

G. Service Connection (Tee) shall be in accordance with Section 2.03.

2.7 SANITARY SEWER STANDARD CLEANOUT ON SERVICE LATERAL:

Where directed, the contractor shall remove (if existing) and install new sanitary sewer cleanout. This shall include: frame and cover, molded polyethylene, four-way cleanout, 12” Ultra-Rib PVC or SDR35 PVC riser pipe, 2-foot square concrete pad, cement stabilized sand backfill, and all labor, equipment, and site restoration.

A. The standard frame and cover shall be cast iron, embossed with “Sewer Cleanout” “Brownsville PUB”.

B. The molded polyethylene, four-way cleanout shall be the “wastewater access chamber” as manufactured by Uponor ETI Co. or approved equal.

C. Riser pipe shall be 12” Ultra-Rib PVC or SDR35 PVC.

D. Provide sealing material between pipe riser and cleanout cover frame that is a hydrophilic elastic sealant, or approved equal.

2.8 SANITARY SEWER 4” OR 6” CLEANOUT ON SERVICE LATERAL

Where directed, the contractor shall remove (if existing) and install new sanitary sewer cleanout. This shall include: 4” or 6” removable threaded countersunk plug, 4” or 6” SDR 35 PVC riser pipe with 45 degree bend and wye, 3-RT Valve Box MFG by Old Castle Precast Inc or approved equal, and all labor, equipment, and site restoration. Payment made will be made at the unit price set in Document 00410B. Where service lateral to an abandoned house is encountered, install 4” or 6” plug for future house connection. All work shall be performed as per 4-Inch Cleanout Detail on Service Lead or Drawing No. 02534-05. Cleanout box may be installed in accordance with Drawing No. 02085-01.

PART 3 E X E C U T I O N

3.1 PERFORMANCE REQUIREMENTS

A. Provide minimum of 72 hours notice to customers whose sanitary sewer service will potentially be interrupted.

B. Accurately field locate service connections, whether in service or not, along rehabilitated sanitary sewer main. For parallel and replacement sewers, service connections may be located as pipe laying progresses from downstream to upstream.

C. Properly disconnect existing connections from sewer and reconnect to rehabilitated liner, as described in this Section.

D. Reconnect service connections, including those that go to unoccupied or abandoned buildings or to vacant lots, unless directed otherwise by Project Manager. Install a stack and cap the reconnection where the service is to a vacant lot or location where a structure has been demolished, unless directed otherwise by Project Manager.

E. Complete reconnection of service lines within 24 hours after cured-in-place liner installation and within 72 hours after disconnection for sliplining, parallel, or replacement sanitary sewer mains.

F. Reconnect services on cured-in-place liner at 10 feet depth or less by excavation method. Project Manager reserves the right to require service connections by excavation when remote cut service connection damages lines.

G. Reconnection by excavation method shall include stack and fittings and required pipe length to reconnect service line.

H. Connect services 8 inches in diameter and larger to sewer by construction of manhole. Refer to appropriate Section on manholes for construction and payment.

I. All couplings and adapters used to either connect existing or new services to new PVC pipe stubouts shall be eccentric reducers when the coupling or adapter is used as a reducer and when used in the horizontal or on a horizontal slope less than 1:1 or less than a 45□ angle (such that the flowline across the pipe size transition shall remain straight; no upset). The Contractor shall properly cut the ends of the two PVC pipes joined by a flexible coupling or adapter such that they do not extend into the transition area of the reducer. Pipe size transitions on existing or new services to new PVC pipe stubouts shall not be made in the vertical (in a stack or riser). Flexible couplings or adapters shall not be allowed for use in the vertical or on a slope greater than 1:1 or greater than a 45□ angle.

3.2 PROTECTION

A. Provide barricades, warning lights, and signs for excavations created for service connections. Conform to requirements of Section 01504 - Temporary Facilities and Controls.

B. Do not allow sand, debris, or runoff to enter sewer system.

3.3 PREPARATION

A. Determine existing sewer locations and number of existing service connections from closed- circuit television (CCTV) inspection tapes or from field survey. Accurately field locate existing service connections, whether in service or not. Use existing service locations to connect or reconnect service lines or liner.

B. For rehabilitated sanitary sewer mains, allow liner to normalize to ambient temperature and recover from imposed stretch. For cured-in-place liners, verify that liner is completely cured.

C. For new parallel and replacement sanitary sewer mains, complete testing and acceptance of downstream sewers as applicable. Provide for compliance with requirements of Paragraph 3.01E.

3.4 EXCAVATION AND BACKFILL

A. Excavate in accordance with Excavation and Backfill for Utilities.

B. Perform work in accordance with OSHA standards. Employ Trench Safety System as specified in Trench Safety System for excavations requiring trench safety.

C. Install and operate necessary ground water and surface water control measures in accordance with requirements of Control of Ground Water and Surface Water.

D. Determine locations where limited access, buildings or structure preclude use of mechanical excavation equipment. Obtain approval from Project Manager for hand excavation.

E. When the excavation shows that a service line is not connected, abandon the service reconnection and backfill the excavation.

3.5 RECONNECTION BY EXCAVATION METHOD

A. SADDLE METHOD

1. Remove a portion of the existing sanitary sewer main or carrier pipe to expose the liner pipe. Provide sufficient working space for installing a pre-fabricated pipe saddle.

2. Carefully cut a hole in the liner pipe to accept the protrusion on the underside of the saddle. Length of protrusion shall be equal to the wall thickness of the liner pipe.

3. Apply an approximately 1/2" diameter bead of uncured, 100% pure silicone caulk (siliconized caulk will not be allowed), GE or approved equal, to the surface of the gasket that contacts the bottom of the saddle. A 1/2" bead of silicone caulk shall also be placed around the tapped hole in the polyethylene, PVC, or cured-in-place pipe. The beads of caulk should be placed approximately in the center of the gasket and, on the pipe, in the center of the area covered by the gasket. The saddle shall be installed and secured while

the silicone caulk is uniformly fluid and pliable, not hardened or rubbery and with no hardened, rubbery areas or nodules. Adequate quantities of silicone caulk should be applied to allow it to flow or be extruded into any corrugations in the gasket surface and into any irregularities (scratches or gouges) in the surface of the polyethylene, PVC, or cured-in-place pipe.

4. Install the saddle with gasket using stainless steel bands on each side of the saddle. Tighten the bands to produce a watertight seal between the saddle and the liner pipe.

B. THREE PIECE SERVICE CONNECTION METHOD

1. Remove a portion of the existing sanitary sewer main or carrier pipe to expose the liner pipe. Provide sufficient working space to install three piece service connection.

2. Precisely cut a circular hole, per the manufactures recommendations, in the liner pipe that will form a tight fit between the liner pipe PVC stub and rubber boot.

3. Install the rubber boot into the cored hole, making sure the boot is properly oriented to the mainline. Lubricate the rubber boot with a special solution provided by the three piece service connection manufacturer. Make sure the upper and lower ribs of the rubber boot are correctly seated against the inside and outside diameter of the liner pipe.

4. Insert the PVC hub into the rubber boot, per manufacturer's recommended instructions. Place stainless steel band around the top of the rubber boot and tighten to form a watertight seal.

C. SERVICE LINE CONNECTIONS TO SADDLES OR THREE PIECE SERVICE CONNECTIONS

1. Remove and replace cracked, offset or leaking service line up to 8 feet (measured horizontally) from the center line of the new liner.

2. Make connections between liner and existing service line using PVC sewer pipe and approved couplings/fittings using stainless steel bands to construct new stacks and/or service lines.

3. Test all service connections by smoke testing the sewer main and connections before backfilling.

4. Encase the entire service connection is cement stabilized sand or crushed stone. Place a minimum of 6 inches below and 12 inches above and on each side of the service line and pipe connection.

3.6 RECONNECTION BY REMOTE METHOD

A. Make service reconnections using remote-operated cutting tools on cured-in-place liners at depth greater than 10 feet.

B. Employ method and equipment that restore service connection capacity to not less than 90 percent of original capacity.

C. Immediately open missed connections and repair holes drilled in error using method approved by Project Manager.

3.7 RECONNECTION ON PARALLEL OR REPLACEMENT SEGMENTS

A. Install a full-bodied tee or wye fitting on the new sanitary sewer main for each service connection.

B. Remove and replace cracked, offset or leaking service line for up to 5 feet, measured horizontally, from centerline of sanitary sewer main.

C. Make up connection between main and existing service line using PVC sewer pipe and approved couplings, as shown on Drawings.

D. Test service connections before backfilling.

E. Embed service connection and service line as specified for sanitary sewer main as shown on Drawings. Place and compact trench zone backfill in compliance with Excavation and Backfill for Utilities.

3.8 INSTALLATION OF NEW SERVICE STUBS

A. Install service connections on sanitary sewer main for each service connection. Provide length of pipe required to allow sufficient room for standard 6-inch clean-out service lead assembly in accordance with detail 02534-05. Install plug(s) or cap on the upstream end(s) of service stub(s) as needed.

B. Test service connections before backfilling.

C. Embed service connection and service line as specified for sanitary sewer main, and as shown on Drawings. Place and compact trench zone backfill in compliance with Section 02317 - Excavation and Backfill for Utilities. Install minimum 2-foot length of magnetic locating tape along axis of service stub and 9 inches to 12 inches above crown of pipe, at end of stub.

3.9 TESTING

A. Test service reconnections and service stubs. Follow applicable procedures given in Section 02533 - Acceptance Testing for Sanitary Sewers to perform smoke testing to confirm reconnection.

B. Perform post installation CCTV inspection as specified in Cleaning and Television Inspection to show locations of service connection.

3.10 CLEANUP

A. Backfill excavation as specified in Excavation and Backfill for Utilities.

B. Replace pavement or sidewalks removed or damaged by excavation in accordance with Pavement Repair and Resurfacing. In unpaved areas, bring surface to grade and slope surrounding excavation. Replace minimum of 4 inches of topsoil and seed according to requirements of Hydro-mulch Seeding.

END OF SECTION

SECTION 03 00 04
CONCRETE ADMIXTURES

SUBSECTION 405S

405S.1 Description

This item shall govern material requirements of admixtures for Portland cement concrete.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

405S.2 Submittals

The submittal requirements of this specification item include:

A. Type and manufacturer of any proposed admixture.

B. Certification that proposed admixture meet the requirements of this specification, ASTM C260 and ASTM C494.

C. For a specific mix design, a statement of compatibility of products shall be submitted when admixtures from multiple manufacturers are proposed.

405S.3 Materials

All admixture submittals must be approved by the Engineer or designated representative. No admixture shall be chloride-based or have chloride(s) added in the manufacturing process. Admixtures must be pretested by the Texas Department of Transportation (TXDOT) Materials and Tests Engineer and be included in the State's current approved admixture list. All admixtures must retain an approved status through the duration of a mix design's one-year approval period.

(1) Air Entraining Admixture:

An "Air Entraining Admixture" is defined as a material which, when added to a concrete mixture in the proper quantity, will entrain uniformly dispersed microscopic air bubbles in the concrete mix. The admixture shall meet the requirements of ASTM Designation: C 260 modified as follows:

(a) The cement used in any series of test shall be either the cement proposed for the specific work or a "reference" Type I cement from one mill.

(b) The air entraining admixture used in the reference concrete shall be Neutralized Vinsol

Resin.

(2) Water-reducing Admixture:

A "Water-reducing Admixture" is defined as a material which, when added to a concrete mixture in the correct quantity, will reduce the quantity of mixing water required to produce concrete of a given consistency and required strength. This admixture shall conform to ASTM C 494, Type A.

(3) Accelerating Admixture:

An "Accelerating Admixture" is defined as an admixture that accelerates the setting time and the early strength development of concrete. This admixture shall conform to ASTM C 494, Type C. The accelerating admixture will contain no chlorides.

(4) Water-reducing, Retarding Admixture:

A "Water-reducing, Retarding Admixture" is defined as a material which, when added to a concrete mixture in the correct quantity, will reduce the quantity of mixing water required to produce concrete of a given consistency and retard the initial set of the concrete. This admixture shall conform to ASTM C 494, Type D.

(5) High-range Water Reducing Admixtures:

A "High-range Water Reducing Admixture", referred to as a superplasticizer, is defined as a synthetic polymer material which, when added to a low slump concrete mixture increases the slump without adversely affecting segregation, impermeability or durability of the mix. This admixture shall conform to ASTM C 494, Type F or G.

(6) Fly Ash:

Fly ash used in Portland cement concrete as a substitute for Portland cement or as a mineral filler shall comply with TXDOT Materials Specification D-9-8900 and be listed on TXDOT's current list of approved fly ash sources. Fly ash obtained from a source using a process fueled by hazardous waste (30 Texas Administrative Code, Section 335.1) shall be prohibited. This applies to any other specification concerning the use of fly ash. Contractor shall maintain a record of source for each batch. Supplier shall certify that no hazardous waste is used in the fuel mix or raw materials.

405S.4 Certification and Product Information

The Contractor shall submit the name of the admixture proposed and manufacturer's certification that the selected admixtures meet the requirements of this item and of ASTM C 260 and C 494 as applicable. Admixtures for a mix design shall be of the same brand. If more than one admixture is proposed in the concrete mix, a statement of compatibility of components shall accompany certification. Manufacturer's product literature shall specify when in the batching/mixing operation the admixture must be added.

The Engineer or designated representative may request additional information such as infrared spectrophotometry scan, solids content, pH value, etc., for further consideration. Any unreported changes in formulation discovered by any of the tests prescribed herein may

be cause to permanently bar the manufacturer from furnishing admixtures for Owner's work.

405S.5 Construction Use of Admixtures

All admixtures used shall be liquid except high-range water reducers which may be a powder. Liquid admixtures shall be agitated as needed to prevent separation or sedimentation of solids; however, air agitation of Neutralized Vinsol Resin will not be allowed.

No admixture shall be dispensed on dry aggregates. Admixtures shall be dispensed at the batching site separately, but at the same time as the mixing water. Only high range water reducers may be introduced into the mix at the job site.

When other admixtures are used with fly ash, the amount of the other admixture to be used shall be based on the amount of Portland cement only and not the amount of Portland cement and fly ash.

When high-range water reducers are to be added at the job site, transit mixers shall be used. Admixture manufacturer literature shall indicate recommended mixing methods and time for the specific equipment and mix design used. The transit mix equipment shall not be loaded in excess of 63 percent of its rated capacity to ensure proper mixing of the admixture at the site. If during discharging of concrete a change in slump in excess of 30% is noted, the remaining concrete shall be rejected unless prior approval was given by the Engineer or designated representative to retemper a load with a second charge of admixture. Retempering with water shall not be allowed.

Accelerating admixtures will not be permitted in combination with Type II cement.

All mixes with air entrainment shall have a minimum relative durability factor of 80 in accordance with ASTM C 260. Dosage of air entrainment admixtures may be adjusted by the Contractor to stay within the specified tolerances for air entrainment of Standard Specification Item No. 403S, "Concrete for Structures".

SECTION 03 00 10

CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the furnishing of materials, storing, mixing, handling and the placement of concrete for concrete pavement, precast concrete, cast-in-place structures or as identified for placement within other Specification Sections or as shown on PLANS.

1.02 RELATED REQUIREMENTS (NOT USED)

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
   1. American Concrete Institute (ACI)
      a. ACI304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete
      b. ACI3.04.4R, Placing Concrete with Belt Conveyors
      c. ACI3.04.5R, Batching, Mixing, and Job Control of Lightweight Concrete
      d. ACI3.04.6R, Guide for the Use of Volumetric Measuring and Continuous-Mixing Concrete Equipment
      e. AC1318/318R, Building Code Requirements for Structural Concrete
   2. American Society For Testing And Materials (ASTM)
      a. ASTM C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field
      b. ASTM C33, Standard Specification for Concrete Aggregates
      c. ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
      d. ASTM C42, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
      e. ASTM C94, Standard Specification for Ready-Mixed Concrete
      f. ASTM C143/C143A, Standard Test Method for Slump of Hydraulic Cement Concrete
      g. ASTM C150, Standard Specification for Portland Cement
      h. ASTM C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
      i. ASTM C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
      j. ASTM C232, Standard Test Methods for Bleeding of Concrete
      k. ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete
      l. ASTM C293, Standard Test Method For Flexural Strength of Concrete (Using Simple Beam With Center - Point Loading)
      m. ASTM C494, Standard Specification for Chemical Admixtures for Concrete
      n. ASTM C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Concrete

o. ASTM C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
p. ASTM E329, Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.04 DEFINITIONS

A. HRWR - High Range Water Reducing Admixture

B. ppm - parts per million

1.05 SUBMITTALS

A. Furnish laboratory reports showing proportions and materials selected will produce laboratory-mixed concrete of specified quality and having strengths 20 percent higher than 28-day strength specified, at maximum slump and maximum air content specified.

