

**REQUEST FOR PROPOSALS
FOR
MULTIPLE ON-CALL SERVICE CONTRACTS:
WATER UTILITY IMPROVEMENTS – CONTRACT NO. 1
SANITARY SEWER UTILITY IMPROVEMENTS – CONTRACT NO. 2
PAVEMENT AND DRAINAGE UTILITY IMPROVEMENTS – CONTRACT NO. 3**

**IDS Project No. 2227-003-00
Issued by the City of Waller, Texas**

Sealed proposals will be accepted until **Thursday, June 5, 2025 at 10:00 a.m.** and then publicly opened and read aloud thereafter.

Legal Name of Responding Firm

Contact Person Title

Telephone Number and E-Mail Address

Street Address of Principal Place of Business City/State Zip

Complete Mailing Address City/State Zip

Acknowledgment of Addenda: #1____ #2____ #3____ #4____ #5____

By signing below, you hereby certify that the information contained in this proposal and any attachments is true and correct and may be viewed as an accurate representation of proposed services to be provided by this organization. You agree that failure to submit all requested information may result in rejection of your company's proposal as non-responsive. You certify that no employee, board member, or agent of the City of Waller has assisted in the preparation of this proposal. You acknowledge that you have read and understand the requirements and provisions of this solicitation and that the organization will comply with the regulations and other applicable local, state, and federal regulations and directives in the implementation of this contract. And furthermore, that I certify that I am legally authorized to sign this offer and to submit it to the City of Waller, on behalf of said offeror by authority of its governing body.

Authorized Signature

NOTICE TO BIDDERS

The CITY OF WALLER will receive sealed proposals for construction of the following:

"ON-CALL SERVICES FOR WATER UTILITY IMPROVEMENTS– CONTRACT NO. 1",

"ON-CALL SERVICES FOR SANITARY SEWER UTILITY IMPROVEMENTS– CONTRACT NO. 2",

"ON-CALL SERVICES FOR PAVEMENT AND DRAINAGE UTILITY IMPROVEMENTS – CONTRACT NO. 3"

Project No. 2227-003-00; CITY OF WALLER, HARRIS AND WALLER COUNTIES, Texas" at the City of Waller (1218 Farr Street, Waller, Texas 77484). The project includes providing repair services to various public water, wastewater, pavement, and drainage utility systems located throughout City of Waller. The services will be requested on an as-needed basis. A Pre-bid conference will be held in person on **Thursday, May 29, 2025 at 10:00 a.m.** Local Time. The Pre-bid conference will be held at the City of Waller. Bids will be publicly opened and read on **Thursday, June 5, 2025 at 10:00 a.m.** Local Time at the City of Waller.

Proposals must be accompanied by a certified or cashier's check or a bid bond from a surety company holding a permit in the State of Texas for an amount equal to 5% of the amount bid. The amount of said certified or cashier's check or bond will be forfeited to the OWNER and the bank or surety shall be liable to the OWNER for the amount in the event the successful bidder shall fail or refuse to enter into a contract or furnish bonds as hereafter required within ten (10) days after the date of notice of award.

Copies of the bidding documents may be reviewed and obtained from www.CivcastUSA.com: search "On-call Services for Water, Sanitary Sewer, and Drainage Services". Bidders must register on this website in order to view and/or download specifications, plans, and other related documents for this project. There is NO charge to view or download documents.

The OWNER reserves the right to reject any or all bids and to waive informalities or irregularities in bidding. In case of lack of clarity in stating prices, the OWNER reserves the right to consider the most advantageous construction thereof, or reject the bid.

CITY OF WALLER

INSTRUCTIONS TO BIDDERS

Bidders are requested to submit their bids in accordance with the following conditions and in duplicate.

PRE-BID CONFERENCE:

A pre-bid conference among CITY, Engineer, prospective bidders, and others will be held to discuss the scope of the Work and to answer questions concerning the Work. No addendum will be issued at this conference, but an addendum will be issued afterwards, if necessary, to answer questions. **The pre-bid conference will be held at Waller City Hall, 1218 Farr St. Waller, Texas 77484 on Thursday, May 29, 2025 at 10:00 a.m.**

PROPOSAL:

DELIVERY OF BIDS - Please submit one (1) hard copy and one (1) electronic copy (on a USB flash drive) of your response to:

By personal delivery, courier, UPS, FedEx:

City of Waller
Waller City Hall
1218 Farr St.
Waller, Texas 77484

By mail:

City of Waller
Waller City Hall
1218 Farr St.
Waller, Texas 77484

IMPORTANT: Mark SEALED PROPOSAL with the RFP Name and Contract Number, Company, and Due Date on the outside of the shipping package. Failure to do so may result in a misdirected package, which may become late if not delivered to the Sealed Bid Box by the closing time.

Faxed, emailed or late proposals will be ineligible and not accepted for consideration.

It is the responsibility of the respondent(s) to ensure that the proposals are received at the CITY address as described above by the designated due date and time. CITY assumes no responsibility for delays caused by postage, mail courier, email, package misdirection or any other form of delivery. Late proposals will not be opened nor considered in the evaluation of the proposal. Proposals may be withdrawn at any time prior to the submittal deadline, but they may not be withdrawn after the official opening. Proposals received will be publicly opened after the response submission deadline at CITY offices.

People wishing to attend the opening should notify the receptionist upon arrival. A staff member will escort attendees to the opening location. Only the names of the respondent(s) submitting a proposal will be read aloud. No other information will be disclosed at that time.

Proposal information is restricted and not publicly available until after the award of a contract. All documents associated with the proposal submitted, unless the respondent indicates a portion of the

proposal is proprietary, may be subject to public inspection in accordance with the Public Information Act. All information obtained in the course of this solicitation will become property of the CITY.

CERTIFICATE OF INTERESTED PARTIES - The Texas Legislature has adopted House Bill 1295. In summary, the law states that a governmental entity or state agency may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties (Form 1295) to our agency prior to the award of certain contracts. The disclosure of interested parties must be completed electronically and submitted through the Texas Ethics Commission website. If the requirement applies to the contract resulting from this RFP, CITY will notify the vendor that the disclosure is required and will provide a specific contract number for inclusion in the submittal. For more information about the process, please visit the following website: <https://www.ethics.state.tx.us/whatsnew/FAQForm1295.html>.

WITHDRAWAL OF BIDS - A bidder may withdraw his proposal providing the request, in writing, is in the hands of the City Clerk by the time set for opening proposals. When such proposal is reached, it will be returned unopened to the bidder.

PROPOSED SERVICES - Respondents will prepare a proposal by offering unit cost pricing on the BID SHEET for the work described in Section II Specifications. The proposal to be submitted will be considered for award only for the sections completed on the BID SHEET. The respondent will not be considered for any section that is not completed.

BASIS ON WHICH BIDS ARE REQUESTED - Bids are requested on the basis of unit and/or lump sum pricing, as clearly set forth in the proposal and in the specifications.

BID GUARANTEE - No proposal shall be considered unless accompanied by a bid bond, certified check, or cashier's check of the character and amount stated in the NOTICE TO BIDDERS. All forms of guarantee shall be made payable to "City of Waller." The bid guarantee of unsuccessful bidders will be returned following action by the CITY on the award of the contract and to the successful bidder within 48 hours following execution of contract and bonds, as required. In case the successful bidder fails to file such contract and bonds, the amount of his bid guarantee shall be forfeited to the City of Waller as liquidated damages.

BIDDERS' RESPONSIBILITY – Bidders are required to inform themselves of the conditions under which the work is to be performed and all other factor that might affect the manner or method of work. The CITY does not make any representations as to the conditions under which the work is to be performed. Any information provided by the CITY, including, but not limited to geotechnical information, shall be for the Bidders' convenience only and the CITY does not guarantee the accuracy or correctness of any information so provided. The Bidder, if awarded the contract, shall not be allowed any extra compensation by reason of any conditions under which the work is to be performed or any other factor that might affect the manner or method of work.

INTERPRETATION OF CONTRACT DOCUMENTS - If the prospective bidder is in doubt as to the true meaning of any part of the specifications or other proposed contract documents, he may submit to the City Engineer a written request for an interpretation thereof. Any interpretation of the proposed documents will be made only by an addendum duly issued. The Bidders are to acknowledge receipt of addenda on the proposal form.

REQUIREMENTS FOR SIGNING BIDS - Bidder must sign his bid in the space provided on the bid form; unsigned bids will not be accepted. If the bid is submitted by a partnership or corporation, the name and address of the partnership or corporation must be shown, together with the name and address of the partners or corporate officers. Bids submitted by a partnership must be signed by one of the partners. Bids submitted by a corporation must be signed by one of the corporate officials having under the corporate structure, the power to act in this capacity and the corporate seal must be affixed onto the bid. Bids submitted by a sole proprietorship must be signed by the Proprietor.

PRE-QUALIFICATION - Manufacturers of materials, articles, or processes not named in the Technical Specifications must pre-qualify their equipment, material, article, or process by submitting to the City Engineer, at least ten (10) calendar days prior to bid date, detailed information on their equipment, material, article, or process. Information required to be submitted on each item to be pre-qualified must include a list of previous installations (including names and phone numbers of personnel who are familiar with specific equipment, material, article or process), the number of years the Bidder has been using the proposed equipment, material or process, the total quantity in footage or number of projects in which this equipment, material, or process has been used in the U.S., catalog data, material list, published performance data, and typical installation drawing and specification. Any deviation from Plans and Specifications must be noted and attached to information submitted for approval. If applicable, five (5) calendar days prior to bid opening City Engineer will advise, by addendum, all plan holders having plan deposits on file on manufacturers whose equipment, material, article, or process has been pre-qualified for this project. No notice will be given to a manufacturer, supplier, or fabricator of failure to pre-qualify.

CITY'S RIGHT TO REQUIRE ADDITIONAL INFORMATION - The CITY reserves the right, after the proposals have been opened and before the contract has been awarded, to require a responding firm to provide the following information:

- The experience record of the bidder showing completed jobs of a nature similar to the one covered by the proposed Contract and all work in progress with bond amounts and percentage completed;
- A sworn statement of the current financial condition of the bidder;
- An equipment schedule.

CONTRACT:

AWARD OF CONTRACT - Before award of any contract can be approved, the City of Waller shall be satisfied that the bidder involved: (1) maintains a permanent place of business; (2) has adequate plant and equipment to do the work properly and expeditiously; (3) has a suitable financial status to meet obligations incident to the work; (4) has appropriate technical experience, (5) can submit a satisfactory performance record, and (6) consistently maintains experienced on-site supervisory staff during construction. The award, if made, will be made to the lowest responsible bidder as recommended by the City Engineer and the City Manager, subject to the decision of the City Council.

WHEN AWARD EFFECTUAL - The contract shall be deemed as having been awarded when formal notice of award shall have been duly served upon the awardee (i.e., the bidder to whom the City intends awarding the contract) by an officer or agent of the City authorized to give such notice.

EXECUTION OF CONTRACT DOCUMENTS - The contractor shall complete execution of contract documents within 15 days after the award of contract by the City Council. Five executed counterparts

of the contract documents and performance and payment bonds will be required.

COMMENCEMENT OF WORK - After contract documents have been executed by all concerned parties, the CITY shall issue a Task Order Agreement to the contractor stating the effective date to begin work.

TEXAS STATE SALES TAX - The City of Waller is tax exempt. No sales tax will be charged on any products or services. Materials incorporated into this project are exempt from State Sales Tax according to the provisions of the Texas Tax Code, Chapter 151, Subsection H. City will not pay any sales tax included in a Contractor's invoice.

The City of Waller cannot exempt any other person/vendor from applicable sales taxes that may be required of them in relation to this project. The Contractor must obtain a limited sales, excise and use tax permit or exemption certificate which shall enable him to buy the materials to be incorporated into the work without paying the tax at the time of purchase.

CONSIDERATION OF YOUR PROPOSAL - The CITY will consider each section on the BID SHEET for award. A vendor submitting a proposal is not required to bid on all contracts but must bid all items in a contract. However, the CITY reserves the right to combine contracts in any manner, and award to the vendor(s) of its choosing, who are deemed to be offering the most advantageous proposal to the CITY.

INTERVIEWS - CITY reserves the right to request an interview, including a presentation by the firm, to supplement their written submission. These presentations will be scheduled, if required, after Proposals are received and prior to the award of the Contract.

AWARD OF THE CONTRACT - Upon completion of the evaluation process, CITY may award the contracts to one or more respondent(s) whose submission is determined to be the most advantageous to CITY.

RENEWALS - This contract for On-Call Services for Water, Sanitary Sewer, and Drainage Services shall be for an initial term of one year, with the option for an extension of the same for two (2) additional one-year periods under the same terms, conditions and unit prices as expressed herein; provided that the unit prices may be adjusted to reflect the Consumer Price Index (Urban) sixty-four (64) days prior to the effective date of the renewed contract if requested by the Contractor and agreed by the Owner. Such option must be exercised in writing by the Owner and the Contractor.

**BID SHEET
CITY OF WALLER**

ON-CALL SERVICES FOR WATER UTILITY IMPROVEMENTS

**PROJECT NO. 2227-003-00, CONTRACT NO. 1
CITY OF WALLER, TEXAS**

Item No.	Qty.	Unit	Description of Item with Unit Price Written in Words	Unit Price	Total Cost
SECTION A: WATER SERVICES:					
1	1	EA.	Furnish and Install 1" Short Side 250 psi Polyethylene Service for all water main sizes, excavation up to 4' deep, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
2	1	EA.	Furnish and Install 1" Long Side 250 psi Polyethylene Service for all water main sizes, excavation up to 4' deep, bored, no casing, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
3	1	EA.	Furnish and Install 2" Short Side 250 psi Polyethylene Service, all water main sizes, excavation up to 4' deep, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
4	1	EA.	Furnish and Install 2" Long Side 250 psi Polyethylene Service, all water main sizes, excavation up to 4' deep, bored, no casing, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
5	1	V.F.	Furnish Excavation and Install Trench Safety System for Utility Construction for each foot past 4' depth, bank sand backfill, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Vertical Foot		

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
6	25	S.Y.	Remove Asphalt Pavement including saw cutting, backfill with utility per detail to bottom of roadway subgrade, install minimum 10" layer of compacted road base to level of pavement, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Square Yard		
SUBTOTAL SECTION A: WATER SERVICES:					\$ _____
SECTION B: FIRE HYDRANTS:					
7	1	EA.	Remove and Replace Fire Hydrant Assembly with Muller Centurion, Including 6" Gate Valve, 10' of foot lead pipe, and thrust blocking, excavation up to 4' deep, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
8	1	EA.	Furnish and Install 6" x 6" TS&V and New Mueller Centurion Fire Hydrant Assembly for 6" Main, Including Valve Box with Riser, Restrained Joints, 10' Lead Pipe, and thrust blocking, excavation up to 4' deep, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
9	1	EA.	Furnish and Install 8" x 6" TS&V and New Mueller Centurion Fire Hydrant Assembly for 8" Main, Including Valve Box with Riser, Restrained Joints, 10' Lead Pipe, and thrust blocking, excavation up to 4' deep, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		

Item No.	Qty.	Unit	Description of Item with Unit Price Written in Words	Unit Price	Total Cost
10	1	EA.	Furnish and Install 10" x 6" TS&V and New Mueller Centurion Fire Hydrant Assembly for 10" Main, Including Valve Box with Riser, Restrained Joints, 10' Lead Pipe, and thrust blocking, excavation up to 4' deep, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
11	1	EA.	Furnish and Install 12" x 6" TS&V and New Mueller Centurion Fire Hydrant Assembly for 12" Main, Including Valve Box with Riser, Restrained Joints, 10' Lead Pipe, and thrust blocking, excavation up to 4' deep, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
12	1	V.F.	Furnish Excavation and Install Trench Safety System for Utility Construction for each foot past 4' depth, bank sand backfill, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Vertical Foot		
SUBTOTAL	SECTION B: FIRE HYDRANTS:				\$ _____
SECTION C: WATER MAIN REPAIRS:					
13	2	EA.	Water Main Repair Using 2"-4" Repair Clamp, excavation up to 4' deep, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
14	2	EA.	Water Main Repair Using 6"-8" Repair Clamp, excavation up to 4' deep, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
15	2	EA.	Water Main Repair Using 10"-12" Repair Clamp, excavation up to 4' deep, Complete in Place: @ Per Each	\$	\$
16	1	EA.	Remove and Replace 2" - 3" Water Main, 10' Length, with SCH-40 PVC or 250 psi Poly service line, Including all Fittings, excavation up to 4' deep, Complete in Place: @ Per Each	\$	\$
17	1	EA.	Remove and Replace 20' length of 4" Non AWWA C900 Water Main with AWWA C-900 DR 18 PVC, Including all Fittings (2 solid sleeve clamps and 4 restrained joint fittings), excavation up to 4' deep, Complete in Place: @ Per Each	\$	\$
18	1	EA.	Remove and Replace 20' length of 6" Non AWWA C900 Water Main with AWWA C-900 DR 18 PVC, Including all Fittings (2 solid sleeve clamps and 4 restrained joint fittings), excavation up to 4' deep, Complete in Place: @ Per Each	\$	\$
19	1	EA.	Remove and Replace 20' length of 8" Non AWWA C900 Water Main with AWWA C-900 DR 18 PVC, Including all Fittings (2 solid sleeve clamps and 4 restrained joint fittings), excavation up to 4' deep, Complete in Place: @ Per Each	\$	\$
20	1	EA.	Remove and Replace 20' length of 10" Non AWWA C900 Water Main with AWWA C-900 DR 18 PVC, Including all Fittings (2 solid sleeve clamps and 4 restrained joint fittings), excavation up to 4' deep, Complete in Place: @ Per Each	\$	\$

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
21	1	EA.	Remove and Replace 20' length of 12" Non AWWA C900 Water Main with AWWA C-900 DR 18 PVC, Including all Fittings (2 solid sleeve clamps and 4 restrained joint fittings), excavation up to 4' deep, Complete in Place: @ _____	\$ _____	\$ _____
			Per Each		
22	1	V.F.	Furnish Excavation and Install Trench Safety System for Utility Construction for each foot past 4' depth, bank sand backfill, Complete in Place: @ _____	\$ _____	\$ _____
			Per Vertical Foot		
23	1	TON	Furnish and Install Additional Fittings as Required for Waterline Repair, Complete in Place: @ _____	\$ _____	\$ _____
			Per Ton		
24	25	S.Y.	Remove Asphalt Pavement including saw cutting, backfill with utility per detail to bottom of roadway subgrade, install minimum 10" layer of compacted road base to level of pavement, Complete in Place: @ _____	\$ _____	\$ _____
			Per Square Yard		
SUBTOTAL SECTION C: WATER MAIN REPAIRS:					\$ _____
SECTION D: INSERTA VALVES:					
25	2	EA.	Furnish and Install 6" Inserta Valve, Excavation up to 4' deep, Includes Valve Box, Complete in Place: @ _____	\$ _____	\$ _____
			Per Each		
26	2	EA.	Furnish and Install 8" Inserta Valve, Excavation up to 4' deep, Includes Valve Box, Complete in Place: @ _____	\$ _____	\$ _____
			Per Each		

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
27	1	EA.	Furnish and Install 10" Inserta Valve, Excavation up to 4' deep, Includes Valve Box, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
28	1	EA.	Furnish and Install 12" Inserta Valve, Excavation up to 4' deep, Includes Valve Box, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
29	1	L.F.	Furnish Excavation and Install Trench Safety System for Utility Construction for each foot past 4' depth, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Linear Foot		
30	25	S.Y.	Remove Asphalt Pavement including saw cutting, backfill with utility per detail to bottom of roadway subgrade, install minimum 10" layer of compacted road base to level of pavement, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Square Yard		
SUBTOTAL		SECTION D: INSERTA VALVES:			\$ _____

SECTION E: WATER METER AND VAULT INSTALLATION

31	1	EA.	Furnish and Install 3" Water Meter and Vault Per Detail, excavations up to 4' deep, offsite disposal of spoil, bank sand backfill, connect to water service tap, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
32	1	EA.	Furnish and Install 4" Water Meter and Vault Per Detail, excavations up to 4' deep, offsite disposal of spoil, bank sand backfill, connect to water service tap, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
33	1	EA.	Furnish and Install 6" Water Meter and Vault Per Detail, excavations up to 4' deep, offsite disposal of spoil, bank sand backfill, connect to water service tap, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
34	1	EA.	Furnish and Install 8" Water Meter and Vault Per Detail, excavations up to 4' deep, offsite disposal of spoil, bank sand backfill, connect to water service tap, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
35	1	EA.	Furnish and Install 10" Water Meter and Vault Per Detail, excavations up to 4' deep, offsite disposal of spoil, bank sand backfill, connect to water service tap, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
36	1	EA.	Furnish and Install 12" Water Meter and Vault Per Detail, excavations up to 4' deep, offsite disposal of spoil, bank sand backfill, connect to water service tap, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
37	1	EA.	Furnish and Install 6" x 4" Tapping Sleeve and Valve, thrust blocking, excavations up to 4' deep, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
38	1	EA.	Furnish and Install 8" x 4" Tapping Sleeve and Valve, thrust blocking, excavations up to 4' deep, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
39	1	EA.	Furnish and Install 10" x 4" Tapping Sleeve and Valve, thrust blocking, excavations up to 4' deep, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
40	1	EA.	Furnish and Install 12" x 4" Tapping Sleeve and Valve, thrust blocking, excavations up to 4' deep, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
41	1	EA.	Furnish and Install 6" x 6" Tapping Sleeve and Valve, thrust blocking, excavations up to 4' deep, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
42	1	EA.	Furnish and Install 8" x 6" Tapping Sleeve and Valve, thrust blocking, excavations up to 4' deep, Complete in Place: @ _____ Per Each	\$ _____	\$ _____

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
43	1	EA.	Furnish and Install 10" x 6" Tapping Sleeve and Valve, thrust blocking, excavations up to 4' deep, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
44	1	EA.	Furnish and Install 12" x 6" Tapping Sleeve and Valve, thrust blocking, excavations up to 4' deep, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
45	1	EA.	Furnish and Install 8" x 8" Tapping Sleeve and Valve, thrust blocking, excavations up to 4' deep, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
46	1	EA.	Furnish and Install 10" x 8" Tapping Sleeve and Valve, thrust blocking, excavations up to 4' deep, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
47	1	EA.	Furnish and Install 12" x 8" Tapping Sleeve and Valve, thrust blocking, excavations up to 4' deep, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
48	1	EA.	Furnish and Install 12" x 10" Tapping Sleeve and Valve, thrust blocking, excavations up to 4' deep, Complete in Place: @ _____ Per Each	\$ _____	\$ _____

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
49	1	EA.	Furnish and Install 12" x 12" Tapping Sleeve and Valve, thrust blocking, excavations up to 4' deep, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
50	1	EA.	Furnish and Install 4-Inch AWWA C-900 DR 18 PVC Short Side Water Service for all water main sizes, Including Fittings and Restrained Joints, excavations up to 4' deep, bank sand backfill, offsite disposal of spoils, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
51	1	EA.	Furnish and Install 6-Inch AWWA C-900 DR 18 PVC Short Side Water Service, Including Fittings and Restrained Joints, All Depths, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
52	1	EA.	Furnish and Install 8-Inch AWWA C-900 DR 18 PVC Short Side Water Service for all water main sizes, Including Fittings and Restrained Joints, excavations up to 4' deep, bank sand backfill, offsite disposal of spoils, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
53	1	EA.	Furnish and Install 10-Inch AWWA C-900 DR 18 PVC Short Side Water Service for all water main sizes, Including Fittings and Restrained Joints, excavations up to 4' deep, bank sand backfill, offsite disposal of spoils, Complete in Place: @ _____ Per Each	\$ _____	\$ _____

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
54	1	EA.	Furnish and Install 12-Inch AWWA C-900 DR 18 PVC Short Side Water Service for all water main sizes, Including Fittings and Restrained Joints, excavations up to 4'deep, bank sand backfill, offsite disposal of spoils, Complete in Place: @ _____	\$ _____	\$ _____
			Per Each		
55	1	EA.	Furnish and Install 4-Inch AWWA C-900 DR 18 PVC Long Side Water Service for all water main sizes, Including Boring and Jacking or Augering Road, Fittings, and Restrained Joints, excavations up to 4'deep, bank sand backfill, offsite disposal of spoils, Complete in Place: @ _____	\$ _____	\$ _____
			Per Each		
56	1	EA.	Furnish and Install 6-Inch AWWA C-900 DR 18 PVC Long Side Water Service for all water main sizes, Including Boring and Jacking or Augering Road, Fittings, and Restrained Joints, excavations up to 4'deep, bank sand backfill, offsite disposal of spoils, Complete in Place: @ _____	\$ _____	\$ _____
			Per Each		
57	1	EA.	Furnish and Install 8-Inch AWWA C-900 DR 18 PVC Long Side Water Service for all water main sizes, Including Boring and Jacking or Augering Road, Fittings, and Restrained Joints, excavations up to 4'deep, bank sand backfill, offsite disposal of spoils, Complete in Place: @ _____	\$ _____	\$ _____
			Per Each		
58	1	EA.	Furnish and Install 10-Inch AWWA C-900 DR 18 PVC Long Side Water Service for all water main sizes, Including Boring and Jacking or Augering Road, Fittings, and Restrained Joints, excavations up to 4'deep, bank sand backfill, offsite disposal of spoils, Complete in Place: @ _____	\$ _____	\$ _____
			Per Each		

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
59	1	EA.	Furnish and Install 12-Inch AWWA C-900 DR 18 PVC Long Side Water Service for all water main sizes, Including Boring and Jacking or Augering Road, Fittings, and Restrained Joints, excavations up to 4' deep, bank sand backfill, offsite disposal of spoils, Complete in Place: @ _____	\$ _____	\$ _____
			Per Each		
60	1	L.S.	Furnish and Install 12" Welded Steel Casing by Bore and Jack Including 20' Casing Pipe, Casing Spacers, and End Seals, excavations up to 4' deep, Complete in Place: @ _____	\$ _____	\$ _____
			Per Lump Sum		
61	1	L.S.	Furnish and Install 16" Welded Steel Casing by Bore and Jack Furnish and Install 16" Welded Steel Casing by Bore and Jack Including 20' Casing Pipe, Casing Spacers, and End Seals, excavations up to 4' deep, Complete in Place: @ _____	\$ _____	\$ _____
			Per Lump Sum		
62	1	L.S.	Furnish and Install 20" Welded Steel Casing by Bore and Jack Including 20' Casing Pipe, Casing Spacers, and End Seals, excavations up to 4' deep, Complete in Place: @ _____	\$ _____	\$ _____
			Per Lump Sum		
63	1	L.F.	Furnish and Install Extra Length 12" Welded Steel Casing by Bore and Jack Including Casing Pipe and Casing Spacers, excavations up to 4' deep, Complete in Place: @ _____	\$ _____	\$ _____
			Per Linear Foot		
64	1	L.F.	Furnish and Install Extra Length 16" Welded Steel Casing by Bore and Jack Including Casing Pipe and Casing Spacers, excavations up to 4' deep, Complete in Place: @ _____	\$ _____	\$ _____
			Per Linear Foot		

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
65	1	L.F.	Furnish and Install Extra Length 20" Welded Steel Casing by Bore and Jack Including Casing Pipe and Casing Spacers, excavations up to 4' deep, Complete in Place: @ _____ Per Linear Foot	\$ _____	\$ _____
66	1	V.F.	Furnish Excavation and Install Trench Safety System for Utility Construction for each foot past 4' depth, bank sand backfill, Complete in Place: @ _____ Per Vertical Foot	\$ _____	\$ _____
SUBTOTAL SECTION E: WATER METER AND VAULT INSTALLATION					\$ _____
TOTAL AMOUNT FOR MATERIALS:					\$ _____
TOTAL AMOUNT FOR SKILLS, LABOR, EQUIPMENT, ETC.:					\$ _____
TOTAL AMOUNT:					\$ _____

The undersigned (Contractor) represents and warrants that (1) all tangible personal property identified as 'materials' in this Proposal will be incorporated into the Project, subject only to field adjustments as to quantities, (2) the prices of such material are exclusive of sales and use taxes, and (3) all sales and use taxes regarding tangible personal property not incorporated into the work are the sole responsibility of the Contractor and the Contractor has paid or will pay such taxes regarding such property.

Acknowledge Receipt of Addendum Nos. ____, ____, ____ (initial).

ALL BID PRICES SHALL INCLUDE ALL APPLICABLE SALES TAX.

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**BID SHEET
CITY OF WALLER**

ON-CALL SERVICES SANITARY SEWER UTILITY IMPROVEMENTS

**PROJECT NO. 2227-003-00, CONTRACT NO. 2
CITY OF WALLER, TEXAS**

Item No.	Qty.	Unit	Description of Item with Unit Price Written in Words	Unit Price	Total Cost
SECTION A: SANITARY SERVICES:					
1	2	EA.	Furnish and Install 4"-6" Schedule 40 PVC or ATSM D3034 SDR 26 PVC Short Side Sanitary Service for 6" - 12" main, Cleanout with Valve Box at Property Line, Excavation up to 8' deep, Cement Stabilized Sand Backfill, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
2	2	EA.	Furnish and Install 4"-6" Schedule 40 PVC or ATSM D3034 SDR 26 PVC Long Side Sanitary Service for 6" - 12" main, Cleanout with Valve Box at Property Line, Excavation up to 8' deep, Cement Stabilized Sand Backfill, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
3	2	EA.	Furnish and Install 8" Schedule 40 PVC or ATSM D3034 SDR 26 PVC Short Side Sanitary Service for 8" - 12" main, Cleanout with Valve Box at Property Line, Excavation up to 8' deep, Cement Stabilized Sand Backfill, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
4	2	EA.	Furnish and Install 8" Schedule 40 PVC or ATSM D3034 SDR 26 PVC Long Side Sanitary Service for 8" - 12" main, Cleanout with Valve Box at Property Line, Excavation up to 8' deep, Cement Stabilized Sand Backfill, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
5	1	EA.	Core existing concrete manhole for 4" or 8" sanitary service, including resilient connector meeting the requirements of ATSM C-923, Excavations up to 8" deep, Cement Stabilized Sand Backfill, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
6	1	L.S.	Furnish and Install 12" Welded Steel Casing by Bore and Jack Including 20' Casing Pipe, Casing Spacers, and End Seals, Excavations up to 8' deep, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Lump Sum		
7	1	L.F.	Furnish and Install Extra Length 12" Welded Steel Casing by Bore and Jack Including Casing Pipe and Casing Spacers, Excavations up to 8' deep, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Linear Foot		
8	1	L.F.	Furnish Excavation and Install Trench Safety System for Utility Construction for each foot past 8' depth, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Linear Foot		

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
9	2	EA.	Furnish and Install 4" Schedule 40 PVC or ASTM D3034 SDR 26 PVC Short Side Sanitary Service for 6" main, Includes Cleanout with Valve Box at Property Line, All Depths, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
10	2	EA.	Furnish and Install 4" Schedule 40 PVC or ASTM D3034 SDR 26 PVC Short Side Sanitary Service for 8" main, Includes Cleanout with Valve Box at Property Line, All Depths, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
11	2	EA.	Furnish and Install 4" Schedule 40 PVC or ASTM D3034 SDR 26 PVC Short Side Sanitary Service for 10" main, Includes Cleanout with Valve Box at Property Line, All Depths, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
12	2	EA.	Furnish and Install 4" Schedule 40 PVC or ASTM D3034 SDR 26 PVC Short Side Sanitary Service for 12" main, Includes Cleanout with Valve Box at Property Line, All Depths, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
13	2	EA.	Furnish and Install 4" Schedule 40 PVC or ASTM D3034 SDR 26 PVC Long Side Sanitary Service for 6" main, Includes Cleanout with Valve Box at Property Line, All Depths, Complete in Place: @ _____ Per Each	\$ _____	\$ _____

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
14	2	EA.	Furnish and Install 4" Schedule 40 PVC or ASTM D3034 SDR 26 PVC Long Side Sanitary Service for 8" main, Includes Cleanout with Valve Box at Property Line, All Depths, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
15	2	EA.	Furnish and Install 4" Schedule 40 PVC or ASTM D3034 SDR 26 PVC Long Side Sanitary Service for 10" main, Includes Cleanout with Valve Box at Property Line, All Depths, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
16	2	EA.	Furnish and Install 4" Schedule 40 PVC or ASTM D3034 SDR 26 PVC Long Side Sanitary Service for 12" main, Includes Cleanout with Valve Box at Property Line, All Depths, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
17	1	EA.	Core existing concrete manhole for 4" or 6" sanitary service, including resilient connetor meeting the requirements of ASTM C-923, all depths, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
18	1	L.S.	Furnish and Install 12" Welded Steel Casing by Bore and Jack Including 20' Casing Pipe, Casing Spacers, and End Seals, All Depths, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Lump Sum		

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
19	1	L.F.	Furnish and Install Extra Length 12" Welded Steel Casing by Bore and Jack Including Casing Pipe and Casing Spacers, All Depths, Complete in Place: @ _____ Per Linear Foot	\$ _____	\$ _____
20	1	L.F.	Furnish and Install Trench Safety System for Utility Construction, Complete in Place: @ _____ Per Linear Foot	\$ _____	\$ _____
SUBTOTAL SECTION A: SANITARY SERVICES:					\$ _____
SECTION B: SANITARY SEWER MANHOLE REPAIRS:					
21	2	EA.	Remove and Replace 4' Diameter Sanitary Sewer Manhole, 0-8' Depth, Excavations up to 8' deep, Cement Stabilized Sand Backfill, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
22	2	EA.	Furnish and Install 4' Diameter Sanitary Sewer Manhole, 0-8' Depth, Excavations up to 8' deep, Cement Stabilized Sand Backfill, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
23	1	V.F.	Furnish Excavation and Install Trench Safety System for Utility Construction for each foot past 8' depth, cement stabilized sand backfill, Complete in Place: @ _____ Per Vertical Foot	\$ _____	\$ _____

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
24	1	V.F.	Furnish and Install Additional Depth for Sanitary Sewer or Forcemain Discharge Manhole, Cement Stabilized Sand Backfill Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Vertical Foot		
25	1	EA.	Remove and Replace 4' Diameter Forcemain Discharge Manhole, Excavations up to 8' deep, Cement Stabilized Sand Backfill, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Each		
SUBTOTAL SECTION B: SANITARY SEWER MANHOLE REPAIRS:					\$ _____
TOTAL AMOUNT FOR MATERIALS:					\$ _____
TOTAL AMOUNT FOR SKILLS, LABOR, EQUIPMENT, ETC.:					\$ _____
TOTAL AMOUNT:					\$ _____

The undersigned (Contractor) represents and warrants that (1) all tangible personal property identified as 'materials' in this Proposal will be incorporated into the Project, subject only to field adjustments as to quantities, (2) the prices of such material are exclusive of sales and use taxes, and (3) all sales and use taxes regarding tangible personal property not incorporated into the work are the sole responsibility of the Contractor and the Contractor has paid or will pay such taxes regarding such property.

Acknowledge Receipt of Addendum Nos. ____, ____, ____ (initial).

ALL BID PRICES SHALL INCLUDE ALL APPLICABLE SALES TAX.

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BID SHEET
CITY OF WALLER
ON-CALL PAVEMENT AND DRAINAGE UTILITY IMPROVEMENTS
PROJECT NO. 2227-003-00, CONTRACT NO. 3
CITY OF WALLER, TEXAS

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
SECTION A: PAVEMENT REMOVE & REPLACE:					
1	25	S.Y.	Remove and Replace Asphalt Pavement including saw cutting, 2" surface course, and 8" Black Base, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Square Yard		
2	25	S.Y.	Remove and Replace Reinforced Concrete Pavement including saw cutting, utilizing High Early Strength Concrete, 7-inch Thick, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Square Yard		
3	25	S.Y.	Remove and Replace Reinforced Concrete Pavement including saw cutting, 7-inch Thick, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Square Yard		
4	25	S.Y.	Remove and Replace Concrete Driveway including saw cutting, 6-inch Thick, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Square Yard		
5	25	S.Y.	Remove and Replace Asphalt Driveway including saw cutting, 2" Surface Course, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Square Yard		

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
6	10	L.F.	Remove and Replace 6" Concrete Curb including saw cutting, Complete in Place: @ _____ Per Linear Foot	\$ _____	\$ _____
7	1	EA.	Remove and Replace Reinforced Concrete Sidewalk Panel (16 Square Feet) including saw cutting, 4.5" Thick, Complete in Place: @ _____ Per Each	\$ _____	\$ _____
8	25	S.Y.	Remove Asphalt Pavement including saw cutting, backfill with utility spoil to bottom of roadway subgrade, install minimum 10" layer of compacted road base to level of pavement, Complete in Place: @ _____ Per Square Yard	\$ _____	\$ _____
9	1	L.F.	Furnish and Install Trench Safety System for Utility Construction, Complete in Place: @ _____ Per Linear Foot	\$ _____	\$ _____
SUBTOTAL SECTION A: PAVEMENT REMOVE & REPLACE:					\$ _____
SECTION B: DRIVEWAY CULVERT INSTALLATION:					
10	1	L.F.	Furnish and Install 18" Diameter High Performance Polypropylene Driveway Culvert Pipe per Detail including excavation up to 4' deep, stabilized sand backfill, Complete in Place: @ _____ Per Linear Foot	\$ _____	\$ _____
11	1	L.F.	Furnish and Install 18" Diameter RCP C-76 Class III Driveway Culvert Pipe per Detail including excavation up to 4' deep, stabilized sand backfill, Complete in Place: @ _____ Per Linear Foot	\$ _____	\$ _____

<u>Item No.</u>	<u>Qty.</u>	<u>Unit</u>	<u>Description of Item with Unit Price Written in Words</u>	<u>Unit Price</u>	<u>Total Cost</u>
12	1	L.F.	Furnish and Install 24" Diameter RCP C-76 Class III Driveway Culvert Pipe per Detail including excavation up to 4' deep, stabilized sand backfill, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Linear Foot		
13	1	V.F.	Furnish Excavation and Install Trench Safety System for Utility Construction for each foot past 4' depth, Complete in Place:		
			@ _____	\$ _____	\$ _____
			Per Vertical Foot		
SUBTOTAL SECTION B: DRIVEWAY CULVERT INSTALLATION:					\$ _____
TOTAL AMOUNT FOR MATERIALS:					\$ _____
TOTAL AMOUNT FOR SKILLS, LABOR, EQUIPMENT, ETC.:					\$ _____
TOTAL AMOUNT:					\$ _____

The undersigned (Contractor) represents and warrants that (1) all tangible personal property identified as 'materials' in this Proposal will be incorporated into the Project, subject only to field adjustments as to quantities, (2) the prices of such material are exclusive of sales and use taxes, and (3) all sales and use taxes regarding tangible personal property not incorporated into the work are the sole responsibility of the Contractor and the Contractor has paid or will pay such taxes regarding such property.

Acknowledge Receipt of Addendum Nos. ____, ____, ____ (initial).

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SECTION I: ABOUT THIS SOLICITATION

1. OVERVIEW

1.0 PURPOSE AND INTENT

The purpose of this RFP is to solicit proposals for providing repair services to various public water, wastewater and drainage utility systems located throughout the City of Waller. The services will be requested on an as-needed basis.

2. INTERLOCAL COOPERATION

2.0 INTERLOCAL AGREEMENTS

Other governmental entities may be extended the opportunity to purchase from contracts awarded by the CITY, with the consent and agreement of the successful Vendor(s) and the CITY. Such consent and agreement shall be conclusively inferred from lack of exception to this clause in the proposal submitted. However, all parties indicate their understanding and all parties hereby expressly agree that the CITY is not an agent of, partner to or representative of those outside agencies or entities and that the CITY is not obligated or liable for any action or debts that arise out of such independently negotiated interlocal or “piggyback” procurements.

3. GENERAL INFORMATION

3.0 ADDENDA

Addendums to this solicitation, if any or issued, will be emailed only to plan holders of record. Addendums will also be posted on www.Civcast.com. However, it is the vendor’s responsibility to check for any addenda that may be issued for this solicitation. Please acknowledge receipt of addenda by checking the appropriate spaces on the cover sheet of this RFP.

3.1 QUESTIONS

Questions arising subsequent to the issuance of this solicitation should be submitted through www.Civcast.com prior to TBD. Questions received after this time may not be answered in a timely manner. Do not submit your questions in any other manner. Oral answers to questions of material nature are not binding.

3.2 SOLICITATION SCHEDULE

The schedule for the RFP process and the work is given below. All times indicated are Central Standard Time (CST). CITY may change this schedule at any time through the addenda process.

The anticipated schedule is as follows:

Inquiry Period Ends	June 2, 2025
Proposal Due Date	June 5, 2025
Anticipated Award Date	June 2025

4. EVALUATION AND AWARD

4.0 TIME FOR EVALUATION

Unless stated otherwise elsewhere in this Request for Proposals, all proposals of qualification submitted shall remain valid for a minimum of 60 calendar days after the due date to allow adequate time for evaluation and award.

4.1 EVALUATION PROCESS

All submissions in response to this solicitation will be evaluated in a manner consistent with the CITY and all applicable rules and policies.

A proposal review committee will be assembled to perform the evaluations. In the initial phase of the evaluation process, the evaluation committee will review all proposals that have been received before the solicitation due date. Nonresponsive submissions (those not conforming to the solicitation requirements) will be eliminated. Each respondent bears sole responsibility for the items included or not included in the response submitted by that respondent. CITY reserves the right to disqualify any submission that includes significant deviations or exceptions to the terms, conditions, and/or specifications in this solicitation.

Once proposals have been submitted, the CITY evaluates the proposals and determines which of those are determined to be reasonably qualified for award. Those so determined will be reviewed and scored. Best and final offers ("BAFO") for those reasonably qualified may be obtained by allowing the submission of a BAFO before the final decision is made to award a contract.

CITY reserves the right to be the sole judge as to the overall acceptability of any submission or to judge the individual merits of specific provisions within competing offers.

Proposals will be reviewed by an evaluation committee composed of City staff. Proposals will be scored by the committee in each of the following categories using the maximum point values listed below:

Experience (years in business)	25
Qualifications	15
References	15
Cost	45
Total	100

5. HOW TO SUBMIT YOUR PROPOSAL

5.0 INSTRUCTIONS FOR RESPONDENTS

Important Note: Your proposal must consist of your responses to Tabs A-E with the completed BID SHEET or it may be disqualified as non-responsive.

Tab A COVER SHEET. The cover to your proposal will consist of:

- Page 1 - The completed page 1 from this RFP document.

- Page 2 - A brief statement explaining your ability to do the work.

Tab B QUALIFICATIONS. A summary of your firm's qualifications to provide those services that you select to offer from the PRICING FORM.

This section must explain your qualifications and relevant technical experience in providing all materials, equipment, and labor necessary for repair services for water, sanitary sewer, pavement and drainage utility improvements that you are proposing to provide. This may include one or more of the following types of infrastructure:

- a. Manhole Rehabilitation / Construction
- b. Sanitary Sewer Lines of Various Dimensions and Depths
- c. Water Lines of Various Dimensions and Depths
- d. Clean Outs
- e. Water Meter Boxes
- f. Water and Sanitary Sewer Service Taps
- g. Poly Water Service Lines

The successful bidder will be expected to provide (this may be through a subcontractor) one or more of the following services as relevant to the services you are offering in your bid:

- h. Concrete Replacement (sidewalk, street paving)
- i. Asphalt and Concrete Pavement Replacement
- j. Driveway Culvert Installation
- k. Bypass Pumping
- l. Traffic Control

Tab C REFERENCES. Include at least three recent references for customers (preferably public agencies) for whom you have provided these services. Please include the customer's name, address, contact person, phone number, and email address for each reference. The CITY reserves the right to contact or visit any of the respondent's current and/or past customers to evaluate the level of performance and customer satisfaction.

Tab D PRICING. Complete the BID SHEET that offers unit cost pricing for the work described in Section II Specifications. The proposal to be submitted will be considered for award only for the sections completed on the BID SHEET. The respondent will not be considered for any section that is not completed.

Tab E BID SECURITY. Each Bid package must be accompanied by a Bid bond or a certified or cashier's check, acceptable to the Owner, in an amount not less than 5 percent (5%) of the total amount Bid, as a guarantee that the successful bidder will enter into the Contract Documents and execute the Bonds on the forms provided and provide the required insurance certificates and Bonds within seven (7) days after the date Contract Documents are received by the successful bidder.

6. GENERAL TERMS AND CONDITIONS

6.0 SALES TAX

The CITY is exempt from Texas limited sales, federal excise and use tax, and does not pay tax on purchase, rental, or lease of tangible personal property. A tax exemption certificate will be issued upon request.

6.1 LABOR CLASSIFICATION AND MINIMUM WAGE SCALE

(A) General: **Chapter 2258 of the Texas Government Code** provides that any political subdivision of the State of Texas shall determine the general prevailing wage rate received by the classes of workers employed on projects similar to this Project and shall specify in the call for bids and in the Contract Documents the minimum wage rates which must be paid for each type of worker. This statute further provides that the Contractor or subcontractors must pay, as penalty to Owner, Sixty Dollars (\$60.00) for each worker employed for each calendar day or part of the day that the worker is paid less than the wage rates stipulated in the Contract. Owner is authorized to withhold from the Contractor the amount of this penalty from any payment due under the Contract Documents. The statute likewise requires that the Contractor and subcontractors keep an accurate record of the names and occupations of all persons employed by them on the construction of the Project and to show the actual per diem wages paid to each worker. These records are open to the inspection of Owner.

(B) The minimum wage rates that apply to this Contract are specified in **Attachment A of Section I**. Contractor and subcontractors must review and ascertain such wage rates and pay at least such minimum rates.

6.2 CONDITIONS

CITY reserves the right to accept or reject any and/or all submissions or to cancel this notice at any time.

6.2.1 A response to this solicitation does not commit CITY to a purchase contract, or to pay any costs incurred in the preparation of such a response.

6.2.2 Unless the respondent specifies in the proposals, CITY may award the contract for any items/services or group of items/services in the solicitation and may increase or decrease the quantity specified.

6.2.3 CITY reserves the right to hold and accept any proposals received by the submission deadline for a period of ninety (60) days after the deadline if a determination has not been made for an award.

6.2.4 CITY reserves the right to negotiate the final terms of any and all purchase contracts with respondent(s) selected and such contracts negotiated as a result of this solicitation may be re-negotiated and/or amended in order to successfully meet the agency needs.

6.2.5 CITY reserves the right to waive any defect in this procurement process or to make changes to this solicitation, as it deems necessary. CITY will provide notifications of such changes, via an Addendum, to all respondents recorded in its official record as having received or requested solicitation.

6.2.6 CITY reserves the right to contact any individual, agencies, or employers listed in a submission, to contact others who may have experience and/or knowledge of the respondent's relevant performance and/or qualifications; and to request additional information from any and all respondents.

6.2.7 CITY reserves the right to conduct a review of records, systems, procedures, etc., of any respondent. This may occur prior to, or subsequent to, the award of a purchase contract. Misrepresentation of the respondent's ability to perform as stated in the qualification submittals may result in cancellation of the contract award.

6.2.8 CITY reserves the right to withdraw or reduce the amount of the award, or to cancel any contract resulting from this procurement if adequate funding is not available.

6.2.9 Respondent shall not, under penalty of law, offer or provide any gratuities, favors, or anything of monetary value to any officer, member, employee, or agent of CITY for the purpose of, or having the effect of, influencing favorable disposition toward their own submission or any other submitted hereunder.

6.2.10 No employee, officer, or agent of CITY shall participate in the selection, award, or administration of a contract if a conflict of interest, real or apparent, exists.

6.2.11 Respondent shall not engage in any activity that will restrict or eliminate competition. Violation of this provision may cause the respondent's bid to be rejected. This does not preclude joint ventures or subcontracts.

6.2.12 All proposals submitted must be an original work product of the respondent. The copying, paraphrasing, or other use of substantial portions of the work product of others and submitted hereunder, as original work of the respondent is not permitted. Failure to adhere to this instruction may cause the proposal submission(s) to be rejected.

6.2.13 The only purpose of this solicitation is to ensure uniform information in the selection of proposals and procurement of services. This solicitation is not to be construed as a purchase contract, or as a commitment of any kind, nor does it commit CITY to pay for costs incurred prior to the execution of a formal contract unless such costs are specifically authorized in writing by CITY.

6.2.14 The contents of a successful proposal submission may become a contractual obligation, if selected for award of a contract. The failure of the respondent to accept this obligation may result in cancellation of the award. No plea of error or mistake shall be available to the successful respondent as a basis for release of proposed services at stated price/cost. Any damages accruing to CITY as a result of the respondent's failure to contract may be recovered from the respondent.

6.2.15 A contract with the selected respondent may be withheld at the sole discretion of CITY if issues of contract compliance or questioned/disallowed costs exist, until such issues are satisfactorily resolved. Award of contract may be withdrawn by CITY if resolution is not satisfactory to CITY.

6.3 INSURANCE REQUIREMENTS

For the entire term of the Agreement ("Term"), CONTRACTOR shall maintain Comprehensive General Liability insurance coverage of \$1,000,000 per occurrence, \$2,000,000 in the aggregate or medical malpractice insurance (whichever applies). CONTRACTOR shall also maintain the following insurance: (a)

Worker's Compensation coverage with statutory limits for the State of Texas, including Employers Liability coverage of \$500,000 per accident (contractors that opt out of workers compensation for their employees will not be considered for contract); Commercial Automobile Liability coverage of \$1,000,000 Combined Single Limit; (iii) for engineers and architects only: Professional Liability coverage of \$1,000,000 per occurrence; and (iv) for builders only: Builder's Risk coverage in the amount of the construction cost, including protection against named windstorm and flood. All policies must contain a waiver of subrogation against the CITY. Comprehensive General Liability and Commercial Automobile Liability policies must be named CITY as Additional Insured. CONTRACTOR shall pay all insurance deductibles and deductibles must not exceed \$10,000 unless approved in advance by CITY. CONTRACTOR shall provide City Certificates of Insurance evidencing these insurance requirements prior to the start of work. The CONTRACTOR shall notify the CITY in the event of any change in the required coverage or cancellation and shall give such notices not less than 30 days prior to the change or cancellation. The CONTRACTOR shall provide a replacement Certificate of Insurance prior to such change or cancellation. The CONTRACTOR agrees to waive all the CONTRACTOR'S, its officers, employees, agents, assigns, and successors' rights of subrogation, except under the Professional Liability, against the CITY, its officers, employees, and elected representatives for injuries, including death, property damage, or other loss covered by insurance and the CONTRACTOR will provide a waiver of subrogation endorsement against the CITY. The CITY must be named or listed on the endorsement.

COVERAGES SHALL BE WITH A COMPANY (WITH AT LEAST AN A-BEST RATING) ACCEPTABLE TO THE CITY PURCHASING AND RISK MANAGEMENT DIVISION AND A COPY OF THE CERTIFICATE OF COVERAGE SHALL BE DELIVERED TO THE CITY ON OR BEFORE THE DATE OF THIS AGREEMENT. At all times during the term of a contract resulting from this procurement, the contractor shall procure, pay for, and maintain, with approved insurance carriers, the minimum insurance coverage and limits required to do business in the state of Texas.

6.4 INDEMNIFICATION

Contractor shall defend, indemnify, and hold harmless CITY, CITY'S affiliates, and any of their respective directors, officers, employees, agents, subcontractors, successors, and assigns from any and all suits, actions, claims, demands, judgments, liabilities, losses, damages, costs, and expenses (including reasonable attorneys' fees and court costs) (collectively, "Losses") arising out of or relating to: (i) Services performed and carried out pursuant to the contract; (ii) breach of any obligation, warranty, or representation in the contract, (iii) the negligence or willful misconduct of contractor and/or its employees or subcontractors; or (iv) any infringement, misappropriation, or violation by contractor and/or its employees or subcontractors of any right of a third party; provided, however, that contractor shall have no obligation to defend, indemnify, or hold harmless to the extent any losses are the result of CITY 's gross negligence or willful misconduct.

6.5 FORCE MAJEURE

It is expressly understood and agreed by both parties that, if the performance of any provision of a contract resulting from this procurement is delayed by force majeure, defined as reason of war, civil commotion, act of God, governmental restriction, regulation or interference, fire, explosion, hurricane, flood, failure of transportation, court injunction, or any circumstances which are reasonably beyond the control of the party obligated or permitted under the terms of the contract to do or perform the same, regardless of whether any such circumstance is similar to any of those enumerated herein, the party so

obligated or permitted shall be excused from doing or performing the same during such period of delay, so that the period of time applicable to such requirement shall be extended for a period of time equal to the period of time such party was delayed. Each party must inform the other in writing within a reasonable time of the existence of such force majeure.

6.6 FORM 1295

The Texas Legislature has adopted House Bill 1295. In summary, the law states that a governmental entity or state agency may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties (Form 1295) to our agency prior to the award of certain contracts. The disclosure of interested parties must be completed electronically and submitted through the Texas Ethics Commission website. If the requirement applies to the contract resulting from this RFP, CITY will notify the vendor that the disclosure is required and will provide a specific contract number for inclusion in the submittal. For more information about the process, please visit the following website: https://www.ethics.state.tx.us/whatsnew/FAQ_Form1295.html.

6.7 EQUAL EMPLOYMENT OPPORTUNITY

Contractor shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, sexual orientation, gender identity, or national origin. Contractor shall take affirmative actions to ensure that applicants are employed, and that employees are treated, during their employment, without regard to their race, religion, color, sex, sexual orientation, gender identity, or national origin. Such actions shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

6.8 DAVIS-BACON ACT

Where the project is subject to the Davis Bacon Act, the Contractor agrees to comply with all applicable provisions of 40 USC § 3141- 3148.

6.9 DRUG-FREE WORKPLACE

Contractor shall provide a drug free workplace in compliance with the Drug Free Workplace Act of 1988.

6.10 TEXAS CORPORATE FRANCHISE TAX CERTIFICATION

Pursuant to Article 2.45, Texas Business Corporation Act, state agencies may not contract with for profit corporations that are delinquent in making state franchise tax payments.

6.11 TEXAS STATE SALES TAX

The City of Waller is tax exempt. No sales tax will be charged on any products or services. Materials incorporated into this project are exempt from State Sales Tax according to the provisions of the Texas Tax Code, Chapter 151, Subsection H. City will not pay any sales tax included in a Contractor's invoice.

The City of Waller cannot exempt any other person/vendor from applicable sales taxes that may be required of them in relation to this project. The Contractor must obtain a limited sales, excise and use tax permit or exemption certificate which shall enable him to buy the materials to be incorporated into the work without paying the tax at the time of purchase.

6.12 GOVERNING LAW

Any contract resulting from this solicitation shall be governed in all respects by the laws of the State of Texas and any litigation with respect thereto shall be brought in the courts of the State of Texas. The Vendor shall comply with applicable federal, state, and local laws and regulations.

ATTACHMENT A TO SECTION I
MINIMUM WAGE RATE SCALE

"General Decision Number: TX20250253 03/14/2025

Superseded General Decision Number: TX20240253

State: Texas

Construction Type: Building

County: Harris County in Texas.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

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 30, 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
1	03/07/2025

ASBE0022-009 07/03/2023

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR (Duct, Pipe and Mechanical System Insulation)....	\$ 28.35	16.02

* BOIL0074-003 01/01/2025

	Rates	Fringes
BOILERMAKER.....	\$ 33.17	24.92

CARP0551-008 04/01/2021

	Rates	Fringes
CARPENTER (Excludes Acoustical Ceiling Installation,Drywall Hanging, Form Work and Metal Stud Installation).....	\$ 25.86	9.08

ELEC0716-005 08/29/2023

	Rates	Fringes
ELECTRICIAN (Excludes Low Voltage Wiring and Installation of Alarms).....	\$ 34.50	10.41

* ELEV0031-003 01/01/2025

	Rates	Fringes
ELEVATOR MECHANIC.....	\$ 53.59	38.435+a+b

FOOTNOTES:

A. 6% under 5 years based on regular hourly rate for all hours worked. 8% over 5 years based on regular hourly rate for all hours worked.

B. Holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Friday after Thanksgiving Day; Christmas Day; and Veterans Day.

ENGI0450-002 04/01/2024

	Rates	Fringes
POWER EQUIPMENT OPERATOR Cranes.....	\$ 39.47	10.39

IRON0084-001 06/01/2024

	Rates	Fringes
IRONWORKER, STRUCTURAL.....	\$ 28.26	8.13

IRON0084-012 06/01/2024

	Rates	Fringes
GLAZIER.....	\$ 23.27	7.12
IRONWORKER, ORNAMENTAL.....	\$ 28.26	8.13

PLAS0783-001 04/01/2023		

	Rates	Fringes
PLASTERER.....	\$ 31.34	10.30

PLUM0068-002 10/01/2024		

	Rates	Fringes
PLUMBER.....	\$ 39.98	11.61

PLUM0211-010 10/01/2024		

	Rates	Fringes
PIPEFITTER (Including HVAC Pipe Installation).....	\$ 41.14	11.86

SFTX0669-002 01/01/2025		

	Rates	Fringes
SPRINKLER FITTER (Fire Sprinklers).....	\$ 36.15	24.47

SHEE0054-006 04/01/2020		

	Rates	Fringes
SHEET METAL WORKER Excludes HVAC Unit Installation.....	\$ 29.70	13.85
HVAC Duct Installation Only.	\$ 29.70	13.85

* SUTX2014-029 07/21/2014		

	Rates	Fringes
ACOUSTICAL CEILING MECHANIC.....	\$ 17.27 **	3.98
BRICKLAYER.....	\$ 18.87	0.00
CAULKER.....	\$ 15.36 **	0.00
CEMENT MASON/CONCRETE FINISHER...	\$ 13.93 **	0.00
DRYWALL FINISHER/TAPER.....	\$ 16.27 **	3.66
DRYWALL HANGER AND METAL STUD INSTALLER.....	\$ 17.44 **	3.93
ELECTRICIAN (Alarm Installation Only).....	\$ 17.97	3.37
ELECTRICIAN (Low Voltage Wiring Only).....	\$ 18.00	1.68
FLOOR LAYER: Carpet.....	\$ 20.00	0.00

FORM WORKER.....	\$ 12.77 **	0.00
INSULATOR - BATT.....	\$ 14.87 **	0.73
IRONWORKER, REINFORCING.....	\$ 12.14 **	0.00
LABORER: Common or General.....	\$ 11.76 **	0.00
LABORER: Mason Tender - Brick...	\$ 13.47 **	0.00
LABORER: Mason Tender - Cement/Concrete.....	\$ 10.48 **	0.00
LABORER: Pipelayer.....	\$ 12.94 **	0.00
LABORER: Roof Tearoff.....	\$ 11.28 **	0.00
LABORER: Landscape and Irrigation.....	\$ 9.52 **	0.00
LATHER.....	\$ 19.73	0.00
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 13.94 **	0.00
OPERATOR: Bobcat/Skid Steer/Skid Loader.....	\$ 13.93 **	0.00
OPERATOR: Bulldozer.....	\$ 22.75	0.00
OPERATOR: Drill.....	\$ 16.22 **	0.34
OPERATOR: Forklift.....	\$ 16.00 **	0.00
OPERATOR: Grader/Blade.....	\$ 13.37 **	0.00
OPERATOR: Loader.....	\$ 13.55 **	0.94
OPERATOR: Mechanic.....	\$ 17.52 **	3.33
OPERATOR: Paver (Asphalt, Aggregate, and Concrete).....	\$ 16.03 **	0.00
OPERATOR: Roller.....	\$ 16.00 **	0.00
PAINTER (Brush, Roller and Spray), Excludes Drywall Finishing/Taping.....	\$ 17.24 **	4.41
ROOFER.....	\$ 15.40 **	0.00
SHEET METAL WORKER (HVAC Unit Installation Only).....	\$ 20.05	2.24
TILE FINISHER.....	\$ 12.00 **	0.00
TILE SETTER.....	\$ 16.17 **	0.00
TRUCK DRIVER: 1/Single Axle Truck.....	\$ 14.18 **	0.00
TRUCK DRIVER: Dump Truck.....	\$ 12.39 **	1.18
TRUCK DRIVER: Flatbed Truck.....	\$ 19.65	8.57

TRUCK DRIVER: Semi-Trailer		
Truck.....	\$ 12.50 **	0.00
TRUCK DRIVER: Water Truck.....	\$ 12.00 **	4.11
WATERPROOFER.....	\$ 14.39 **	0.00

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"

SECTION II: CONDITIONS

1. SCOPE OF WORK

The work to be done under this solicitation shall consist of the following:

Provide all personnel, equipment, tools, materials, supervision, and other items and services necessary for on-call water and wastewater utility repair services for which the CITY does not have the manpower, equipment, or means to self-perform.