B. Samples
1. Furnish material samples to approved testing laboratory for review and testing.
2. Provide sufficient material quantities for testing and determining mixes to produce concrete classes specified.

C. Mix Designs
1. Submit mix designs for each different concrete mix proposed for the project.
2. Secure confirmation of laboratory tests on proposed mix designs prior to submittal.
3. Use only approved mix designs.
4. Make required tests of mix as called for elsewhere in this Specification Section under Paragraph 1.05 E.

D. Reports: Provide certified mill test reports on cement and sieve analysis on aggregates. When fly ash is used, provide documentation to confirm fly ash source is approved by the Texas Department of Transportation for use in concrete for bridges.

E. Tests
1. Make moisture tests of aggregate to ensure proper batching and proportioning.
2. Provide and maintain curing facilities for test specimens conforming to ASTM C31.
3. For Structural Concrete
   a. Perform sufficient number of tests to maintain check on quality.
   b. Conduct tests as per test procedures ASTM C31 and C39 for Compression Test.
   c. When portland cement concrete (other than high-early-strength concrete) is used, test minimum of two standard 6-inch by 12-inch cylinders at 7 days and minimum of two 6-inch by 12-inch cylinders at 28 days for each 50 yards of concrete placed, for each day's placement, or for each structure, whichever results in more cylinders.
   d. When high-early-strength concrete is used, test a minimum of two standard 6-inch by 12-inch cylinders at 3 days and minimum of two 6-inch by 12-inch cylinders at 7 days for each 50 cubic yards of concrete placed, for each day's placement, or for each structure, whichever results in more cylinders. Minimum strengths normally required at 7 and 28 days will be required at 3 and 7 days, respectively.
4. For paving concrete, test pavement work as required by PLANS and/or as follows:
   a. Make one beam for each 1,000 square yards of pavement, or part thereof, for each day's placement, and/or one beam on each street.

b. Size of beams as required by ASTM C31.
c. Core sampling in accordance with requirements as indicated on PLANS. If the requirements are not shown on PLANS, make one core for each 1,000 square yards of pavement or at least one core for each street, whichever is least in area. Core samples to be in accordance with ASTM C42.
d. Fill core hole with nonshrinking grout per ASTM C11 07 at no additional cost to OWNER.
e. Test core for compressive strength and for thickness in accordance with ASTM C42.
f. Test for flexural strength in accordance with ASTM C293, "Flexural Strength of Concrete (using simple beam with center-point loading)."

5. For air entrainment, make two tests, in accordance with ASTM C231 or C173, for each day's placing.
6. Measure slump, in accordance with ASTM C143, periodically, but not less than one measurement for each batch of concrete from which specimens are made.

F. Specimen Handling
1. Mark test specimens clearly in a definite sequence.
2. Transport and store specimens to prevent damage.
3. Provide insulated shed for storage of cylinders and beams.
4. Provide records identifying each cylinder with locations from which specimens are taken.
5. Cure specimens under laboratory conditions. When there is a possibility of surrounding air temperature falling below 40°F; additional specimens shall be made and cured under job conditions.

G. Failure to Meet Specifications
1. Concrete failing to meet specifications will be rejected.
2. Should a 3-day (high-early cement) or 7-day (normal cement) test fail to meet established strength requirements, extended curing, or resumed curing, may be required.
3. CONTRACTOR to strengthen structures, or replace portions thereof, which fail to meet established strength requirements, at CONTRACTOR's expense.
4. Test cores, when required, to be in accordance with procedures of ASTM C42, at no additional cost to OWNER. The OWNER is to select a testing laboratory, conforming to ASTM E329, to make tests throughout the concrete operations. When requested by the OWNER, ENGINEER will monitor tests and review results.

1.06 DELIVERY, STORAGE AND HANDLING

A. Cement
1. Store in weather tight enclosures and protect against dampness, contamination, and warehouse set.
2. Store off ground in a well-ventilated building.

B. Aggregates
1. Stockpile to prevent excessive segregation or contamination with other materials or other sizes of aggregates.
2. Use only one supply source for each aggregate stockpile.

C. Admixtures
   1. Store to prevent contamination, evaporation, or damage.
   2. Protect liquid admixtures from freezing or harmful temperature ranges.
   3. Agitate emulsions prior to use.

1.07 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in contract price bid for work of which this is a component part.

PART 2 - PRODUCTS

2.01 MATERIALS AND/OR EQUIPMENT

A. Concrete: Ready-mixed concrete conforming to ASTM C94.
   1. Cement
      a. ASTM C150, Type I or Type 1/11.
      b. Allowable weight variations and length of storage to be in accordance with ASTM C150.
      c. Use no caked cement.
      d. Deliver in bags for site-mixed concrete.
      e. Use only one brand of cement in anyone structure.
   2. Admixtures
      a. Air-entraining admixtures in accordance with ASTM C260.
      b. Water-reducing and retarding admixtures in accordance with ASTM C494, Type A or Type D admixture, modified as follows:
         1) Bleeding water no greater than bleeding water of ASTM C494 reference concrete when tested as per ASTM C232.
         2) Increase durability, decrease permeability, and increase resistance to surface scaling, when compared to ASTM C494 reference concrete.
         3) No chlorides or alkalies added during manufacture of admixture.
      c. High-range water-reducing admixture (superplasticizer) in accordance with ASTM C494, Type F or Type G, modified as follows:
         1) Superplasticized concrete to be nonsegregating, have little bleeding, and have physical properties similar to low water cement ratio concrete.
         2) Admixture composed of a synthesized sulfonated polymer to be added to the concrete mixer with gauge water at the central batch plant.
         3) Use only one liquid admixture to achieve the superplasticized concrete, except where air entrainment is desired, in which case, air entraining admixture to be compatible with superplasticizer admixture.
         4) Treated concrete must be capable of maintaining superplastic state in excess of 2 hours.
         5) Dosage as recommended by the manufacturer.
      d. Additional Requirements
         1) Manufacturer to provide proof of successful field use of waterreducing and retarding admixture from recognized laboratories and other authorities.

2) Manufacturer to provide local representative and warehouse facilities, when requested by OWNER.
3) Provide qualified concrete technician to assist in concrete mix design, if required.
4) If required, CONTRACTOR to acquire approved commercial laboratory testing, at no cost to OWNER, to furnish certification of compliance with this specification.
5) Water-reducing and retarding admixtures used in Class A and Class K concrete only, unless otherwise specified.
6) Use manufacturer's published recommended dosage for optimum results as minimum requirements. Dosage may be varied by ENGINEER after analysis of results of local commercial laboratory tests using materials from sources assigned by CONTRACTOR.
7) Dispensing and mixing equipment and procedures at batch plant are subject to approval.

3. Coarse Aggregate
   a. Durable particles of crushed blast furnace slag, crushed stone, or combination thereof, conforming to ASTM C33.
   b. Use clean, durable particles, free from frozen materials, clay, salt, alkali, vegetable matter, or other coating which would adversely affect strength of concrete or bonding of aggregate to cement paste.
      1) Nonprestressed concrete aggregate: ASTM Size No. 467 (1-1/2 In. to No.4) for liquid containing structural elements 10 inches and thicker, and ASTM Size No. 57 (1 In. to No.4) for all other concrete.
      2) Prestressed concrete aggregate: ASTM Size No. 57 (1 In. to No. 4).
   c. The maximum size coarse aggregate to be as indicated above or no greater than three-fourths of the minimum clear spacing between parallel reinforcing bars or prestressing tendons, whichever is smaller.
4. Fine Aggregate
   a. Natural sand as per ASTM C33.
   b. Fineness modulus between 2.4 and 2.9.
5. Water
   a. Free from oils, acids, alkalis, organic matter, or other deleterious substances and not containing more than 1,000 parts per million of sulphates.
   b. Testing not required from municipal supplies approved by Texas Department of Health, but from other sources water will be sampled and tested, at no additional cost to OWNER, before use.
6. Slump
   a. Test method as per ASTM C143.
   b. As indicated in Classification Table.
7. Mix Proportioning
   a. Per CLASSIFICATION TABLE, based on maximum water-cement ratio and minimum strength requirements, with limits set on minimum cement content.
   b. Increase cement content above minimum or use approved admixtures, without additional cost to OWNER, if type, gradation, or sizes of aggregate being supplied gives concrete mixture not meeting strength and workability requirements.

8. Coring Materials: Per Section "Concrete Structures".

B. Nonshrink Grout: Grout to have moderate fluidity and to conform to CRD-C621.

C. Fly Ash
1. ASTM C618, Class F.
2. Compatible with other concrete ingredients.
3. Obtain proposed fly ash from a source approved by the Texas Department of Transportation for use in concrete for bridges.
4. When fly ash is used, it shall make up from 20% to 25% of the total cementitious material, by weight.

CLASSIFICATION TABLE

Max. Water Content(1)

Class- Type	Min Comp. Strength (psi)		Lbs. Water/ Lbs. Cement (W/C)	Min. Cement per C.Y.(2)(10) (Lbs.)	Slump Range (in.)*	Total Air Content (%)
	7-Day	28-Day				
A - Structural	2,000	3,000	0.55	494	2 ½ to 4 ½	2 ½ to 4 ½
A_{sp}- Structural(3)	2,000	3,000	0.50	423	7 to 10(4)	3 to 5
B- Slope Protection	1,200	2,000	0.75	400	2 ½ to 4	2 ½
C- Pipe Blocking	----	1,500	0.97	282	3 to 5	3 to 6
D- Seal Slab	----	----	----	376	6 to 8	as needed
E- Monolithic Sewer	2,000	3,000	0.55	564	4 to 6	3 to 5
F- Prestressed(5)	----	5,000	.51	635	2 to 3	as needed
G- Prestressed(5)	----	6,000	0.49	658	2 to 3	as needed
K- Structural(6)	2,800	4,000	0.45	564	3 ½ to 5	2 ½ to 4 ½
K_{sp}- Structural(3)	2, 800	4,000	0.40	517	7 to 10(4)	3 to 5
Kw- Structural(9)	2,800	4,000	0.40	517	7 to 10(4)	3 to 5
P- Paving 6-Inch(8)	2,000	3,000	0.66	470	3 to 5	2 ½ to 4 ½
	500(7)					
P- Paving 7-Inch(8)	2,000	3,000	0.66	470	3 to 5	2 ½ to 4 ½
	500(7)					
P- Paving 8-Inch(8)	2,100	3,000	0.66	517	3 to 5	
	500(7)					

* All Slump Ranges + ½ -lnch Tolerance
(1) Include in maximum water, free water in aggregate minus absorption of aggregate based on a 30-minute absorption period.
(2) For concrete placed under water, minimum cement per cubic yard shall be 611 pounds (6.5 bags).
(3) Asp, Ksp" and Kw shall contain approved HRWR Admixture.
(4) Maximum 2-inch slump before addition of HRWR Admixture.
(5) For prestressed concrete, water reducing admixture may be used as needed.
(6) Use approved water-reducing and retarding admixture.
(7) Minimum flexural strength at 7 days.
(8) Slump range ½ - 1 ½ inches when slip form method of construction used.
(9) Use Class F Fly Ash in Class Kw concrete.
(10) Total combined weight of portland cement and fly ash, if any is used.

APPLICATIONS OF VARIOUS CONCRETE MIX CLASSES A AND K:
Class K Concrete or Class Ksp Concrete: At Contractor's option, use either Class K or Ksp for any concrete uses not noted otherwise.
Class Kw Concrete: Use for all concrete elements of environmental (liquid containing) structures~

2.02 SOURCE QUALITY CONTROL

A. To be in accordance with those requirements as specified within Paragraphs 1.06 and 2.01 of this Specification Section.

PART 3 - PART 3· EXECUTION

3.01 ERECTION/INSTALLATION APPLICATION AND/OR CONSTRUCTION

A. Mixing Concrete
   1. Ready-mixed and in accordance within the requirements of ACI 304, 304.4, 304.5 and 304.6, measuring, mixing, and transporting of concrete as applicable to type methods used.
   2. Postpone or delay work during adverse weather conditions.
   3. Protect dry batch material so it reaches mixer in a dry condition.
   4. Use batch mixer having approved and positive water control and measuring device for all materials.
   5. Continue mixing to ensure uniform distribution of materials, but not less than 1% minutes after all materials have been introduced into mixer drum.
   6. Rotate drum at peripheral speed recommended by mixer manufacturer.
   7. Mix and deliver as per ASTM C94.
      a. . Add mixing water at plant.
      b. Mix concrete in quantities required for immediate use, and discharge at jobsite within 1 hour after introduction of cement to aggregate. If CONTRACTOR can prove that concrete consistency measured by slump will not be reduced by more than 2 inches when superplasticized concrete is used, time interval between mixing and placing may be extended to a maximum of 90 minutes or to a period in which slump loss will not exceed 2 inches.

c. Begin mixing operation within 30 minutes after cement and aggregates intermingle.
d. Ready-mixed concrete producer to furnish delivery tickets indicating:
1) Delivery date and time dispatched.
2) Name and location of project.
3) Name of CONTRACTOR.
4) Name of ready-mixed concrete producer.
5) Truck number.
6) Number of cubic yards of concrete in load.
7) Class of concrete.
8) Cement content in bags per cubic yard of concrete.
9) Amount of admixture in concrete, if any.
10) Number of gallons of water in mixture.
11) Air content.

8. Job mix concrete in approved type mixer and do not load beyond manufacturer's rated capacity.
a. Normal Weight Concrete
1) Mix batches of 1 cubic yard or less for minimum of 1% minutes after materials are placed in mixer.
2) Increase mixing time 15 seconds for each cubic yard increase over one cubic yard batch.
b. Maintain positive batch control equipment to within 1 percent accuracy.
c. Clean, maintain, and operate equipment so as to thoroughly mix material as required.
d. Hand-mixing permitted for small placements only as authorized.
e. Hand-mixed batches not to exceed a two-bag batch in volume.
9. Do not mix when air temperature is at or below 40°F (taken in the shade away from artificial heat) and falling, or if likely to fall below 40°F in next 24 hours.
10. To produce concrete with minimum temperature of 50°F, heat aggregate and/or water uniformly as follows:
a. Water temperature not to exceed 180°F and/or aggregate temperature not to exceed 150°F
b. Heat mass of aggregate uniformly.
c. Temperature of aggregates and water to be between 50°F and 85°F before introduction of cement.

B. Installation
1. In accordance with other Specification Sections which are included within these Contract Documents.

3.02 FIELD QUALITY CONTROL

A. As specified under Paragraphs 2.01 and 3.01 of this Specification Section.

END OF SECTION

SECTION 03 00 50
CONCRETE PAVING

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Portland cement concrete paving.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for concrete paving is on square yard basis. Separate pay items are used for each different required thickness of pavement.

2. Payment for concrete paving, high early strength, is on square yard basis.

3. Payment for pavement repair or pavement replacement for utility projects is on a square yard basis and includes base materials.

4. Refer to Measurement and Payment for unit price procedures.

1.3 REFERENCES

A. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

B. ASTM A185 - Standard Specifications for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

C. ASTM A497 – Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

D. ASTM A615 - Standard Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement.

E. ASTM C 31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

F. ASTM C 33 - Standard Specifications for Concrete Aggregates.

G. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

H. ASTM C 40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.

I. ASTM C 42 - Standard Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

J. ASTM C 78 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third Point Loading).

K. ASTM C 94 - Standard Specification for Ready-Mixed Concrete.

L. ASTM C 131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

M. ASTM C 136 - Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

N. ASTM C 138 - Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.

O. ASTM C 143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

P. ASTM C 150 - Standard Specification for Portland Cement.

Q. ASTM C 174 - Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores.

R. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

S. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete.

T. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete.

U. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.

V. TxDOT Tex-203-F - Sand Equivalent Test.

W TxDOT Tex-406-A - Material Finer than 75 □m (No. 200) Sieve In Mineral Aggregates (Decantation Test for Cement Aggregates).

1.4 SUBMITTALS

A. Conform to requirements of Section - Submittal Procedures.

B. Submit proposed mix design and test data for each type and strength of concrete in Work. Include proportions and actual flexural strength obtained from design mixes at required test ages.

C. Submit for approval manufacturer's description and characteristics for mixing equipment, and for traveling form paver, when proposed for use.

D. Submit manufacturer's certificates giving properties of reinforcing steel. Include certificate of compliance with ASTM A 82. Provide specimens for testing when required by Project Manager.

1.5 HANDLING AND STORAGE

A. Do not mix different classes of aggregate without written permission of Project Manager.

B. Class of aggregate being used may be changed before or during Work with written permission of Project Manager. Comply new class with specifications.

C. Reject segregated aggregate. Before using aggregate whose particles are separated by size, mix them uniformly to grading requirements.

D. Reject aggregates mixed with dirt, weeds, or foreign matter.

E. Do not dump or store aggregate in roadbed.

PART 2 P R O D U C T S

2.1 MATERIALS

A. Portland Cement:

1. Sample and test cement to verify compliance with Standards of ASTM C 150, Type I or Type III.

2. Bulk cement which meets referenced standards may be used when method of handling is approved by Project Manager. When using bulk cement, provide satisfactory weighing devices.

3. Fly ash which meets standards of ASTM C 618 may be used as mineral fill when method of handling is approved by Project Manager.

B. Water: Conform to requirements for water in ASTM C 94.

C. Coarse Aggregate: Crushed stone, gravel, or combination thereof, which is clean, hard, and durable, conforms to requirements of ASTM C 33, and has abrasion loss not more than 45 percent by weight when subjected to Los Angeles Abrasion Test (ASTM C 131).

1. Maximum percentage by weight of deleterious substances shall not exceed following values:

Item	Percent by Weight of Total Sample Maximum
Clay lumps and friable particles	3.0
Material finer than 75-µm (No. 200) sieve:	
Concrete subject to abrasion	3.0*
All Other concrete	5.0*
Coal and lignite:	
Where surface appearance of concrete is of importance	0.5
All other concrete	1.0

* In case of manufactured sand, when material finer than 75-µm (No. 200) sieve consists of dust of fracture, essentially free from clay or shale, these limits may be increased to 5 and 7 percent, respectively.

2. Conform coarse aggregate (size 1 1/2 inch to No. 4 sieve) to requirements of ASTM C
33. Use gradation within following limits when graded in accordance with ASTM C 136:

Sieve Designation (Square Openings)	Percentage by Weight
Retained on 1 3/4" sieve	0
Retained on 1 1/2"sieve	0 to 5
Retained on 3/4" sieve	30 to 65
Retained on 3/8" sieve	70 to 90
Retained on No. 4 sieve	95 to 100
Loss by Decantation Test *Method Tex-406-A	1.0 maximum

* In case of aggregates made primarily from crushing of stone, when material finer than 200 sieve is dust of fracture essentially free from clay or shale as established by Part III of TxDOT Tex-406-A, percent may be increased to 1.5.

D. Fine Aggregate: Sand, manufactured sand, or combination thereof, composed of clean, hard, durable, uncoated grains, free from loams or other injurious foreign matter. Conform fine aggregate for concrete to requirements of ASTM C 33. Use gradation within following limits when graded in accordance with ASTM C 136:

Sieve Designation (Square Openings)	Percentage by Weight
Retained on 3/8" sieve	0
Retained on No. 4 sieve	0 to 5
Retained on No. 8 sieve	0 to 20
Retained on No. 16 sieve	15 to 50
Retained on No. 30 sieve	35 to 75
Retained on No. 50 sieve	65 to 90
Retained on No. 100 sieve	90 to 100
Retained on No. 200 sieve	97 to 100

1. When subjected to color test for organic impurities (ASTM C 40), fine aggregate shall not show color darker than standard color. Fine aggregate shall be subjected to Sand Equivalent Test (Tex-203-F). Sand equivalent value shall not be less than 80, unless higher value is shown on Drawings.

E. Mineral Filler: Type “C” or Type “F” fly ash of acceptable quality and meeting requirements of ASTM C 618 may be used as mineral admixture in concrete mixture. When fly ash mineral filler is used, store and inspect in accordance with ASTM C 618. Do not use fly ash in amounts to exceed 25 percent by weight of cementatious material in mix design. Cement content may be reduced when strength requirements can be met. Note: When fly ash is used, term "cement" is defined as cement plus fly ash.

F. Air Entraining Agent: Furnish air entraining agent conforming to requirements of ASTM C 260.

G. Water Reducer: Water reducing admixture conforming to requirements of ASTM C 494 may be used when required to improve workability of concrete. Amount and type of admixture is subject to approval by Project Manager.

H. Reinforcing Steel:

1. Provide new billet steel manufactured by open hearth process and conforming to ASTM A 615, Grade 60. Store steel to protect it from mechanical injury and rust. At time of placement, steel shall be free from dirt, scale, rust, paint, oil, or other injurious materials.

2. Cold bend reinforcing steel to shapes shown. Once steel has been bent, it may not be rebent.

3. Provide wire fabric conforming to ASTM A 82. Use fabric in which longitudinal and transverse wires have been electrically welded at points of intersection. Welds shall have sufficient strength not to be broken during handling or placing. Conform welding and fabrication of fabric sheets to ASTM A 185.

2.2 EQUIPMENT

A. Conform Equipment to requirements of ASTM C94.

2.3 MIXING

A. Flexural strength shall be as specified using test specimens prepared in accordance with ASTM C 31 and tested in accordance with ASTM C78 (using simple beam with third-point loading). Compressive strength shall be as specified using test specimens prepared in accordance with ASTM C 31 and tested in accordance with ASTM C 39. Determine and measure batch quantity of each ingredient, including water for batch designs and all concrete produced for Work. Mix shall conform to these specifications and other requirements indicated on Drawings.

B. Mix design to produce concrete which will have flexural strength of 500 psi at 7 days and 600 psi at 28 days. Minimum compressive strength shall be 3000 pounds per square inches for 7 days and 3500 pounds per square inches at 28 days when tested in accordance with ASTM C39. Slump of concrete shall be at least 2 inches but no more than 5 inches, when tested in accordance with ASTM C143.

1. Concrete pavement, including curb, curb and gutter, and saw-tooth curb, shall contain at least 5 1/2 sacks (94 pounds per sack) of cement per cubic yard, with not more than 6.5 gallons of water, net, per sack of cement (water-cement ratio maximum 0.57). Determine cement content in accordance with ASTM C 138. Addition of mineral filler may be used to improve workability or plasticity of concrete to limits specified.

2. Coarse dry aggregate shall not exceed 85 percent of loose volume of concrete.

3. Add air-entraining admixture to ensure uniform distribution of agent throughout batch. Base air content of freshly mixed air-entrained concrete upon trial mixes with materials to be used in Work, adjusted to produce concrete of required plasticity and workability. Percentage of air entrainment in mix shall be 4 1/2 percent plus or minus 1 1/2 percent. Determine air content by testing in accordance with ASTM C 231.

4. Use retardant when temperature exceeds 90 degrees F. Proportion as recommended by manufacturer. Use same brand as used for air-entraining agent. Add and batch material using same methods as used for air-entraining agent.

C. Use high early strength concrete pavement to limits shown on Drawings. Design to meet following:

1. Concrete Mix: Flexural strength greater than or equal to 500 psi at 72 hours.

2. Cement: Minimum of 7 sacks of cement per cubic yard of concrete.

3. Water-Cement Ratio maximum of 0.45. Slump of concrete shall a maximum of 5 inches, when tested in accordance with ASTM C 143.

4. Other requirements for proportioning, mixing, execution, testing, etc., shall be in accordance with this Section 02751 - Concrete Paving.

PART 3 E X E C U T I O N

3.1 EXAMINATION

A. Verify compacted base is ready to support imposed loads and meets compaction requirements.

B. Verify lines and grades are correct.

3.2 PREPARATION

A. Properly prepare, shape and compact each section of subgrade before placing forms, reinforcing steel or concrete. After forms have been set to proper grade and alignment, use subgrade planer to shape subgrade to its final cross section. Check contour of subgrade with template.

B. Remove subgrade that will not support loaded form. Replace and compact subgrade to required density.

3.3 EQUIPMENT

A. Alternate equipment and methods, other than those required by this Section, may be used provided equal or better results will be obtained. Maintain equipment for preparing subgrade and for finishing and compacting concrete in good working order.

B. Subgrade Planer and Template:

1. Use subgrade planer with adjustable cutting blades to trim subgrade to exact section shown on Drawings. Select planer mounted on visible rollers which ride on forms. Planer frame must have sufficient weight so that it will remain on form, and have strength and rigidity that, under tests made by changing support from wheels to center, planer will not develop deflection of more than 1/8 inch. Tractors used to pull planer shall not produce ruts or indentations in subgrade. When slip form method of paving is used, operate subgrade planer on prepared track grade or have it controlled by electronic sensor system operated from string line to establish horizontal alignment and elevation of subbase.

2. Provide template for checking contour of subgrade. Template shall be long enough to rest upon side forms and have strength and rigidity that, when supported at center, maximum deflection shall not exceed 1/8 inch. Fit template with accurately adjustable rods projecting downward at 1 foot intervals. Adjust these rods to gauge cross sections of slab bottom when template is resting on side forms.

C. Machine Finisher: Provide power-driven, transverse finishing machine designed and operated to strike off and consolidate concrete. Machine shall have two screeds accurately adjusted to crown of pavement and with frame equipped to ride on forms. Use finishing machine with rubber tires when it operates on concrete pavement.

D. Hand Finishing:

1. Provide mechanical strike and tamping template 2 feet longer than width of pavement to be finished. Shape template to pavement section.

2. Provide two bridges to ride on forms and span pavement for finishing expansion and dummy joints. Provide floats and necessary edging and finishing tools.

E. Burlap Drag or transverse broom for Finishing Slab: Furnish four plies of 10 ounce burlap material fastened to bridge to form continuous strip of burlap full width of pavement. Maintain contact 3 foot width of burlap material with pavement surface. Keep burlap drags clean and free of encrusted mortar.

F. Vibrators: Furnish mechanically-operated, synchronized vibrators mounted on tamping bar which rides on forms and hand-manipulated mechanical vibrators. Furnish vibrators with frequency of vibration to provide maximum consolidation of concrete without segregation.

G. Traveling Form Paver: Approved traveling form paver may be used in lieu of construction methods employing forms, consolidating, finishing and floating equipment. Meet requirements of this specification for subgrade, pavement tolerances, pavement depth, alignments, consolidation, finishing and workmanship. When traveling form paver does not provide concrete paving that meets compaction, finish, and tolerance requirements of this Specification, immediately discontinue its use and use conventional methods.

1. Equip traveling paver with longitudinal transangular finishing float adjustable to crown and grade. Use float long enough to extend across pavement to side forms or edge of slab.

2. Ensure that continuous deposit of concrete can be made at paver to minimize starting and stopping. Use conventional means of paving locations inaccessible to traveling paver, or having horizontal or vertical curvature that traveling paver cannot negotiate.

3. Where Drawings require tie bars for adjacent paving, securely tie and support bars to prevent displacement. Tie bars may be installed with approved mechanical bar inserter mounted on traveling-form paver. Replace pavement in which tie bars assume final position other than that shown on Drawings.

3.4 FORMS

A. Side Forms: Use metal forms of approved shape and section. Preferred depth of form is equal to required edge thickness of pavement. Forms with depths greater or less than

required edge thickness of pavement will be permitted, provided difference between form depth and edge thickness when not greater than 1 inch, and further provided that forms of depth less than pavement edge are brought to required edge thickness by securely attaching wood or metal strips to bottom of form, or by grouting under form. Bottom flange of form shall be same size as thickness of pavement. Aluminum forms are not allowed. Forms shall be approved by Project Manager. Length of form sections shall be not less than 10 feet and each section shall provide for staking in position with not less than 3 pins. Flexible or curved forms of wood or metal of proper radius shall be used for curves of 200-foot radius or less. Forms shall have ample strength and shall be provided with adequate devices for secure setting so that when in-place they will withstand, without visible springing or settlement, impact and vibration of finishing machine. In no case shall base width be less than 8 inches for form 8 inches or more in height. Forms shall be free from warp, bends or kinks and shall be sufficiently true to provide straight edge on concrete. Top of each form section, when tested with straight edge, shall conform to requirements specified for surface of completed pavement. Provide sufficient forms for satisfactory placement of concrete. For short radius curves, forms less than 10 feet in length or curved forms may be used. For curb returns at street intersections and driveways, wood forms of good grade and quality may be used.

B. Form Setting:

1. Rest forms directly on subgrade. Do not shim with pebbles or dirt. Accurately set forms to required grade and alignment and, during entire operation of placing, compacting and finishing of concrete, do not deviate from this grade and alignment more than 1/8 inch in 10 feet of length. Do not remove forms for at least 8 hours after completion of finishing operations. Provide supply of forms that will be adequate for orderly and continuous placing of concrete. Set forms and check grade for at least 300 feet ahead of mixer or as approved by Project Manager.

2. Adjacent slabs may be used instead of forms, provided that concrete is well protected from possible damage by finishing equipment. Do not use adjacent slabs for forms until concrete has aged at least 7 days.

3.5 REINFORCING STEEL AND JOINT ASSEMBLIES

A. Place reinforcing steel and joint assemblies and position securely as indicated on Drawings. Wire reinforcing bars securely together at intersections and splices. Bars and coatings shall be free of rust, dirt or other foreign matter when concrete is placed. Secure reinforcing steel to chairs.

B. Position pavement joint assemblies at required locations and elevations, and rigidly secure in position. Install dowel bars in joint assemblies, each parallel to pavement surface and to center line of pavement, as shown.

C. Cut header boards, joint filler, and other material used for forming joints to receive each dowel bar.

D. Secure in required position to prevent displacement during placing and finishing of concrete.

E. Drill dowels into existing pavement, secure with epoxy, and provide paving headers as required to provide rigid pavement sections.

F. Use sufficient number of chairs for steel reinforcement bars to maintain position of bars within allowable tolerances. Place reinforcement as shown on Drawings. In plane of steel parallel to nearest surface of concrete, bars shall not vary from plan placement by more than 1/12 of spacing between bars. In plane of steel perpendicular to nearest surface of concrete, bars shall not vary from plan placement by more than 1/4 inch.

3.6 FIBROUS REINFORCING

A. Do not use fibrous reinforcing to replace structural, load-bearing, or moment-reinforcing steel.

3.7 PLACEMENT

A. Place concrete when air temperature taken in shade and away from artificial heat is above 35 degrees F and rising. Do not place concrete when temperature is below 40 degrees F and falling.

B. Place concrete within 90 minutes after initial water had been added. Remove and dispose of concrete not placed within this period.

C. Concrete slump during placement shall be 1 to 5 inches, except when using traveling-form paver, slump shall be maximum of 2 inches.

D. Deposit concrete continuously in successive batches. Distribute concrete in manner that will require as little rehandling as possible. Where hand spreading is necessary, distribute concrete with shovels or by other approved methods. Use only concrete rakes in handling concrete. At placement interruption of more than 30 minutes, place transverse construction joint at stopping point. Remove and replace sections less than 10 feet long.

E. Take special care in placing and spading concrete against forms and at longitudinal and transverse joints to prevent honeycombing. Voids in edge of finished pavement will be cause for rejection.

3.8 COMPACTION

A. Consolidate concrete using mechanical vibrators as specified herein. Extend vibratory unit across pavement, not quite touching side forms. Space individual vibrators at close enough intervals to vibrate and consolidate entire width of pavement uniformly. Mount mechanical vibrators to avoid contact with forms, reinforcement, transverse or longitudinal joints.

B. Furnish enough hand-manipulated mechanical vibrators for proper consolidation of concrete along forms, at joints and in areas not covered by mechanically controlled vibrators.

3.9 FINISHING

A. Finish concrete pavement with power-driven transverse finishing machines or by hand finishing methods.

1. Hand finish with mechanical strike and tamping template in same width as pavement to be finished. Shape template to pavement section shown on Drawings. Move strike template forward in direction of placement, maintaining slight excess of material in front of cutting edge. Make minimum of two trips over each area. Screed pavement surface to required section. Work screed with combined transverse and longitudinal motion in direction work is progressing. Maintain screed in contact with forms. Use longitudinal float to level surface.