Services will consist of providing repair services to various public water, wastewater and drainage utility systems located throughout the City of Waller. The services will be requested on an as-needed basis.

Major items of construction and services required are designated as follows:

1. Installing Water Services.
2. Installing Fire Hydrants.
3. Repairing Water Mains.
4. Replacing Gate Valves in Water Mains.
5. Installing Gate Valves in Water Mains.
6. Installing Sanitary Sewer Services.
7. Installing / Replacing Sanitary Sewer Manholes.
8. Removing and Replacing Pavement.
9. Driveway Culvert Installation.
10. Water Meter and Vault Installation.
11. Testing of constructed facilities.
12. Site clean up and restoration.

The City of Waller will award multiple contracts as follows:

- An award will be made for each On-Call Services Contract identified in the BID SHEET. There will be a primary award and, at the CITY's discretion, a secondary and tertiary award for each item. The secondary and tertiary contract awards WILL ONLY be used when the primary contract cannot meet the CITY's performance requirements for an individual work order.
- A contract will be executed for each vendor awarded a primary, secondary or tertiary award and the contract shall contain in its Appendix those awarded items. There will not be a separate contract executed for each line item.
- The CITY reserves the right to bypass a contractor for the issuance of work orders if the contractor has not met performance requirements on previous work orders. The CITY also reserves the right to terminate any contract without cause at any time.

The CITY estimates the value of the awarded contracts will be approximately \$700,000.00. The City of Waller does not guarantee this as a minimum or maximum value for this contract, as the actual value of the contract and renewal contracts are subject to available funding and budgets. The City of Waller will attempt to issue assignments to the contractor with a minimum value of approximately \$1,000 per assignment but cannot guarantee the value size of each assignment.

Task Orders - The quantity and description of the tasks to be performed, and the notice to proceed with the work, shall be submitted to the contractor through the issuance of an executed written work order document prepared by either the CONTRACTOR or the CITY. The work order and its accompanying notice to proceed may also be initiated with an email from the City staff member containing the task instructions. Individual work orders upon execution will become a part of the agreement. A copy of the approved written work order is required to be submitted as documentation accompanying any invoice submitted to the CITY for payment.

Vendor must be an established business with hands-on experience in municipal water, wastewater, and drainage utility servicing and repairs. Evidence of this experience must be provided in vendor's proposal.

2. DELIVERY OF SERVICES

- Vendor **must be able** to provide service twenty-four (24) hours a day, seven (7) days a week, three hundred sixty-five (365) days a year, including holidays for the duration of the agreement.
- The City of Waller expects the Vendor to give "priority" service to any call for repairs for the CITY. Water and wastewater infrastructure in some cases is a matter of public safety. Therefore, reliable emergency response capabilities are critical. Vendor must commit to the following response times:
- Under normal working conditions, no more than four (4) hours shall elapse from time of call to time of arrival.
- In the event of an emergency, the successful bidder shall have a crew at the designated site within one (1) hour of the call from the City of Waller.
- It is the responsibility of the Vendor to provide an up-to-date list of names and contact numbers of on-call personnel. The CITY will contact the Vendor by phone as emergencies occur and will provide as much information as available about the emergency work assignment, including the location(s), type of work and site condition(s).
- Service will be performed in a variety of locations throughout the City of Waller. All unique requirements and or regulations for each type of repair shall be strictly followed by the Vendor and Vendor's employees.
- The City of Waller's "normal business hours" are defined as being 8:00 AM to 5:00 PM, Monday through Friday.

Contractor shall designate one (1) person with the company to act as the point of contact for the CITY. The Contractor shall provide the CITY a cell phone number and email address for this person. Phone calls made by the CITY shall be returned by the Contractor within one (1) hour and emails shall be responded to within twenty-four (24) hours. If a new person is assigned as point of contact for the CITY, the CITY shall be notified within twenty-four (24) hours of the change.

3. SAFETY MEASURES

Vendor shall take all necessary precautions for the safety of employees on the worksite and shall erect and properly maintain at all times, as required based on job conditions and process of the work, all necessary safeguards for the protection of the workmen and public including traffic control, warning signs, and barricades.

A typical project will have the following scope of services:

- Receive call from City staff indicating a problem.
- Visit the project site with City staff and identify a preliminary scope of services.
- Review any drawings, specifications, reports, etc. provided by City staff on the proposed project.
- Develop and agree on a final scope of services.
- Provide schedule and quote based on bid pricing.
- Obtain written approval from the CITY for implementation of the scope of services.
- Perform all work necessary.
- City staff will review all work prior to final sign off. Vendor is to address all identified deficiencies in the work.
- Contractor to provide final documentation for all work performed.

4. BRAND NAMES

Where equipment or materials are specified by a trade or brand name, it is not the intention of the CITY to discriminate against an equal product of another manufacturer but rather to set a definite standard of quality and/or performance and to establish an equal basis for the evaluation of bids. Where the words "equivalent" or "equal to" are used, they shall be understood to mean that the thing referred to shall be, in the opinion or judgment of the Professional, the equivalent of or equal to the product or item specified by name. Unless otherwise specified, all materials shall be the best of their respective kinds and shall be, in all cases, fully equivalent to approved samples. Notwithstanding that the words "equivalent", "equal to" or other such expressions may be used in the specifications in connection with a material, manufactured article or process, the material, article or process specifically designated shall be used unless a substitute shall be approved in writing by the Professional. The Professional has the right to require the use of such specifically designated materials, articles or processes.

5. WEEKEND WORKING HOURS

Construction work under this Contract requiring an inspector will not be performed on weekends or holidays unless the following conditions exist:

- The project being constructed is essential to the City of Waller's ability to provide the necessary service to its citizens; or
- Delays in construction are due to factors outside the control of the Contractor. The Contractor is approaching the penalty provisions of the Contract and can show that he has made a diligent effort to complete the Contract within the allotted time.

Before construction work requiring an inspector is to be performed on weekends or holidays, the Contractor must notify the CITY's representative not less than three (3) full working days prior to the weekend or holiday the Contractor desires to do work and obtain written permission from the CITY's

representative to do such work. The final decision on whether to allow construction work requiring an inspector on weekends or holidays will be made by the CITY's representative.

In any event, if a condition should occur or arise at the site of this project or from the work being done under this Contract which is hazardous or dangerous to property or life, the Contractor shall immediately commence work, regardless of the day of the week or the time of day, to correct or alleviate such condition so that it is no longer dangerous to property or life.

6. MATERIALS AND WORKMANSHIP

The intent of these contract documents is that only materials and workmanship of the best quality and grade will be furnished. The fact that the specifications may fail to be sufficiently complete in some detail will not relieve the Contractor of full responsibility for providing materials of high quality and for protecting them adequately until completion of the project and acceptance by the CITY. The presence or absence of a representative of the CITY on the construction site will not relieve the Contractor of full responsibility for complying with this provision. The specifications for materials and methods set forth in the contract documents provide minimum standards of quality which the CITY believes necessary to procure a satisfactory project.

7. GUARANTEES

All equipment and materials incorporated in the project and all construction shall be guaranteed against defective materials and workmanship. Prior to final acceptance, the Contractor shall furnish the CITY with a written general guarantee which shall provide that the Contractor shall remedy any defects in the work, at no cost to the CITY, and pay for any and all damages of any nature whatsoever resulting from such defects when such defects appear as a result of defective materials or workmanship within one (1) year from the date of final acceptance of the work.

8. PROTECTION OF THE WORK

The Contractor shall be responsible for the care, preservation, conservation and protection of all materials, supplies, machinery, equipment, tools, apparatus, accessories, facilities and all means of construction, and any and all parts of the work, whether the Contractor has been paid, partially paid or not paid for such work until the date the City issues its certificate of completion to the Contractor.

9. PROTECTION OF SUBSURFACE LINES AND STRUCTURES

It shall be the Contractor's responsibility to prosecute the work in such a way as to exercise due care to locate and prevent damage to all underground pipelines, utility lines, conduits or other underground structures which might or could be damaged by Contractor during the construction. The City of Waller agrees that it will furnish Contractor with the approximate location of all such underground lines and utilities which it has knowledge. However, such fact shall not relieve the Contractor of his responsibilities aforementioned and it shall be the responsibility of the Contractor to determine for himself the exact location and depth of any utilities which exist in the project site. All such underground lines or structures cut or damaged by Contractor during the prosecution of the work shall be repaired immediately by Contractor, at Contractor's expense, to the satisfaction of the CITY.

10. TRAFFIC CONTROL, BARRICADES AND SAFETY MEASURES

The Contractor shall, at his own expense, furnish and erect such traffic control, barricades, fences, lights and danger signals, and shall take such other precautionary measures for the protection of persons, property and the work as may be necessary.

The Contractor will be held responsible for all damage to the work due to failure of barricades, signs and lights to protect it; and when damage is incurred, the damaged portion shall be immediately removed and replaced by Contractor at his own cost and expense. The Contractor's responsibility for maintenance of barricades, signs and lights shall not cease until the date of issuance to Contractor of the CITY's certificate of acceptance of the project.

The Contractor will be held responsible for all damage to the work which may occur prior to final acceptance by the CITY regardless of the adequacy of protective barricades and lighting, and when damage is incurred, the damaged portion shall be immediately removed and replaced by Contractor at his own cost and expense.

11. EXPLOSIVES

The use of explosives will not be permitted unless written permission to do so is obtained by the Contractor from the CITY. In all cases where written permission is obtained for the use of explosives, the Contractor shall assume full responsibility for all damage which may occur as a direct or indirect result of the blasting. In addition, in all cases where explosives are authorized to be used, the Contractor shall use utmost care so as not to endanger life or property, and the Contractor shall further use only such methods as are currently utilized by persons, firms or corporations engaged in similar types of construction activity.

Explosive materials shall not be stored or kept at the construction site by the Contractor.

In all cases where explosives are to be used during the construction of the project, it shall be the duty of the Contractor to notify each utility company having structures (above or below the ground) in proximity to the site of the work, of Contractor's intention to use explosives, and such notice shall be given sufficiently in advance to enable the companies to take such steps as they may deem necessary to protect their property from injury. Such notices, however, shall not relieve the Contractor of responsibility for any damage resulting from his blasting operations.

12. PAYMENT OF EMPLOYEES

The Contractor and each of his subcontractors agree to pay all employees engaged in work on the project under this Contract in full (less mandatory legal deductions), and further agree that no such employees shall look to the CITY for payment of wages or compensation earned by reason of such work.

13. LIST OF SUBCONTRACTORS

With the bid, submit a list of subcontractors for major portions of the work. Give the names and addresses of the selected subcontractors listed in the bid form. Failure to list subcontractors constitutes may be reason for rejecting the bid.

14. SITE EXAMINATION

Bidder should carefully examine the bidding documents and be familiar with the City of Waller to determine the actual conditions under which work will be done. Data in the bidding documents pertaining to existing conditions is for convenience only and does not supplant obtaining firsthand information at the site. Submission of a bid constitutes acceptance by the bidder of existing site conditions as part of the requirements of this work.

15. UNIT PRICE

Unit Prices shall be for complete compensation as measured in place for all materials, labor, dewatering, shoring, traffic control, removal, overhead, incidental costs, fees, profits, insurance, site restoration, warranties, and any other costs that is necessary to cover the finished work performed to the City's Specifications.

When requested work to be performed cannot reasonably be categorized by an already established item of work, the CITY may request the contractor provide unit pricing for such work. If the CITY agrees to the supplied unit price for the item of work, a new item of work with the agreed upon unit pricing will be incorporated into the contract.

The Contractor is made aware and shall make provisions in his unit price bid to allow for changes in alignment of the proposed utility (storm, water, sanitary sewer or force main) and roadway (including sidewalk) during construction to avoid conflicts, conditions encountered in the field, and to expedite construction. The CITY will not be responsible for any claims for downtime costs resulting from such conflicts. If the change in alignment results in increased quantities of the pertinent item, the Contractor shall be paid at the established bid unit price in the Contract. Any coordination or verification of existing utilities (including but not limited to gas, electric, water, sewer, petrochemical pipeline) resulting from the realignment shall not be paid for separately and shall be incidental to project costs.

16. WARRANTY

Neither the final payment nor certificate nor any provision in this Contract shall relieve the Contractor of responsibility for faulty materials or workmanship, and he shall remedy any defects due thereto and pay for any damage to other work resulting therefrom, which shall appear within a period of one (1) year from the date of work performed.

17. GUARANTEES

The CONTRACTOR shall guarantee all work, including equipment installed, to be free from defects due to faulty workmanship or materials for period of one year from date of issue of work performed. Upon notice from CITY, the CONTRACTOR shall repair defects in all construction, which develop during specified period at no cost to CITY. Neither final acceptance nor final payment nor any provision in the Contract Documents relieves CONTRACTOR of above guarantee. Notice of observed defects will be given with reasonable promptness. Failure to repair or replace defect upon notice entitles CITY to repair or replace it and recover reasonable cost thereof from CONTRACTOR and/or his Surety.

18. SUBSURFACE EXPLORATION

It is the Contractor's responsibility to determine the depth, location and existence of any existing utilities which may conflict with the proposed construction by referring to available records, consulting appropriate municipal departments and by making necessary exploration and excavations. It is not represented that PLANS show all existing storm sewer, sanitary sewer, water, gas, telephone, and electrical facilities and other underground structures.

It is the Contractor's responsibility to relocate all utilities as necessary to function properly and to properly fulfill the installation requirements of this contract. This includes lowering or adjusting water services and gas services exposed during construction. The Contractor shall coordinate with the proper gas company for relocation of gas lines. Contractor shall maintain a minimum 12- inches clearance between gas lines and all other utilities (either new or relocated utilities).

Whenever existing utilities, not indicated on PLANS, present obstructions to grade and alignment of pipe, immediately notify the CITY, who without delay, will determine whenever existing improvements are to be relocated, or grade and alignment of pipe changed. Where necessary to move services, poles, guy wires, pipelines, or other obstructions, the Contractor shall contact and coordinate and make arrangements with the CITY.

19. RELOCATING GAS LINES

In the event a gas line is exposed due to excavation and is in need of relocation, the Contractor shall contact the appropriate gas company. The Contractor shall coordinate the relocation work.

20. UTILITY SERVICES FOR CONSTRUCTION

Contractor will provide all utilities necessary for construction at no additional cost to CITY. The Contractor may obtain water from City of Waller fire hydrants by obtaining a temporary meter from the City's representative.

21. INTERRUPTION OF UTILITY SERVICES

Operate no valve or other control on existing systems without authorization from the CITY. Exercise care in performing work so as not to interrupt service. Coordinate requests to open or close any valves with the CITY in advance of the date of the opening or closing of any valve. Locate and uncover existing utilities ahead of heavy excavation equipment. At house connections, either lift trenching machine over lines or cut and reconnect with minimum interruption of service.

22. RESIDENT AND PROPERTY CITY NOTIFICATION

Once the work begins it shall be constructed and completed in the shortest time possible to minimize inconvenience to property owners. Contractor shall assure that all affected property owners are notified between 48 hours and 7 days before work begins on their street, except during emergencies. The Contractor shall provide property owners the minimum following information: Contractor's name, 24-hour phone number, office phone number, work to be performed, starting and ending dates, and name and phone number of City of Waller official to be contacted for questions.

23. DRIVEWAY DISTURBANCE

Residents and property owners shall be notified, by the Contractor, between 48 hours and 7 days in advance of disturbance of driveways. Notice to property owners shall follow the procedure in the item above. Driveways that are excavated shall be reconstructed as soon as possible to minimize inconvenience to the property owners. The materials used for the replacement of the driveways shall be as shown on the plans and in all cases shall be equal to or better than the existing material. In the event an excavation at a driveway must be left open overnight, the excavation shall be covered and temporary access to the property shall be provided. Anchored steel sheeting, bridges or other substantial structure shall be used to provide temporary access to the property.

24. TRAFFIC DURING CONSTRUCTION

When construction begins on a street, the Contractor shall maintain traffic on the streets at all times. Contractor shall also make necessary provisions to allow ambulance, police, fire and other emergency vehicles access to the street.

During construction, the Contractor shall allow resident traffic access to the street with proper guidance, direction, flagmen and traffic control and only at such times that damage will not occur to the new construction or to the vehicles.

All traffic control devices, placement and activities shall be as per the latest edition of the Texas Manual of Uniform Traffic Control Devices (TMUTCD). If there is any conflict between the MUTCD and traffic control requirements within the Contract Documents, the CONTRACTOR shall notify the CITY immediately.

In so far as possible, the CONTRACTOR shall schedule and conduct street operations in the intersections as rapidly as possible to minimize the length of time the intersections will be closed to traffic.

25. CLOSING STREETS TO TRAFFIC

The Contractor shall maintain traffic on the project streets throughout construction. In the event a Contractor must close a street to all traffic, he shall obtain prior permission from the Public Works Department and he shall provide a minimum of 48 hours' notice in the following order, to the Waller Public Works Department and Waller Police Department.

Whenever a cross street must be closed to traffic, the CONTRACTOR shall verify that alternate access is available for residents and property in the area affected by the street closure.

Whenever a portion of a street is closed to traffic, the CONTRACTOR shall verify that alternate access is available for residents and property owners on that street or for residents and property owners desiring to access crossing streets. Appropriate detour signage shall be provided to clearly indicate detours, as per the Texas Manual of Uniform Traffic Control Devices.

CONTRACTOR shall maintain cross street traffic at other intersecting streets at appropriate times during the construction to facilitate local access as approved and coordinated with the CITY.

All materials incorporated into the work pertaining to the road closure, must be on the jobsite 24- hours in advance of the road closure for inspection. All barricading and construction signage shall be in accordance with the Texas Manual on Uniform Traffic Control Devices for Streets and Highways.

The CONTRACTOR shall provide the CITY a schedule and plan of anticipated road blockages, alternative access and detours prior to implementing said schedule and plan.

26. WARNING SIGNS AND BARRICADES

When any street or any section of a street is closed, the Contractor shall furnish and maintain adequate barricades, warning and directing signs, red flags and lights at the end of each street and at all intersections along the street within the limits of the work. All expenses incurred for the above requirements shall be borne by the Contractor. All warning signs and barricades shall be in conformance with the Texas Manual of Uniform Traffic Control Devices.

27. EXCAVATED MATERIAL AND STORAGE OF EQUIPMENT AND MATERIAL

No equipment, material or excavated material shall be stored or deposited on streets, lawns, driveways, sidewalks, gardening or shrubbery. The City of Waller Ordinances prohibits the Contractor from storing any equipment and material in the yards of residential areas within City limits.

28. TRAFFIC

The Contractor is hereby made aware that the work is being conducted in an area consisting of a high amount of pedestrian and vehicular traffic. The possibility of vandalism to his barricades, sheeting, tape, other protective devices and equipment do exist. The contractor is responsible for maintaining all traffic barricades, sheeting, tape and other protective devices during construction hours and non-construction hours such as weekends, holidays and nights. Upon notification of the need for maintenance of the barricaded areas, either by the contractor's own personnel, the City of Waller or its representatives, the Contractor shall promptly take the required corrective measures.

29. DAMAGE

Damage to pavement, curbs, driveways, sidewalks or any other structure caused by the Contractor during construction shall be repaired at the Contractor's expense. It shall be the Contractor's responsibility to prevent damage to any existing pavement by equipment and trucks.

30. WATER

Contractor shall not use residents' water.

31. OTHER CONTRACTS

Other construction may be underway concurrently in this area. Afford utility companies and other contractor's reasonable opportunity for introduction and storage of their materials and execution of their work. All work under this Contract must be properly connected and coordinated with that constructed by others. The City is not responsible or liable for any claims resulting from delays by other Contractors or utility companies in the area regardless of the entity authorizing such work and any faulty workmanship resulting from such work performed.

32. CLEANUP

Remove from site of work, and from public and private property, temporary structures, rubbish and waste materials including excess excavated materials. Dispose of surplus earth as directed or as specified. Complete cleanup on one street before progressing to the next. The construction operation

may be suspended temporarily if cleanup is not complete. Contractor is to be aware that the CITY will strictly enforce the cleanup procedure. There will be no extra pay for complying to said item.

33. MANHOLES

Some manholes may have been paved over or otherwise covered up, may not be existing, may not be correctly shown in plans, or may be shown as a cleanout or vice versa. The cost to field locate and open the manhole shall be incidental to the work specified.

34. INCIDENTAL CONSTRUCTION ITEMS

All items called out on the construction drawings or within the specifications that are not itemized in the bid proposal section of these documents shall be considered incidental to the cost of the project. If contractor believes additional pay items required to complete the work he shall notify the CITY prior to executing the task order.

35. ASPHALT

The use of reclaimed asphalt or recycled asphalt will not be permitted.

36. DRAINAGE

Yard swales and pipe drains disturbed during construction shall be repaired or replaced with positive drainage towards the street or proposed storm sewer at no additional cost to the CITY.

37. TWC RULE

The Contractor shall comply with the Texas Workers' Compensation Commission Rule, 28 TAC§ 110.110 relating to Reporting Requirements for Building or Construction Projects for Governmental Entities.

38. WORKERS COMPENSATION INSURANCE

Contractor is required to comply with Texas state law regarding requirements pertaining to Worker's Compensation.

39. CONSTRUCTION DAMAGE - YARD AREAS

When construction occurs in CITY rights-of-way, alleys and easements on residential yard areas, care shall be taken to minimize construction damage to yard areas. CONTRACTOR shall return areas to a condition equal or better than prior to construction. Any areas of grass, which are disturbed or dug up during the construction, shall be replaced with sod, which matches the grass removed and shall be incidental to the work being performed.

40. INCIDENTAL WIDTH

Any increased width of pavement, driveway, curb or sidewalk reconstruction or repairs, required due to over excavation, undermining (due to improper shoring) or for contractor convenience shall be incidental to the cost of the project.

41. SURFACES

Drainage is of utmost importance to this project. The Contractor shall perform all transitions to existing pavements and driveways so that positive drainage is maintained and ponding is prevented. Transitions shall be performed so that a smooth driving surface is maintained. Contractor shall transition driveways so that vehicles will not "bottom out".

42. BACKFILL

Full depth cement stabilized sand backfill for sewer lines shall extend one foot from the edge of pavement where sewer lines and services are crossing pavements and roadways.

43. SOILS

Stratigraphy and groundwater conditions encountered during excavations may vary throughout the City of Waller. The CONTRACTOR should collect additional subsurface information, as he deems necessary to determine the conditions of the site at no additional cost to the CITY.

44. EXCAVATING

The CONTRACTOR shall monitor all excavations and retaining structures on a continuous basis by experienced personnel who can make evaluations as to the appropriateness of the retention system being used.

45. RAMPS

In the event it is necessary to remove and replace a sidewalk, which terminates at a street radius, a wheelchair ramp shall be constructed. The payment for the wheelchair ramp shall be at the bid unit price for wheelchair ramps.

46. DEWATERING

CONTRACTOR shall maintain dewatering after the cement stabilized sand bedding and backfill has been installed long enough so that a good set on the cement has been obtained. Do not remove well points immediately after placement of cement- stabilized sand.

47. TRENCH SAFETY

CONTRACTOR shall be aware that conditions may exist whereby solid sheeting and shoring may be more appropriate than trench boxes.

The CONTRACTOR shall provide an excavation safety system as approved by OSHA 29 CFR Part 1926 (amended October 31, 1989) indicating the use of sheeting, shoring, bracing, under pinning, etc., to be utilized where conditions warrant such system. This system shall be provided in addition to other excavation systems the CONTRACTOR selects as per section 01526 "Trench Safety System". There will be no payment for trench safety, the costs shall be considered incidental to the project.

48. DUST CONTROL

The CONTRACTOR shall take necessary measures to control dust on the site and minimize blowing dust. The CONTRACTOR shall water the site as necessary and when requested by the CITY to control blowing

dust. The site shall be watered to the CITY'S satisfaction. There will be no payment for Dust Control, the cost shall be considered incidental to the project.

49. GROUNDWATER SEEPAGE

Contractor shall be aware that groundwater is present in the construction sites. Seepage into excavation may occur. This seepage should be collected in sumps and pumped out. This type of de-watering is considered incidental to the cost of the improvement.

If seepage cannot be handled by pumping, then mechanical dewatering techniques such as well pointing shall be used. The Contractor shall be paid for well pointing as per the unit price bid. All pumps used for well pointing shall be driven by electric motors and shall be wrapped or barricaded to minimize noise.

50. SWEEPING

The street in the construction area shall be swept clean at the end of each working day at a minimum. Dirt and debris that falls off trucks or equipment shall be cleaned up immediately.

51. TRENCHES

Trenches shall be backfilled to surrounding grade at the end of each day or covered with anchored steel plates in paved areas or wood sheeting in non-paved areas.

52. DAILY STORAGE

Equipment and unused construction materials shall be removed from the site at the end of each day.

53. OSHA

The Contractor shall carry out his operations in strict accordance with all applicable Occupational Safety and Health Administration (OSHA) standards. Special attention is drawn to those safety requirements involving work on all elevated platforms and entry into a confined space. It shall be the CONTRACTOR'S responsibility to familiarize himself with OSHA standards and regulations pertaining to all aspects of the work. All work shall be done in accordance with OSHA, Safety and Health Regulations of the United States Government for Construction, State of Texas laws and regulations, Harris County regulations and City ordinances.

54. WAIVER

Each bidder agrees to waive any claim it has or may have against the CITY, Engineer, and their respective employees, arising out of or in connection with the administration, evaluation, or recommendation of any bid.

55. PRESERVATION OF TREES AND SHRUBS

Trees and shrubs within the right of way shall not be removed or disturbed. Contractor shall obtain permission for tree removal from the CITY. Where tree roots must be cut, follow the repair method described in the "Technical Specification".

56. REPLACEMENT LANDSCAPING

Any trees, shrubs, landscaping or grass which are disturbed or dug up during the construction shall be replaced in equal quality and kind by Contractor at no expense to the CITY.

57. REPLACEMENT OF DAMAGE

If any damage is done to existing asphalt or concrete roads or appurtenances, by equipment, tires, metal tracks or other construction practices, damage shall be saw cut, removed and replaced with materials equal to or superior to the existing material. Saw cutting may be done with no limitations in advance, but any roadway removed shall be replaced within ten (10) working days, and the Contractor shall provide temporary pavement during that time at no additional cost to the project.

Damage to pavement, curbs, driveways, sidewalks, trees, fences, shrubbery, and other structures caused by the Contractor during construction shall be repaired at the Contractor's expense to a condition equivalent to or better than existing condition to the City's satisfaction. Repairs to driveways and sidewalks shall be constructed with materials consistent with the existing and adjacent material and according to the detail shown in the plans as a minimum. In the event sod is removed or disturbed, it will be replaced to a healthy green condition regardless of the condition of existing sod. Grass sod shall be installed in all non-pavement or non-roadway areas of construction. Any areas inside or outside of the construction area disturbed or dug up during construction shall be replaced with sod at the expense of the Contractor. Sod shall be placed in these disturbed areas even if grass was not present prior to the construction.

58. CUTS

All curbs, sidewalks, roadways and driveways to be removed and replaced shall be a full depth saw cut (a straight, even, clean cut) at the point of removal so that an even joint results between existing pavement and new pavement. Jointing material shall be placed between the new and existing material. Where no steel is available to tie proposed concrete to existing concrete, either drill dowels into existing pavement as load transfer devices or pour concrete header under the existing concrete.

59. UTILITIES

The Contractor shall be aware that utilities and utility service lines (including but not limited to telephone, gas, cable, and electric) are present in the easements or right-of-way. The potential of encountering such lines during excavation is very high. The Contractor shall coordinate with all the pertinent utility companies and schedule his work in such manner that delays do not occur. The Contractor will provide adequate protection as necessary to the utility company's satisfaction and include costs in the related bid items to work around the pertinent utilities and to complete the work.

In the event a utility including but not limited to gas, electric, telephone, cable, petroleum or petroleum related pipelines is exposed due to excavation and is in conflict, the appropriate company shall be contacted by the Contractor. The Contractor shall make a concerted effort to avoid any conflict with the utility. The Contractor shall provide all the necessary documentation for performing such efforts. The documentation shall be telephone conversation memos, letters, meeting's on site and other coordination efforts utilized to identify the utility or pipeline. In the event, it is determined that the Contractor had made a concerted effort to avoid the conflict and in spite of his effort, the conflict

cannot be avoided without the utility being relocated, the CITY will coordinate the relocation efforts of the utility with the pertinent company. (The Contractor is still responsible for coordinating with the utility or the pipeline company). The Contractor, during the period the utility is being relocated, will move his crew(s) to other areas or perform other work at his own expense. The CITY will not be responsible for any compensation and/or delays resulting from the coordination efforts performed by the Contractor due to the utility conflict. If the Contractor chooses to assist the utility or pipeline company in the performance of their work, he shall be doing that at his own risk. The CITY will not be responsible for costs incurred by the Contractor from providing such assistance to the utility or pipeline companies.