B. On narrow strips and transitions, finish concrete pavement by hand. Thoroughly work concrete around reinforcement and embedded fixtures. Strike off concrete with strike-off screed. Move strike-off screed forward with combined transverse and longitudinal motion in direction work is progressing, maintaining screed in contact with forms, and maintaining slight excess of materials in front of cutting edge. Tamp concrete with tamping template. Use longitudinal float to level surface.

C. After completion of straightedge operation, make first pass of burlap drag or transverse 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 texture depth. Permit no unnecessary delays between passes. Keep drag wet, clean and free from encrusted mortar during use.

3.10 JOINTS AND JOINT SEALING

A. Conform to requirements of Section 02752 - Concrete Pavement Joints.

3.11 CONCRETE CURING

A. Conform to requirements of Section 02753 - Concrete Pavement Curing.

3.12 TOLERANCES

A. Test entire surface before initial set and correct irregularities or undulations. Bring surface within requirements of following test and then finish. Place 10-foot straightedge parallel to center of roadway to bridge depressions and touch high spots. Do not permit ordinates measured from face of straight edge to surface of pavement to exceed 1/16 inch per foot from nearest point of contact. Maximum ordinate with 10-foot straightedge shall not exceed 1/8 inch. Grind spots in excess of required tolerances to meet surface test requirements. Restore texture by grooving concrete to meet surface finishing specifications.

3.13 FIELD QUALITY CONTROL

A. Perform testing under provisions of Section 01454 - Testing Laboratory Services.

B. Compressive Strength Test Specimens: Make four test specimens for compressive strength test in accordance with ASTM C 31 for each 150 cubic yards or less of pavement that is placed in one day. Test two specimens at 7 days or at number of hours as directed by the Project Manager for high early strength concrete. Test remaining two specimens at 28 days. Test specimens in accordance with ASTM C 39. Minimum compressive strength shall be 3000 pounds per square inch for first two specimens and 3500 pounds per square inch at 28 days.

C. When compressive test indicates failure, make yield test in accordance with ASTM C 138 for cement content per cubic yard of concrete. When cement content is found to be less than that specified per cubic yard, increase batch weights until amount of cement per cubic yard of concrete conforms to requirements.

D. Minimum of one 4-inch core will be taken at random locations per 375 feet per 12 feet lane or 500 square yards of pavement to measure in-place depth. Measure depth in accordance with ASTM C 174. Each core may be tested for 28-day compressive strength according to methods of ASTM C 42. 28-day compressive strength of each core tested shall be a minimum of 3000 pounds per square inch.

E. Request, at option, three additional cores in vicinity of cores indicating nonconforming in- place depths at no cost to City. In-place depth at these locations shall be average depth of four cores.

F. Fill cores and density test sections with new concrete paving or non-shrink grout.

3.14 NONCONFORMING PAVEMENT

A. Remove and replace areas of pavement found deficient in thickness by more than 10 percent, or that fail compressive strength tests, with concrete of thickness shown on Drawings.

B. When measurement of any core is less than specified thickness by more than 10 percent, actual thickness of pavement in this area will be determined by taking additional cores at 10 foot intervals parallel to centerline in each direction from deficient core until, in each direction, core is taken which is not deficient by more than 10 percent. Exploratory cores for

deficient thickness will not be used in averages for adjusted unit price. Exploratory cores are to be used only to determine length of pavement in unit that is to be removed and replaced. Replace nonconforming pavement sections at no additional cost to City.

3.15 UNIT PRICE ADJUSTMENT

A. Unit price adjustments shall be made for in-place depth determined by cores as follows:

1. Adjusted Unit Price shall be ratio of average thickness as determined by cores to thickness bid upon, times unit price.

2. Apply adjustment to lower limit of 90 percent and upper limit of 100 percent of unit price.

3. Average depth below 90 percent but greater than 80 percent may be accepted by Project Manager at adjusted Unit Price of:

a. Unit Price Bid - [2 x (1-ratio) x Unit Price Bid]

b. Ratio equals average core thickness divided by thickness bid upon

c. 0.9 ratio pays 80 percent of unit price and 0.8 ratio pays 60 percent of unit price.

4. Average depth below 80 percent will be rejected by Project Manager.

3.16 PAVEMENT MARKINGS

A. Restore pavement markings to match those existing in accordance with City of Brownsville standard specifications and details and Project Manager's requirements.

3.17 PROTECTION

A. Barricade pavement section to prevent use until concrete has attained minimum design strength. Cure barricade pavement section for minimum 72 hours before use. Do not open pavement to traffic until concrete is at least 10 days old. Pavement may be open to traffic earlier provided Contractor pays for testing and additional specimen once 7 day specified strength is obtained. Pavement may be opened when high early strength concrete is used meeting specified 72-hour strength.

B. High early strength concrete may be used to provide access at driveways, street intersections, esplanades and other locations approved by Project Manager.

C. On those sections of pavement to be opened to traffic, seal joints, clean pavement, and place earth against pavement edges before permitting use by traffic. Opening of pavement to traffic shall not relieve responsibility for Work.

D. Maintain concrete paving in good condition until completion of Work.

E. Repair defects by replacing concrete to full depth.

END OF SECTION

SECTION 03 00 52

CONCRETE PAVEMENT JOINTS

CONCRETE PAVEMENT JOINTS

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Joints for concrete paving; concrete sidewalks, concrete driveways, curbs, and curb and gutters.

B. Saw-cutting existing concrete or asphalt pavements for new joints.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for street pavement expansion joints, with or without load transfer, is on linear foot basis.

2. Payment for horizontal dowels is on a unit price basis for each horizontal dowel.

3. No separate payment will be made for formed or sawed street pavement contraction joints and longitudinal weakened plane joints. Include payment in unit price for Concrete Paving.

4. No separate payment will be made for joints for Curb, Curb and Gutter, Saw-tooth Curb, Concrete Sidewalks, and Concrete Driveways. Include payment in unit price for Curb and Gutter, Concrete Sidewalks, and Concrete Driveways.

5. Payment will be made for Preformed Expansion Joints on a linear foot basis only when field conditions require that sidewalk be moved adjacent to existing concrete structure (i.e., street, back of curb, etc.).

6. Refer to Measurement and Payment for unit price procedures.

7.0 The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used. When specified as a separate pay item in the contract bid form, this work shall be measured as specified above and paid for at the contract unit bid price for this work. The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

1.3 REFERENCES

A. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

B. ASTM D 994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).

C. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

D. ASTM D 3405 - Standard Specification for Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements.

E. TxDOT Tex-525-C - Tests for Asphalt and Concrete Joint Sealers

1.4 SUBMITTALS

A. Conform to requirements of Section 01330 - Submittal Procedures.

B. Submit product data for joint sealing compound and proposed sealing equipment for approval.

C. Submit samples of dowel cup, metal supports, and deformed metal strip for approval. Submit manufacturer's recommendation for placing sealant(s).

PART 2 P R O D U C T S

2.1 BOARD EXPANSION JOINT MATERIAL

A. 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.

2.2 PREFORMED EXPANSION JOINT MATERIAL

A. Bituminous fiber and bituminous mastic composition material conforming to ASTM D 994 and ASTM D 1751.

2.3 JOINT SEALING COMPOUND

A. Conform joint sealants to one of sealant classes described in this section.

B. Conform hot-poured rubber-asphalt compound to ASTM D 3405.

C. Two-component Synthetic Polymer.

1. Curing is to be by polymerization and not by evaporation of solvent or fluxing of harder particles.

2. Cure sufficiently at average temperature of 25 ± 1 C (77 ± 2 F) so as not to pick up under wheels of traffic in maximum three hours.

3. Performance requirements, when tested in accordance with TxDOT Tex-525-C, shall meet above curing times and requirements as follows:

Cold-Extruded and Cold-Pourable (Self-Leveling) Specifications	
Property	**Requirement**
Penetration, 25 C (77 F) 150 g Cone, 5 s, 0.1 mm (in.), maximum	130
Bond and Extension 50%, -29 C (-20 F), 3 cycles: *Dry Concrete Block *Steel blocks (Primed, if recommended by manufacturer) *Steel blocks shall be used when armor joints are specified	 Pass Pass
Flow at 70 C (158 F)	None
Water content % by mass, maximum	5.0
Resilience: * Original sample, % min. (cured) * Oven-aged at 70 C (158 F), % min.	 50 50
Cold-extruded material only - Cold Flow (10 minutes)	None

After bond and extension test, there shall be no evidence of cracking, separation or other opening that is over 3 millimeters (1/8 inch) deep in sealer or between sealer and test blocks.

4. Provide cold-extruded type for vertical or sloping joints.

5. Provide self-leveling type for horizontal joints.

D. Self-Leveling, Low Modulus Silicone or Polyurethane Sealant for Asphaltic Concrete and Portland Cement Concrete Joints. This shall be a single component self-leveling silicone or polyurethane material that is compatible with both asphalt and concrete pavements. The sealer shall not require a primer for bond; a backer rod shall be required which is compatible with the sealant; no reaction shall occur between rod and sealant.

When tested in accordance with TxDOT Tex-525-C, self-leveling sealant shall meet following requirements:

Self-Leveling, Low Modulus Silicone or Polyurethane Sealant	
Property	**Requirements**
Tack Free Time, 25 ± 1 C (77 ± 2 F), minutes	120 maximum
Nonvolatile content, % by mass	93 minimum
Tensile Strength and 24 Hour Extension Test: * Initial, 10-day cure, 25 ± 1 C (77 ± 2 F), kPa (psi) * After Water Immersion, kPa (psi) * After Heat Aging, kPa (psi) * After Cycling, -29 C (-20 F), 50%, 3 cycles, kPa (psi) * 24 Hour Extension	 * 21 to 69 (3 to 10) * 21 to 69 (3 to 10) * 21 to 69 (3 to 10) * 21 to 69 (3 to 10) * Pass (All Specimens) After 24 hours, there shall be no evidence of cracking, separation or other opening that is over 3 mm (1/8 in.) deep at any point in the sealer or between the sealer and test blocks.

2.4 LOAD TRANSMISSION DEVICES

A. Smooth, steel dowel bars conforming to ASTM A 615, Grade 60. When indicated on Drawings, encase one end of dowel bar in approved cap having inside diameter 1/16 inch greater than diameter of dowel bar.

B. Deformed steel tie bars conforming to ASTM A 615, Grade 60.

2.5 SUPPORTS FOR REINFORCING STEEL AND JOINT ASSEMBLY

A. Employ supports of approved shape and size that will secure reinforcing steel and joint assembly in correct position during placing and finishing of concrete. Space supports as directed by Project Manager.

PART 3 E X E C U T I O N

3.1 PLACEMENT

A. When new Work is adjacent to existing concrete, place joints at same location as existing joints in adjacent pavement.

B. If limit of removal of existing concrete or asphalt 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.

3.2 CONSTRUCTION JOINTS

A. Place transverse construction joint wherever concrete placement must be stopped for more than 30 minutes. Place longitudinal construction joints at interior edges of pavement lanes using No. 6 deformed tie bars, 30 inches long and spaced 18 inches on centers.

3.3 EXPANSION JOINTS

A. Place 3/4 inch expansion joints at radius points of curb returns for cross street intersections, or as located in adjacent pavement but no further than 80 feet apart. Use no boards shorter than 6 feet. When pavement is 24 feet or narrower, use not more than 2 lengths of board. Secure pieces to form straight joint. Shape board filler accurately to cross section of concrete slab. Use load transmission devices of type and size shown on Drawings unless otherwise specified or shown as "No Load Transfer Device." Seal with joint sealing compound.

3.4 CONTRACTION JOINTS

A. Place contraction joints at same locations as in adjacent pavement or at spaces indicated on Drawings. Place smoothed, painted and oiled dowels accurately and normal to joint. Seal groove with joint sealing compound.

3.5 LONGITUDINAL WEAKENED PLANE JOINTS

A. Place longitudinal weakened plane joints at spaces indicated on Drawings. If more than 15 feet in width is poured, longitudinal joint must be saw cut. Seal groove with joint sealing compound.

3.6 SAWED JOINTS

A. Use sawed joints as alternate to contraction and weakened plane joints. Use circular cutter capable of cutting straight line groove minimum of 1/4 inch wide. Maintain depth of one quarter of pavement thickness. 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, continue until completed. Make saw cut with one pass. Complete sawing within 24 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. Maintain ample supply of saw blades at work site during sawing operations. Maintain sawing equipment on job during concrete placement.

3.7 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 120-foot centers.

3.8 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 36 feet. Provide expansion joint material conforming to ASTM D 994 for small radius curves and around fire hydrants and utility poles. Extend expansion joint material full depth of slab.

3.9 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. Extend expansion joint material full depth of slab.

3.10 JOINT SEALING

A. Seal joints only when surface and joints are dry, ambient temperature is above 50 degrees F and less than 85 degrees F and weather is not foggy or rainy.

B. Use joint sealing equipment in like new working condition throughout joint sealing operation, and be approved by Project Manager. Use concrete grooving machine or power-operated wire brush and other equipment such as plow, brooms, brushes, blowers or hydro or abrasive cleaning as required to produce satisfactory joints.

C. Clean joints of loose scale, dirt, dust and curing compound. The term joint includes wide joint spaces, expansion joints, dummy groove joints or cracks, either preformed or natural. Remove loose material from concrete surfaces adjacent to joints.

D. Fill joints neatly with joint sealer to depth shown. Pour sufficient joint sealer into joints so that, upon completion, surface of sealer within joint will be 1/4 inch above level of adjacent surface or at elevation as directed.

3.11 PROTECTION

A. Maintain joints in good condition until completion of Work.

B. Replace damaged joints material with new material as required by this Section.

END OF SECTION

SECTION 03 00 53

CONCRETE PAVEMENT CURING

CONCRETE PAVEMENT CURING

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Curing of Portland cement concrete paving.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No separate payment will be made for concrete curing under this Section. Include payment in unit price for Concrete Paving, Concrete Sidewalks, Concrete Driveways, Curbs, and Curb and Gutters.

2. Refer to Measurement and Payment for unit price procedures.

1.3 REFERENCES

A. ASTM C 156 - Standard Test Method for Water Retention by Concrete Curing Materials.

B. ASTM C 171 - Standard Specifications for Sheet Materials for Curing Concrete.

C. ASTM C 309 - Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.

1.4 SUBMITTALS

A. Conform to requirements of Submittal Procedures.

B. Submit manufacturer's product data for cover materials and liquid membrane-forming compounds.

PART 2 P R O D U C T S

2.1 COVER MATERIALS FOR CURING

A. Conform curing materials to one of the following:

1. Polyethylene Film: Opaque pigmented white film conforming to requirements of ASTM C 171.

2. Waterproofed Paper: Paper conforming to requirements of ASTM C 171.

3. Cotton Mats: Single layer of cotton filler completely enclosed in cover of cotton cloth. Mats shall contain not less than 3/4 of a pound of uniformly distributed cotton filler per square yard of mat. Cotton cloth used for covering materials shall weigh not less than 6 ounces per square yard. Stitch mats so that mat will contact surface of pavement at all points when saturated with water.

2.2 LIQUID MEMBRANE-FORMING COMPOUNDS

A. Conform liquid membrane-forming compounds to ASTM C 309. Membrane shall restrict loss of water to not more than 0.55 kg/m2 in 72 hours using test method ASTM C 156.

PART 3 E X E C U T I O N

3.1 CURING REQUIREMENT

A. Cure concrete pavement by protecting against loss of moisture for period of not less than 72 hours immediately upon completion of finishing operations. Do not use membrane curing for concrete pavement to be overlaid by asphalt concrete.

B. Failure to provide sufficient cover material shall be cause for immediate suspension of concreting operations.

3.2 POLYETHYLENE FILM CURING

A. Immediately after finishing surface, and after concrete has taken its initial set, apply water in form of fine spray. Cover surface with polyethylene film so film will remain in direct contact with surface during specified curing period.

B. Cover entire surface and both edges of pavement slab. Overlap joints in film sheets minimum of 12 inches. Immediately repair tears or holes occurring during curing period by placing acceptable moisture-proof patches or replacing.

3.3 WATERPROOFED PAPER CURING

A. Immediately after finishing surface, and after concrete has taken its initial set, apply water in form of fine spray. Cover surface with waterproofed paper so paper will remain in direct contact with surface during specified curing period.

B. Prepare waterproofed paper to form blankets of sufficient width to cover entire surface and both edges of pavement slab, and not be more than 60 feet in length. Overlap joints in blankets caused by joining paper sheets not less than 5 inches and securely seal with asphalt cement having melting point of approximately 180 degrees F. Place blankets to secure overlap of at least 12 inches. Immediately repair tears or holes appearing in paper during curing period by cementing patches over defects.

3.4 COTTON MAT CURING

A. Immediately after finishing surface, and after concrete has taken its initial set, completely cover surface with cotton mats, thoroughly saturated before application, maintaining contact with surface of pavement equally at all points.

B. Keep mats on pavement for specified curing period. Keep mats saturated so that, when lightly compressed, water will drip freely from them. Keep banked earth or cotton mat covering edges saturated.

3.5 LIQUID MEMBRANE-FORMING COMPOUNDS

A. Immediately after free surface moisture, and after concrete has dispersed, apply liquid membrane-forming compound in accordance with manufacturer's instructions.

B. Moisten concrete by water fogging prior to application of membrane when surface has become dry.

C. Seal concrete surface with single coat at rate of coverage recommended by manufacturer and directed by Project Manager, but not less than one gallon per 200 square feet of surface area.

3.6 TESTING MEMBRANE

A. Treated areas will be visually inspected for areas of lighter color of dry concrete as compared to dump concrete. Test suspected areas by placing few drops of water on surface. Membrane passes test when water stands in rounded beads or small pools which can be blown along surface of concrete without wetting surface.

B. Reapply membrane compound immediately at no cost to City when membrane fails above test.

END OF SECTION

SECTION 03 00 54
CONCRETE DRIVEWAYS

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Portland cement concrete driveways.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for concrete driveways is on square foot basis, including excavation.

2. No payment will be made for work in areas where driveway has been removed or replaced for Contractor's convenience.

3. Refer to Measurement and Payment for unit price procedures.

4. The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used. When specified as a separate pay item in the contract bid form, this work shall be measured as specified above and paid for at the contract unit bid price for this work. The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

PART 2 P R O D U C T S

2.1 MATERIALS

A. Concrete: Conform to material and proportion requirements for concrete of Section 02751 - Concrete Paving.

B. Reinforcing Steel: Conform to material requirements for reinforcing steel of Section 02751 - Concrete Paving.

C. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Section 02752 - Concrete Pavement Joints.

D. Expansion Joint Filler: Conform to material requirements for expansion joint material of Section 02752 - Concrete Pavement Joints.

E. Subgrade Materials: Conform to subgrade material requirements of Section 02336 - Lime Stabilized Subgrade, Section 02337 - Lime/Fly-Ash Stabilized Subgrade, or Section 02338 - Portland Cement Stabilized Subgrade.

PART 3 E X E C U T I O N

3.1 PREPARATION

A. Prepare subgrade in accordance with applicable portions of Section 02336 - Lime Stabilized Subgrade, Section 02337 - Lime/Fly-Ash Stabilized Subgrade, and Section 02338 - Portland Cement Stabilized Subgrade.

3.2 PLACEMENT

A. Place and finish concrete in accordance with applicable portions of Section 02751 - Concrete Paving.

3.3 JOINTS

A. Install joints in concrete driveway in accordance with Section 02752 - Concrete Pavement Joints.

3.4 CONCRETE CURING

A. Cure concrete driveway in accordance with Section 02753 - Concrete Pavement Curing.

3.5 PROTECTION

A. Conform to applicable requirements of Section 02753 - Concrete Pavement Curing.

END OF SECTION

SECTION 03 00 55

CURB, CURB AND GUTTER, AND HEADERS

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Reinforced concrete curb, reinforced monolithic concrete curb and gutter, and mountable curb.

B. Paving headers and railroad headers poured monolithically with concrete base or pavement.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for curbs, curbs and gutter, and esplanade curbs is on linear foot basis measured along face of curb.

2. Payment for 3 foot concrete valley gutter is on a linear foot basis.

3. Payment for mountable concrete curbs is on a square foot basis.

4. Payment for concrete paving headers and concrete railroad headers is on a linear foot basis.

5. Payment for headers is on linear foot basis measured between lips of gutters adjacent to concrete base and measured between backs of curbs adjacent to concrete pavement.

6. Refer to Measurement and Payment for unit price procedures.

7. **The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used**. When specified as a separate pay item in the contract bid form, this work shall be measured as specified above and paid for at the contract unit bid price for this work. The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

1.3 SUBMITTALS

A. Conform to requirements of Submittal Procedures.

B. Submit details of proposed form work for approval.

PART 2 P R O D U C T S

2.1 MATERIALS

A. Concrete: Conform to material and proportion requirements for concrete of Section 02751 - Concrete Paving.

B. Reinforcing Steel: Conform to material requirements for welded wire fabric of Section 02751 - Concrete Paving.

C. Grout: Nonmetallic, nonshrink grout containing no chloride producing agents conforming to following requirements.

1. Compressive strength

a. at 7 days: 3500 psi

b. at 28 days: 8000 psi

2. Initial set time: 45 minutes

3. Final set time: 1.5 hours

D. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Concrete Pavement Joints.

E. Expansion Joint Filler: Conform to material requirements for expansion joint filler of Section 02752 - Concrete Pavement Joints.

F. Mortar: Mortar finish composed of one part Portland cement and 1 1/2 parts of fine aggregate. Use only when approved by Project Manager.

PART 3 E X E C U T I O N

3.1 PREPARATION

A. Prepare subgrade in accordance with applicable portions of sections on excavation and fill, embankment, and subgrade and roadbed.

3.2 PLACEMENT

A. Guideline: Set to follow top line of curb. Attach indicator to provide constant comparison between top of curb and guideline. Ensure flow lines for monolithic curb and gutters conform to slopes indicated on Drawings.

B. Forms: Brace to maintain position during pour. Use metal templates cut to section shown on Drawings.

C. Reinforcement: Secure in position so that steel will remain in place throughout placement. Reinforcing steel shall remain at approximate center of base or pavement as indicated on Drawings.

D. Joints: Place in accordance with Concrete Pavement Joints. Place dummy groove joints at to match concrete pavement joints at right angles to curb lines. Cut dummy grooves 1/4 inch deep using approved edging tool.

E. Place concrete in forms to required depth. Consolidate thoroughly. Do not permit rock pockets in form. Entirely cover top surfaces with mortar.

3.3 MANUAL FINISHING

A. After concrete is in place, remove front curb forms. Form exposed portions of curb, and of curb and gutter, using mule which conforms to curb shape, as shown on Drawings.

B. Thin coat of mortar may be worked into exposed face of curb using mule and two-handled wooden darby at least 3 feet long.

C. Before applying final finish move 10 foot straightedge across gutter and up curb to back form of curb. Repeat until curb and gutter are true to grade and section. Lap straightedge every 5 feet.

D. Steel trowel finish surfaces to smooth, even finish. Make face of finished curb true and straight.

E. Edge outer edge of gutter with 1/4 inch edger. Finish edges with tool having 1/4 inch radius.

F. Finish visible surfaces and edges of finished curb and gutter free from blemishes, form marks and tool marks. Finished curb or curb and gutter shall have uniform color, shape and appearance.

3.4 MECHANICAL FINISHING

A. Mechanical curb forming and finishing machines may be used instead of, or in conjunction with, previously described methods, when approved by Project Manager. Use of mechanical methods shall provide specified curb design and finish.

3.5 CURING

A. Immediately after finishing operations, cure exposed surfaces of curbs and gutters in accordance with Concrete Pavement Curing.

3.6 TOLERANCES

A. Top surfaces of curb and gutter shall have uniform width and shall be free from humps, sags or other irregularities. Surfaces of curb top, curb face and gutter shall not vary more than 1/8 inch from edge of straightedge laid along them, except at grade changes.

3.7 PROTECTION

A. Maintain curbs and gutters in good condition until completion of Work.

B. Replace damaged curbs and gutters to comply with this Section.

END OF SECTION

SECTION 03 00 56

CONCRETE SIDEWALKS

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Reinforced concrete sidewalks.

B. Wheelchair ramps.

C. Reinforced slope paving.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for concrete sidewalks is on square foot basis.

2. No payment will be made for work outside these limits or in areas where driveway has been removed or replaced for Contractor's convenience.

3. Payment for wheelchair ramps of each type specified is on square foot basis. Removal and replacement of existing sidewalk, curb or curb and gutter and saw-cutting is paid by unit cost for each item. Sodding will be paid one foot on each side of sidewalk unless otherwise noted. Staining of wheelchair ramps is included in cost of ramp.

4. Refer to Measurement and Payment for unit price procedures.

5. The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used. When specified as a separate pay item in the contract bid form, this work shall be measured as specified above and paid for at the contract unit bid price for this work. The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

1.3 REFERENCES

A. ASTM C 31 - Standard Practice for Making and Curing Concrete Test Specimens in Field.

B. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

C. ASTM C 42 - Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

D. ASTM C 138 - Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.

E. ASTM C 143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

F. ASTM C 172 - Standard Practice for Sampling Freshly Mixed Concrete.

G. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).

H. Texas Accessibility Standards of Architectural Barriers Act, Article 9102, Texas Civil Statues.

1.4 SUBMITTALS

A. Conform to requirements of Submittal Procedures.

B. Submit certified testing results and certificates of compliance.

PART 2 P R O D U C T S

2.1 MATERIALS

A. Concrete: Conform to material and proportion requirements for concrete of Section 02751 - Concrete Paving.

B. Reinforcing Steel: Conform to material requirements of Section 02751 - Concrete Paving for reinforcing steel. Use No. 3 reinforcing bars.

C. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Concrete Pavement Joints.

D. Expansion Joint Filler: Conform to material requirements for expansion joint material of Concrete Pavement Joints.

E. Forms: Use straight, unwarped wood or metal forms with nominal depth equal to or greater than proposed sidewalk thickness. The use of 2 inch by 4 inch lumber as forms will not be allowed.

F. Sand Bed: Conform to material requirements for bank run sand of the Utility Backfill Materials specification.

G. Sodding: Conform to material requirements for sodding of the Sodding specification.

H. Coloring for wheelchair ramps: Conform to material requirements for colored concrete of Section 02761 - Colored Concrete for Medians and Sidewalks. Color shall be Brick Red or as shown on the drawings.

PART 3 E X E C U T I O N

3.1 REPLACEMENT

A. Replace sidewalks and slope paving which are removed or damaged during construction with thickness and width equivalent to one removed or damaged, unless otherwise shown on Drawings. Finish surface (exposed aggregate, brick pavers, etc.) to match existing sidewalk.

B. Provide replaced and new sidewalks with wheelchair ramps when sidewalk intersects curb at street or driveway.

3.2 PREPARATION

A. Identify and protect utilities which are to remain.

B. Protect living trees, other plant growth, and features designated to remain.

C. Conduct clearing and grubbing operations in accordance with the Clearing and Grubbing specification.

D. Excavate subgrade 6 inches beyond outside lines of sidewalk. Shape to line, grade and cross section. For soils with plasticity index above 40 percent, stabilize soil with lime in accordance with Lime-Stabilized Subgrade. Compact subgrade to minimum of 90 percent maximum dry density at optimum to 3 percent above optimum moisture content, as determined by ASTM D 698.

E. Immediately after subgrade is prepared, cover with compacted sand bed to depth as shown on Drawings. Lay concrete when sand is moist but not saturated.

3.3 PLACEMENT

A. Setting Forms: Straight, unwarped wood or metal forms with nominal depth equal to or greater than proposed sidewalk thickness. Use of 2 by 4's as forms will not be allowed. Securely stake forms to line and grade. Maintain position during concrete placement.

B. Reinforcement:

1. Install reinforcing bars.

2. Install reinforcing steel as shown on the drawings. Lay longitudinal bars in walk

continuously, except through expansion joints.

3. Use sufficient number of chairs to support reinforcement in manner to maintain reinforcement in center of slab vertically during placement.

4. Drill dowels into existing paving, sidewalk and driveways, secure with epoxy, and provide headers as required.

5. Use sufficient number of chairs for steel reinforcement bars to maintain position of bars within allowable tolerances. Place reinforcement as shown on Drawings. In plane of steel parallel to nearest surface of concrete, bars shall not vary from plan placement by more than 1/12 of spacing between bars. In plane of steel perpendicular to nearest surface of concrete, bars shall not vary from plan placement by more than 1/4 inch.

C. Expansion Joints: Install expansion joints with load transfer units in accordance with Concrete Pavement Joints.

E. Place concrete in forms to specified depth and tamp thoroughly with "jitterbug" tamp, or other acceptable method. Bring mortar to surface.

F. Strike off to smooth finish with wood strike board. Finish smoothly with wood hand float. Brush across sidewalk lightly with fine-haired brush.

G. Apply coating to wheelchair ramp with contrasting color in accordance with Section Colored Concrete for Medians and Sidewalks when applicable.

H. Unless otherwise indicated on Drawings, mark off sidewalk joints 1/8 inch deep, at spacing equal to width of walk. Use joint tool equal in width to edging tool.

I. Finish edges with tool having 1/4 inch radius.

J. After concrete has set sufficiently, refill space along sides of sidewalk to one-inch from top of walk with suitable material. Tamp until firm and solid, place sod as applicable. Dispose of excess material in accordance with Section 01576 - Waste Material Disposal. Repair driveways and parking lots damaged by sidewalk excavation in accordance with Pavement Repair and Resurfacing.

3.4 CURING

A. Conform to requirements of Concrete Pavement Curing.

3.5 FIELD QUALITY CONTROL

A. Testing will be performed under provisions of Testing Laboratory Services.

B. Compressive Strength Test Specimens: Four test specimens for compressive strength test will be made in accordance with ASTM C 31 for each 30 cubic yards or less of sidewalk that is placed in one day. Two specimens will be tested at 7 days. Remaining two specimens will be tested at 28 days. Specimens will be tested in accordance with ASTM C 39. Minimum compressive strength: 3000 psi at 7 days and 3500 psi at 28 days.

C. Yield test for cement content per cubic yard of concrete will be made in accordance with ASTM C 138. When cement content is found to be less than that specified per cubic yard, reduce batch weights until amount of cement per cubic yard of concrete conforms to requirements.

D. If the Contractor places concrete without notifying the laboratory, the City will have the concrete tested by means of core test as specified in ASTM C 42. When concrete does not meet specification, cost of test will be deducted from payment.

E. Sampling of fresh concrete shall be in accordance with ASTM C 172.

F. Take slump tests when cylinders are made and when concrete slump appears excessive.

G. Concrete shall be acceptable when average of two 28 day compression tests is equal to or greater than minimum 28 day strength specified.

H. If either of two tests on field samples is less than average of two tests by more than 10 percent, that entire test shall be considered erratic and not indicative of concrete strength. Core samples will be required of in-place concrete in question.

I. If 28 day laboratory test indicates that concrete of low strength has been placed, test concrete in question by taking cores as directed by Project Manager. Take and test at least three representative cores as specified in ASTM C 42 and deduct cost from payment due.

3.6 NONCONFORMING CONCRETE

A. Remove and replace areas that fail compressive strength tests, with concrete of thickness shown on Drawings.

B. Replace nonconforming sections at no additional cost to City.

3.7 PROTECTION

A. Maintain newly place concrete in good condition until completion of Work.

B. Replace damaged areas.

END OF SECTION

SECTION 03 11 20

CONCRETE STRUCTURES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the construction procedures for all concrete structures which includes the methods required for the forming, placing, and curing of concrete as shown on PLANS and as specified elsewhere within the Contract Documents.

1.02 RELATED REQUIREMENTS

A. PLANS show sizes, shapes, thickness, reinforcing requirements, and location of expansion, contraction, and construction joints for concrete structures.