60. COMPLAINTS

The Contractor is responsible for addressing all complaints from citizens and commercial property owners caused due to the performance of his work. The Contractor shall take appropriate measures to address all complaints from the citizen and commercial property City's to their satisfaction in a timely manner. The Contractor shall submit to the CITY a letter from the citizen and commercial property City acknowledging the complaints have been addressed and any repair work necessary work has been completed by the Contractor.

61. TIE-INS

The CITY reserves the right to make adjustments (tie-in at different locations) in the field. Payment for performing the work shall be made at the established bid unit price in the contract.

62. RAINFALL & DRAINAGE

The Contractor is made aware of rainfall events that may impact the construction efforts regardless of where the rainfall occurs, whether upstream or downstream of the project. The Contractor's construction operation shall not impede the drainage flow and shall maintain drainage at all times. The Contractor is responsible for the installation and removal of temporary pipes, pumps and/or structures or any other means as necessary to maintain drainage during construction operations. The Contractor shall submit a proposed plan to maintain drainage for approval by the CITY prior to commencing work in the area. The Contractor shall take all necessary measures to provide a safe condition during the construction operations to protect his workers, machinery and property.

No separate payment shall be made for maintaining drainage or removing water during the duration of construction and maintain drainage flow shall not be paid for separately and shall be considered incidental to the project cost. Work necessary to provide property drainage during construction, including maintaining sections, existing ditches, channels, culverts and sewers and including temporary construction and maintenance of ditches, existing storm sewer systems and drainage ways, will be considered incidental to the various pay items and no separate payment for this work will be made. Where new curb is installed, Contractor shall backfill and regrade behind curb as necessary to maintain positive drainage from non-paved areas over top of curb. Re-grading of existing ditches and swales shall be considered incidental.

Replacement of yard drains beyond property line/right of way line may be required to maintain slope towards the street. Contractor to obtain written "Right of Entry" from property owner CITY prior to construction on private property.

63. HAND EXCAVATION

The Contractor shall accomplish the construction by hand excavation while working in close proximity to utilities, structures, landscaping, trees, shrubs, swimming pools, etc. and whenever necessary or as directed by the CITY. Any additional costs associated with utilizing hand excavation shall not be paid for separately and shall be included in the unit price bid for the pertinent item.

64. TEMPORARY PAVING

After backfill of trenches, temporary pavement shall be placed and maintained until such time as permanent pavement is constructed. The temporary paving shall consist of base material and an all-weather surface treatment. The base material may be composed of cement stabilized sand, crushed stone or asphaltic materials from rototilling operations or other approved material and shall be compacted to ninety-five percent (95%) of the maximum density based on ASTM D698. The all-weather surface treatment shall be composed of a minimum one-inch (1") thick hot-mix asphaltic concrete. The hot-mix asphaltic concrete can be new material or recycled asphalt-paving material. The cost for temporary pavement shall be incidental to the cost of the utility. There will be no separate pay for any temporary pavement.

65. STANDBY PUMPS

The Contractor is responsible for maintaining additional standby pumps on site for bypass pumping in the event of failure of any pumps. The Contractor shall make provisions to provide a full-time qualified attendant throughout the duration of all bypass-pumping operations. Well points and bypass pumps are specified to be electric powered for noise consideration. The Contractor will be allowed to use gas or diesel powered pumps during normal working hours only if the Contractor can complete such operations during normal working hours or if work is greater than 500' from any residential dwelling units. The bypass system should have adjacent noise suppressing barriers. In the event the noise suppressing barriers are determined to be inadequate by the CITY, the Contractor must utilize electric powered pumps after normal working hours. The Contractor shall make all necessary arrangements with the pertinent utility company. The Contractor shall absorb any delays or costs associated with changing from gas or diesel powered pumping to electrically powered pumping.

Bypass pumping shall not be performed on weekends or holidays unless conditions exist where it is deemed necessary by the CITY.

66. SEWER SYSTEM

The Contractor shall be aware that the City's sewer system may remain surcharged for a period of time after a significant rainfall event. However, this time period of surcharge may vary depending on the nature of the rain event and the location of the surcharge within the system. The Contractor shall allow for such surcharging in his construction efforts. No additional payment will be made for impact on the construction efforts due to surcharging regardless of the time period which surcharging occurs.

67. SURFACE RESTORATION

Bedding and backfill and surface restoration shall be per Trench Bedding and Backfill detail in the plans.

68. PROXIMITY OF STRUCTURES

The Contractor shall be aware that the work may be performed on storm sewer, sanitary sewer and/or waterline systems that are in close proximity to structures (storage shed, building and other utilities). The Contractor shall take all precautions necessary to protect such structures from damage due to the construction operations. Any damages resulting from the Contractor's operations to such facilities shall be replaced at no additional cost to the project.

69. UNIFORMS

The selected service provider will ensure all employees are either wearing a company logo shirt, jacket, or safety vest at all times while on City of Waller property or within the public rights-of-way. All employees on site must be employees of the selected company and no phase or aspect of the work may be done through subcontractors without written permission from the City of Waller. It is further agreed that it is the intent of this Contract that all work must be performed, and all material must be furnished in accordance with the generally accepted practice for such materials furnished or work completed. All unsafe conditions will be reported to the City of Waller immediately and not put off until later in the day. The Contractor is responsible for providing all personal protective equipment, ensuring the employee has been properly trained in how to use safety equipment and assure the employee is utilizing proper personal protective equipment. The City of Waller reserves the right to cease all work that may be disruptive or considered to be unsafe.

PART 1 - G E N E R A L

1.01 GENERAL PROVISIONS

- A. City will issue a Request for Proposal to initiate Task Order Work to be performed pursuant to a Task Order issued under the Agreement (the “Task Order Work”). The Request for Proposal will include a detailed description of the Task Order Work to be performed and the duration thereof.
- B. CONTRACTOR shall confirm receipt of the Request for Proposal within (2) two calendar days following the date of issue. Confirmation of receipt of the Request for Proposal shall be issued via electronic mail or facsimile to the City.
- C. Within (15) fifteen calendar days following the date of issue of the Request for Proposal, CONTRACTOR shall SUBMIT A COMPLETE PROPOSAL FOR THE Task Order Work which shall include the following items at a minimum:
 - 1. Task Order Duration (as defined in the Request for Proposal and the Supplementary Conditions of the Contract) and construction schedule in accordance with Section 01014;
 - 2. Estimated Task Order Sums (as defined in the Supplementary Conditions of the Contract) based on unit prices provided in the Bid Form; 3. Schedule of Values in accordance with Section 01026; and 4. List of Subcontractors to be used for the Task Order Work.
- D. City will review and Approve the CONTRACTOR’S Proposal. Once approved, the City will sign the Task Order Agreement. Owner will submit (3) three Task Order Agreements to the Contractor. Contractor shall sign all Task Order Agreements and submit to the appropriate parties within (5) five calendar days.
- E. The Task Order Duration begins (1) one day following the effective date of the Task Order Agreement.

1.02 SCOPE OF SERVICES

- A. The Task Order Agreement will define the specific scope of work for each Task Order. A sample Task Order Agreement is attached at the end of this Section.

1.03 MEASUREMENT AND PAYMENT

- A. Measurement and payment for the Base Unit Price Items for each Task Order will be based on the agreed Unit Prices indicated on the Bid Form.
- B. The Task Order Sum indicated on the Task Order Agreement will be based on the OWNER’S quantity and measurement estimated for the specified scope of services. CONTRACTOR’S compensation will be based on actual quantities and measurements supplied or placed in the field and accepted by OWNER’s quantity and measurement supplied or placed in the field and accepted by OWNER.

1.04 RELATED SECTIONS

- A. Section 01310 – Construction Scheduling
- B. Section 01026 – Schedule of Values

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

TASK ORDER AGREEMENT NO. _____

This Task Order Agreement No. __ (this “Task Order Agreement”) attached to and made part of the Agreement dated the _____ day of _____ in the year 2025 by and between The City of Waller, Texas, hereinafter called CITY and _____ hereinafter call CONTRACTOR. CITY and CONTRACTOR, in consideration of the mutual convents set forth, agree as follows:

1. Task Order Work: CONTRACTOR shall provide for the OWNER the following Task Order Work:

1.1 (insert scope of services here)

2. Task Order Duration: CONTRACTOR shall complete the Task Order Work within _____ calendar days commencing on the first day following the Effective Date of this Task Order Agreement (the “Task Order Duration”).

3. Compensation: Compensation for CONTRACTOR’S services shall be based on agreed Unit Prices in the Bid Form. Total Estimated Task Order No. ____ \$ _____

CONTRACTOR’S compensation will be based on actual quantities and measurements supplied or placed in the field and accepted by CITY.

4. Terms and Conditions: The terms and conditions of the Master Service Agreement referred to above shall apply to this Task Order Agreement except to the extent expressly modified herein. In the event of any such modification the modification shall be set forth below and the Article of the Agreement to be modified shall be specifically referenced. Modifications to the Agreement included in this Task Order Agreement are as follows:

4.1 (insert modifications here)

5. Terms or Provisions in Conflict: If the provisions set forth in the Agreement are in conflict with the provisions set forth in this Task Order Agreement the provisions of this Task Order Agreement shall govern.

Acceptance of the terms of this Task Order Agreement is acknowledged by the following authorized signatures of the parties of the Agreement. The parties hereto have signed this Task Order Agreement in triplicate. One copy each has been delivered to OWNER and one copy each to CONTRACTOR and ENGINEER. All portions of the Contract Documents have been signed or identified by CITY and CONTRACTOR or by ENGINEER on their behalf.

This Task Order Agreement shall become effective on _____, 2025

City of Waller, Texas, Owner _____, Contractor

By: _____ By: _____

Title: _____ Title: _____

TECHNICAL SPECIFICATIONS

CITY OF WALLER ON-CALL SERVICES FOR WATER, SANITARY SEWER, AND DRAINAGE SERVICES

IDS PROJECT NO. 2227-003-00

The work covered by this contract is to be constructed in accordance with the specifications listed below. Only the Divisions listed below shall apply.

<u>Documents</u>	<u>Title</u>	<u>No. of Pages</u>
01010	Summary of Work.....	2
01015	Contractor's Use of Premises.....	3
01025	Measurement and Payment	13
01045	Cutting and Patching.....	4
01090	Reference Standards.....	5
01526	Trench Safety Systems.....	4
01535	Tree and Plant Protection.....	5
01563	Control of Ground Water and Surface Water	8
01564	Waste Material Disposal	2
01565	TPDES Requirements	1
01566	Source Controls for Erosion and Sedimentation.....	4
01567	Filter Fabric Fence	3
01568	Reinforced Filter Fabric Barrier.....	3
01570	Traffic Control and Regulation.....	6
01571	Inlet Protection Barriers.....	5
01572	Inlet Protection Barriers for Stage II Inlet	4
02076	Remove Existing Pavements and Structures.....	2
02227	Excavation and Backfill for Utilities	18
02229	Utility Backfill Materials	10
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This document is released for the purpose of bidding under the authority of Brian D. Gerould, P.E. 108604 on 7/24/2024. It is not to be used for construction purposes.

SECTION 01010
SUMMARY OF WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Summary of the Work including work by City, City furnished products, Work sequence, future Work, Contractor use of Premises, and City occupancy.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

- A This Project involves providing on-call water and wastewater utility repair services to the City of Waller.

1.03 CONSTRUCTION PHOTOGRAPHS

- A Submit preconstruction (and post construction) photographs in accordance with Section 01380.

1.04 WORK SEQUENCE

- A Construct Work in phases during the construction period in accordance with the traffic control plans. Coordinate construction schedule and operations with Engineer.
- B Coordination of the Work Refer to Section 01040 - Coordination and Meetings, and Section 01300 - Submittal (Construction Schedule).

1.05 CONTRACTOR USE OF PREMISES

- A Comply with procedure for access to the site and Contractor's use of right-of-way as specified in Section 01015 - Contractor's Use of Premises.
- B Utility Outages and Shutdown: Give two week notice to the City prior to requiring a water valve to be closed for any relocations or adjustments.

1.06 CITY OCCUPANCY

- A The City will occupy the premises during the entire period of construction for the conduct of normal operations.

B. Cooperate with the City to minimize conflict, and to facilitate the City's operations. Coordinate Contractor's activities with Engineer.

C. Schedule work to accommodate this requirement.

1.07 OTHER CONTRACTS

A. Other construction may be underway concurrently in these areas. Afford utility companies and other contractor's reasonable opportunity for introduction and storage of their materials and execution of their work. All work under this contract must be properly connected and coordinated with that constructed by others.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01015

CONTRACTOR'S USE OF PREMISES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Section includes general use of the site including properties inside and outside of rights-of-way, work affecting road, ramps, streets and driveways and notification to adjacent occupants.

1.02 RIGHTS-OF-WAY

- A Confine access and operations and storage areas to rights-of-way provided by City as stipulated in Document 00700 - General Conditions; trespassing on abutting lands or other lands in the area is not allowed.
- B Contractor may make arrangements, at Contractor's cost, for temporary use of private properties, in which case Contractor and Contractor's surety shall indemnify and hold harmless the City against claims or demands arising from such use of properties outside of rights-of-way.
- C Restrict total length which materials may be distributed along the route of the construction at any one time to 1,000 linear feet unless otherwise approved by Engineer.

1.03 PROPERTIES OUTSIDE OF RIGHTS-OF-WAY

- A Altering the condition of properties adjacent to and along rights-of-way will not be permitted unless authorized by the Engineer.
- B Means, methods, techniques, sequences, or procedures which will result in damage to properties or improvements in the vicinity outside of rights-of-way will not be permitted.
- C Any damage to properties outside of rights-of-ways shall be repaired or replaced to the satisfaction of the Engineer and at no cost to the City.

1.04 USE OF SITE

- A Obtain approvals of governing authorities prior to impeding or closing public roads or streets. Do not close more than two consecutive intersections at one time.
- B Notify Engineer 72 hours prior to closing a street or a street crossing. Permits for street closures are required in advance and are the responsibility of the Contractor.

- C Maintain access for emergency vehicles including access to fire hydrants.
- D Avoid obstructing drainage ditches or inlets; when obstruction is unavoidable due to requirements of the Work, provide grading and temporary drainage structures to maintain unimpeded flow.
- E Locate and protect private lawn sprinkler systems which may exist on rights-of-ways within the site. Repair or replace damaged systems to condition equal to or better than that existing at start of Work.
- F Perform daily clean up of dirt outside the construction zone, and debris, scrap materials, and other disposable items. Keep streets, driveways, and sidewalks clean of dirt, debris and scrap materials. Do not leave buildings, roads, streets or other construction areas unclean overnight.

1.05 NOTIFICATION TO ADJACENT OCCUPANTS

- A Notify individual occupants in areas to be affected by the Work of the proposed construction and time schedule. Notification shall be not less than 72 hours or more than 2 weeks prior to work being performed within 200 feet of the homes or businesses.
- B Include in notification names and telephone numbers of two company representatives for resident contact, who will be available on 24-hour call. Include precautions which will be taken to protect private property and identify potential access or utility inconvenience or disruption.
- C Submit proposed notification to Engineer for approval. Consideration shall be given to the ethnicity of the neighborhood where English is not the dominant language. Notice shall be in an understandable language.

1.06 PUBLIC, TEMPORARY, AND CONSTRUCTION ROADS AND RAMPS

- A Construct and maintain temporary detours, ramps, and roads to provide for normal public traffic flow when use of public roads or streets is closed by necessities of the Work.
- B Provide mats or other means to prevent overloading or damage to existing roadways from tracked equipment or exceptionally large or heavy trucks or equipment.
- C Construct and maintain access roads and parking areas as specified in Section 01500 - Temporary Facilities and Controls.

1.07 EXCAVATION IN STREETS AND DRIVEWAYS

- A Avoid hindering or needlessly inconveniencing public travel on a street or any intersecting alley or street for more than two blocks at any one time, except by permission of the Engineer.
- B Obtain the Engineer's approval when the nature of the Work requires closing of an entire street. Permits required for street closure are the Contractor's responsibility. Avoid unnecessary inconvenience to abutting property Citys.
- C Remove surplus materials and debris and open each block for public use as work in that block is complete.
- D Acceptance of any portion of the Work will not be based on return of street to public use.
- E Avoid obstructing driveways or entrances to private property.
- F Provide temporary crossing or complete the excavation and backfill in one continuous operation to minimize the duration of obstruction when excavation is required across drives or entrances.
- G Provide barricades and signs in accordance with Section VI of the State of Texas Manual on Uniform Traffic Control Devices.

1.08 TRAFFIC CONTROL

- A Comply with traffic regulation as specified in Section 01570 - Traffic Control and Regulation.

1.09 SURFACE RESTORATION

- A Restore site to condition existing before construction to satisfaction of the City and Engineer.
- B Repair paved area per the requirements of Section 02571 - Pavement Repair for Utilities.
- C Repair turf areas which become damaged, level with bank run sand conforming to Section 02227 - Excavation and Backfill for Utilities, or topsoil conforming to Section 02920 - Topsoil, as approved by the Engineer and resod in accordance with Section 02935 - Sodding. Water and level newly sodded areas with adjoining turf using steel wheel rollers appropriate for sodding. Do not use spot sodding or sprigging.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION - NOT USED****END OF SECTION**

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Procedures for measurement and payment plus conditions for nonconformance assessment and nonpayment for rejected products.

1.02 AUTHORITY

- A Measurement methods delineated in Specification sections are intended to complement the criteria of this section. In the event of conflict, the requirements of the Specification section shall govern.
- B Measurements and quantities submitted by the Contractor will be verified by the Engineer.
- C Contractor shall provide necessary equipment, workers, and survey personnel as required by Engineer to verify quantities.

1.03 UNIT QUANTITIES SPECIFIED

- A Quantity and measurement estimates stated in the Agreement are for contract purposes only. Quantities and measurements supplied or placed in the Work and verified by Engineer shall determine payment as stated in the General Conditions.
- B If the actual Work requires greater or lesser quantities than those quantities indicated in the Bid Form, provide the required quantities at the unit prices contracted, except as otherwise stated in the General Conditions.

1.04 MEASUREMENT OF QUANTITIES

- A Measurement by Weight: Reinforcing steel, rolled or formed steel or other metal shapes will be measured by CRSI or AISC Manual of Steel Construction weights. Welded assemblies will be measured by CRSI or AISC Manual of Steel Construction or scale weights.
- B Measurement by Volume:
 - 1 Stockpiles: Measured by cubic dimension using mean length, width, and height or thickness.
 - 2 Excavation and Embankment Materials: Measured by cubic dimension using the average end area method.

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- C Measurement by Area: Measured by square dimension using mean length and width or radius.
- D Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
- E Stipulated Price Measurement: By unit designated in the agreement.
- F Other: Items measured by weight, volume, area, or lineal means or combination, as appropriate, as a completed item or unit of the Work.

1.05 PAYMENT

- A Payment Includes: Full compensation for all required supervision, labor, products, tools, equipment, plant, transportation, services, and incidentals; and erection, application or installation of an item of the Work; and Contractor's overhead and profit.
- B Total compensation for required Unit Price Work shall be included in Unit Price bid in Bid schedule. Claims for payment as Unit Price Work, but not specifically covered in the list of unit prices contained in Bid Schedule, will not be accepted.
- C Interim payments for stored materials will be made only for materials to be incorporated under items covered in unit prices, unless disallowed in Special Conditions. Such materials must be stored on the job site or at a location approved by the Engineer. No payment will be made for street construction, backfill or landscape materials on hand.
- D Progress payments will be based on the Engineer's observations and evaluations of quantities incorporated in the Work multiplied by the unit price.
- E Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities determined by Engineer multiplied by the unit price for Work which is incorporated in or made necessary by the Work.

1.06 NONCONFORMANCE ASSESSMENT

- A Remove and replace the Work, or portions of the Work, not conforming to the Contract Documents.
- B If, in the opinion of Engineer, it is not practical to remove and replace the Work, the Engineer will direct one of the following remedies:
 - 1 The nonconforming Work will remain as is, but the unit price will be adjusted to a lower price at the discretion of Engineer.

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- 2 The nonconforming Work will be modified as authorized by the Engineer, and the unit price will be adjusted to a lower price at the discretion of Engineer, if the modified work is deemed to be less suitable than originally specified.
- C Specification sections may modify these options or may identify a specific formula or percentage price reduction.
- D The authority of Engineer to assess the nonconforming work and identify payment adjustment is final.

1.07 NONPAYMENT 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 to Engineer.
 - 2 Products determined as nonconforming before or after placement.
 - 3 Products not completely unloaded from transporting vehicle.
 - 4 Products placed beyond the lines and levels of the required Work.
 - 5 Products remaining on hand after completion of the Work, unless specified otherwise.
 - 6 Loading, hauling, and disposing of rejected products.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL

- A It is the intent of the Proposal that the aggregate bid amount as submitted shall cover all work required by Contract Documents in place, complete, and ready for use.
- B Unit prices in the Proposal include all compensation for full completion of all work items in place, and include providing all labor, materials, tools, equipment, services, supplies, incidentals and all necessary operations.
- C Work to protect items to remain by installation of temporary construction; including posting of warning signs, placement of protective fencing, barriers, barricades and covers, and restoration of damaged items to remain; will be considered incidental to the various pay items and no separate payment for this work will be made.
- D Work necessary to HAUL materials from original positions to points of disposition, including excavation of earth materials and utilization in construction or other

disposition, will be considered incidental to the various pay items and no separate payment for this work will be made.

- E. Work necessary to provide proper drainage during construction; including maintaining sections, existing ditches, channels, culverts, and sewers and including temporary construction and maintenance of ditches and drainage ways, will be considered incidental to the various pay items and no separate payment for this work will be made.
- F. No costs in connection with work required by the Contract Documents for proper and successful completion of the Contract will be paid outside of or in addition to unit prices submitted in the Bid Proposal.
- G. Work not specifically set forth in the Bid Proposal as unit price pay items shall be considered subsidiary obligations of Contractor and costs shall be included in unit prices named in the Bid Proposal.

PART 4 UNIT PRICES

4.01 WATER LINE INSTALLATION

- A. Water lines will be measured horizontally by the linear foot of pipe installed or removed and replaced for all depths and for each size and type and shall be measured from centerline of fitting to centerline of fitting. No deduction in length will be made for valves or fittings. Measurement for casing shall be by the linear foot as indicated in the bid proposal.
- B. This shall be full compensation for providing all labor, materials, tools, equipment, necessary operations and all incidentals to install the pipe in place by open cut or augered construction.
- C. In the event that the alignment and depth of the proposed water line is changed due to field conditions, any additional fittings such as tees, crosses, thrust blocking, reducers, bends, and any appurtenances necessary shall be incidental to the cost of water line installed. Payment for additional length of pipe installed (regardless of depth) shall be made at the established bid unit price in the Contract.
- D. No water line will be paid for until tested and disinfected.
- E. The cost of fittings, tees, crosses, thrust blocking, joint restraints, reducers, tracer wire and bends shall be incidental to the various sizes of pipe to be installed and no additional payment will be allowed, and the associated cost thereof should be included in the price bid for the various sizes of pipe to be installed.
- F. Fittings shall include all concrete thrust blocking.

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- G. Incidental items include all pavement types, sidewalk, curb and driveway removal and replacement unless indicated otherwise on the Plans, bedding and backfill including cement stabilized sand backfill where backfill is under pavements (all types) or alleys (paved or non-paved), all surface and site restoration, testing and all incidentals.
- H. The water line installation across all driveways, street crossings, tree crossings, landscaped areas, and any other additional areas identified in the field shall be accomplished by augured construction. In the event the Contractor chooses to install the water line by open cut construction in other areas, no separate payment shall be made for bedding and backfill (including cement stabilized sand), surface restoration including pavement, sidewalk, driveway and curb removal and replacement.

4.02 VALVES

- A. Valves will be measured by the number installed and will be paid for at the applicable contract unit bid price listed in the proposal.
- B. The cost of the valve box for gate valves and Inserta-Valves will not be paid for separately, but will be included in the bid price for the valve.
- C. The cost of permanently installed blow off valves, as called out by design drawings, shall be paid for separately per bid price.
- D. Temporary blow off valves used for testing purposes will not be paid for separately.
- E. Cost shall include all concrete blocking.

4.03 TAPPING SLEEVE AND VALVE

- F. Tapping sleeve and valve shall be measured by each installed and paid for at the contract bid price.
- G. The cost of the valve box and gate valve will not be paid for separately, but will be included in the bid price for the tapping sleeve and valve.
- H. Unit price shall include all concrete blocking.

4.04 FIRE HYDRANT ASSEMBLY

- A. Fire hydrant assembly shall be measured by the number installed and paid for at the bid unit price. The work shall be performed as per the details shown on the plans.
- B. Unit price shall include all concrete blocking, tie rods, drainage medium, and fittings, and bends including gate valves, lead pipe and barrel pipe (as necessary). Main line tee shall be included in the unit price for water main.

- C. Additional lead pipe lengths required for fire hydrant installations greater than 5 feet from main shall be measured by the linear foot and paid for at the contract unit price bid for 6" waterline as indicated in the bid proposal.
- D. The work shall be performed as per the detail shown on the plans.

4.05 REMOVE & SALVAGE EXISTING FIRE HYDRANTS AND VALVES

- A. This item consists of the removal of existing fire hydrants and valves as noted on the drawings and specifications.
- B. Removal and salvage of fire hydrant shall be measured and paid for by each fire hydrant delivered to the City and will include all costs for removal (includes removal and disposal of lead pipe and associated appurtenances), storage and delivery of the fire hydrants to a location requested by the City.
- C. Removal and salvage of valves shall be measured and paid for by each valve removed and delivered to the City and will include all costs for removal, storage, and delivery of the valves to a location requested by the City. In line valves on existing lines being abandoned shall be closed watertight, plugged, thrust blocked and the operating nut on said valve be cut off. All valve boxes on abandoned lines shall be removed, except those in paved area. Those located in paved areas shall be poured full of concrete and the cap shall be permanently removed at no additional cost to the project (No separate pay).
- D. Contractor shall obtain written and signed receipt from the City verifying delivery of fire hydrant prior to payment.

4.06 WATER SERVICE (SHORT AND LONG)

- A. This item shall apply for service (short and long) tie-ins to newly installed water mains and service (short and long) tie-ins to water mains not designated for replacement.
- B. This item will be paid for each service installed and reconnected at all depths and all sizes (single and dual services). In the event, water service tubing is in excess of the linear footage outlined below, the extra service line tubing (as applicable) shall be paid per the pertinent bid item.
 - 1. Service line tubing lengths shall be the following for residential service:
 - a. Single Short Side: 20-feet
 - b. Single Long Side: 60-feet
- C. This shall be full compensation for providing labor, materials, tools, equipment, incidentals, and all necessary operations to perform the work. Incidental items include all pavement, sidewalk, curb and driveway removal and replacement unless indicated otherwise on the Plans, cement stabilized sand bedding and cement stabilized sand

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backfill where backfill is under pavements, augering, and all surface and site restoration and all testing.

4.07 WATER METER AND BOX (NEW AND RELOCATION)

- A. This item will apply to installation of a new water meter and box to replace an existing water meter and box or to relocate an existing water meter and box.
- B. The contractor shall obtain the water meters from the CITY supplier. The Contractor is responsible for providing the box and other fittings and appurtenances.
- C. This item shall not be measured separately and shall be incidental to Short Side or Long Side Water Service as applicable.
- D. For water meters that are designated by the City to be removed (No separate pay) the Contractor shall note the address and serial number of each water meter removed and salvaged and obtain written and signed receipt from the City acknowledging delivery of water meter prior to payment.

4.08 CONNECTION TO EXISTING WATER LINES

- A. Payment for connection of existing water line to new water lines shown on drawings is on contract unit bid price basis for each wet connection. Separate payment will be made for each size of water line as indicated in the bid proposal.
- B. 2-inch thru 4-inch connection:
 - 1. All fittings, saddles, pipe and tools required to make the connection shall be incidental to the cost of the connection.
 - 2. All pipe removed to make connection shall be incidental to cost of connection.
- C. 6-inch and larger connection:
 - 1. Standard wet connection or connection by use of tee or cross shall be considered one connection.
 - 2. Connection by use of tapping sleeve and valve shall be paid for at the bid unit price described as "tapping sleeve and valve."
 - 3. All pipe removed to make connection shall be incidental to cost of connection.

4.09 CUT, PLUG AND ABANDON EXISTING WATERLINE

- A. This item shall be measured and paid for by each water line cut, plugged and abandoned as shown on the plans regardless of the depth at the sizes indicated in the bid proposal. The Contractor shall transfer all affected services to the proposed mains prior to abandonment of existing mains and shall obtain City's concurrence prior to performing the abandonment.
- B. This shall be full compensation for providing all labor, materials, tools, equipment necessary operations and all appurtenances to cut, plug and abandon existing water line in place, removal of pipe if necessary, and install plug on existing waterline remaining in service.

4.10 PAVEMENT REPAIR

- A. This item shall only apply to areas designated for pavement removal and replacement as shown on the plan drawings.
- B. This item consists of a pavement repair required as part of the water line installation. In the event the limits of the pavement removal and replacement exceed the limits shown on the plans the Contractor must obtain prior approval from the City and the Engineer. In those instances payment shall be made at the bid unit price. Any other areas not shown on the drawings where pavement removal and replacement is necessary shall be incidental to the cost of the project. The Contractor shall obtain prior approval from the City if pavement removal and replacement is necessary in areas not designated on the plan drawings.
- C. This bid item includes all work to sawcut, remove the existing pavement or roadway material, and replace the pavement section to the existing thickness or thicker and replace the pavement section to equal or better than the existing pavement section.

Pavement sections thicknesses shall match existing pavement thickness and in no case will be less than the following thicknesses:

- 1. Concrete: 7-inch reinforced concrete - doveled into existing concrete, compacted subgrade.
- 2. Asphalt Overlay on top of concrete - 2-inch
- 3. Asphalt Pavement = 2-inch Type D HMA, 12-inch crushed stone with 6-inch cement stabilized sand subgrade.
Or
8-inch asphalt stabilized base (black base) with 6-inch cement stabilized sand subgrade.