B. Related work as called for on PLANS, or in this or other Specification Sections.

1.03 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.
   1. American Society For Testing And Materials (ASTM)
      a. ASTM C109, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
      b. ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
      c. ASTM C579, Standard Test Method for Compressive Strength of Chemical Resistant Mortars and Monolithic Surfacings
      d. ASTM C827, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
      e. ASTM D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension
      f. ASTM D1752, Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
      g. ASTM D2628, Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
      h. ASTM E488, Standard Test Methods for Strength of Anchors in Concrete and Masonry
   2. Federal Specifications (FS)
      a. FS-TT-S-0277E, Sealing Compound: Elastomeric Type, Multi-Component (For Caulking, Sealing and Glazing in Building and other Structures) Amendment 3
   3. U.S. Army Corps Of Engineers (CRD)
      a. CRD-C621, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

1.04 DEFINITIONS

A. "Curing Day" is any calendar day during which the temperature, taken in the shade away from artificial heat, is above 50°F for at least 19 hours (on colder days, if satisfactory provisions are made, maintain the temperature at all surfaces of the concrete above 40°F for the entire 24-hour day). Required curing period begins when all concrete therein has attained initial set.

B. "Nonshrink" is defined as no plastic or vertical shrinkage at any time when measured in accordance with ASTM C827.

1.05 SUBMITTALS

A. Furnish in accordance with Specification "Submittals".
   1. Shop drawings and Product Data. In addition to the items specified in "Submittals", furnish the following:
      a. Concrete mix designs, samples and test reports in accordance with the requirements of Specification, "Concrete".
      b. Drawings showing placement, sizes and materials for reinforcing in accordance with Specification Section 03210, "Reinforcing Steel".
      c. Prior to any construction activities, submit the following information in full or part as directed by the ENGINEER.
         1) Concrete placement schedule.
         2) Monolith drawings, in either two dimensions or isometric, clearly identify, locate, and dimension the following:
            a) Construction, contraction, and expansion joints.
            b) Embedded items.
            c) All concrete penetrations.
            d) Key elevations.
            e) Electrical conduit.
            f) All other items passing through concrete.
         3) Tabulation of concrete surfaces indicating types of finish to be provided on each surface.

1.06 SCHEDULING

A. Time sequence requirements for construction operations are as specified under Paragraph 3.01 of this Specification Section.

1.07 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

PART 2 - PRODUCTS

2.01 MATERIALS AND/OR EQUIPMENT

A. Concrete: In accordance with Specification "Concrete" with class of concrete as noted on PLANS.

B. Reinforcing Steel: In accordance with Specification "Reinforcing Steel" with size and type of reinforcing noted on PLANS.

C. Expansion Joint Filler Material: In accordance with ASTM 01752.

D. Waterstop: Manufactured from virgin polyvinyl chloride plastic compound and containing no scrap or reclaimed material. Unless otherwise indicated, furnish "Wirestop" waterstops as manufactured by Paul Murphy Plastics, Roseville, Michigan or equal of the following types.
   1. Expansion Joints: Center-bulb, ribbed, minimum of 0.375" thick, 6-inch width (unless otherwise shown on PLANS) with integral wire loops for attachment to reinforcing steel. "Wirestop" Model CR-6380 or equal.
   2. Construction Joints: Flat, ribbed, minimum of 0.375" thick, 6-inch width (unless otherwise shown on PLANS) with integral wire loops for attachment to reinforcing steel. "Wirestop" Model FR-6380 or equal.
   3. When called for on the PLANS furnish flat, dumbbell type, a minimum of 0.375" thick, 6-inch width (unless otherwise shown on PLANS) with integral wire loops for attachment to reinforcing steel. "Wirestop" Model FO-6380 or equal.

E. Curing Materials: Unless otherwise indicated, use one of the following.
   1. Potable Water.
   2. Liquid Membrane - Forming compounds in accordance with ASTM C309.

F. Forms and Falsework
   1. Timber:
      a. Seasoned, good quality timber free from loose or unsound knots, knot holes, twists, shakes, decay, and other imperfections which would affect its strength or impair finished surface of concrete.
      b. Wedges, when required, to be hardwood.
   2. Metal:
      a. Thickness of metal forms as required to maintain true shape without warping or bulging.
      b. Keep metal forms free from rust, grease, or other foreign materials, and use only those which present a smooth surface and form to alignment.
      c. Aluminum is not permitted.
   3. All screeds to be made of metal pipe. Plastic or hardened concrete sills not allowed in work. Maximum screed spacing 8'-0".

G. Grout
   1. Nonshrink Grout: Premixed grout which is nonmetallic, noncorrosive, and nonstaining; containing specially selected silicon sands, cement, shrinkage compensating agents, plasticizing and water reducing agents.
      a. Conform to requirements of CRO-C621.
      b. Minimum 28-day compressive strength of 5,000 psi when tested in accordance with ASTM C109.
      c. Maintain grout temperature during placement between 50°F and 90°F.
      d. Prepare and place grout according to grout manufacturer's specifications and the requirements of Paragraph 3.02 of this Specification Section.
   2. Nonshrink Epoxy Grout:

a. Minimum 7-day compressive strength of 16,000 psi when tested in accordance with ASTM C579.
b. Five Star epoxy grout as manufactured by Five Star Products or equal.

H. Vapor Barrier: Polyethylene film minimum thickness of 0.010-inch (10 mils) with highimpact strength rating. Provide recommended tape of proper width for sealing joints in barrier.
1. Acceptable Brands: Stego Wrap 10-mil Class A Vapor Retarder or approved equal.

I. Concrete Bonding Agent - Acceptable manufacturers:
1. "Duraweld-C" as manufactured by W.R. Grace and Company.
2. "Acrylic Bond Crete" as manufactured by Burke Concrete Accessories.

J. Waterproofing:
1. General: Where waterproofing is required on PLANS:
a. Under Slabs: Provide self-adhering polyethylene-waterproofing.
b. Walls: Use the product specified in Section 07160, "Bituminous Dampproofing".
2. Self-adhering polyethylene with a rubberized asphalt mastic material.
a. Minimum 4 mil thickness polyethylene coated on one side with a layer of adhesive rubberized asphalt with protective membrane.
b. Designed for tensile strength of 250 psi when tested in accordance with ASTM 0412.
c. Thickness to be 60 mils excluding the protective release membrane.
d. Furnish in rolls 36 inches minimal width and 50 feet minimal length.

K. Expansion Bolts and/or Anchors: Expansion bolts and/or anchors are to be of the type, sizes, shapes, dimensions and/or manufacturer as shown on PLANS.

L. Exterior Concrete Coatings: If exterior concrete coatings are required and are shown on PLANS, coating to be in accordance with the applicable Painting and Coating Specification Section.

M. Joint Sealant: Unless otherwise shown on PLANS, liquid joint sealant to be in accordance with FS-TT-S-0227E and preformed compression seals to be in accordance with ASTM 02628.

N. Concrete Floor Sealant: SON-NO-MAR as manufactured by Sonneborn or equal.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Time Sequence of Construction Operations
1. Do not place superstructure members, forms, falsework, or erection equipment on substructure before concrete has cured for minimum 4 days.
2. Erect forms on footings supported by piling or drilled shafts after concrete has cured for minimum 4 days. Work may begin on spread footings after concrete has aged at least 2 curing days.
3. Support of tie beam and/or cap forms by falsework placed on previously placed tie beams is permissible, provided curing requirements are completed and tie beams are properly supported to eliminate stresses not provided for in design.

4. Sequence of Pouring Operations: When construction requires the placement of concrete in successive pours, CONTRACTOR is to submit sketch and schedule for pouring sequence. Schedule and sequence is to allow a minimum of two days (48 hours) curing of adjacent concrete on all sides prior to placing new concrete in contact with previously placed concrete. Schedule to be submitted in accordance with the requirements as specified within Specification Section 01300, "Submittals".

3.02 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. General Design Requirements - Falsework and Forms
   1. Design and construct to carry maximum anticipated loads including wind load, and provide rigidity to prevent settlement or deformation.
   2. Use 150 pounds per cubic foot for concrete and minimum live load of 50 pounds per square foot of horizontal surface of form work. The maximum unit stresses not to exceed 125 percent of allowable stresses used for design of structures.

B. Falsework
   1. Make timber sills and grillages large enough to support superimposed load without settlement.
   2. Place falsework which cannot be founded on a satisfactory spread footing on piling or drilled shafts.
   3. Cap each falsework bent transversely by a member of proper size, and fasten caps securely to each pile or column in bent and set at proper elevation, allowing for a construction camber.
   4. Use wedges, if required, in pairs and arrange so as to ensure uniform bearing.
   5. Use of wedges to compensate for incorrectly cut bearing surfaces are not permitted.

C. Forms - General Requirements
   1. Provide mortar-tight forms sufficient in strength to prevent bulging or sagging.
   2. Maintain to proper line and grade, and prevent warping and shrinkage.
   3. Clean areas of extraneous material before concrete placement.
   4. If bulging or sagging occurs, remove concrete causing such condition and reset forms.
   5. Construct forms to permit their removal without damage to concrete.
   6. Use metal form ties of a type that permits their easy removal and which will not require removal of excessive concrete. Tapered form ties are acceptable.
   7. Remove metal alignment appliances from forms to a depth of at least 2 inch from concrete surface without undue chipping or spalling, leaving a smooth opening in the concrete surface.
   8. Burning off of rods, bolts, or ties not permitted.
   9. Cut wire ties back at least 2 inch from face of concrete.
   10. Metal tie-holding devices to develop strength of ties and to be adjustable for alignment.
   11. Remove spreaders, which are separate from the forms, as concrete is placed.
   12. Provide clean-out openings for walls and other locations where access to bottom of forms is not readily attainable.
   13. Prior to erection, treat facing of forms with oil or other bond-breaking coating which will not discolor or otherwise injuriously affect concrete surface.

14. Wet surface of forms to be in contact with concrete immediately before placing concrete.
15. Before concrete placement, align edges and faces of form panels and tape or fill joints with patching plaster or cold-water putty to prevent leakage; sand lightly with No. 0 sandpaper to make joints smooth.
16. No forms of any kind are to be left in place under permanent structures.

D. Timber Forms
   1. Timber for facing or sheathing surfaced on at least one side and two edges.
   2. Use nominal 2-inch lumber minimum thickness for forms for bottoms of beams.
   3. Use lumber of nominal 1-inch minimum thickness elsewhere, generally, and back by sufficient number of studs and wales.
   4. Provide form linings free of irregularities for concrete surfaces to be given rubbed finish.
   5. Lining not required with plywood forms.
   6. Plywood form lining made with waterproof adhesive to be 1/4-inch minimum thickness, oiled at mill, and re-oiled or lacquered on job before using.
   7. Use tempered Masonite Concrete Form Board, 3/16-inch minimum thickness, as alternate form lining. Keep moist at least 12 hours before applying to sheathing by moistening screen side of board and stacking boards screen side to screen side. Use smooth, hard face as concrete contact surface of form.
   8. Plywood forms to be minimum 3/4-inch thickness and made with waterproof adhesive backed by adequate studs and wales, with form lining not required.
   9. Molding for chamfer strips, to be Redwood, cypress, or pine. Material is not split when nailed and will hold true lines. All faces to be mill cut and dressed. Fillet sharp corners and edges with triangular chamfer strips, 3/4 inch on sides.

E. Metal Forms: Linings are not required. Countersink bolt and rivet heads on facing sides of metal forms. Design clamps, pins, or other connecting devices to hold forms rigidly together and to allow removal without injury to the concrete. Straight metal panel forms may be used for all structures with straight walls and for those structures with curved walls only below ground level. Curved metal panels may be used for all structures with curved walls.

F. Expansion Joints: Remove form from formed joints as soon as possible to permit free expansion of concrete. Anchor expansion joint fillers to concrete on side of joint by means of copper wire not lighter than No. 12 B&S gage or copper nails of approved size. Ensure complete separation of concrete sections by joint material.

G. Construction Joints: Other than those indicated on the approved Monolith Drawing, joints are not permitted without written authorization by the ENGINEER. Thoroughly clean joint surfaces of previously placed concrete by power water blasting. Keep all concrete surfaces moist for 12 hours prior to placing adjacent concrete. Immediately prior to placing concrete, wet surface of joint with clean water.

H. Placing Reinforcement: Concrete reinforcement to be placed as shown on PLANS and in accordance with approved shop drawing. Materials to be in accordance with Specification Section 03210, "Reinforcing Steel" and/or as shown on PLANS.

I. Concrete Placement

1. Seal Slabs:
    a. Use in all excavations for structures requiring reinforcing steel in base slab. For retaining wall footings and bridge footings, use seal slab only if shown on PLANS.
    b. Excavate 2 inches minimum or to the depth as shown on PLANS below bottom of structural slab and pour seal slab concrete to structural slab bottom elevation. Surfaces to have a rough float finish.
    c. Concrete for seal slabs to be Class D per applicable concrete specification Section unless otherwise noted. No cylinders or testing is required for seal slab concrete. No direct payment will be made for seal slab concrete.
2. General Requirements:
    a. ENGINEER is to be given 48 hours advanced notice before placing concrete. Place concrete only after forms and reinforcing placement have been checked. Pile driving and other causes of vibration are to be discontinued until concrete has attained an age of at least 18 hours.
    b. It is preferable to mix, place, and finish concrete in daylight hours. If necessary to conduct concrete operations in other than daylight hours, light entire working area. Do not place concrete when impending weather conditions, such as rain, sleet, or snow, threaten to impair quality of finished work. If rainfall occurs during concrete placement, provide covering to protect work.
    c. Place concrete in forms or excavations with no apparent moisture therein. Standing water is not permitted in forms or excavations during concrete placement.
3. Handling and Transporting of Concrete:
    a. Use method and equipment to maintain rate of placement as required to prevent cold joints. Place concrete by buckets, chutes, buggies, pipes, or troughs, which prevent separation of concrete ingredients.
    b. With prior written approval by the ENGINEER, use belt conveyors or pumps, and test samples at discharge end. Protect concrete transported by conveyors from sun and wind to prevent loss of slump and workability. Pipes used to pump concrete to be shaded and/or wrapped with wet burlap to prevent loss of slump and workability. Do not transport concrete through aluminum pipes, tubes, or other aluminum equipment. Use of chutes in excess of 35 feet total length prohibited.
4. Concrete Placement:
    a. CONTRACTOR is to provide thermometer to measure temperature of concrete during placement for the ENGINEER's usage.
    b. Equip chutes with baffles for depositing concrete on steep slopes, or make chutes in short lengths that reverse lateral direction of movement. Provide downpipe at the end of chute. Use no slope steeper than one vertical to two horizontal.

c. Discharge concrete from chutes and troughs either vertically down the inside of forms or into pockets outside of forms from which it may flow through holes left in forms. Keep chutes, troughs, and pipes clean and free from coatings of hardened concrete. Deposit concrete in continuous horizontal layers maximum 12 inches in thickness. Depositing large quantities at one point and running or working of the concrete along forms not permitted. Limit free-fall of concrete to 5 feet, except in walls 10-inches or less in thickness, if segregation can be prevented.
d. Use tremies for placing concrete in walls over 10 inches thick. Remove hardened concrete spatter ahead of plastic concrete. Do not jar forms after concrete has taken initial set or place any strain on projecting reinforcement. Make tremies in sections, or provide in several lengths, so outlet may be adjusted to proper heights during placing operations. Place each layer while preceding layer is still plastic, but do not allow more than one hour to elapse between placement of successive layers.
e. Apply vibrators to concrete immediately after depositing and move throughout mass, through layer of concrete just placed, and several inches into plastic layer below. Consolidate concrete and flush mortar to form surfaces by continuous working with immersion-type vibrators. Do not attach vibrators to forms or reinforcement. Provide one standby vibrator for emergency use.
f. If excessive bleeding causes water to form on surface of concrete in tall forms, use stiffer mix. In walls and deep beams, place concrete to a point approximately 1 foot below finished elevation of bottom of slab or beam to be poured monolithically with wall, and allow to settle; but to avoid a cold joint, resume placement of concrete before initial set occurs. Overfill forms and screed off excess concrete after partial stiffening.

5. Concrete Placement in Cold Weather Conditions:
   a. The minimum temperature of all concrete at time of placement to be not less than 50°F. Maintain slab temperatures at 50°F or above for period of 72 hours from time of placement and above 40°F for additional 72 hours.
   b. Maintain temperature of all other structural elements at 40°F or above for period of 72 hours from time of placement. Maintain temperature of concrete placed on or in the ground above 40°F for period of 72 hours from time of placement.
   c. Protect concrete against freezing during curing period in accordance with Portland Cement Association "Design and Control of Concrete Mixtures". Protect concrete from temperatures below 40°F until it has cured for a minimum of 3 days at 70°F or 5 days at 50°F. Remove and replace, at CONTRACTOR's expense, all concrete deemed unsatisfactory by ENGINEER. Protection may consist of additional covering, insulated forms, artificial heating, or other means approved by ENGINEER.
6. Concrete Placement in Hot Weather Conditions:
   a. When air temperature is above 90°F use approved retarding agent in all exposed concrete.
   b. Reinforcing steel, steel beam flanges, and other surfaces in contact with concrete to be cooled to below 90°F by means of water spray or other approved methods.

c. Concrete temperature prior to placement not to exceed 90°F. Reduce concrete temperature at time of placement to satisfy maximum allowable temperature by one or more of the following:
    1) Addition of cold water with a subsequent addition of cement to maintain proper water-cement ratio. Tanks or trucks used for storing or transporting water to be insulated or painted white. Mechanical refrigeration may be used to reduce water temperatures.
    2) Addition of crushed, shaved, or chipped ice directly into the mixer with a subsequent addition of cement to maintain proper water-cement ratio. Continue mixing until ice is completely melted.
    3) Any other methods that may be incorporated into the work to be approved in writing by the ENGINEER.

7. Concrete Placement in Water Conditions:
    a. Only when approved by the ENGINEER, use concrete mix with minimum 6.5 sacks cement per cubic yard of concrete. Forms, cofferdams, or caissons to be sufficiently tight to prevent water current passing through space in which concrete is being deposited. Pumping water not permitted during placing, nor until concrete has set for at least 36 hours.
    b. Place concrete with tremie, closed bottom-dump bucket, or other approved method to avoid free-fall through water. Do not disturb concrete after depositing, and maintain horizontal layers at all times. Use watertight tube 10 inches or less in diameter for tremie and constructed so that bottom can be sealed and opened after it is in place and fully charged with concrete.
    c. Support tremie to allow easy movement horizontally to cover work area and vertically to control concrete flow. Stop flow by lowering the tremie.
    d. Capacity of bottom-dump buckets to be not less than 2 cubic yard. Lower bucket or tremie gradually and carefully to rest upon concrete already placed and raise very slowly during upward travel, intent being to maintain still water at point of discharge and to avoid agitating mixture. Pour concrete continuously until work is completed.
8. Concrete Placement on Ground or Seal Slabs:
    a. Place concrete in footings after depth and character of foundation is observed. Place footing concrete upon seal slabs after caissons, cofferdams, excavations, forms, etc. are free from water and seal surface cleaned.
    b. Locate pumps or bailing equipment in sump outside of forms. Immediately before placing concrete, moisten subgrade to decrease absorption of moisture, if seal slab or waterproofing not required.
    c. With ENGINEER's approval, side forms in dry excavation may be omitted. Place column concrete monolithically unless otherwise provided.

J. Curing Concrete: Keep forms tight against concrete, or remove with the approval of the ENGINEER and start curing operations.
1. Length of Curing: Cure concrete for 6 consecutive curing days. Cure high-early strength concrete for 3 consecutive curing days
2. Curing Methods: CONTRACTOR to select curing method that is compatible with protective coatings, sealants, and/or waterproofing materials (if any):

a. Water Curing: Keep all exposed concrete surfaces wet continuously for the required curing time.
    1) Place wet cotton mats as soon as practical after surface has hardened sufficiently to prevent damage to concrete.
    2) Weight down mats to provide continuous contact with all concrete surfaces.
    3) Use over lapping water sprays or sprinklers that keep all unformed surfaces continuously wet.
    4) Use minimum of 2-inches of clean, granular material, kept wet at all times or minimum 1-inch depth of water.
    5) Provide a dam or similar procedure to retain water or saturated sand.
b. Membrane Curing:
    1) Flat Concrete: Apply curing material as specified at the rate of coverage recommended by the manufacturer but not greater than 200 square feet per gallon using a pump type spray. Apply after concrete is set sufficient to bear full weight of applicator.
    2) Formed Concrete: Apply curing material as specified as soon as practical after removing forms, at the rate of coverage recommended by the manufacturer but not greater than 200 square feet per gallon.
    3) Formed concrete that is to be rub-finished: Apply curing material as specified as soon as rubbing is finished.
    4) Formed or flat concrete that is to be painted or waterproofed should be treated with curing material as specified as soon as possible after finishing and prior to application of paint or waterproofing material.

K. Removal of Forms and Falsework:
1. Remove forms from surface to receive rubbed finish when concrete has attained adequate strength to prevent damage, and remove only as rapidly as rubbing operation progresses.
2. Re-wet wood forms or form lining left in place longer than 24 hours as required to keep them moist.
3. Remove forms and falsework from portions of structures that do not require rubbed finish, after the following number of curing days.
    a. Forms for falsework under slabs, beams, or girders - 7 days.
    b. Forms for walls, columns and piers - 2 days.
4. If cold weather continues below 40°F, form and falsework may be removed at the end of a period of calendar days equal to twice the number of curing days specified.

L. Defective Work: Any defective work discovered after form removal to be repaired or replaced immediately at CONTRACTOR's expense.

M. Concrete Surface Finish: For concrete having no special finish indicated, remove ties, fill holes, and remove fins and rough edges. Exposed concrete surfaces, other than floors, to have a rubbed finish except where noted on PLANS.
1. Monolithic Finish: Finish slabs, platforms, and steps monolithically between joints. Set screeds prior to concrete placement, and make sufficiently rigid to withstand impact of concrete being placed. Tamp concrete thoroughly to force coarse aggregate away from surface of slab, then float to secure hard surface.
2. Provide light broom finish unless otherwise directed by the ENGINEER.

3. "Dusting" floor surfaces with dry material not permitted. Round edges at all expansion joints with suitable jointing or edging tools.
4. Unless otherwise noted, all interior concrete floor slabs are to be sealed with a concrete floor sealant.

N. Exposed Aggregate Panels:
1. Forms for exposed aggregate panels to be sandblasted may be removed on the day following concrete placement (about 18 hours). Continue curing after sandblasting. Immediately after form removal, sandblast to a depth of from 3/8inch to 5/8-inch. Protect smooth surfaces adjacent to sandblasted panels during sandblasting. Coarse aggregate for raised panels range from Standard No.4 to 1%-inch gradation.
2. Exposed aggregate sandblasted surfaces are to receive a coat of curing material as specified. Preparatory work, application, and precautions in strict compliance with manufacturer's recommendations.

O. Rub-Finished Surfaces:
1. General Requirements: Rub-finish exposed vertical and battered surfaces from 6-inches below ground surface or from 6-inches below normal water level to top, except for small plinths and similar structures which extend less than 12-inches above finished grade.
2. Procedure:
   a. Start rubbing operations when concrete has attained adequate strength for form removal. Continue curing afterwards.
   b. Do necessary pointing as forms are removed. Remove forms only as rubbing progresses in order to prevent rapid hardening of surface to be rubbed.
   c. After pointing has set, wet surface with brush and give first surface rubbing with No. 16 Carborundum stone or equal. Rub sufficiently to bring surface to paste and to produce smooth dense surface without irregularities. Add no cement to form surface paste.
   d. Spread or brush material, which has been ground to paste, uniformly over surfaces and allow to take reset. Do not rub chamfered corners in first rubbing. Complete first rubbing within 36 hours after completion of concrete placement.
   e. For final acceptance, clean surfaces of structure and give final finish rubbing with No. 30 Carborundum stone or equal. After rubbing, strip surfaces with brush and allow mortar on surface to take reset; then wash surface with clean water. Leave structure with clean, neat, and uniform appearing finish.
   f. Apply a coat of curing material as specified. Preparatory work, application, and precautions in strict compliance with manufacturer's recommendations.

P. Patching and Filling Holes:
1. Tie and Bolt Holes:
   a. Fill holes with cement mortar to which has been added white cement so that patches will not appear darker than adjacent concrete surface. Use mortar as dry as possible and pack into holes.
   b. Fill holes, entirely through concrete, with nonshrink grout from inside structure with a pressure gun or other device that will force mortar through to outside face. Strike off excess mortar flush and finish surface to make filled holes as inconspicuous as possible.

c. Tapered form ties holes shall be filled as follows:
    1) Heavy sandblast and clean tie holes.
    2) After cleaning, drive neoprene plug into each of taper tie holes with a steel rod. Locate plugs within middle third of the wall thickness. Bond neoprene plugs to the concrete with epoxy.
    3) Coat tie hole surfaces with epoxy and fill with cement mortar as specified in paragraph a above. Place mortar in heavily compacted thin layers.
    4) At tie holes on the water-side of water containing structures and on the outside of below grade walls, cover with an epoxy coating extending a minimum of 2 inches beyond the tie hole.

2. Honeycomb and Minor Defects:
    a. Patch slight honeycomb and minor defects in concrete with cement mortar mixed one part cement to two parts fine aggregate. Match color of adjacent concrete.
    b. Repair area by cutting out unsatisfactory material by chipping or other approved methods and replace with new concrete, securely keyed and bonded to old concrete, and finish so as to make joints as inconspicuous as possible. Use stiff mixture and thoroughly tamp into place.
    c. Use nonshrink grout for large honeycomb and for hydraulic structures with honeycomb sufficient to cause leakage through concrete.

Q. Waterstops and Waterproofing:
1. Waterstops:
    a. Secure each edge of waterstop by tying with clean steel wire to reinforcing steel at intervals not to exceed one foot.
    b. Make waterstops continuous by heat sealing at splices as recommended by manufacturer. Minimum requirements are:
        1) Only splicing of straight runs allowed in forms. Butt weld straight splices.
        2) Fabricate all other waterstop joints at central location on jobsite or use factory fabricated joint intersections furnished by the waterstop manufacturer.
        3) Miter and weld splices in expansion joint waterstops at directional changes bulb to bulb. Puncturing waterstops not allowed.
2. Waterproofing:
    a. Apply approved primer, as recommended by manufacturer of membrane, to clean, dry surface at rate of not more than 250 square feet per gallon, and allow to dry to tack-free condition before applying membrane.
    b. Apply membrane within 12 hours of priming, or re-prime surface. Apply membrane vertically or horizontally, wrinkle free, with a minimum of 2%inch overlaps and staggered. For horizontal application, upper course to lap over lower course.
    c. Repair accidental damage to membrane by spot application of material to damaged areas with minimum of 6-inch overlap in all directions. Exercise special care to ensure protection of waterproofing membrane from damage during backfill operations.

R. Grouting:
1. 1. General Grouting:

a. For general purposes, use mixture of one part Portland cement and two parts sand by weight. If space to be grouted is 1 inch or less in thickness and cannot be tamp grouted, use a mixture of one part Portland cement and one part sand by weight. If space to be grouted is large, use original concrete mixture. For grout to be tamped, use stiff mixture produced by prolonged mixing.
b. To obtain stiff grout, mix mortar using amount of water required to thoroughly mix ingredients, then continue mixing without additional water until grout is stiff enough to be compacted by tamping when placed.
c. For grouting blockouts for embedded pipes and similar items, use nonshrink grout as per Paragraph 2.01 G of this Specification Section.
d. Prior to grout application remove curing material from concrete surface to assure bonding of grout to concrete. Apply curing material as specified to the grout after application.

2. Setting New Equipment: Use nonshrink epoxy grout as specified in Paragraph 2.02 G of this Specification Section.
   a. Clean surface to receive grout of laitance, grease, oil, organic matter, curing compound, and loose particles. Blowout bolt holes. Chip concrete to obtain a firm bond.
   b. Set grout forms true, level, tight, and well braced. Assemble equipment to be grouted before grouting. Clean baseplates and all items to be embedded and set in final position. Shim equipment bases for easy removal of shims. Moisten area to receive grout. Do not mix more grout than can be placed in 20 minutes.
   c. Place grout from one end or side only to avoid excessive air entrapment and to ensure good compaction. Work and rod grout continuously while it is being placed.
   d. After grout has attained full strength, remove shims. Replace grout damaged by shim removal with like material.
   e. Steel trowel exposed grout, and protect exposed area from drying out rapidly. Do not stress items embedded in grout, and do not operate equipment for 36 hours after grout is placed.

3.03 CLEANING

A. Clean up area and remove excess material, dismantled forms and falsework, and debris during construction, and clean area completely and thoroughly after completion of the work herein described.

3.04 PROTECTION

A. Protect finished concrete from damage or discoloration until final acceptance by the ENGINEER.

END OF SECTION

SECTION 03 12 50

CONCRETE FOR UTILITY CONSTRUCTION

PART 1 G E N E R A L

1.1 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.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No payment will be made for concrete for utility construction under this Section. Include cost in applicable utility structure.

2. Obtain services of and pay for certified testing laboratory to prepare design mixes.

3. Refer to Measurement and Payment for unit price procedures.

1.3 REFERENCES

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 - Guide for Concrete Plant Inspection and Field Testing of Ready-Mix Concrete.

H. ACI 315 - Details and Detailing of Concrete Reinforcement.

I. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary.

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) Steel Bars for Concrete Reinforcement.

O. ASTM A 775 - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

P. ASTM A 820 - Standard Specification for 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 Test Method for 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.

AB. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

AC. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete. AD. ASTM C 309 - Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.

AE. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete. AF. ASTM C 595 - Standard Specification for Blended Hydraulic Cements.

AG. ASTM C 685 - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.

AH. ASTM C 1064 - Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.

AI. ASTM C 1077 - Standard Practice for Laboratory Testing of Concrete and Concrete Aggregate for Use in Construction and Criteria for Laboratory Evaluation.

AJ. CRSI MSP-1 - Manual of Standard Practice. AK. CRSI - Placing Reinforcing Bars.

AL. Federal Specification SS-S-210A - Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints

AM. NRMCA - Concrete Plant Standards.

1.4 SUBMITTALS

A. Conform to requirements of - Submittal Procedures.

B. Submit proposed mix design and test data for each type and strength of concrete in Work.

C. Submit laboratory reports prepared by 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 Project Manager.

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.

1.5 HANDLING AND STORAGE

A. Cement: Store cement off of ground in 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 coating.

PART 2 P R O D U C T S

2.1 CONCRETE MATERIALS

A. Cementitious Material:

1. Portland Cement: ASTM C 150, Type II, unless use of Type III is authorized by Project Manager; or ASTM C 595, Type IP. For concrete in contact with sewage use Type II cement.

2. When aggregates are potentially reactive with alkalis in cement, use cement not exceeding 0.6 percent alkali content in 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 following ASTM standard sizes: No. 357 or No. 467; No. 57 or No. 67, No. 7. Maximum size: Not larger than 1/5 of 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 potential reactivity of fine and coarse aggregate in accordance with 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 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 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.

2.2 FORM WORK 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 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. Form work 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 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 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 smooth surface and which line up properly.

2.3 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.

2.4 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.

2.5 DESIGN MIX

A. Use design mixes prepared by 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 Project Manager for review.

C. Proportioning on basis of field experience or trial mixtures in accordance with requirements at Section 5.3 of ACI 318 may be used, when approved by Project Manager.

D. Classification:

CLASS	TYPE	MINIMUM COMPRESSIVE STRENGTH (LBS/SQ. IN.)		MAXIMUM W/C RATIO	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	----	1500	----	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 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 Drawings and other Specifications. Use Class B for unreinforced concrete used for plugging pipes, seal slabs, thrust blocks, trench dams, tunnel inverts and concrete fill unless indicated otherwise. Use Class A for all other applications.

2.6 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 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.

2.7 RESILIENT WATERSTOP

A. Resilient Waterstop: Where shown on Drawings; either 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 asphaltics.

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 2 part protective paper.

4. Submit independent laboratory tests verifying that material seals joints in concrete against leakage when subjected to minimum of 30 psi water pressure for at least 72 hours.

5. Provide primer, to be used on hardened concrete surfaces, from same manufacturer who supplies waterstop material.

6. Acceptable Manufacturer: Synko-Flex Preformed Plastic Adhesive Waterstop, Synko- Flex Products, Inc.; or approved equal.

PART 3 E X E C U T I O N

3.1 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 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 clean out 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 form work with sufficient number of studs and wales to prevent deflection.

E. Re-oil or lacquer liner on 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 Project Manager, treat both sides of face forms with coating. Apply coating before reinforcement is placed. Immediately before concrete is placed, wet surface of forms which will come in contact with concrete.