- D. Texas Department of Transportation Rights-of-Way Areas – Pavement thickness, reinforcement, and type shall match existing and meet TxDOT's requirements (no separate payment).
- E. Contractor shall refer to the pertinent specifications for other items which could affect measurement and payment. No payment will be made for work outside maximum payment limits, or in areas removed or replaced for Contractor's convenience.
- F. This item shall be payment for all work necessary to complete the removal and replacement complete in place.
- G. In the event the pavement to be removed and replaced is concrete pavement with asphalt overlay, the cost of replacing the asphalt to match the existing shall be incidental to the cost of concrete removal and replacement bid item.

4.11 TRENCH SAFETY REQUIREMENTS

- A. As per Section 01526.
- B. Will be measured by one unit for each linear foot of pipe trench safety installed for trenches that are greater than 5-feet in depth.
- C. This item will be paid by unit price bid.
- D. This shall be full compensation for all work required to comply with the State of Texas Trench Safety Act, including the design of an appropriate system by a registered Engineer.
- E. For trench depths less than 5-feet the Contractor shall implement all necessary measures to obtain and maintain safe trench conditions. Non payment for trenches at depths less than 5-feet in no way relieves the Contractor of his obligation to maintain a safe trench system.
- F. Depth measurement shall be performed from the highest edge of the trench to the bottom of the trench. The measurement of the trench depth shall be to the closest foot and shall apply to the payment depth range as follows:

Actual Depth Measurement
 0 to 4.9-feet
 5.0-feet and above

Depth Payment Range
 No Payment
 As per bid proposal

4.12 FILTER FABRIC FENCE (WITH OR WITHOUT REINFORCEMENT)

- A. Filter fabric fence will be measured by the linear foot of completed and accepted filter fabric fence between the limits of the beginning and ending of wooden stakes. Filter

fabric fence, measured as stated, will be paid for each type at the unit price bid, complete in place.

- B. Payment for filter fabric fence will include and be full compensation for all labor, equipment, materials, supervision, and all incidental expenses for construction of these items, complete in place, including, but not limited to protection of trees, maintenance requirements, repair and replacement of damaged sections, removal and disposal of sediment deposits, and removal of erosion and sediment control systems at the end of construction.
- C. The Contractor shall install and maintain filter fabric fence in areas where active construction is ongoing.

4.13 INLET PROTECTION BARRIERS (INCLUDING STAGE II INLET)

- A. Inlet Protection Barrier (including Stage II) will be measured by each inlet protection barrier installed at the location shown on the plan drawings.
- B. Payment will include and be full compensation for all labor, equipment, materials, supervision, and all incidental expenses for construction of this item, complete and in place, including but not limited to furnishing and placing all materials, maintenance requirements, repair and replacement of damaged sections, removal and disposal of sediment deposits, and removal and disposal of erosion protection and sediment control systems after final stabilization.

4.14 RESTRAINED PLUGS

- A. Restrained MJ plugs with or without taps shall be measured by each type and class installed and paid for at the contract bid price as shown on the bid form.
- B. The cost of connections, blocking, bedding, backfill, and other Water Line construction incidental items will not be paid for separately, but will be included in the bid price for the restrained plug.

4.15 MISCELLANEOUS ALLOWANCE AS DIRECTED BY ENGINEER

- A. This item shall be utilized for payment for miscellaneous items as directed by the Engineer upon prior approval by the City.
- B. This item cannot be utilized without obtaining prior approval from the City.

4.16 EXTRA CONCRETE (ALL CLASSES)

- A. This item will be measured by each cubic yard complete in place and paid for by the bid unit price.

- B. This shall be full compensation for labor, materials, tools and operations necessary to provide extra concrete.
- C. Includes concrete in excess of amount required for normal thrust blocking, bollard supports or pipe connections collars. This work shall only be performed if requested by the City.

4.17 WET CONDITION BEDDING

- A. This item shall be paid for per linear foot of pipe installed utilizing wet condition bedding as per the detail shown on the plan drawings regardless of the depth and sizes as indicated in the bid proposal.
- B. Wet condition bedding shall be utilized when installation of the water line in water bearing silts and sands where mechanical dewatering does not provide a firm and a stable trench bottom.
- C. This item includes all work necessary to install the wet condition bedding including all filter fabrics and other materials.

4.18 PIEZOMETERS

- A. This item is intended to apply to the payment for a piezometer for the purpose of determining ground water prior to excavation.
- B. It will be paid for each piezometer installed, when it is determined that well pointing is not necessary. If it is determined that well pointing is necessary, then the cost of the piezometer will be incidental to the well pointing.
- C. This bid item includes the cost for all installation, removal and recording and reporting of data associated with the piezometer as necessary.

4.19 EXTRA CEMENT STABILIZED SAND BACKFILL

- A. This item will be measured by each cubic yard complete in place and paid for by the bid unit price. This item is for cement stabilized sand that is required in excess of the amount required for normal backfill and requested by City.
- B. This shall be full compensation for labor, materials, tools and operations necessary to provide extra cement stabilized sand backfill.
- C. Measurement shall be by typical trench section area filled with cement stabilized sand backfill times trench length.

4.20 EXTRA BANK SAND BACKFILL

- A. This item shall be measured by the one unit for each cubic yard complete in place and paid for by unit price. This item shall apply for the placement of bank sand in excess of amount required for normal bedding and backfill included originally and requested by the City and Engineer
- B. This shall be full compensation for labor, materials, tools and operations necessary to provide extra cement stabilized sand backfill.
- C. Measurement shall be by typical trench section area filled with bank sand backfill times trench length.

4.21 EXTRA SERVICE TUBING

- A. As per Section 02665.
- B. This bid item shall be paid per the linear foot of extra water service line (long or short) necessary to complete the connection from the water main that is in excess of the Water Service Line (Short and Long) bid item.
- C. This shall be full compensation whether the additional footage is installed by open-cut or by augered construction.
- D. Incidental items include all bedding, backfill, cement stabilized sand backfill, pavement restoration (includes streets, alleys, sidewalks, and driveways), connection to existing water meter, and surface restoration as incidentals.

4.22 SOLID SHEET SHORING ORDERED LEFT IN PLACE

- A. This item shall be paid for per linear foot of trench, where solid sheet shoring has been ordered left in place regardless of depth.
- B. Solid sheet shoring ordered left in place shall be utilized when it is necessary to protect adjacent utilities, significant structures and other facilities. It is the Contractor's responsibility to notify and obtain concurrence with the City if such conditions exist which may require solid sheet shoring left in place.
- C. This bid item includes all costs associated with leaving solid sheet shoring in place.

4.23 WELL POINT SYSTEMS

- A. This item will be measured by the one unit for each linear foot of trench dewatered by well pointing systems regardless of the depth and sizes and paid for by unit price. This item shall apply for water line installation by open cut or augered construction

(including insertion and receiving pits). Payment shall be made for actual linear feet of trench well pointed.

- B. This shall be full compensation for labor, materials, tools and operations necessary.
- C. Includes lowering and maintaining ground water level not less than 12-inches below bottom of excavation.

4.24 BRACE, SUPPORT AND PROTECT UTILITY STRUCTURES

- A. This item shall be measured by each utility structure (power poles, telephone structures) braced, supported and protected to facilitate the water line installation and shall be paid for as indicated in the bid proposal.
- B. This shall be full compensation for providing all labor, materials, tools, equipment necessary operations and all coordination with the appropriate utility company as necessary to perform the work.
- C. Brace, support and protect utility structures shall be utilized when it is necessary, in the opinion of the Contractor, to protect significant structures and other facilities. It is the Contractor's responsibility to notify the City if such conditions exist which may require such effort. The Contractor shall obtain concurrence with the City prior to performing such effort.

4.25 REMOVAL AND REPLACEMENT OF CONCRETE CURB/CURB AND GUTTER/SIDEWALK/DRIVEWAYS

- A. This item shall be performed as per details shown on the plans per the specifications. This item shall only apply if shown on the plan drawings.
- B. No payment for removal and replacement of concrete curb and gutter, sidewalk, and driveways (regardless of type). The Contractor shall remove and replace with like material at no cost to the project.
- C. In the event the Contractor chooses to open cut across driveways and obtains concurrence with the City, the removal and replacement shall extend to the right-of-way regardless of the trench width. No payment shall be made for driveway replacement. The work shall be incidental to the unit price bid for open cut construction and augered construction.

END OF SECTION

SECTION 01045

CUTTING AND PATCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Cutting, patching and fitting of Work to existing facilities, or to accommodate installation or connection of Work with existing facilities, or to uncover work for access, inspection or testing.

1.02 CUTTING AND PATCHING

- A Perform activities to avoid interference with facility operations and the Work of others in accordance with all provisions and sections of these specifications.
- B Execute cutting and patching, including excavation, backfill and fitting to:
 - 1. Remove and replace defective Work or Work not conforming to the Drawings and Specifications.
 - 2. Take samples of installed Work as required for testing.
 - 3. Remove construction required to provide for specified alteration or addition to existing work.
 - 4. Uncover Work to provide for inspection or reinspection of covered Work by the City Representative or regulatory agencies having jurisdiction.
 - 5. Connect any Work that was not accomplished in the proper sequence to completed Work.
 - 6. Remove or relocate existing utilities and pipes which obstruct Work to which connections must be made.
 - 7. Make connections or alterations to existing or new facilities.
 - 8. Provide openings, channels, chases and flues, if any, and do cutting, patching and finishing.
- C Restore existing work to a state equal to or better than that prior to cutting and patching. Restore new Work to standards of these Specifications.

- D. Support, anchor, attach, match, trim and seal materials to the Work of others. Unless otherwise specified, furnish and install sleeves, inserts, hangers, required for the execution of the Work.
- E. Provide shoring, bracing and support as required to maintain structural integrity and protect adjacent Work from damage during cutting and patching. Before cutting beams or other structural members, anchors, lintels or other supports, request written instructions from the City Representative. Follow such instructions, as applicable.

1.03 SUBMITTALS

- A. Submit written notice to the City Representative requesting consent to proceed prior to cutting which may affect structural integrity or design function, City operations, or work of another contractor.
- B. Include the following in submittal:
 - 1. Identification of project.
 - 2. Description of affected Work.
 - 3. Necessity for cutting.
 - 4. Effect on other work and on structural integrity.
 - 5. Include description of proposed Work:
 - a. Scope of cutting and patching.
 - b. Contractor, subcontractor or trade to execute Work.
 - c. Products proposed to be used.
 - d. Extent of refinishing.
 - e. Schedule of operations.
 - 6. Alternatives to cutting and patching, if any.
- C. Should conditions of Work or schedule indicate change of materials or methods, submit a written recommendation to the City Representative including:
 - 1. Conditions indicating change.

- 2. Recommendations for alternative materials or methods.
- 3. Submittals as required for substitutions.
- D. Submit written notice to the City Representative designating time Work will be uncovered for observation. Do not begin cutting or patching operations until authorized by the City Representative.

1.04 CONNECTIONS TO EXISTING FACILITIES

- A. Perform construction necessary to complete connections and tie-ins to existing facilities. Keep all existing facilities in continuous operation unless otherwise specifically permitted in these Specifications or approved by the City Representative.
- B. Coordinate with the City Representative, interruption of service requiring connection into existing facilities. Bypassing of wastewater or sludge to waterways is not permitted. Provide temporary pumping facilities to handle wastewater if necessary. Use temporary bulkheads (e.g., inflatable plugs) to minimize disruption. Provide temporary power supply and piping to facilitate construction where necessary.
- C. Submit a detailed schedule of proposed connections, including shut-downs and tie-ins. Include in the submittal the proposed time and date as well as the anticipated duration of the Work. Submit the detailed schedule coordinated with the construction schedule.
 - 1. Provide specific time and date information to the City Representative 48 hours in advance of proposed Work.
- D. Procedures and Operations:
 - 1. Only city personnel shall operate any valve, gate or other item of equipment without authorization of the City.
 - 2. Insofar as possible, equipment shall be tested and in operating condition before final tie-ins are made to connect equipment to the existing facility.
 - 3. Carefully coordinate Work and schedules. Provide written notice to the City Representative at least 48 hours before shut-downs or by-passes are required.

PART 2 PRODUCTS - NOT USED.

PART 3 EXECUTION - NOT USED.

END OF SECTION

SECTION 01090

REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Section includes general quality assurance as related to Reference Standards and a list of references.

1.02 QUALITY ASSURANCE

- A. For Products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on the date as stated in the General Conditions.
- C. Request clarification from Engineer before proceeding should specified reference standards conflict with Contract Documents.

1.03 SCHEDULE OF REFERENCES

AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, N.W Washington, DC 20001
ACI	American Concrete Institute P.O. Box 19150 Redford Station Detroit, MI 48219-0150
AGC	Associated General Contractors of America 1957 E Street, N.W. Washington, DC 20006
AI	Asphalt Institute Asphalt Institute Building College Park, MD 20740
AITC	American Institute of Timber Construction

	333 W. Hampden Avenue Englewood, CO 80110
AISC	American Institute of Steel Construction 400 North Michigan Avenue, Eighth Floor Chicago, IL 60611
AISI	American Iron and Steel Institute 1000 16 th Street, N.W. Washington, DC 20036
ASME	American Society of Mechanical Engineers 345 East 47 th Street New York, NY 10017
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
APA	American Plywood Association Box 11700 Tacoma, WA 98411
API	American Petroleum Institute 1220 L Street, N.W. Washington, DC 20005
AREA	American Railway Engineering Association 50 F Street, N.W. Washington, DC 20001
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWPA	American Wood-Preservers' Association 7735 Old Georgetown Road Bethesda, MD 20014
AWS	American Welding Society P.O. Box 35104 Miami, FL 33135
AWWA	American Water Works Association

	6666 West Quincy Avenue Denver, CO 80235
CLFMI	Chain Link Fence Manufactures Institute 1101 Connecticut Avenue, N.W. Washington, DC 20036
CRD	U.S.A. Corps. Of Engineers
CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Road Schaumburg, IL 60173-4758
EJMA	Expansion Joint Manufacturers Association 707 Westchester Avenue White Plains, NY 10604
FS	Federal Standardization Documents General Services Administration, Specifications Unit (WFSIS) 7 th and D Streets, S.W. Washington, DC 20406
ICEA	Insulated Cable Engineer Association P.O. Box 440 S. Yarmouth, MA 02664
IEEE	Institute of Electrical and Electronics Engineers 445 Hoes Lane P.O. Box 1331 Piscataway, NJ 0855-1331
MIL	Military Specifications General Services Administration, Specifications Unit (WFSIS) 7 th and D Streets, S.W. Washington, DC 20406
NACE	National Association of Corrosion Engineers P.O. Box 986 Katy, TX 77450
NEMA	National Electrical Manufacturers' Association 2101 L Street, N.W., Suite 300 Washington, DC 20037
NFPA	National Fire Protection Association

	Batterymarch Park, P.O. Box 9101 Quincy, MA 02269-9101
OSHA	Occupational Safety Health Administration U.S. Department of Labor, Government Printing Office Washington, DC 20402
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077-1083
PCI	Prestressed Concrete Institute 201 North Wacker Drive Chicago, IL 60606
SDI	Steel Deck Institute Box 9506 Canton, OH 44711
SSPC	Steel Structures Painting Council 4400 Fifth Avenue Pittsburgh, PA 15213
TAC	Texas Administrative Code
TNRCC	Texas Commission on Environmental Quality P.O. Box 13087 Austin, TX 78711-3087
TxDOT	Texas Department of Transportation 11 th and Brazos Austin, TX 78701-2483
UL	Underwriters' Laboratories, Inc. 333 Pfingston Road Northbrook, IL 60062
UNI-BELL	UNI-BELL Pipe Association 2655 Villa Creek Drive, Suite 155 Dallas, TX 75234

**City of Waller
Standard Specifications****REFERENCE STANDARDS**

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01526

TRENCH SAFETY SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Trench safety system for the construction of trench excavations.
- B. Trench safety system for structural excavations which fall under provisions of State and Federal trench safety laws.

1.02 UNIT PRICES

- A. Measurement for trench safety systems used on trench excavations is on a linear foot basis measured along the centerline of the trench, including manholes and other line structures. No separate measurement will be made of shoring systems used by the Contractor for protection unless identified as Special Shoring on the Drawings. Shoring, other than Special shoring, will be included in the trench safety system measurements.
- B. Measurement for Special Shoring system installations shown on the Drawings and included in the bid schedule for trench excavations, is on a square foot basis.
- C. No payment will be made for trench safety systems for structural excavations under this section. Include payment for trench safety system in applicable structure installation sections.
- D. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 DEFINITIONS

- A. A trench is 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.
- B. The trench safety system requirements apply to larger open excavations if the erection of structures or other installations limits the space between the excavation slope and the installation to dimensions equivalent to a trench as defined.
- C. Trench Safety Systems include both Protective Systems and Shoring Systems but are not limited to sloping, sheeting, trench boxes or trench shields, slide rail systems, sheet

piling, cribbing, bracing, shoring, dewatering or diversion of water to provide adequate drainage.

1. Protective Systems: A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of an adjacent structure.
2. Shoring System: A structure that supports the sides of an excavation and which is designed to prevent cave-ins, or to prevent movements of the ground affecting adjacent installations or improvements.
3. Special Shoring: A shoring system meeting Special Shoring Requirements for locations identified on the Drawings.

1.04 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. 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, and in accordance with any Special Shoring requirements at locations shown on the Drawings.
- C. Have construction and shop drawings for trench safety systems sealed as required by OSHA by a licensed Professional Engineer retained and paid by the Contractor.
- D. Review of the safety program by the Engineer will only be in regard to compliance with the Contract Documents and will not constitute approval by the Engineer nor relieve Contractor of obligations under State and Federal trench safety laws.

1.05 REGULATORY REQUIREMENTS

- A. Install and maintain trench safety systems in accordance with 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 on Tuesday, October 31, 1989. The sections that are incorporated into these specifications by reference include Sections 1926-650 through 1926-652.
- B. A reproduction of the OSHA standards included in "Subpart P - Excavations" from the Federal Register Vol. 54, No. 209 is available upon request to Contractors bidding on City's projects. The City assumes no responsibility for the accuracy of the

reproduction. The Contractor is responsible for obtaining a copy of this section of the Federal Register.

- 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. Reference materials, if developed for a specific project, will be issued with the Bid Documents, including the following:
 - 1. Geotechnical information obtained for use in design of the trench safety system.
 - 2. Special Shoring Requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install and maintain trench safety systems in accordance with provisions of OSHA 29CFR.
- B. Install specially designed trench safety systems shall be installed in accordance with the Contractor's trench excavation safety program for the locations and conditions identified in the program. Install Special Shoring at the locations shown on the Drawings.
- C. Obtain verification from a competent person, as identified in the Contractor's trench excavation safety program, that trench boxes and other premanufactured systems are certified for the actual installation conditions.

3.02 INSPECTION

- A. Conduct daily inspections by Contractor or Contractor's independently retained consultant, of the trench safety systems to ensure that the installed systems and operations meet OSHA 29CFR and other personnel protection regulations requirements.
- B. If evidence of possible cave-ins or slides is apparent, immediately stop work in the trench and move personnel to safe locations until necessary precautions have been taken to safeguard personnel.
- C. Contractor shall maintain a permanent record of daily inspections.

3.03 FIELD QUALITY CONTROL

- A. Verify specific applicability of the selected or specially designed trench safety systems to each field condition encountered on the project.

END OF SECTION

SECTION 01535

TREE AND PLANT PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tree and plant protection.
- B. Minimum qualifications of Arborist and Urban Forester.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 SUBMITTALS

- A. Conform to requirements of Section 01300 - Submittals.
- B. Submit name and experience of qualified Arborist proposed for use of work.

1.04 PROJECT CONDITIONS

- A. Preserve and protect existing trees and plants to remain from foliage, branch, trunk, or root damage that could result from construction operations.
- B. Prevent following types of damage:
 - 1. Compaction of root zone by foot or vehicular traffic, or material storage.
 - 2. Trunk damage from equipment operations, material storage, or from nailing or bolting.
 - 3. Trunk and branch damage caused by ropes or guy wires.
 - 4. Root or soil contamination from spilled solvents, gasoline, paint, lime slurry and other noxious materials.
 - 5. Branch damage due to improper pruning or trimming.
 - 6. Damage from lack of water due to:
 - a. Cutting or altering natural water migration patterns near root zones.
 - b. Failure to provide adequate watering.

7. Damage from alteration of soil pH factor caused by depositing lime, concrete, plaster, or other base materials near roots.
8. Cutting of roots larger than one inch in diameter, other than those called out to be cut with root pruning.

1.05 DAMAGE ASSESSMENT

- A. When trees other than those designated for removal are destroyed or badly damaged as a result of construction operations, remove and replace with same size, species, and variety up to and including 8-inches in trunk diameter. Tree larger than 8-inches in diameter shall be replaced with an 8-inch diameter tree of the same species and variety and total contract amount will be reduced by an amount determined from the following formula: $0.7854 \times D^2 \times \28.00 where D is diameter in inches of tree or shrub trunk measured 12-inches above grade for that portion of the tree which is greater than 8-inches in diameter. Tree removal and replacement must be approved in writing by the City and Project Engineer prior to removing any tree.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Pruning paint: Black latex, water based paint, free of all petroleum products.
- B. Fertilizer: Fertilizer shall be a root stimulant that contains at a minimum the following ingredients: Ectomycorrhizal Fungi, VA Mycorrhizal (VAM) Fungi, *Rhizosphere Bacillus spp.*, Kelp Meal, Humic Acid and Soluble Yucca.
- C. Tree Protection Fencing: Orange, plastic mesh fencing, 4-feet in height with 6-feet high "T" bar posts installed 10-feet on centers.
- D. Plastic Root/Soil Protection: Clear polyethylene sheeting, minimum 6 mil. thickness.

PART 3 EXECUTION

3.01 PROTECTION AND MAINTENANCE OF EXISTING TREES AND SHRUBS

- A. Except for trees and shrubs shown on Drawings to be removed, all trees and shrubs within the project area are to remain and be protected from damage.
- B. For trees to be removed, as designated on the Drawings, perform the following:
 1. Stake right-of-way limits and identify any tree of diameter greater than 4 inches which is to be removed. Mark trees prior to felling with an X in orange paint, clearly visible, on the trunk, and at eye level.

2. After marking trees give a minimum of 48-hours notice in writing to the Engineer of intent to begin felling operations.
 3. Trees whose trunks are only partially in the right-of-way shall be protected and preserved as described below.
- C. For trees or shrubs to remain, perform the following:
1. Trim trees and shrubs only as necessary.
 - a. Trees and shrubs requiring pruning for construction should also be pruned for balance as well as to maintain proper form and branching habit.
 - b. Cut limbs at branch collar. No stubs should remain on trees. Branch cuts should not gouge outer layer of tree structure or trunk.
 2. Use extreme care to prevent excessive damage to root systems.
 - a. Roots in construction areas will be cut smoothly with a trencher before excavation begins. Do not allow ripping of roots with a backhoe or other equipment.
 - b. Temporarily cover exposed roots with wet burlap to prevent roots from drying out.
 - c. Cover exposed roots with soil as soon as possible.
 3. Prevent damage or compaction of root zone (area below dripline) by construction activities.
 - a. Do not allow scarring of trunks or limbs by equipment or other means.
 - b. Do not store construction materials, vehicles, or excavated material under dripline of trees.
 - c. Do not pour liquid materials under dripline.
 4. Water and fertilize trees and shrubs that will remain to maintain their health during construction period.
 - a. Supplemental watering of landscaping during construction should be done once every 7 days in cold months and once every 4 days in hotter months.
 - b. This watering shall consist of saturating soils at least 6 to 8 inches beneath surface.

5. Water areas currently being served by private sprinkler systems while systems are temporarily taken out of service to maintain health of existing landscapes.
6. At option of the Contractor and with the Engineer's permission, trees and shrubs to remain may be temporarily transplanted and returned to original positions under supervision of professional horticulturist.

3.02 PROTECTION

A Protection of Trees or Shrubs in Open Area:

1. Install steel drive-in fence posts in protective circle, approximately 8 feet on center, not closer than 4 feet to trunk of trees or stems of shrubs.
2. Drive steel drive-in fence posts 3 feet minimum into ground, leaving 5 feet minimum above ground.
3. Mount steel hog-wire on fence posts.
4. For trees or shrubs in paved areas, mount concrete-filled steel pipe 2-1/2 inches in diameter minimum in rubber auto tires filled with concrete (movable posts).

B Timber Wrap Protection for Trees in Close Proximity of Moving or Mechanical Equipment and Construction Work:

1. Wrap trunk with layer of burlap.
2. Install 2 x 4's or 2 x 6's (5-foot to 6-foot lengths) vertically, spaced 3 inches to 5 inches apart around circumference of tree trunk.
3. Tie in place with 12 to 9 gage steel wire.

3.03 MAINTENANCE OF NEWLY PLANTED TREES

A Water trees during dry periods.

B The Contractor guarantees that trees planted for this Project shall remain alive and healthy at least until the end of a one-year warranty period.

1. Within four weeks of notice from City, Contractor shall replace, at his expense, any dead trees or any trees that in the opinion of City, have become unhealthy or unsightly or have lost their natural shape as a result of additional growth, improper pruning or maintenance, or weather conditions.
2. When tree must be replaced, the guarantee period for that tree shall begin on date of replacement of tree, subject to the City's inspection, for no less than one year.

3. Straighten leaning trees and bear entire cost.
4. Dispose of trees rejected at any time by Engineer at Contractor's expense.

3.04 ARBORIST AND URBAN FORESTER QUALIFICATIONS

- A. Arborist: All tree pruning, removal, and root stimulation shall be contracted to a qualified Arborist. Arborist shall be normally engaged in the field and have a minimum of 8 years' experience. Qualifications of the selected Arborist shall be submitted for review and approval by the Project Engineer and City.
- B. Urban Forester: An Urban Forestry consultant shall be hired to monitor and assist with field layout (exact locations of fencing, root pruning, and zero curb cutback) of the tree preservation program during demolition and construction to ensure tree protection procedures and techniques are practiced as specified and to address concerns and conditions which occur in the field. At a minimum, the individual responsible for monitoring and field layout of the tree protection shall have a minimum of 5 years of experience as a consultant, and shall not be affiliated with a tree care contractor in the area. Qualifications of the selected Urban Forester shall be submitted for review and approval by the Project Engineer and City.

END OF SECTION

SECTION 01563

CONTROL OF GROUND WATER AND SURFACE WATER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Dewatering, depressurizing, draining, and maintaining trench and structure excavations and foundation beds in dry and stable condition.
- B. Protecting work against surface runoff and rising flood waters.
- C. Disposing of removed water.

1.02 METHOD OF PAYMENT

- A. See Section 01025 - Measurement and Payment for Unit Prices.
- B. Subsurface investigation and groundwater control plan preparation and monitoring shall be incidental to the project and shall include subsurface investigation to identify groundwater conditions, design, install, operate, maintain, and monitor ground water control systems.
- C. No separate payment will be made for control of ground water and surface water except for well pointing and piezometer as noted. Include the cost to control ground water and surface water in unit price for work requiring such controls. Dewatering required to lower water table, for utility installation, construction of structures, removal of standing water, surface drainage seepage, or to protect against rising waters or floods shall be considered incidental to Work.

1.03 DEFINITIONS

- A. Ground water control includes both dewatering and depressurization of water-bearing soil layers.
 - 1. Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from slopes or bottoms of excavations and disposing of removed water. The intent of dewatering is to increase stability of 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.

- 2. Depressurization includes reduction in piezometric pressure within strata not controlled by dewatering alone, as required to prevent failure or heaving of excavation bottom.
- B. Excavation drainage includes keeping excavations free of surface and seepage water.
- C. Surface drainage includes use of temporary drainage ditches and dikes and installation of temporary culverts and sump pumps with discharge lines as required to protect the Work from any source of surface water.
- D. 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.

1.04 PERFORMANCE REQUIREMENTS

- A. Conduct subsurface investigations to identify groundwater conditions and to provide parameters for design, installation, and operation of groundwater control systems.
- B. Design a ground water control system, compatible with requirements of Federal Regulations 29 CFR Part 1926 and Section 01526 - Trench Safety Systems, to produce the following results:
 - 1. Effectively reduce the hydrostatic pressure affecting excavations.
 - 2. Develop a substantially dry and stable subgrade for subsequent construction operations.
 - 3. Preclude damage to adjacent properties, buildings, structures, utilities, installed facilities, and other work.
 - 4. Prevent the loss of fines, seepage, boils, quick condition, or softening of the foundation strata.
 - 5. Maintain stability of sides and bottom of excavations.
- C. 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.
- D. Provide drainage of seepage water and surface water, as well as water from any other source entering the excavation. Excavation drainage may include placement of drainage materials, such as crushed stone and filter fabric, together with sump pumping.
- E. Provide ditches, berms, pumps and other methods necessary to divert and drain surface water from excavation and other work areas.

- F. Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.
- G. 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.
- H. 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.
- I. 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.
- J. Decommission piezometers and monitoring wells installed during design phase studies and left for Contractors monitoring and use.

1.05 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Submit a Ground Water and Surface Water Control Plan for review by the 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.
- C. 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.
- D. 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.
- E. 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.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Comply with requirements of agencies having jurisdiction.
- B. Comply with Texas Commission on Environmental Quality (TCEQ) and Texas Water Well Drillers Association for development, drilling, and abandonment of wells used in dewatering system.
- C. Obtain permit from EPA under the Texas Pollutant Discharge Elimination System (TPDES), for storm water discharge from construction sites. Refer to Section 01565 TPDES Permit Requirements.

- D. Obtain all necessary permits from agencies with control over the use of groundwater and matters affecting well installation, water discharge, and use of existing storm drains and natural water sources. Because the review and permitting process may be lengthy, take early action to pursue and submit for the required approvals.
- E. Monitor ground water discharge for contamination while performing pumping in the vicinity of potentially contaminated sites.

PART 2 PRODUCTS

2.01 EQUIPMENT AND MATERIALS

- A. 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 of the Engineer through submittals required in Paragraph 1.05, Submittals.
- B. 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.
- C. All equipment must be in good repair and operating order.
- D. Sufficient standby equipment and materials shall be kept available to ensure continuous operation, where required.

PART 3 EXECUTION

3.01 GROUND WATER CONTROL

- A. 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 waterbearing layers. The results shall be presented in the Ground Water and Surface Water Control Plan (See Paragraph 1.05B.1).
- B. 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.
- C. Install, operate, and maintain ground water control systems in accordance with the Ground Water and Surface Water Control Plan. Notify Engineer in writing of any changes made to accommodate field conditions and changes to the Work. Provide revised drawings and calculations with such notification.

- D. Provide for continuous system operation, including nights, weekends, and holidays. Arrange for appropriate backup if electrical power is primary energy source for dewatering system.
- E. 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.
- F. 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.
- G. Maintain water level below subgrade elevation. Do not allow levels to rise until foundation concrete has achieved design strength.
- H. During backfilling, dewatering may be reduced to maintain water level a minimum of 5 feet below prevailing level of backfill. However, do not allow that water level to result in uplift pressures in excess of 80 percent of downward pressure produced by weight of structure or backfill in place. Do not allow water levels to rise into cement stabilized sand until at least 48 hours after placement.
- I. 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.
- J. 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.
- K. Remove system upon completion of construction or when dewatering and control of surface or ground water is no longer required.
- L. Compact backfill to not less than 95 percent of the maximum dry density in accordance with ASTM D698.

3.02 REQUIREMENTS FOR EDUCTOR, WELL POINTS, OR DEEP WELLS

- A. For aboveground piping in ground water control system, include a 12-inch minimum length of clear, transparent piping between every eductor well or well point and discharge header so that discharge from each installation can be visually monitored.
- B. Install sufficient piezometers or monitoring wells to show that all trench or shaft excavations in water bearing materials are predrained prior to excavation. Provide

separate piezometers for monitoring of dewatering and for monitoring of depressurization. Install piezometers and monitoring wells for tunneling as appropriate for Contractor's selected method of work.

- C. Install piezometers or monitoring wells not less than one week in advance of beginning the associated excavation.
- D. Dewatering may be omitted for portions of underdrains or other excavations, but only where auger borings and piezometers or monitoring wells show that soil is predrained by an existing system such that the criteria of the ground water control plan are satisfied.
- E. Replace installations that produce noticeable amounts of sediments after development.
- F. Provide additional ground water control installations, or change the methods, in the event that the installations according to the ground water control plan does not provide satisfactory results based on the performance criteria defined by the plan and by the specification. Submit a revised plan according to Paragraph 1.05B.

3.03 EXCAVATION DRAINAGE

- A. Contractor may use excavation drainage methods if necessary to achieve well drained conditions. The excavation drainage may consist of a layer of crushed stone and filter fabric, and sump pumping in combination with sufficient wells for ground water control to maintain stable excavation and backfill conditions.

3.04 MAINTENANCE AND OBSERVATION

- A. Conduct daily maintenance and observation of piezometers or monitoring wells while the ground water control installations or excavation drainage are operating in an area. Keep system in good condition.
- B. Replace damaged and destroyed piezometers or monitoring wells with new piezometers or wells as necessary to meet observation schedule.
- C. 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.
- D. 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.

3.05 MONITORING AND RECORDING

- A. Monitor and record average flow rate of operation for each deep well, or for each wellpoint 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.

- B. 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 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.

3.06 SURFACE WATER CONTROL

- A. 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.
- B. 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 01564

WASTE MATERIAL DISPOSAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Disposal of waste material and salvageable material.

1.02 UNIT PRICES

- 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. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Obtain and submit disposal permits for proposed disposal sites if required by local ordinances.
- C. Submit a copy of written permission from property City, along with description of property, prior to disposal of excess material adjacent to the Project. Submit a written and signed release from property City upon completion of disposal work.

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. Base, surface, and bedding material: Deliver shell, gravel, bituminous, or other base and surfacing material designated for salvage to the location designated by the Engineer.
- C. Pipe culvert: Deliver culverts designated for salvage to City's storage area.
- D. Other salvageable materials: Conform to requirements of individual Specification Sections.
- E. Coordinate delivery of salvageable material with Engineer.

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. Excess soil may be deposited on private property adjacent to the Project when written permission is obtained from property City. See Paragraph 1.03 C above.
- C. Verify the flood plain status of any proposed disposal site. Do not dispose of excavated materials in an area designated as within the 100-year Flood Hazard Area.
- D. 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 01565

TPDES REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Contractor, before conducting construction operations, shall adhere to all requirements in accordance with the Texas Pollutant Discharge Elimination System (TPDES).

END OF SECTION

SECTION 01566

SOURCE CONTROLS FOR EROSION AND SEDIMENTATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Description of erosion and sediment control and other control-related practices which shall be utilized during construction activities.

1.02 UNIT PRICES

- A. Unless indicated in the bid proposal as a pay item, 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.

PART 2 PRODUCT - NOT USED

PART 3 EXECUTION

3.01 PREPARATION AND INSTALLATION

- A. No clearing and grubbing or rough cutting shall be permitted until erosion and sediment control systems are in place, other than site work specifically directed by the engineer to allow soil testing and surveying.
- B. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damage caused by construction traffic to erosion and sediment control systems shall be repaired immediately by the Contractor.
- C. The Contractor shall be responsible for collecting, storing, hauling, and disposing of spoil, silt, and waste materials as specified in this or other Specifications and in compliance with applicable federal, state, and local rules and regulations.
- D. Contractor shall conduct all construction operations under this Contract in conformance with the erosion control practices described in the Drawings and this Specification.
- E. The Contractor shall install, maintain, and inspect erosion and sediment control measures and practices as specified in the Drawings and in this or other Specifications.

3.02 TOPSOIL PLACEMENT FOR EROSION AND SEDIMENT CONTROL SYSTEMS

- A. When topsoil is specified as a component of another Specification, the Contractor shall conduct erosion control practices described in this Specification during topsoil placement operations.

1. When placing topsoil, maintain erosion and sediment control systems, such as swales, grade stabilization structures, berms, dikes, silt fences, and sediment basins.
2. Maintain grades which have been previously established on areas to receive topsoil.
3. After the areas to receive topsoil have been brought to grade, and immediately prior to dumping and spreading the topsoil, loosen the subgrade by discing or by scarifying to a depth of at least 2 inches to permit bonding of the topsoil to the subsoil.

3.03 DUST CONTROL

- A. Implement dust control methods to control dust creation and movement on construction sites and roads and to prevent airborne sediment from reaching receiving streams or storm water conveyance systems, to reduce on-site and off-site damage, to prevent health hazards, and to improve traffic safety.
- B. Control blowing dust by using one or more of the following methods:
 1. Mulches bound with chemical binders.
 2. Temporary vegetative cover.
 3. Tillage to roughen surface and bring clods to the surface.
 4. Irrigation by water sprinkling.
 5. Barriers using solid board fences, burlap fences, crate walls, bales of hay, or similar materials.
- C. Implement dust control methods immediately whenever dust can be observed blowing on the project site.

3.04 KEEPING STREETS CLEAN

- A. Keep streets clean of construction debris and mud carried by construction vehicles and equipment. If necessary, to keep the streets clean, install stabilized construction exits at construction, staging, storage, and disposal areas. A vehicle/equipment wash area (stabilized with coarse aggregate) may be installed adjacent to the stabilized construction exit, as needed. Release wash water into a drainage swale or inlet protected by erosion and sediment control measures.
- B. In lieu of or in addition to stabilized construction exits, shovel or sweep the pavement to the extent necessary to keep the street clean. Waterhosing or sweeping of debris and mud off of the street into adjacent areas is not allowed.

3.05 EQUIPMENT MAINTENANCE AND REPAIR

- A. Confine maintenance and repair of construction machinery and equipment to areas specifically designated for that purpose. Locate such areas so that oils, gasoline, grease, solvents, and other potential pollutants cannot be washed directly into receiving streams or storm water conveyance systems. Provide these areas with adequate waste disposal receptacles for liquid as well as solid waste. Clean and inspect maintenance areas daily.
- B. On a construction site where designated equipment maintenance areas are not feasible, take precautions during each individual repair or maintenance operation to prevent potential pollutants from washing into streams or conveyance systems. Provide temporary waste disposal receptacles.

3.06 WASTE COLLECTION AND DISPOSAL

- A. Contractor shall formulate and implement a plan for the collection and disposal of waste materials on the construction site. In plan, designate locations for trash and waste receptacles and establish a collection schedule. Methods for ultimate disposal of waste shall be specified and carried out in accordance with applicable local, state, and federal health and safety regulations. Make special provisions for the collection and disposal of liquid wastes and toxic or hazardous materials.
- B. Keep receptacles and waste collection areas neat and orderly to the extent possible. Waste shall not be allowed to overflow its container or accumulate from day-to-day. Locate trash collection points where they will least likely be affected by concentrated storm water runoff.

3.07 WASHING AREAS

- A. Vehicles such as concrete delivery trucks or dump trucks and other construction equipment shall not be washed at locations where the runoff will flow directly into a watercourse or storm water conveyance system. Designate special areas for washing vehicles. Locate these areas where the wash water will spread out and evaporate or infiltrate directly into the ground, or where the runoff can be collected in a temporary holding or seepage basin. Beneath wash areas construct a gravel or rock base to minimize mud production.

3.08 STORAGE OF CONSTRUCTION MATERIALS AND CHEMICALS

- A. Isolate sites where chemicals, cements, solvents, paints, or other potential water pollutants are stored in areas where they will not cause runoff pollution.
- B. Store toxic chemicals and materials, such as pesticides, paints, and acids in accordance with manufacturers' guidelines. Protect groundwater resources from leaching by

placing a plastic mat, packed clay, tar paper, or other impervious materials on any areas where toxic liquids are to be opened and stored.

3.09 DEMOLITION AREAS

- A. Demolition activities which create large amounts of dust with significant concentrations of heavy metals or other toxic pollutants shall use dust control techniques to limit transport of airborne pollutants. However, water or slurry used to control dust contaminated with heavy metals or toxic pollutants shall be retained on the site and shall not be allowed to run directly into watercourses or storm water conveyance systems. Methods of ultimate disposal of these materials shall be carried out in accordance with applicable local, state, and federal health and safety regulations.

3.10 SANITARY FACILITIES

- A. Provide the construction sites with adequate portable toilets for workers in accordance with Section 01500 - Temporary Facilities and Controls, and applicable health regulations.

3.11 PESTICIDES

- A. Use and store pesticides during construction in accordance with manufacturers' guidelines and with local, state, and federal regulations. Avoid overuse of pesticides which could produce contaminated runoff. Take great care to prevent accidental spillage. Never wash pesticide containers in or near flowing streams or storm water conveyance systems.

END OF SECTION

SECTION 01567

FILTER FABRIC FENCE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Installation of erosion and sediment control filter fabric fences used during construction and until final development of the site. The purpose of filter fabric fences is to contain pollutants from overland flow. Filter fabric fences are not for use in channelized flow areas.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 SUBMITTALS

- A. Manufacturer's catalog sheets and other product data on geotextile fabric.

PART 2 PRODUCTS

2.01 FILTER FABRIC

- A. Provide woven or nonwoven geotextile filter fabric made of either polypropylene, polyethylene, ethylene, or polyamide material.
- B. Geotextile fabric shall have a grab strength of 100 psi in any principal direction (ASTM D-4632), Mullen burst strength exceeding 200 psi (ASTM D-3786), and the equivalent opening size between 50 and 140.
- C. Filter fabric material shall contain ultraviolet inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0 degrees F to 120 degrees F.
- D. Representative Manufacturer: Mirafi, Inc., or equal.

PART 3 EXECUTION

3.01 PREPARATION AND INSTALLATION

- A. Provide erosion and sediment control systems at the locations shown on Drawings. Such systems shall be of the type indicated and shall be constructed in accordance with

the requirements shown on the Drawings and specified in this Section.

- B. No clearing and grubbing or rough cutting shall be permitted until erosion and sediment control systems are in place, other than site work specifically directed by the Engineer to allow soil testing and surveying.
- C. Regularly inspect and repair or replace damaged components of filter fabric fences as specified in this Section. Unless otherwise directed, maintain the erosion and sediment control systems until the project area stabilization is accepted by the City. Remove erosion and sediment control systems promptly when directed by the Engineer. Discard removed materials off site.
- D. Remove sediment deposits and dispose of them at the designated spoil site for the project. If a project spoil site is not designated on the Drawings, dispose of sediment off site at a location not in or adjacent to a stream or floodplain. Off-site disposal is the responsibility of the Contractor. Sediment to be placed at the project site should be spread evenly throughout the site, compacted and stabilized. Sediment shall not be allowed to flush into a stream or drainage way. If sediment has been contaminated, it shall be disposed of in accordance with existing federal, state, and local rules and regulations.
- E. Conduct all construction operations under this Contract in conformance with the erosion control practices described in Section 01566 - Source Controls for Erosion and Sedimentation.

3.02 CONSTRUCTION METHODS

- A. Provide filter fabric fence systems in accordance with the Drawing detail for Filter Fabric Fences. Filter fabric fences shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.
- B. Attach the filter fabric to 2-inch by 2-inch wooden stakes spaced a maximum of 3 feet apart and embedded a minimum of 8 inches. If filter fabric is factory preassembled with support netting, then maximum spacing allowable is 8 feet. Install wooden stakes at a slight angle toward the source of anticipated runoff.
- C. Trench in the toe of the filter fabric fence with a spade or mechanical trencher as shown on the Drawings. Lay filter fabric along the edges of the trench. Backfill and compact trench.
- D. Filter fabric fence shall have a minimum height of 18 inches and a maximum height of 36 inches above natural ground.

- E. Provide the filter fabric in continuous rolls and cut to the length of the fence to minimize the use of joints. When joints are necessary, splice the fabric together only at a support post with a minimum 6-inch overlap and seal securely.
- F. Inspect sediment filter barrier systems after each rainfall, daily during periods of prolonged rainfall, and at a minimum once each week. Repair or replace damaged sections immediately. Remove sediment deposits when silt reaches a depth one-third the height of the fence or 6 inches, whichever is less.

END OF SECTION

SECTION 01568

REINFORCED FILTER FABRIC BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Installation of reinforced filter fabric barriers for erosion and sediment control used during construction and until the final development of the site. Reinforced filter fabric barriers are used to retain sedimentation in channelized flow areas.

1.02 UNIT PRICES

- A. Unless indicated in the Bid Proposal as a pay item, 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 SUBMITTALS

- A. Manufacturer's catalog sheets and other product data on geotextile fabrics.

PART 2 PRODUCTS

2.01 FILTER FABRIC

- A. Provide woven or nonwoven geotextile filter fabric made of either polypropylene, polyethylene, ethylene, or polyamide material.
- B. Geotextile fabric shall have a minimum grab strength of 100 psi in any principal direction (ASTM D-4632), Mullen burst strength exceeding 200 psi (ASTM D-3786), and the equivalent opening size between 50 and 140.
- C. Filter fabric material shall contain ultraviolet inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0 degrees F to 120 degrees F.
- D. Representative Manufacturers: Mirafi, Inc., or equal.

2.02 FENCING

- A. Provide woven galvanized steel wire fence with minimum thickness of 14 gauge and a maximum mesh spacing of 6 inches.

PART 3 EXECUTION**3.01 PREPARATION AND INSTALLATION**

- A. Provide erosion and sediment control systems at the locations shown on the Drawings. Such systems shall be of the type indicated and shall be constructed in accordance with the requirements shown on the Drawings and specified in this Section.
- B. No clearing and grubbing or rough cutting shall be permitted until erosion and sediment control systems are in place, other than as specifically directed by the Engineer to allow soil testing and surveying.
- C. Regularly inspect and repair or replace damaged components of the reinforced filter fabric barrier as specified in this Section. Unless otherwise directed, maintain the erosion and sediment control systems until the project area stabilization is accepted by the City. Remove erosion and sediment control systems promptly when directed by the Engineer. Discard removed materials off site.
- D. Remove sediment deposits and dispose of them at the designated spoil site for the project. If a project spoil site is not designated on the Drawings, dispose of sediment off site at a location not in or adjacent to a stream or floodplain. Off-site disposal is the responsibility of the Contractor. Sediment to be placed at the project site should be spread evenly throughout the site, compacted and stabilized. Sediment shall not be allowed to flush into a stream or drainage way. If sediment has been contaminated, it shall be disposed of in accordance with existing federal, state, and local rules and regulations.
- E. Conduct all construction operations under this Contract in conformance with the erosion control practices described in Section 01566 - Source Controls for Erosion and Sedimentation.

3.02 CONSTRUCTION METHODS

- A. Provide filter fabric barriers in accordance with the Drawing detail for Reinforced Filter Fabric Barrier. Filter fabric barrier systems shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.
- B. Attach the woven wire support to 2-inch by 2-inch wooden stakes spaced a maximum of 6 feet apart and embedded a minimum of 8 inches. Install wooden stakes at a slight angle toward the source of the anticipated runoff.
- C. Trench in the toe of the filter fabric barrier with a spade or mechanical trencher as shown on the Drawings. Lay filter fabric along the edges of the trench. Backfill and

compact trench.

- D. Securely fasten the filter fabric material to the woven wire with tie wires.
- E. Reinforced filter fabric barrier shall have a minimum height of 18 inches.
- F. Provide the filter fabric in continuous rolls and cut to the length of the fence to minimize the use of joints. When joints are necessary, splice the fabric together only at a support post with a minimum 6-inch overlap and seal securely.
- G. Inspect the reinforced filter fabric barrier systems after each rainfall, daily during periods of prolonged rainfall, and at a minimum once each week. Repair or replace damaged sections immediately. Remove sediment deposits when silt reaches a depth one-third the height of the barrier or 6 inches, whichever is less.
- H. Remove erosion and sediment control systems at end of construction.

END OF SECTION

SECTION 01570

TRAFFIC CONTROL AND REGULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for signs, signals, control devices, flares, lights and traffic signals, as well as construction parking control, designated haul routes and bridging of trenches and excavations.
- B. Qualifications and requirements for use of flagmen.

1.02 SUBMITTALS

- A. Make submittals in accordance with Section 01300 - Submittals

1.03 UNIT PRICES

- A. Refer to Section 01025 – Measurement and Payment for unit price.

1.04 FLAGMEN

- A. Use only flagmen who are off-duty, regularly employed, uniformed peace officers. The Contractor may also utilize certified flagmen at locations approved by the City or Engineer.
- B. Use flagmen to control, regulate and direct an even flow and movement of vehicular and pedestrian traffic, for periods of time as may be required to provide for public safety and convenience, where:
 - 1. Where multi-lane vehicular traffic must be diverted into single-lane vehicular traffic.
 - 2. Where vehicular traffic must change lanes abruptly.
 - 3. Where construction equipment either enters or crosses vehicular traffic lanes and walks.
 - 4. Where construction equipment may intermittently encroach on vehicular traffic lanes and unprotected walks and crosswalks.

- 5. Where traffic regulation is needed due to rerouting of vehicular traffic around the work site.
- 6. Where construction activities might affect public safety and convenience.
- C. The use of flagmen is for the purpose of assisting in the regulation of traffic flow and movement, and does not in any way relieve the contractor of full responsibility for taking such other steps and provide such other flagmen or personnel as the Contractor may deem necessary to protect the work and the public, and does not in any way relieve the Contractor of his responsibility for any damage for which he would otherwise be liable.

Flagmen shall be used and maintained at such points for such periods of time as may be required to provide for the public safety and convenience of travel.

PART 2 PRODUCTS

2.01 SIGNS, SIGNALS, AND DEVICES

- A. Comply with Texas State Manual on Uniform Traffic Control Devices (latest revision).
- B. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.

PART 3 EXECUTION

3.01 PUBLIC ROADS

- A. Abide by laws and regulations of governing authorities when using public roads. If the Contractor's work requires that public roads be temporarily impeded or closed, approvals shall be obtained from governing authorities and permits paid for before starting any work. Coordinate activities with the Engineer.
- B. Give Engineer one-week notice before implementing approved traffic control phases. Inform local businesses of impending traffic control activities.
- C. Notify police department, fire department, and local schools, churches, and businesses in writing a minimum of five business days prior to beginning work.
- D. Contractor shall maintain at all times a 10-foot-wide all-weather lane adjacent to work areas which shall be kept free of construction equipment and debris and shall be for the use of emergency vehicles, or as otherwise provided in the traffic control plan.

- E. Contractor shall not obstruct the normal flow of traffic from 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. on designated major arterials or as directed by the Engineer.
- F. Contractor shall maintain local driveway access to residential and commercial properties adjacent to work areas at all times. Use all-weather materials approved by Engineer to maintain temporary driveway access to commercial and residential driveways. The Contractor shall also give special consideration to maintain access by constructing temporary driveway pavement for schools, apartment complex, day care facilities, hospitals, clinics, retirement and assisted living facilities.
- G. Cleanliness of Surrounding Streets:
 - 1. Keep streets used for entering or leaving the job area free of excavated material, debris, and any foreign material resulting from construction operations in compliance with applicable ordinances.
- H. Remove existing signage and striping that conflict with construction activities or that may cause driver confusion.
- I. Provide safe access for pedestrians along major cross streets.
- J. Alternate closures of cross streets so that two adjacent cross streets are not closed simultaneously.
- K. Do not close more than two consecutive esplanade openings at a time without prior approval from Engineer.

3.02 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and the City's operations.
- B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.
- C. Prevent parking on or adjacent to access roads or in non-designated areas.

3.03 FLARES AND LIGHTS

- A. Provide flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.04 HAUL ROUTES

- A. Utilize haul routes designated by authorities or shown on the Drawings for construction traffic.
- B. Confine construction traffic to designated haul routes.
- C. Provide traffic control at critical areas of haul routes to regulate traffic and minimize interference with public traffic.

3.05 TRAFFIC SIGNS AND SIGNALS

- A. Construct all necessary traffic control devices including but not limited to loop detectors, traffic signal conduits, traffic signal wiring and cross walk signals as shown on the plan drawings.
- B. Install traffic control devices at approaches to the site and on site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
- C. Relocate traffic signs and appurtenances as Work progresses to maintain effective traffic control.
- D. Unless otherwise approved by Engineer, provide driveway signs with the name of business that can be accessed from the particular cross-over. Two signs will be required for each cross-over.
- E. Replace existing traffic control devices in the project area.
- F. Engineer may direct Contractor to make adjustments to traffic control signage to eliminate driver confusion and maintain orderly traffic flow during construction at no additional cost to the City.
- G. Repair or replace signal control devices, detectors or cables where damage occurred due to Contractor's construction efforts or operation of equipment related to paving repairs or removal.

3.06 BRIDGING TRENCHES AND EXCAVATIONS

- A. Whenever necessary, bridge trenches and excavation to permit an unobstructed flow of traffic. Provide steel plates that can be laid across construction areas and major drives of commercial businesses.
- B. Secure bridging against displacement by using adjustable cleats, angles, bolts or other devices whenever bridge is installed:

1. On an existing bus route;
 2. When more than five percent of daily traffic is comprised of commercial or truck traffic;
 3. When more than two separate plates are used for the bridge; or
 4. When bridge is to be used for more than five consecutive days.
- C. Install bridging to operate with minimum noise.
- D. Adequately shore the trench or excavation to support bridge and traffic.
- E. Extend steel plates used for bridging a minimum of one foot beyond edges of trench or excavation. Use temporary paving materials (premix) to feather edges of plates to minimize wheel impact on secured bridging.
- F. Use steel plates of sufficient thickness to support H-20 loading, truck or lane, that produces maximum stress.

3.07 REMOVAL

- A. Remove equipment and devices when no longer required.
- B. Repair damage caused by installation.
- C. Remove post settings to a depth of 2 feet.

3.08 MAINTENANCE OF EQUIPMENT AND MATERIAL

- A. Designate individual to be responsible for maintenance of traffic handling around construction area. This individual must be accessible at all times to immediately correct any deficiencies in equipment and materials used to handle traffic, such as missing, damaged, or obscured signs, drums, barricades, or pavement markings. Give name, address and telephone number of designated individual to the Engineer.
- B. Make daily inspections of signs, barricades, drums, lamps and temporary pavement markings to verify that these are visible, and in good working order, and in conformance with TxDOT or any other entity. When not in conformance immediately bring equipment and materials into conformance by replacement, repair, cleaning, relocation, and/or realignment.
- C. Keep all equipment and materials, especially signs and pavement markings, clean and free of dust, dirt, grime, oil, mud or debris.

END OF SECTION

SECTION 01571

INLET PROTECTION BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnishing, installing, maintaining and removing temporary erosion protection and sediment control inlet protection barriers.
- B. The inlet protection barrier consists of a geotextile fabric (filter fabric) supported by a net reinforced face structure around an inlet.
- C. Alternate design of the inlet protection barrier, as approved by the Engineer, consists of fiber rolls placed around a frame, staked in place (or weighted down by clean gravel bags) and constructed around an inlet.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment for unit price procedures.

PART 2 PRODUCTS

2.01 GEOTEXTILE FABRIC

- A. The geotextile fabric (filter fabric) shall consist of large chain synthetic polymers composed of at least 95 percent by weight of polyolefins in a woven fabric.
- B. The geotextile fabric shall meet the following specifications:

(See Following Page for Table)

Table 1 Silt Fence Geotextile Fabric Properties			Requirements Unsupported Silt Fence	
	Units	Supported Silt Fence	Geotextile Elongation ≥50%	Geotextile Elongation <50%
Grab Strength				
Machine Direction	lbs.	90	123	123
X-Machine Direction	lbs.	90	100	100
Permittivity	sec ⁻¹	0.05	0.05	0.05
Apparent Opening Size (maximum average roll value)	mm/sieve	0.6/30	0.6/30	0.6/30
Ultraviolet Stability (Retained Tensile Strength)	%	70 after 500 hrs exposure	70 after 500 hrs exposure	70 after 500 hrs exposure
NOTES: 1. Table 1 adapted from AASHTO M 288 <i>Geotextile Specification for Highway Applications</i> Table 6. Temporary Silt Fence Property Requirements. 2. All numeric values in Table 1 except Apparent Opening Size (AOS) represent minimum average roll values (MARV). Values for AOS represent maximum average roll values.				

- C. Geotextile fabric shall contain stabilizers and/or inhibitors to make the fabric resistant to deterioration resulting from exposure to sunlight or heat and shall be resistant to commonly encountered soil chemicals, mildew, rot and insects.
- D. Geotextile fabric shall be free of defects or flaws that affect its physical and/or filtering properties.
- E. Geotextile fabric shall provide an expected useable life comparable to the anticipated construction period.

2.02 POST

- A. Posts shall be either steel or hardwood, essentially straight, with a minimum length of 4-feet.
- B. Support beams shall be either steel or hardwood and essentially straight.

- C. Hardwood posts and support beams shall be 2-inch x 2-inch minimum or equivalent.
- D. Metal posts and support beams shall be either studded T or U steel type with a minimum weight of 1.28 lbs per linear foot.
- E. Fin anchors shall be used to resist post movement as directed by the Engineer.

2.03 FABRIC MESH

- A. Net reinforced fence shall be 2-inch by 4-inch welded wire fabric mesh.
- B. The mesh support height shall be the equivalent height, or greater, of the geotextile fabric to be attached.
- C. Plastic grid mesh or other support mesh may be substituted for welded wire mesh as approved by the Engineer.

2.04 ATTACHMENT

- A. Attachment of net reinforced fence and geotextile fabric shall be with wire ties, staples, or shoat rings.
- B. Wire ties shall be 14 gage minimum.
- C. Staples shall be no. 9 minimum with a 2 inch minimum crown length.
- D. Shoat rings shall be galvanized.

2.05 ALTERNATES

- A. A prefabricated unit with geotextile fabric, posts, supports and wire mesh meeting the minimum specifications may be used in lieu of a constructed inlet protection barrier.
- B. Fiber roll material for inlet protection barrier alternative design shall be as approved by the Engineer.

PART 3 EXECUTION

3.01 PREPARATION AND INSTALLATION

- A. No clearing and grubbing or rough cutting, other than specifically directed by the Engineer to allow for soil testing, surveying and installation of erosion protection and sediment control measures, shall be permitted until sediment control and erosion protection systems are in place.

- B. Inlet protection barriers shall be installed at locations shown on the drawings and in accordance with the details in the drawings.
- C. Inlet protection barriers shall be constructed in accordance with an approved schedule that clearly describes the timing during the construction process that the various erosion control measures will be implemented.
- D. Inlet protection barriers shall be installed so surface run-off will percolate through the system and allow sediment to be retained and accumulated.
- E. The Contractor shall inspect the inlet protection barriers at least once every fourteen calendar days, within 24 hours of the end of a storm event of 0.5-inches of rainfall or greater and during daily prolonged rainfalls. Contractor shall remove irregularities which will impede normal flow. Erosion protection and sediment control systems shall be maintained by the Contractor until final stabilization. Damage caused to erosion protection and sediment control systems shall be repaired immediately.
- F. The Contractor is responsible for removal and proper disposal of sediment and debris from the inlet protection barrier system and as directed by the Engineer. Sediment and debris shall not be allowed to flush into the storm sewer system, waterways and jurisdictional wetlands, or onto adjacent properties. Sediment deposits shall be removed before they reach one-third of the height of the inlet protection barrier.
- G. Uncontaminated sediment can be placed at the project spoil site or, if properly handled, spread out to supplement fill requirements. The Engineer will designate how the sediment deposits are to be handled. Uncontaminated sediment shall not be placed in waterways or jurisdictional wetlands. If sediment has been contaminated, then it shall be disposed of in accordance with the applicable federal, state and local regulations. Off-site disposal shall be the responsibility of the Contractor.
- H. After final stabilization, at the direction of the Engineer, the Contractor shall be responsible for removing all erosion protection and sediment control systems that are not permanent for the project.