3.2 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 Project Manager 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 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 Project Manager. 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.

3.3 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.

3.4 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 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 though 8.

C. Maintain concrete workability without segregation of material and excessive bleeding. Obtain approval of Project Manager before adjustment and change of mix proportions.

D. Ready-mixed concrete delivered to site shall be accompanied by batch tickets providing information required by ASTM C 94, Section 16. Concrete produced by continuous mixing shall be accompanied by batch tickets providing information required by ASTM C 685, Section 14.

E. 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 shade, away from artificial heat. Protect concrete from temperatures below 32 degrees F until concrete has cured for minimum of 3 days at 70 degrees F or 5 days at 50 degrees F.

F. Clean, maintain and operate equipment so that it thoroughly mixes material as required.

G. Hand-mix only when approved by Project Manager.

3.5 PLACING CONCRETE

A. Give sufficient advance notice to Project Manager (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 Project Manager's approval.

B. Schedule concrete placing to permit completion of finishing operations in daylight hours. However, when necessary to continue after daylight hours, light site as required. When rainfall occurs after placing operations are started, provide covering to protect 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 initial set; do not place 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. Place concrete in continuous horizontal layers approximately 12 inches thick. Place each layer while layer below is still plastic.

G. Compact each layer of concrete with concrete spading implements and mechanical vibrators of approved type and adequate number for size of placement. When immersion vibrators cannot be used, use form vibrators. Apply vibrators to concrete immediately after depositing. Move vibrator vertically through 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.

H. Handling and Placing Concrete: Conform to ACI 302.1R, ACI 304R and ACI 309R.

3.6 WATERSTOPS

A. Embed waterstops in concrete across joints as shown. Waterstops shall be continuous for extent of joint; make splices necessary to provide continuity in accordance with manufacturer's instructions. Support and protect waterstops during construction operations; repair or replace waterstops damaged during construction.

B. Install waterstops in concrete on one side of joints, leaving other side exposed until next pour. When waterstop will remain exposed for 2 days or more, shade and protect exposed waterstop from direct rays of sun during entire exposure and until exposed portion of waterstop is embedded in concrete.

C. Splicing PVC Waterstops:

1. Splice waterstops by heat-sealing adjacent waterstop sections in accordance with manufacturer’s printed instructions.

2. Butt end-to-end joints of two identical waterstop sections may be made in forms during placement of waterstop material.

3. Prior to placement in form work, prefabricate waterstop joints involving more than two ends to be joined together, angle cut, alignment change, or joining of two dissimilar waterstop sections, allowing not less than 24 inch long strips of waterstop material beyond joint. Upon inspection and approval by Project Manager, install prefabricated waterstop joint assemblies in form work, and butt-weld ends of 24 inch strips to straight- run portions of waterstop in forms.

D. Setting PVC Waterstops:

1. Correctly position waterstops during installation. Support and anchor waterstops during progress of work to ensure proper embedment in concrete and to prevent folding over of waterstop by concrete placement. Locate symmetrical halves of waterstops equally between concrete pours at joints, with center axis coincident with joint openings. Thoroughly work concrete in joint vicinity for maximum density and imperviousness.

2. Where waterstop in a vertical wall joint does not connect with any other waterstop, and is not intended to be connected to waterstop in future concrete placement, terminate waterstop 6 inches below top of wall.

E. Replacement of Defective Field Joints: Replace waterstop field joints showing evidence of misalignment, offset, porosity, cracks, bubbles, inadequate bond or other defects with products and joints complying with Specifications.

F. Resilient Waterstop:

1. Install resilient waterstop in accordance with manufacturer's instructions and recommendations.

2. When requested by Project Manager, provide technical assistance by manufacturer's representative in field at no additional cost to OWNER.

3. Use resilient waterstop only where complete confinement by concrete is provided; do not use in expansion or contraction joints.

4. Where resilient waterstop is used in combination with PVC waterstop, lap resilient waterstop over PVC waterstop minimum of 6 inches and place in contact with PVC waterstop. Where crossing PVC at right angles, melt PVC ribs to form smooth joining surface.

5. At free top of walls without connecting slabs, stop resilient waterstop and grooves (where used) 6 inches from top in vertical wall joints.

6. Bentonite Waterstop:

a. Locate bentonite waterstop as near as possible to center of joint and extend continuous around entire joint. Minimum distance from edge of waterstop to face of member: 5 inches.

b. Where thickness of concrete member to be placed on bentonite waterstop is less than 12 inches, place waterstop in grooves at least 3/4 inch deep and 1 1/4 inches wide formed or ground into concrete. Minimum distance from edge of waterstop placed in groove to face of member: 2.5 inches.

c. Do not place bentonite waterstop when waterstop material temperature is below 40 degrees F. Waterstop material may be warmed so that it remains above 40 degrees F during placement but means used to warm it shall in no way harm material or its properties. Do not install waterstop where air temperature falls outside manufacturer's recommended range.

d. Place bentonite waterstop only on smooth and uniform surfaces; grind concrete smooth when necessary to produce satisfactory substrate, or bond waterstop to irregular surfaces using epoxy grout which completely fills voids and irregularities beneath waterstop material. Prior to installation, wire brush concrete surface to remove laitance and other substances that may interfere with bonding of epoxy.

e. In addition to adhesive backing provided with waterstop, secure bentonite waterstop in place with concrete nails and washers at 12 inch maximum spacing.

7. Adhesive Waterstop:

a. With wire brush thoroughly clean concrete surface on which waterstop is to be placed and then coat with primer.

b. If surface is too rough to allow waterstop to form complete contact, grind to form adequately smooth surface.

c. Install waterstop with top protective paper left in place. Overlap joints between strips minimum of 1 inch and cover back over with protective paper.

d. Do not remove protective paper until just before final form work completion. Place concrete immediately. time that waterstop material is uncovered prior to concrete placement shall be minimized and shall not exceed 24 hours.

3.7 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 Project Manager. 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.

3.8 CURING

A. Comply with ACI 308. Cure by preventing loss of moisture, rapid temperature change and mechanical injury for 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 concrete surface after placing and finishing. A curing day is any calendar day in which temperature is above 50 degrees F for at least 19 hours. Colder days may be counted when 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 end of calendar days equal to twice required number of curing days. However, leave soffit forms and shores in place until concrete has reached specified 28 day strength, unless directed otherwise by Project Manager.

B. Cure formed surfaces not requiring rubbed-finished surface by leaving forms in place for full curing period. Keep wood forms wet during 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. Rubbed Finish:

1. At formed surfaces requiring rubbed finish, remove forms as soon as practicable without damaging surface.

2. 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 final finish and surplus water sheen has disappeared, immediately seal surface with uniform coating of approved curing compound, applied at rate of coverage recommended by manufacturer or as directed by Project Manager. 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 compound.

2. Thoroughly agitate 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 dry surface. When concrete surface has become dry, thoroughly moisten surface immediately prior to application. At locations where coating shows discontinuities, pinholes or other defects, or when rain falls on newly coated surface before film has dried sufficiently to resist damage, apply additional coat of compound at specified rate of coverage.

3.9 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 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 specified 28-day strength, unless directed otherwise by Project Manager.

3.10 DEFECTIVE WORK

A. Immediately repair defective work discovered after forms have been removed. When concrete surface is bulged, uneven, or shows excess honeycombing or form marks which cannot be repaired satisfactorily through patching, remove and replace entire section.

3.11 FINISHING

A. Patch honeycomb, minor defects and form tie holes in concrete surfaces with cement mortar mixed one part cement to two parts fine aggregate. 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 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 surface.

B. Apply rubbed finish to exposed surfaces of formed concrete structures as noted on Drawings. After pointing has set sufficiently, wet surface with 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 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 surface to reset; then wash surface with clean water. Leave structure with clean, neat and uniform-appearing finish.

C. Apply wood float finish to concrete slabs.

3.12 FIELD QUALITY CONTROL

A. Testing shall be performed under provisions of Section - Testing Laboratory Services.

B. Unless otherwise directed by Project Manager, following minimum testing of concrete is required. Testing shall be performed by qualified individuals employed by approved independent testing agency, and conform to requirements of ASTM C 1077.

1. Take concrete samples in accordance with ASTM C 172.

2. Make one set of four compression test specimens for each mix design at least once per day and for each 150 cubic yards or fraction thereof. Make, cure and test 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, specified 7 day and 28 day compressive strengths shall be applicable at 3 and 7 days, respectively.

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. When additional curing fails to produce required strength, strengthening or replacement of portions of structure which fail to develop required strength may be required by Project Manager, at no additional cost to OWNER.

3.13 PROTECTION

A. Protect concrete against damage until final acceptance by OWNER.

B. Protect fresh concrete from damage due to rain, hail, sleet, or snow. Provide protection while concrete is still plastic, and whenever precipitation is imminent or occurring.

C. Do not backfill around concrete structures or subject them to design loadings until components of structure needed to resist loading are complete and have reached specified 28-day compressive strength, except as authorized otherwise by Project Manager.

END OF SECTION

SECTION 03 21 00

REINFORCING STEEL

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the furnishing and subsequent placing of reinforcing steel, deformed and smooth, chairs, ties, splicing devices, and other reinforcing accessory items required to complete work as shown on PLANS and specified in other Specification Sections.

1.02 RELATED REQUIREMENTS (NOT USED)

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
   1. American Concrete Institute (ACI)
      a. ACI315, ACI Detailing Manual Publication SP-66
   2. American Society for Testing and Materials (ASTM)
      a. ASTM A82, Standard Specification for Steel Wire, Plain for Concrete Reinforcement
      b. ASTM A185, Standard Specification for Steel Welded Wire Fabric, Plain for Concrete Reinforcement
      c. ASTM A615/A615M, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

1.04 SUBMITTALS

A. Submit the following in accordance with Specification, "Submittals".

B. Product data for all materials used.

C. Shop drawings indicating location, placement, sizes, and bending.

D. Certificate of Compliance: Submit certified copy of mill certificates of compliance with requirements herein specified.

E. Special Equipment: Submit information on mechanical splicing devices, couplers, and all other reinforcing accessories.

1.05 QUALITY ASSURANCE

A. Reinforcement and placement to be in accordance with the requirements and guidelines as specified within ACI 315.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver to jobsite free from dirt, loose scale and rust, paint, oil, or other foreign material.

B. Store above surface of ground upon platforms, skids, or other supports, and protect from mechanical injury and surface deterioration caused by exposure to conditions producing rust or other damage.

C. Handle so as not to sustain crimping, bending, or warping before and during placement.

1.07 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

PART 2 - PRODUCTS

2.01 MATERIALS AND/OR EQUIPMENT

A. General Requirements
   1. Nominal size, area, and theoretical weight in accordance with ASTM A615/615M Table(s) 1a/1b.
   2. Bending: Bends to be completed in shop, cold, true to shapes shown on PLANS. Any irregularities in bending are cause for rejection. Bars to be detailed in accordance with ACI 315. The inside diameter of bar bends, in terms of nominal bar diameter (d) of bar which is bent, to be in accordance with ACI 315.
   3. Fabrication tolerances in accordance with ACI 315 except as necessary to satisfy clearance requirements indicated within Paragraph 3.01 A.2 of this Specification Section.
   4. Splices
      a. Except where shown on PLANS, splices are not permitted without ENGINEER's prior written approval.
      b. Not permitted in main reinforcement at points of maximum stress, unless shown otherwise on PLANS.
      c. When not indicated on PLANS, but permitted with prior ENGINEER's written approval, subject to the following:
         1) Not larger than NO.8 bars.
         2) Not permitted in bars 30 feet or less in length, except vertical.
         3) Splices center to center not less than 30 feet.
         4) Maintain specified concrete cover.
         5) Stagger main bar splices in adjacent bars a minimum of two splice lengths.
      d. Lap Splices
         1) Lap bars in accordance with table shown on PLANS.
         2) Lap bars so that both bars will be in the same plane parallel with the nearest concrete surface.
      e. All splices, whether mechanical, or coupler, to develop full strength of bar.

B. Reinforcing Steel
   1. Deformed, conforming to ASTM A615/A615M Grade 60.
   2. Welded wire fabric conforming to ASTM A185.
   3. Cold drawn steel wire conforming to ASTM A82.
   4. Spiral reinforcement to be deformed bars conforming to ASTM A615/A615M, or smooth bars or wire conforming to ASTM A82.
   5. Smooth dowels for expansion joints, conforming to ASTM A615/A615M Grade 60.

C. Bar Supports:
   1. Plastic Protected Bar Supports: CRSI Bar Support Specifications, Class 1Maximum Protection.

2. Stainless Steel Bar Supports: CRSI Bar Support Specifications, Class 2Moderate Protection.
3. Bright Basic Wire Bar Supports: CRSI Bar Support Specifications, Class 3-No Protection.
4. Precast Concrete Block Bar Supports: CRSI Bar Support Specifications. Strength shall be equal to or greater than surrounding concrete.
5. Plastic Bar Supports: CRSI Bar Support Specifications.

D. Epoxy: Unless otherwise specified or shown, the epoxy for grouting reinforcement into existing concrete to conform to the materials as specified in the Concrete Specification Section within these Contract Documents or as shown on PLANS.

PART 3 - EXECUTION

3.01 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. Place reinforcing steel in positions indicated on PLANS and approved shop drawings.
   1. Dimensions shown on PLANS are to centers of bars, unless otherwise noted.
   2. Hold bars securely in place with tie wires and other approved means during placement of concrete.
      a. In plane of steel parallel to nearest surface of concrete, bars not to vary from placement shown on PLANS, by more than one-twelfth of spacing between bars.
      b. In plane of steel perpendicular to nearest surface of concrete, bars not to vary from placement shown on PLANS, by more than 3-inch.
   3. Looped wire bar ties ("pig tails") will be permitted for concrete pavement only. Do not use looped wire bar ties ("pig tails") for structural concrete.
   4. Do not tack weld reinforcing steel in position.
   5. Space steel required distance from forms or earth by chairs or spacers as approved by the ENGINEER
   6. Use precast concrete blocks or steel chairs with sand plates to support reinforcing steel supported over soil.
   7. Use stainless steel bar supports or steel chairs with stainless steel tips where the chairs are set on forms for concrete surfaces that will be exposed to weather, high humidity, or liquid. This includes soffits of concrete structural members over liquid containing areas. Plastic bar supports may be used in walls to provide required concrete cover on reinforcing bars.
   8. Use plastic tipped metal chairs for all other applications unless otherwise noted or shown.
   9. For pavement use plastic chairs to support all reinforcing steel. Space plastic or metal chairs 24-inch, center-to-center each way to support reinforcing in concrete pavement. Metal chairs to be secured with wire to the reinforcing steel.
   10. Use heavy bolster to support bottom layer of reinforcing in abutment caps, bent caps, and other beams.
   11. In bridge deck slab, use two rows of supports for bottom layer of reinforcing parallel to beams for each bay between beams. Use high chairs to support top layer.
   12. Clean all mortar, mud, dirt, etc. from reinforcement before placing concrete.
   13. Protect exposed steel from corrosion or other damage.

14. Correct placement of steel to be verified by CONTRACTOR before concrete is placed.
15. Provide adequate support for reinforcement extending out of formwork to ensure proper alignment.
16. Tie reinforcing steel for all structural slabs at all intersections, except where spacing is less than one foot in each direction, alternate intersections only need to be tied. Tie reinforcing steel in concrete pavement at a minimum of alternate intersections.
17. For reinforcing steel cages for other structural members, tie steel at enough intersections to provide a rigid cage of steel.

B. Grout reinforcing steel into existing concrete when shown on PLANS.
1. Holes to receive reinforcement may be wet or dry drilled using rotating machines only.
2. Drill holes within 3 inch of the location shown on PLANS.
3. Flush wet drilled holes with clean water to remove residue and blowout using oil free compressed air.
4. Blowout dry drilled holes with oil-free compressed air.
5. Clean oil-contaminated hole using appropriate solvents and bottle brush. Solvents to be flushed and hole blown out with oil-free compressed air.
6. Backfill over-drilled holes with epoxy grout.
7. Reinforcement grouted in place to be free of contaminants. Use the appropriate solvents and wire brushing to remove contaminants.
8. Provide adequate support for reinforcement to ensure alignment and maintain reinforcement in the center of the drilled hole.

END OF SECTION

DRAWINGS