3.02 CONSTRUCTION METHODS

- A. Posts
 1. Shall be driven a minimum depth of 1-foot into the ground.
 2. Shall be a minimum 18" above the ground.
 3. Shall be placed with a maximum spacing of 4-feet.
 4. Horizontal support beams shall be securely attached from post to post and no higher than the top of the filtering material.
- B. Trench
 1. Shall be dug along the upstream side of the barrier to anchor at least 8-inches of

- the geotextile fabric to prevent underflow.
- 2. Trench shall be a 6-inch by 6-inch square, or a 4-inch deep V-trench.
- C. Net Reinforced Fence
 - 1. Shall be attached to the posts.
 - 2. Attachment shall be at the top and mid-section.
 - 3. Additional ties or staples shall be added to secure the net reinforced fence to the posts as directed by the Engineer.
- D. Geotextile Fabric
 - 1. Shall be placed against the side of the trench with approximately 2-inches across the bottom in the upstream direction.
 - 2. Shall be attached to the net reinforced fence with wire ties or shoat rings. Fabric shall be attached at the top and mid-section. The horizontal spacing of the attachment shall be every 24-inches or less. Additional ties, shoat rings, or staples shall be added to secure fabric to the net reinforced fence or posts as directed by the Engineer.
 - 3. Shall be entrenched and attached to posts so as a minimum of 18-inches of the fabric is above ground.
 - 4. Shall be provided in continuous rolls and cut to the length of the barrier, so as to minimize joints.
 - 5. When joints of two sections of fabric are necessary, the fabric shall be spliced together only at a support post. The fabric shall be overlapped a minimum of 6-inches at a post, folded and secured at six or more places.
- E. After the geotextile fabric has been securely attached, the trench shall be backfilled and hand tamped as approved by the Engineer.
- F. For inlet protection barriers with reinforced filter fabric, if the immediately adjacent surface is a hard packed surface, the geotextile fabric shall extend outward away from the inlet protection barrier and upstream along the hard packed surface for at least 12-inches and be weighed down continuously along the perimeter of the structure with at least 4-inches of clean gravel or nylon gravel filled bags.

END OF SECTION

Section 01572

INLET PROTECTION BARRIERS FOR STAGE II INLET

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnishing, installing, maintaining and removing temporary erosion protection and sediment control gravel bag inlet protection barriers for Stage II inlets.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment for unit price procedures.

PART 2 PRODUCTS

2.01 BAGS

- A. Provide bags consisting of geotextile fabric (filter fabric) made of long-chain synthetic polymers composed of at least 95 percent by weight of polyolefins in a woven fabric.
- B. Bag size shall be as follows:
 - Length: 18 to 24 inches
 - Width: 12 to 18 inches
 - Thickness: 6 to 8 inches
 - Weight: 50 to 125 pounds
- C. Bags shall be filled with open-graded gravel. The gravel shall be free from adherent coatings, salt, alkali, dirt, clay, or organic and injurious matter. Clean coarse sand may be substituted only as approved by the Engineer.
- D. Nylon rope shall be used to secure the closure of the gravel filled bags.

2.02 GEOTEXTILE FABRIC

A. Geotextile fabric shall meet the following specifications:

Table 1 Silt Fence Geotextile Fabric Properties			Requirements Unsupported Silt Fence	
	Units	Supported Silt Fence	Geotextile Elongation ≥50%	Geotextile Elongation <50%
Grab Strength				
Machine Direction	lbs.	90	123	123
X-Machine Direction	lbs.	90	100	100
Permittivity	sec ⁻¹	0.05	0.05	0.05
Apparent Opening Size (maximum average roll value)	mm/sieve	0.6/30	0.6/30	0.6/30
Ultraviolet Stability (Retained Tensile Strength)	%	70 after 500 hrs exposure	70 after 500 hrs exposure	70 after 500 hrs exposure
NOTES: 1. Table 1 adapted from AASHTO M 288 <i>Geotextile Specification for Highway Applications</i> Table 6. Temporary Silt Fence Property Requirements. 2. All numeric values in Table 1 except Apparent Opening Size (AOS) represent minimum average roll values (MARV). Values for AOS represent maximum average roll values.				

- B. Geotextile fabric shall be free of defects or flaws that affect its physical and/or filtering properties.
- C. The fabric shall contain stabilizers and/or inhibitors to make the fabric resistant to deterioration resulting from exposure to sunlight or heat and shall be resistant to commonly encountered soil chemicals, mildew, rot and insects.
- D. The fabric shall provide an expected useable life comparable to the anticipated construction period.

PART 3 EXECUTION**3.01 CONSTRUCTION METHODS**

- A. Inlet Protection Barriers for Stage II Inlets shall be installed at locations shown on the drawings or as deemed necessary by the Engineer in accordance with the drawings.
- B. Inlet Protection Barriers for Stage II Inlets shall be constructed in accordance with an approved schedule that clearly describes the timing during the construction process that the various erosion control measures will be implemented.
- C. No clearing and grubbing or rough cutting, other than as specifically directed by the Engineer to allow for soil testing, surveying and installation of erosion protection and sediment control measures, shall be permitted until sediment control and erosion protection systems are in place.
- D. Inlet Protection Barriers for Stage II Inlets shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.
- E. Gravel bags shall be placed in the gutter on each side of the curb inlet and continuously along the back of the curb inlet. Gravel bags shall be placed in a row with ends tightly abutting the adjacent gravel bag. Gravel bags shall not be placed so the throat of the inlet is blocked.
- F. The Contractor shall inspect the inlet protection barrier for stage II inlets at least once every fourteen calendar days, within 24-hours of the end of a storm of 0.5 inches of rainfall or greater, and daily during prolonged rainfalls. Contractor shall remove irregularities which will impede normal flow. Erosion protection and sediment control systems shall be maintained by the Contractor until final stabilization. Damage caused to erosion protection and sediment control systems shall be repaired immediately.
- G. The Contractor is responsible for removing and disposing of silt and sediment as directed by the Engineer. Sediment shall not be allowed to flush into the storm sewer system, waterways, jurisdictional wetlands, or onto adjacent properties. Sediment deposits shall be removed before they reach one-third of the height of the gravel bags.
- H. Uncontaminated sediment can be placed at the project spoil site or, if properly handled, spread out to supplement fill requirements. The Engineer will designate how the sediment deposits are to be handled. Uncontaminated sediment shall not be placed in waterways or jurisdictional wetlands, unless as approved by the Engineer. If sediment has been contaminated, then it shall be disposed of in accordance with the applicable federal, state, or local regulations. Offsite disposal shall be the responsibility of the Contractor.

- I. After final stabilization and at the direction of the Engineer, the Contractor, when required, shall be responsible for removing all erosion protection and sediment control systems, that are not permanent, from the project.

END OF SECTION

SECTION 02076

REMOVE EXISTING PAVEMENTS AND STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removing concrete paving, asphaltic concrete pavement, and base courses.
- B. Removing concrete curbs, concrete curb and gutters, sidewalks and driveways.
- C. Removing pipe culverts and sewers.
- D. Removing miscellaneous structures of concrete, masonry, or combination of concrete and masonry.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for disposal of debris.
- B. Coordinate removal work with utility companies.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION

- A. Obtain advance approval from Engineer for dimensions and limits of removal work.
- B. Identify known utilities below grade. Stake and flag locations.

3.02 PROTECTION

- A. Protect utilities that remain from damage.
- B. Protect trees, other plant growth, and features designated to remain.
- C. Protect adjacent public and private property from damage.
- D. Protect benchmarks, monuments, and existing structures designated to remain from damage or displacement.

3.03 REMOVALS

- A. Remove by methods that will not damage underground utilities. Do not use a 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 a minimum depth of 2 inches.
- D. Where street and driveway saw cut locations coincide or fall within three feet of existing construction or expansion joints, break-out to existing joint.
- E. Remove sidewalks and curbs to nearest existing dummy, expansion, or construction joint.

3.04 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 01564 - Waste Material Disposal.
- B. Remove debris resulting from Work under this section from site in accordance with requirements of Section 01564 - Waste Material Disposal.

END OF SECTION

SECTION 02227

EXCAVATION AND BACKFILL FOR UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavation, trenching, foundation, embedment, and backfill for installation of utilities, including manholes and other pipeline structures.

1.02 UNIT PRICES

- A. No additional payment will be made for trench excavation, embedment and backfill. Include payment in the unit price for installed underground piping, sewer, conduit, or duct work.
- B. No separate or additional payment will be made for surface water control, or for excavation drainage. Include payment in the unit price for the installed piping, sewer, conduit, or duct work.
- C. No additional payment will be made for performing critical location exploratory excavation. Include cost for unit price work requiring critical locates.
- D. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 DEFINITIONS

- A. Pipe Foundation: Suitable and stable native soils that are exposed at the trench subgrade after excavation to depth of bottom of the bedding as shown on the Drawings, or foundation backfill material placed and compacted in over-excavations.
- B. Pipe Bedding: The portion of trench backfill that extends vertically from top of foundation up to a level line at bottom of pipe, and horizontally from one trench sidewall to opposite sidewall.
- C. Haunching: The material placed on either side of pipe from top of bedding up to springline of pipe and horizontally from one trench sidewall to opposite sidewall.
- D. Initial Backfill: The portion of trench backfill that extends vertically from springline of pipe (top of haunching) up to a level line 12 inches above top of pipe, and horizontally from one trench sidewall to opposite sidewall.

- E. Pipe Embedment: The portion of trench backfill that consists of bedding, haunching and initial backfill.
- F. Trench Zone: The portion of trench backfill that extends vertically from top of pipe embedment up to pavement subgrade or up to final grade when not beneath pavement.
- G. 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 required density due to either gradation, plasticity, or moisture content.
 - 3. Materials that contain large clods, aggregates, stones greater than 4 inches in any dimension, debris, vegetation, waste or any other deleterious materials.
 - 4. Materials that are contaminated with hydrocarbons or other chemical contaminants.
- H. Suitable Material: Suitable soil materials are those meeting specification requirements. Unsuitable soils meeting specification requirements for suitable soils after treatment with lime or cement are considered suitable, unless otherwise indicated.
- I. Backfill: Suitable material meeting specified quality requirements, placed and compacted under controlled conditions.
- J. Ground Water Control Systems: Installations external to trench, such as well points, eductors, or deep wells. Ground water control includes dewatering to lower ground water, intercepting seepage which would otherwise emerge from side or bottom of trench excavation, and depressurization to prevent failure or heaving of excavation bottom. Refer to Section 01563 - Control of Ground Water and Surface Water.
- K. Surface Water Control: Diversion and drainage of surface water runoff and rainwater away from trench excavation. Rainwater and surface water accidentally entering trench shall be controlled and removed as a part of excavation drainage.
- L. Excavation Drainage: Removal of surface and seepage water in trench by sump pumping and using a drainage layer, as defined in ASTM D 2321, placed on the foundation beneath pipe bedding or thickened bedding layer of Class I material.

- M. Trench Conditions are defined with regard to the stability of trench bottom and trench walls of pipe embedment zone. Maintain trench conditions that provide for effective placement and compaction of embedment material directly on or against undisturbed soils or foundation backfill, except where structural trench support is necessary.
1. Dry Stable Trench: Stable and substantially dry trench conditions exist in pipe embedment zone as a result of typically dry soils or achieved by ground water control (dewatering or depressurization) for trenches extending below ground water level.
 2. Stable Trench with Seepage: Stable trench in which ground water seepage is controlled by excavation drainage.
 - a. Stable Trench with Seepage in Clayey Soils: Excavation drainage is provided in lieu of or to supplement ground water control systems to control seepage and provide stable trench subgrade in predominately clayey soils prior to bedding placement.
 - b. Stable Wet Trench in Sandy Soils: Excavation drainage is provided in the embedment zone in combination with ground water control in predominately sandy or silty soils.
 3. Unstable Trench: Unstable trench conditions exist in the pipe embedment zone if ground water inflow or high water content causes soil disturbances, such as sloughing, sliding, boiling, heaving or loss of density.
- N. Subtrench: Subtrench is a special case of benched excavation. Subtrench excavation below trench shields or shoring installations may be used to allow placement and compaction of foundation or embedment materials directly against undisturbed soils. Depth of a subtrench depends upon trench stability and safety as determined by the Contractor.
- O. Trench Dam: A placement of low permeability material in pipe embedment zone or foundation to prohibit ground water flow along the trench.
- P. Over-Excavation and Backfill: Excavation of subgrade soils with unsatisfactory bearing capacity or composed of otherwise unsuitable materials below top of foundation as shown on Drawings, and backfilled with foundation backfill material.
- Q. Foundation Backfill Materials: Natural soil or manufactured aggregate of controlled gradation, and geotextile filter fabrics as required, to control drainage and material

Standard Specifications

FOR UTILITIES

separation. Foundation backfill material is placed and compacted as backfill to provide stable support for bedding. Foundation backfill materials may include concrete seal slabs.

- R. Trench Safety Systems include both Protective Systems and Shoring Systems as defined in Section 01526 - Trench Safety Systems.
- S. Trench Shield (Trench Box): A portable worker safety structure moved along the trench as work proceeds, used as a Protective System and designed to withstand forces imposed on it by cave-in, thereby protecting persons within the trench. Trench shields may be stacked if so designed or placed in a series depending on depth and length of excavation to be protected.
- T. Shoring System: A structure that supports sides of an excavation to maintain stable soil conditions and prevent cave-ins, or to prevent movements of the ground affecting adjacent installations or improvements.

1.04 SCHEDULING

- A. Schedule work so that pipe embedment can be completed on the same day that acceptable foundation has been achieved for each section of pipe installation, manhole, or other structures.

1.05 SUBMITTALS

- A. Conform to Section 01300 - Submittals.
- B. Submit a written description for information only of the planned typical method of excavation, backfill placement and compaction, including:
 - 1. Sequence of work and coordination of activities.
 - 2. Selected trench widths.
 - 3. Procedures for foundation and embedment placement, and compaction.
 - 4. Procedure for use of trench boxes and other premanufactured systems while assuring specified compaction against undisturbed soil.
 - 5. Procedure for installation of Special Shoring at locations identified on the Drawings.
- C. Submit a ground and surface water control plan in accordance with requirements in this Section and Section 01563 - Control of Ground Water and Surface Water.

- D. Submit backfill material sources and product quality information in accordance with requirements of Section 02229 - Utility Backfill Materials.
- E. Submit a trench excavation safety program in accordance with requirements of Section 01526 - Trench Safety System. Include designs for special shoring meeting the requirements defined in Paragraph 1.03 of Section 01526.
- F. Submit record of location of utilities as installed, referenced to survey control points. Include locations of utilities encountered or rerouted. Give stations, horizontal dimensions, elevations, inverts, and gradients.

1.06 TESTS

- A. Perform backfill material source qualification testing in accordance with requirements of Section 02229 - Utility Backfill Materials.
- B. Testing and analysis of backfill materials for soil classification and compaction during construction will be performed by an independent laboratory provided by the City in accordance with requirements of Section 01410 - Testing Laboratory Services and as specified in this Section.

1.07 PROTECTION

- A. Protect trees, shrubs, lawns, existing structures, and other permanent objects outside of grading limits and within the grading limits as designated on the Drawings, and in accordance with requirements of Section 01535 - Tree and Plant Protection.
- B. Protect and support above-grade and below-grade utilities which are to remain.
- C. Restore damaged permanent facilities to pre-construction conditions unless replacement or abandonment of facilities is indicated on the Drawings.

1.08 SPECIAL SHORING DESIGN REQUIREMENTS

- A. Have Special Shoring designed or selected by the Contractor's Professional Engineer to provide support for the sides of the excavations, including soils and hydrostatic ground water pressures as applicable, and to prevent ground movements affecting adjacent installations or improvements such as structures, pavements and utilities. Special shoring may be a premanufactured system selected by the Contractor's Professional Engineer to meet the project site requirements based on the manufacturer's standard design.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Perform excavation with hydraulic excavator or other equipment suitable for achieving the requirements of this Section.
- B. Use only hand-operated tamping equipment until a minimum cover of 12 inches is obtained over pipes, conduits, and ducts. Do not use heavy compacting equipment until adequate cover is attained to prevent damage to pipes, conduits, or ducts.
- C. Use trench shields or other Protective Systems or Shoring Systems which are designed and operated to achieve placement and compaction of backfill directly against undisturbed native soil.
- D. Use Special Shoring systems where required which may consist of braced sheeting, braced soldier piles and lagging, slide rail systems, or other systems meeting the Special Shoring design requirements.

2.02 MATERIAL CLASSIFICATIONS

- A. Embedment and Trench Zone Backfill materials: Conform to the classifications and product descriptions of Section 02229 - Utility Backfill Materials.
- B. Concrete Backfill: Conform to requirements for Class B concrete as specified in the pertinent Section.
- P. Geotextile (Filter Fabric): Conform to requirements of Section 02249 - Geotextile.
- Q. Concrete for Trench Dams: Concrete backfill or 3 sack premixed (bag) concrete.
- E. Timber Shoring Left in Place: Untreated oak.

PART 3 EXECUTION

3.01 STANDARD PRACTICE

- A. Install flexible pipe, including "semi-rigid" pipe, to conform to standard practice described in ASTM D 2321, and as described in this Section. Where an apparent conflict occurs between the standard practice and the requirements of this Section, this Section governs.

- B. Install rigid pipe to conform with standard practice described in ASTM C 12, and as described in this Section. Where an apparent conflict occurs between the standard practice and the requirements of this Section, this Section governs.

3.02 PREPARATION

- A. Establish traffic control to conform to requirements of Section 01570 - Traffic Control and Regulation. Maintain barricades and warning lights for streets and intersections where Work is in progress or where affected by the Work, and is considered hazardous to traffic movements.
- B. Perform Work to conform to applicable safety standards and regulations. Employ a trench safety system as specified in Section 01526 - Trench Safety Systems.
- C. Immediately notify the agency or company owning any existing utility line which is damaged, broken, or disturbed. Obtain approval from the Engineer and agency for any repairs or relocations, either temporary or permanent.
- D. Remove existing pavements and structures, including sidewalks and driveways, to conform to requirements of Section 02076 - Removing Existing Pavements and Structures, as applicable.
- E. Install and operate necessary dewatering and surface water control measures to conform to Section 01563 - Control of Ground Water and Surface Water.
- F. Maintain permanent benchmarks, monumentation, and other reference points. Unless otherwise directed in writing, replace those which are damaged or destroyed in accordance with Section 01050 - Field Surveying.
- G. Complete, as incidental to construction, site preparation work including clearing and grubbing; removal and disposal of trash, rubbish, debris, and minor obstacles to construction; relocation of salvageable items; stripping topsoil within excavation areas, stockpiling topsoil; and, after construction, spreading topsoil over disturbed areas as required and finishing and grading surface within construction areas.
- H. Perform Potential Conflict Investigation at all critical locations. Locate existing utilities ahead of pipe laying activities. Notify Engineer in writing immediately upon identification of any conflict. In the event, Contractor will not be entitled to extra cost for downtime including, but not limited, payroll, equipment, overhead demobilization and remobilization.

3.03 EXCAVATION

- A. Except as otherwise specified or shown on the Drawings, install underground utilities in open cut trenches with vertical sides.
- B. Perform excavation work so that pipe, conduit, and ducts can be installed to depths and alignments shown on the Drawings. Avoid disturbing surrounding ground and existing facilities and improvements. Excavate trench so that pipe is centered in trench. Do not obstruct sight distance for vehicles utilizing roadways or detours with stockpiled materials.
- C. Determine trench excavation widths using the following schedule (as a minimum) as related to pipe outside diameter (O.D.) or as shown on the drawings. Maximum trench width shall be the minimum trench width plus 12 inches.

<u>Nominal Pipe Size, Inches</u>	<u>Minimum Trench Width, Inches</u>
Less than 18	O.D. + 18
18 to 30	O.D. + 24
Greater than 30	O.D. + 36

- D. Use sufficient trench width or benches above the embedment zone for installation of well point headers or manifolds and pumps where depth of trench makes it uneconomical or impractical to pump from the surface elevation. Provide sufficient space between shoring cross braces to permit equipment operations and handling of forms, pipe, embedment and backfill, and other materials.
- E. Upon discovery of unknown utilities, badly deteriorated utilities not designated for removal, or concealed conditions, discontinue work at that location. Notify the Engineer and obtain instructions before proceeding.
- F. Shoring of Trench Walls.
 - 1. Install Special Shoring in advance of trench excavation or simultaneously with the trench excavation, so that the soils within the full height of the trench excavation walls will remain fully laterally supported at all times.
 - 2. For all types of shoring, support trench walls in the pipe embedment zone throughout the installation. Provide trench wall supports sufficiently tight to prevent washing the trench wall soil out from behind the trench wall support.

3. Unless otherwise directed by the Engineer, leave sheeting driven into or below the pipe embedment zone in place to preclude loss of support of foundation and embedment materials. Leave rangers, walers, and braces in place as long as required to support sheeting, which has been cut off, and the trench wall in the vicinity of the pipe zone.
 4. Employ special methods for maintaining the integrity of embedment or foundation material. Before moving supports, place and compact embedment to sufficient depths to provide protection of pipe and stability of trench walls. As supports are moved, finish placing and compacting embedment.
 5. If sheeting or other shoring is used below top of the pipe embedment zone, do not disturb pipe foundation and embedment materials by subsequent removal. Maximum thickness of removable sheeting extending into the embedment zone is 1 inch. Fill voids left on removal of supports with compacted backfill material.
- G. Use of Trench Shields. When a trench shield (trench box) is used as a worker safety device, the following requirements apply:
1. Make trench excavations of sufficient width to allow shield to be lifted or pulled freely, without damage to the trench sidewalls.
 2. Move trench shields so that pipe, and backfill materials, after placement and compaction, are not damaged nor disturbed, nor the degree of compaction reduced.
 3. When required, place, spread, and compact pipe foundation and bedding materials beneath the shield. For backfill above bedding, lift the shield as each layer of backfill is placed and spread. Place and compact backfill materials against undisturbed trench walls and foundation.
 4. Maintain trench shield in position to allow sampling and testing to be performed in a safe manner.
- H. Cover:
1. Provide 24 in. minimum cover over top of pipe where surface grades are definitely established and 30 in. in other locations.
 2. Greater depth of cover may be necessary on vertical curves or to provide necessary clearance beneath pipes, conduits, drains, drainage structures or

-
- other obstructions encountered at normal pipe grades.
3. For water mains, provide 4 ft. minimum cover unless noted otherwise.
 4. Measure depth of backfill cover vertically from top of pipe to finish ground or pavement surface elevations.
- I. Trenching:
1. Excavation for pipe stubs to be laid transversely across streets may be made with trench hoe.
 2. Where surface or underground obstructions make excavation inaccessible to trenching machine, trench hoe may be used.
 3. Where trench hoe is used, do not use excavated material composed of large chunks and clods for backfill.
 4. No excavated material will be stockpiled along trench or on paved surfaces. Load excavated material into dump truck as trench is excavated.
 5. Topsoil excavated from the trench shall be returned to trench to be used as backfill material for the top 2 inches of the trench.
 6. For trench excavations requiring cement stabilized sand backfill to subgrade of pavement, stockpiling of cement stabilized sand on pavement is not permitted.
- J. Voids under paving area outside shield will require removal of pavement, consolidation and replacement of pavement in accordance with Contract Documents. Repair damage resulting from failure to provide adequate supports.
- K. Place sand or soil behind shoring or trench shield to prevent soil outside shoring from collapsing and causing voids under pavement. Immediately pack suitable material in outside voids following excavation to avoid caving of trench walls.
- L. Do not use excavators with side cutters installed while working within 15 feet of pipeline company=s pipeline. Use a small, rubber-tired excavator, such as a backhoe, to do exploratory excavation. Bucket that is used to dig in close proximity to pipelines shall not have teeth or shall have a guard installed over teeth to approximate a bucket without teeth. Excavate by hand within 1 foot of pipeline company=s line. Do not use larger excavation equipment normally used to dig water main trench in vicinity of pipeline until all pipelines have been uncovered and fully exposed. Do not place large excavation and hauling equipment directly over

pipelines unless approved by pipeline company=s representative.

- M. Regrade adjacent ground surfaces where surfaces have been disturbed during construction operations to original and matching grades.
- N. Trees and shrubs designated to remain that sustain cutting or injury to roots, trunk, or limbs shall be pruned by a tree surgeon and cut or injury painted with asphaltic horticultural coating without cost to City.
- O. Perform repair on pipe in locations shown on plans/specifications.
- P. Where pipe is to be installed in fill, complete area fill and compaction to an elevation not less than 1 ft. above top of pipe before open-cut excavation and trenching for pipe.
- Q. Excavate adequate but not excessive working space and clearances for installation of work and form removal.
- R. Allow not less than 6 in. clearance in horizontal dimensions of excavations for outside plastering of manholes and similar structures constructed of masonry units.
- S. Do not undercut excavation faces for extended footings of structures.
- T. Excavate by hand within 2 ft. of existing utility to remain.
- U. BLASTING: Use of explosions will not be permitted.
- V. UNAUTHORIZED EXCAVATION: Refill excavation below subgrade elevations with tamped sand, gravel, cement stabilized sand, or concrete.

3.04 HANDLING EXCAVATED MATERIALS

- A. Use only excavated materials which are suitable as defined in this Section and conforming with Section 02229 - Utility Backfill Materials. Place material suitable for backfilling in stockpiles at a distance from the trench to prevent slides or cave-ins.
- B. When required, provide additional backfill material conforming with requirements of Section 02229 - Utility Backfill Materials.
- C. Do not place stockpiles of excavated materials on streets and adjacent properties. Maintain site conditions in accordance with Section 01500 - Temporary Facilities and

Controls.

- D. Dispose of unsuitable excavated materials off-site in legal manner.
- E. Excess excavated material shall become the property of the contractor to be disposed of off-site in a legal manner.

3.05 GROUND WATER CONTROL

- A. Implement ground water control according to Section 01563 - Control of Ground Water and Surface Water. Provide a stable trench to allow installation in accordance with the Specifications.

3.06 TRENCH FOUNDATION

- A. Excavate bottom of trench to uniform grade to achieve stable trench conditions and satisfactory compaction of foundation or bedding materials.
- B. Place trench dams in Class I foundations in line segments longer than 100 feet between manholes, and not less than one in every 300 feet of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than 5 feet from manholes.
- C. Where rock or other incompressible material is encountered, remove material to depth 6 in. below subgrade and backfill with tamped sand, gravel, or concrete.
- D. Reinforce trench bottoms or subgrade surfaces for concrete structures which are solid, but which become mucky on top due to construction operations with specified sand.
- E. Use only tamped sand, gravel, or concrete to bring fills to lines and grades indicated and for replacing unsatisfactory materials.

3.07 PIPE EMBEDMENT PLACEMENT AND COMPACTION

- A. Immediately prior to placement of embedment materials, the bottoms and sidewalls of trenches shall be free of loose, sloughing, caving, or otherwise unsuitable soil.
- B. Place geotextile to prevent particle migration from the in-situ into open-graded (Class I) embedment materials or drainage layers.

- C. Place embedment including bedding, haunching and initial backfill to meet requirements indicated on Drawings.
- D. For pipe installation, manually spread embedment materials around the pipe to provide uniform bearing and side support when compacted. Do not allow materials to free-fall from heights greater than 24 inches above top of pipe. Perform placement and compaction directly against the undisturbed soils in the trench sidewalls, or against sheeting which is to remain in place.
- E. Do not place trench shields or shoring within height of the embedment zone unless means to maintain the density of compacted embedment material are used. If moveable supports are used in embedment zone, lift the supports incrementally to allow placement and compaction of the material against undisturbed soil.
- F. Do not damage coatings or wrappings of pipes during backfilling and compacting operations. When embedding coated or wrapped pipes, do not use crushed stone or other sharp, angular aggregates.
- G. Place haunching material manually around the pipe and compact it to provide uniform bearing and side support. If necessary, hold small-diameter or lightweight pipe in place during compaction of haunch areas and placement beside the pipe with sandbags or other suitable means.
- H. Place electrical conduit directly on foundation without bedding.
- I. Shovel pipe embedment material in place and compact it using pneumatic tampers in restricted areas, and vibratory-plate compactors or engine-powered jumping jacks in unrestricted areas. Compact each lift before proceeding with placement of the next lift.
 - 1. Class I embedment materials.
 - a. Maximum 6-inches compacted lift thickness.
 - b. Systematic compaction by at least two passes of vibrating equipment. Increase compaction effort as necessary to effectively embed the pipe to meet the deflection test criteria.
 - c. Moisture content as determined by Contractor for effective compaction without softening the soil of trench bottom, foundation or trench walls.

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- 2. Class II embedment and cement stabilized sand.
 - a. Maximum 6-inches compacted thickness.
 - b. Compaction by methods determined by Contractor to achieve a minimum of 95 percent of the maximum dry density as determined according to ASTM D 698 for Class II materials and according to ASTM D 558 for cement stabilized materials.
 - c. Moisture content of Class II materials within 3 percent of optimum as determined according to ASTM D 698. Moisture content of cement stabilized sands on the dry side of optimum as determined according to ASTM D 558 but sufficient for effective hydration.
 - J. Place trench dams in Class I embedments in line segments longer than 100 feet between manholes, and not less than one in every 500 feet of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than 5 feet from manholes.

3.08 TRENCH ZONE BACKFILL PLACEMENT AND COMPACTION

- A. Place backfill for pipe or conduits and restore surface as soon as practicable. Leave only the minimum length of trench open as necessary for construction.
- B. Where damage to completed pipe installation work is likely to result from withdrawal of sheeting, leave the sheeting in place. Cut off sheeting 1.5 feet or more above the crown of the pipe. Remove trench supports within 5 feet from the ground surface.
- C. For sewer pipes, use backfill materials described here as determined by trench limits. As trench zone backfill in paved areas for streets and to one foot back of curbs and pavements, use cement stabilized sand as indicated on the Drawings. Uniformly backfill trenches partially within limits one foot from streets and curbs according to the paved area criteria. Use select backfill within one foot below pavement subgrade for rigid pavement. For asphalt concrete roadway, use flexible base material within one foot below pavement subgrade.
- D. For water lines, backfill in trench zone, including auger pits, with bank run sand, select fill material as specified in Section 02229 - Utility Backfill Materials except when water line is placed under pavement. Backfill under pavement shall be cement stabilized sand in accordance with the details.
- E. For trench excavations under pavement, place trench zone backfill in lifts and compact by methods indicated below or as stated on the plans. Fully compact each lift

beforeplacement of the next lift.

1. Cement-stabilized sand.
 - a. Place backfill in 8 in. maximum layers to achieve uniform placement and required compaction.
 - b. Compaction by vibratory equipment to a minimum of 95 percent of the maximum dry density determined according to ASTM D 558.
 - c. Moisture content on the dry side of optimum determined according to ASTM D 558 but sufficient for cement hydration.
- F. For trench excavations outside pavements, bank run sand of select fill per section 02229 and as shown on the drawings shall be used in the trench zone.
 1. Maximum 12-inch compacted lift thickness for clayey soils and maximum 12-inch lift thickness for granular soils.
 2. Compact to a minimum 95 percent of the maximum dry density determined according to ASTM D 698, or to same density as adjacent soils.
 3. Moisture content, as necessary, to achieve density.
- G. Do not backfill with wet, mucky, or unsuitable materials or with large rocks or clods of material.
- H. Trench backfill above pipe embedment shall conform to requirements for type and location of pipe as shown on the drawing.
- I. Place backfill material to minimum depth 12 in. above pipe before ceasing backfilling operations for day.
- J. Base Material Backfill for Patching of Existing Pavement: Provide 12 in. of base material.
- K. Flooding of backfill for compaction (water tamping) is not acceptable. Obtain compaction by mechanical means which allows access to all areas of backfill.

3.09 MANHOLES, JUNCTION BOXES AND OTHER PIPELINE STRUCTURES

- A. Meet the requirements of adjoining utility installations for backfill of pipeline structures, as shown on the Drawings.

3.10 FIELD QUALITY CONTROL

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- A. Test for material source qualifications as defined in Section 02229 - Utility Backfill Materials.
- B. Provide excavation and trench safety systems at locations and to depths required for testing and retesting during construction.
- C. Laboratory Quality Control by Contractor:
 - 1. Establish optimum moisture-maximum density curve for bedding and backfill material, ASTM D 698.
 - a. For those soils which will not exhibit a well-defined moisture-density relationship, determine maximum and minimum index densities of the soil, ASTM D4253 and D4254, for calculation of the relative density of the soil in the field.
 - 2. Establish optimum moisture-maximum density curve, ASTM D 698; Atterberg Limits, ASTM D 4318; and sieve analysis, ASTM D 422 for the following:
 - a. Borrow bedding and backfill material to be used.
 - b. Excavated material of questionable suitability for use as bedding and backfill material.
 - 3. One optimum moisture-maximum density curve, ASTM D 698, shall be established for each significant change in materials.
 - 4. Bedding and backfill materials which do not meet specified requirements shall be replaced with suitable materials.
- D. Field Quality Control by City
 - 1. Laboratory density testing of trench backfill:
 - a. One field in-place density test per 500 linear ft. of trench for each fill layer.
 - b. One field in-place density test per 150 linear ft. of trench for each fill layer under existing or proposed paved areas and at least one test per fill layer at each road crossing.
 - 2. Laboratory density testing of general fill: One field in-place density test per 100 cu. yds. of fill placed.
 - 3. Field in-place density tests shall be in compliance with ASTM D 1556, ASTM D 2922, or ASTM D 2167.

- E. Submit minimum 10 lb. Samples of any borrow bedding and backfill material to be used to materials testing laboratory.
- F. Recondition, recompact, and retest at Contractor's expense if tests indicate Work does not meet specified compaction requirements. For hardened soil cement with nonconforming density, core and test for compressive strength at Contractor's expense.
- G. Acceptability of crushed rock compaction will be determined by inspection.

3.11 DISPOSAL OF EXCESS MATERIAL

- A. Dispose of excess materials in accordance with requirements of Section 01564 - Waste Material Disposal.

3.12 POTENTIAL OBSTRUCTION INVESTIGATION

- A. Horizontal and vertical location of various underground lines shown on Drawings, including but not limited to water mains, gas lines, storm sewers, sanitary sewers, telephone lines, electric lines or power ducts, pipelines (petrochemical or petroleum product), concrete and debris, are based on best information available but are only approximate locations. At critical locations field verify horizontal and vertical locations of such lines within a zone 2 feet vertically and 4 feet horizontally of proposed main. Verify location of existing utilities prior to commencing construction. Use extreme caution and care when uncovering these lines. Any damage to known or unknown utilities will be full responsibility of Contractor. No separate payment shall be made for performing such efforts.
- B. Prior to actual field verification phase, notify all utility companies involved and request that their respective utility lines be marked in field. If any utility or pipeline company requires their line be excavated, or exposed prior to construction, comply with that request and utilize a methodology approved by the said company in locating or exposing their lines. Provide Engineer with 48 hours notice prior to any field excavation or related work.
- C. Once known, unknown or potential obstructions have been uncovered, survey vertical and horizontal locations relative to project baseline and datum and plot on 11" X 17" copy of Drawings.
- D. Submit 11" X 17" copy of Drawing with plotted utility or obstruction location before

or simultaneous with pipe shop drawing submittal.

- E. Engineer will promptly review "Potential Obstruction Report" and approve construction of proposed main as designed or modify design if necessary. Contractor will be promptly notified of any design modifications.

END OF SECTION

SECTION 02229

UTILITY BACKFILL MATERIALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Material Classifications
- B. Utility Backfill Materials
 - 1. Concrete sand.
 - 2. Gem sand.
 - 3. Pea gravel.
 - 4. Crushed stone.
 - 5. Crushed concrete.
 - 6. Bank run sand.
 - 7. Select backfill.
 - 8. Random backfill.
- C. Material handling and quality control requirements.

1.02 UNIT PRICES

- A. No payment will be made for backfill material unless specifically listed in the bid proposal. Include payment in unit price for applicable utility installation.
- B. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 DEFINITIONS

- A. Backfill: Suitable material meeting specified quality requirements for the designated application as embedment or trench zone backfill.

- B. Embedment: 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.
- C. Trench Zone Backfill: 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.
- D. 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.
- E. 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.
- F. Refer to Section 02227 - Excavation and Backfill for Utilities, for other definitions regarding utility installation by trench construction.

1.04 SUBMITTALS

- A. Conform to requirements of Section 01300 - Submittals.
- 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 3.03, Material Quality Control.
- D. Identify off-site sources for backfill materials at least 14 days ahead of intended use so that the Engineer may obtain samples for verification testing.
- E. Before stockpiling materials, submit a copy of temporary easement or approval from landowner for stockpiling backfill material on private property.

1.05 TESTS

- A. Perform tests of sources for backfill material in accordance with Paragraph 3.03A.
- B. Verification tests of backfill materials may be performed by the City in accordance with Section 01410 - Testing Laboratory Services and in accordance with Paragraph 3.03B.

- C. Random fill obtained from the Project excavation as source is exempt from prequalification requirements by Contractor, but must be inspected 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 sands and gravels, 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 gravels and sands, silty sands and gravels, little to moderate fines (GM, GP, SP, SM)
 - a. Plasticity Index: Nonplastic to 4
 - b. Gradation (GP, SP): Amount passing No. 200 Sieve - less than 5 percent
 - c. Gradation (GM, SM): Amount passing No. 200 Sieve - between 12 percent and 50 percent
 - 3. Class III: Clayey gravels and sands, poorly graded mixtures of sand, gravel, and clay (GC, SC)
 - a. Plasticity Index: greater than 7
 - b. Gradation: Amount passing No. 200 Sieve - between 12 percent and 50 percent
 - 4. Class IV: Lean clays (CL)
 - a. Plasticity Index: greater than 7

- b. Liquid Limit: less than 50
 - c. Gradation: Amount passing No. 200 Sieve - greater than 50 percent
 - d. Inorganic
5. Use soils with dual class designation according to ASTM D 2487 according to the more restrictive class.

2.02 PRODUCT DESCRIPTIONS

- A. Soils classified as silt (ML), silty clay (CL - ML with PI of 4 to 7), 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 Engineer. Soils classified as fat clay (CH) may be used as backfill materials where allowed by the applicable backfill installation specification. Refer to Section 02226 - Excavation and Backfill for Structures and Section 02227 - 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 may be substituted for natural soil or rock products where indicated in the product specification, and approved by Engineer, provided that the physical property criteria are determined to be satisfactory by testing.
- D. Bank Run Sand: Durable bank run sand classified as SP, SW, or SM by the Unified Soil Classification System (ASTM D 2487) meeting the following requirements:
 - 1. Less than 15 percent passing the number 200 sieve when tested in accordance with ASTM C 136. 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.

b. Plasticity index not exceeding 7.

- E. Concrete Sand: Natural sand, manufactured sand, or a combination of natural and manufactured sand conforming to the requirements of ASTM C 33 and graded within the following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
3/8"	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

- F. Gem Sand: Sand conforming to the requirements of ASTM C 33 for coarse aggregates specified for number 8 size and graded within the following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
3/8"	95 to 100
No. 4	60 to 80
No. 8	15 to 40

- G. 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
2"	100
3/8"	85 to 100

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No. 4	10 to 30
No. 8	0 to 10
NO. 16	0 to 5

H. Crushed Aggregates: All crushed aggregates consist of durable particles obtained from an approved source and meeting the following requirements:

1. All 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 40 percent when tested in accordance with ASTM C 131.
4. 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
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

5. Crushed stone: Produced from oversize quarried aggregate, sized by crushing from a naturally occurring single source. Crushed gravel or uncrushed gravel are not acceptable materials for utility embedment.
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, base course material, reinforcing steel fragments, soil, debris, or deteriorated concrete fragments.

- I. 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 02570 - Pavement Repair and Resurfacing, to meet plasticity criteria.
- J. 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 02226 - Excavation and Backfill for Structures and Section 02227 - Excavation and Backfill for Utilities.
- K. Cement Stabilized Sand: Conform to requirements of Section 02252 - Cement Stabilized Sand.
- L. Concrete Backfill: Conform to Class B concrete as specified in Section 03305 - Concrete for Utility Construction or Section 03310 - Concrete for Structures.
- M. Pavement Restoration: Conform to requirements of Section 02570 - Pavement Repair and Resurfacing.

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 source.
- B. Obtain approval for each material source by the Engineer before delivery is started. If sources previously approved do not produce uniform and satisfactory products, furnish materials from other approved sources. All 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 Engineer, expense for sampling and testing required to change to a different material will be credited to the City through a change order.
- C. 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.
- D. The City 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, have that pit opened to expose the vertical faces of the various strata of acceptable material to be used. Excavate the 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 Engineer 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 MATERIAL QUALITY CONTROL

- 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. Responsibilities include:
 - 1. Source or Supplier Qualification. Perform testing, or obtain representative tests by suppliers, for selection of material sources and products. Provide test results for a minimum of three samples for each source and material type. Test samples of processed materials from current production representing material to be delivered. Tests shall verify that the materials meet specification requirements. Repeat qualification test procedures each time the source characteristic changes or there is a planned change in source location or supplier. Qualification tests shall include, as applicable:
 - a. 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.
 - b. Plasticity
 - c. Los Angeles abrasion
 - d. Clay lumps
 - e. Light weight pieces

- f. Organic impurities
 - 2. Production Testing. Establish a program to provide assurance that backfill materials delivered from the sources and placed in the Work meet applicable specification requirements. Report results to the Engineer.
 - 3. Assist the Engineer in obtaining material samples for verification testing at the source or at the production plant.
 - 4. Notify the Engineer in the field when non-conforming material is detected.
- B. Quality Control
 - 1. The Engineer may sample and test backfill at:
 - a. Sources including borrow pits, production plants and Contractor's designated off-site stockpiles.
 - b. On-site stockpiles.
 - c. Materials placed in the Work.
 - 2. The Engineer may resample material at any stage of work or location if changes in characteristics are apparent.
 - 3. The Engineer will notify Contractor at the Project site about non-conforming materials and will, as appropriate, resample materials to verify results.
- C. Tolerances

The following tolerances apply to production quality control testing.

 - 1. Embedment Material and Select Backfill: The Engineer may accept material provided that not more than one out of the most recent five consecutive tests are out of the specification limits for:
 - a. Gradation: Not more than 5 percentage points on any individual sieve.
 - b. Plasticity: Not more than 2 percentage points.
 - 2. Trench Zone Backfill Material: Except for select and random backfill, the Engineer may accept the material provided that not more than one out of the most recent three consecutive tests are out of the specification limits for:
 - a. Gradation: Not more than 8 percentage points on any individual sieve.

- b. Plasticity: Not more than 5 percentage points.
- 3. Select and Random Backfill: No quantified tolerances. Remove non-conforming material identifiable by visual-manual procedure.

END OF SECTION

SECTION 02252

CEMENT STABILIZED SAND

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cement stabilized sand for backfill and bedding.

1.02 UNIT PRICES

- A. No payment will be made for cement stabilized sand under this Section unless an extra unit price item is included in the Bid Proposal and the application of the pay item is approved by the Engineer. Include payment for cement stabilized sand in unit price for applicable utility or structure installation section.
- B. If use of cement stabilized sand is allowed based on the Engineer's direction the extra unit price item will be paid on a per ton basis. A conversion between volume calculated based on theoretical limits and total weight will be made based on a ratio of 1.64 tons per cubic yard.

1.03 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Submit material qualification and mix design tests to include:
 - 1. Three series of tests of sand or fine aggregate material from the proposed source. Tests shall include procedures defined in Paragraph 2.01.
 - 2. Three moisture-density relationship tests prepared using the material qualified by the tests of Paragraph 1.03B.1. Blends of fine aggregate from crushed concrete and bank run sand shall be tested at the ratio to be used for the mix design testing.
 - 3. Mix design report to meet the design requirements of Paragraph 1.04. The mix design shall include compressive strength tests after 48-hours and 7 days curing.

1.04 DESIGN REQUIREMENTS

- A. Design sand-cement mixture to produce a minimum unconfined compressive strength of 100 pounds per square inch in 48 hours when compacted to 95 percent in

accordance with ASTM D558 and when cured in accordance with ASTM D1632, and tested in accordance with ASTM D1633. Mix for general use shall contain a minimum of 1-1/2 sacks of cement per cubic yard. Mix for use as sanitary sewer embedment within 9 feet of waterlines shall contain 2 sacks of cement per cubic yard. Compact mix with a moisture content on the dry side of optimum.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cement: Type 1 Portland cement conforming to ASTM C150.
- B. Sand: Clean, durable sand meeting grading requirements for fine aggregates of ASTM C33, or requirements for Bank Run Sand of Section 02229 - Utility Backfill Materials, and the following requirements:
 - 1. Classified as SW, SP or SM by the United Soil Classification System of ASTM D2487.
 - 2. Deleterious materials:
 - a. Clay lumps, ASTM C142; less than 0.5 percent.
 - b. Lightweight pieces, ASTM C123; less than 5.0 percent.
 - c. Organic impurities, ASTM C40; color no darker than the standard color.
 - 3. Plasticity index of 4 or less when tested in accordance with ASTM D4318.
- C. Fine aggregate manufactured from crushed concrete meeting the quality requirements for crushed rock material of Section 02229 - Utility Backfill Materials, may be used as a complete or partial substitute for bank run sand. The blending ratio of fine aggregate from crushed concrete and bank run sand shall be defined in the mix design report.
- D. Water: Potable water, free of oils, acids, alkalies, organic matter or other deleterious substances, meeting requirements of ASTM C94.

2.02 MIXING MATERIALS

- A. Thoroughly mix sand, cement and water in proportions of the mix design using a pugmill-type mixer. The plant shall be equipped with automatic weight controls to ensure correct mix proportions.
- B. Stamp batch ticket at plant with time of loading directly after mixing. Material not placed and compacted within 4 hours after mixing shall be rejected.

PART 3 EXECUTION

3.01 PLACING

- A. Place sand-cement mixture in 8-inch-thick loose lifts and compact to 95 percent of ASTM D558, unless otherwise specified. The moisture content during compaction shall be on the dry side of optimum but sufficient for hydration. Perform and complete compaction of sand-cement mixture within 4 hours after addition of water to mix at the plant.
- B. Do not place or compact sand-cement mixture in standing or free water.

3.02 FIELD QUALITY CONTROL

- A. Testing will be performed under provisions of Section 01410 - Testing Laboratory Services.
- B. One sample of cement stabilized sand shall be obtained for each 150 tons of material placed per day with no less than one sample per day of production. Random samples of delivered cement stabilized sand shall be taken in the field at point of delivery in accordance with ASTM 3665. Obtain three individual samples of approximately 12 to 15 lb each from the first, middle, and last third of the truck and composite them into one sample for test purpose.
- C. Prepare and mold four specimens (for each sample obtained) in accordance with ASTM D 558, Method A, without adjusting moisture content. Samples will be molded at approximately same time material is being used, but no later than 4 hours after water is added to mix.
- D. After molding, specimens will be removed from molds and cured in accordance with ASTM D 1632.
- E. Specimens will be tested for compressive strength in accordance with ASTM D 1633, Method A. Two specimens will be tested at 48 hours plus or minus 2 hours and two specimens will be tested at 7 days plus or minus 4 hours.
- F. A strength test will be average of strengths of two specimens molded from same sample of material and tested at same age. Average daily strength will be average of strengths of all specimens molded during one day's production and tested at same age.
- G. Precision and Bias: Test results shall meet recommended guideline for precision in ASTM D 1633 Section 9.
- H. Reporting: Test reports shall contain, as a minimum, the following information:

1. Supplier and plant number
2. Time material was batched
3. Time material was sampled
4. Test age (exact hours)
5. Average 48-hour strength
6. Average 7-day strength
7. Specification section number
8. Indication of compliance / non-compliance
9. Mixture identification
10. Truck and ticket numbers
11. The time of molding
12. Moisture content at time of molding
13. Required strength
14. Test method designations
15. Compressive strength data as required by ASTM D 1633
16. Supplier mixture identification
17. Specimen diameter and height, in.
18. Specimen cross-sectional area, sq. in.

3.03 ACCEPTANCE

- A. Strength level of material will be considered satisfactory if:
 1. The average 48-hour strength is greater than 100 psi with no individual strength test below 70 psi.
 2. All 7-day individual strength tests (average of two specimens) are greater than or equal to 100 psi.
- B. Material will be considered deficient when 7-day individual strength test (average of two specimens) is less than 100 psi but greater than 70 psi. See Paragraph 3.04 Adjustment for Deficient Strength.
- C. The material will be considered unacceptable and subject to removal and replacement

at Contractor's expense when individual strength test (average of two specimens) has 7-day strength less than 70 psi.

- D. When moving average of three daily 48-hour averages falls below 100 psi, discontinue shipment to project until plant is capable of producing material, which exceeds 100 psi at 48 hours. Five 48-hour strength tests shall be made in this determination with no individual strength tests less than 100 psi. Testing laboratory shall notify Contractor, Project Manager, and material supplier by facsimile of tests indicating results falling below specified strength requirements within 24 hours.
- E. If any strength test of laboratory cured specimens falls below the specified strength, Contractor may, at his own expense, request test of cores drilled from the area in question in accordance with ASTM C42. In such cases, three (3) cores shall be taken for each strength test that falls below the values given in 3.03.A.
- F. Cement stabilized sand in an area represented by core tests shall be considered satisfactory if the average of three (3) cores is equal to at least 100 psi and if no single core is less than 70 psi. Additional testing of cores extracted from locations represented by erratic core strength results will be permitted.

3.04 ADJUSTMENT FOR DEFICIENT STRENGTH

- A. When mixture produces 7-day compressive strength greater than or equal to 100 psi, then material will be considered satisfactory and bid price will be paid in full.
- B. When mixture produces 7-day compressive strength less than 100 psi and greater than or equal to 70 psi, material shall be accepted contingent on credit in payment. Compute credit by the following formula:

$$\text{Credit per Cubic Yard} = \frac{\$30.00 \times 2 (100 \text{ psi} - \text{actual psi})}{100}$$

- C. When mixture produces 7-day compressive strength less than 70 pounds per square inch, then remove and replace cement-sand mixture and paving and other necessary work at no cost to City.

END OF SECTION

SECTION 02317

AUGERING PIPE FOR WATER LINES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Installing water service pipe by methods of augering or casing by jacking and boring.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 SUBMITTALS

- A. Submit product data in accordance with requirements of Section 01300 - Submittals.
- B. Submit product data for casing spacers and end seals for approval.
- C. Prior to commencement of work, furnish for the Engineer's approval, a plan showing pit locations. Approval of this plan will not relieve Contractor from responsibility to obtain specified results.
- D. Show actual pit locations dimensioned on as-built drawings so that they can be identified in field.

1.04 CONTRACTOR QUALIFICATIONS

- A. The General Contractor shall submit qualifications of his tunneling subcontractor for approval prior to construction. It shall include but not limited to:
 - 1. Minimum experience of at least ten (10) projects of similar nature and type involving successful trenchless installation of water lines in similar conditions (i.e. Railroad, TxDOT, and County right-of-ways).
 - 2. Each superintendent or crew chief directing the tunneling operations in the field shall have a minimum of two years' experience in tunneling work with the present company and verifiable experience with other companies.
 - 3. The City reserves the right to direct the Contractor to utilize another tunneling subcontractor if such requirements are not met.

1.05 DEFINITIONS

- A. Dry Auger Method (Bore and Jack): Installation of steel casing by excavating soil at advancing end of casing and transporting spoil through casing, while advancing casing by jacking at same rate as auger excavation progresses.

- B. Slurry Auger Method: Installation of casing or pipe by first drilling a small diameter pilot hole from pit to pit along the desired line and grade, followed by removing excess soil and installing pipe by pull-back or jacking method into the open hole.

1.06 REGULATORY REQUIREMENTS

- A. Conform to Texas Department of Transportation for installations under state highways. City will obtain required permits for State Highway crossings.
- B. Installations under railroads:
 - 1. Secure and comply with requirements of right-of-entry for crossing railroad company's easement or right-of-way from railroad companies affected. Comply with railroad permit requirements. Submit copy to the Engineer.
 - 2. Use dry auger method only.
 - 3. No extra compensation for damages due to delays caused by the railroad requesting work to be done at hours which will not inconvenience the railroad.
 - 4. Maintain minimum 35-foot clearance from centerline of tracks.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Piping and Fittings: As required by Specification or Drawings.
- B. Casings: Where required by Drawings, in accordance with Section 02611 - Steel Pipe and Fittings. Provide casing with smooth, continuous interior surface.
- C. Casing Spacers (For Pipe Diameters 12 inches and Smaller): Where casings are shown on Drawings, use casing spacer width 8 inches for pipe sizes 4 to 12 inches. Wood skids or concrete "donuts" are not acceptable.
 - 1. For welded steel pipe, use Pipeline Seal & Insulator Model PE, Raci High Density Polyethylene Spacers or approved equal.
 - 2. For other pipe materials, use Pipeline Seal & Insulator Model C8G-2, Raci High Density Polyethylene Spacers or approved equal.
 - 3. Obtain approval for equal product in writing from Engineer prior to bidding.
 - 4. Use ISO-9002 registered casing spacer manufacturer or supplier. Submit copy of current certificate with submittal package.
- D. Casing Spacers (For Pipe Diameters 16 inches or Greater): Where casings are shown on Drawings, use casing spacer width 12 inches for pipe sizes larger than 12 inches. Bolt-

**City of Waller
Standard Specifications**
AUGERING PIPE FOR WATER LINES

on style with shell made of two sections of 14-gauge carbon steel, hot rolled, cleaned, and lined with PVC liner, 0.090 inch thick with Durometer A 85-90 overlapping edges to secure liner to spacer; deep embossed flanges for added strength; coated prior to installation of liner and runner with fusion-bonded PVC powder of 14 to 20 mils thickness; electroplated studs, nuts, and washers.

1. Runners (For Pipe Diameters 16 inches or Greater): Supported by 10-gauge carbon steel MIG risers welded to shell. Total length of weld beads shall be at least 50 percent of the length of the runner. Fill bolt holes with caulk or approved equal to provide a water-tight seal. Minimum requirements: Glass reinforced plastic conforming to the following tests:

- a. Tensile Strength: ASTM D 638; 17,600 psi
- b. Flexural Strength: ASTM D 790; 25,300 psi
- c. Compression Strength: ASTM D 695; 18,000 psi
- d. Deflection Temperature at 264 psi: ASTM D 648; 405 F
- e. Polyethylene runners are not acceptable

- E. Casing End Seals: Provide Pipeline Seal and Insulator Model C, or approved equal.

PART 3 EXECUTION
3.01 GENERAL

- A. Do not exceed 100 feet for length of auger hole for PVC pipe less than 12 inches in diameter without intermediate pit.
- B. Do not exceed 75 feet for length of auger hole for PVC pipe 12 inches to 16 inches in diameter without intermediate pit.
- C. Do not exceed 40 feet for length of auger hole for PVC pipe greater than 16 inches in diameter without intermediate pit.

3.02 PREPARATION

- A. Conform to applicable provisions of Section 01015 - Contractor's Use of Premises.

3.03 TRAFFIC CONTROL

- A. Conform to applicable provisions of Section 01570 - Traffic Control and Regulation.
- B. Secure right-of-entry for crossing railroad company's easement or right-of-way.

- C. During construction operations, furnish and maintain barricades and lights to safeguard traffic and pedestrians as directed by the Engineer, until such time as backfill has been completed and removed from site.

3.04 PITS

- A. Locate auger pits where there is minimum interference with traffic or access to property.
- B. Pit Size: Provide minimum 6-inch space between pipe and walls of bore pit. Maximum allowable width of pit shall be 5 feet unless otherwise approved by the Engineer. Width of pit at surface shall not be less than at bottom. Maximum allowable length of pit shall be no more than 5 feet longer than one full joint of pipe and shall not exceed 25 feet unless otherwise approved by the Engineer.
- C. Excavate bore pits to finished grade at least 6 inches lower than grade indicated by stakes or as approved by the Engineer.
- D. Backfill in accordance with Section 02227 - Excavation and Backfill for Utilities.
- E. Install sheeting, lining, shoring, and bracing required for protection of workmen and public in accordance with Section 01526 - Trench Safety System for all pits, access shafts, end trenches and other excavations relating to work required by this specification.

3.05 SLURRY AUGER

- A. Auger from approved pit locations. Excavate for pits and install shoring as outlined above under Paragraph 3.04, "Pits." Auger mechanically with use of a pilot hole entire length of crossing and check for line and grade on opposite end of bore from work pit. The large hole is to be no more than 2 inches larger than diameter of pipe bell. Place excavated material outside working pit and dispose of as required. Use water or other fluids in connection with boring operation only to lubricate cuttings; jetting will not be permitted.
- B. In unconsolidated soil formations, a gel-forming colloidal drilling fluid may be used. Fluid is to consist of at least 10 percent of high-grade processed bentonite and shall consolidate cuttings of bit, seal walls of hole, and shall furnish lubrication for subsequent removal of cuttings and installation of pipe.
- C. Depending on character of soil encountered during augering operation, conduct operations without interruption, insofar as practical, to prevent hole from collapsing or pipe from seizing up in hole before installation is complete.

- D. Allowable variation from line and grade shall be as specified under Paragraph 3.06, "Dry Auger (Jacking)."
- E. Remove and replace any pipe damaged during augering operations.

3.06 DRY AUGER (JACKING)

- A. Comply with Section 01526 - Trench Safety System for all pits, access shafts, end trenches and other excavations relating to work required by this specification.
- B. If grade of pipe at jacking end is below ground surface, excavate suitable pits or trenches for conducting jacking operations and for placing end joints of pipe. Wherever end trenches are cut in sides of embankment or beyond it, sheath securely and brace such work to prevent earth caving.
- C. No more than one joint shall be made-up in pit or trench prior to jacking.
- D. Construction shall not interfere with operation of railroad, street, highway, or other facility, nor weaken or damage embankment or structure.
- E. Provide heavy-duty jacks suitable for forcing casing pipe through embankment. Use suitable jacking head, usually of timber, and suitable bracing between jacks and jacking head and suitable jacking frame or backstop so that jacking pressure will be applied to casing pipe uniformly around ring of pipe.
- F. Set casing pipe to be jacked on guides, properly braced together, to support section of casing pipe and to direct it in proper line and grade. Place jacking assembly in line with direction and grade of casing pipe. Provide steerable front section of casing to allow vertical grade adjustments. Provide water level or other means to allow monitoring of grade elevation of auger casing. Excavate embankment material just ahead of casing pipe and remove material through pipe. Force casing pipe through embankment with jacks, into space thus provided.
- G. Conform excavation for underside of casing pipe to contour and grade of pipe, for at least one third of circumference of pipe. Provide clearance of not more than 2 inches for upper half of casing pipe. Taper off upper clearance to zero at point where excavation conforms to contour of casing pipe.
- H. Bentonite slurry may be used to lubricate casing pipe during installation. Use of water to facilitate removal of spoil and to lubricate exterior casing is permitted; however, water jetting for excavation of soil is not allowed when jacking casing pipe.
- I. Distance that excavation shall extend beyond end of casing pipe depends on character of material, but it shall not exceed 2 feet in any case. Decrease distance on instructions from the Engineer, if character of material being excavated makes it desirable to keep advance excavation closer to end of casing pipe.

- J. Jack casing pipe from low or downstream end. Tolerances from lines and grades shown on the plan drawings for pipe installed in casing are plus or minus 6 inches in horizontal alignment and plus or minus 1-1/2 inches in elevation unless otherwise approved by the Engineer.
- K. Use cutting edge of steel plate around head end of casing pipe extending short distance beyond end of pipe with inside angles or lugs to keep cutting edge from slipping back onto pipe.
- L. Once jacking of casing pipe is begun, carry on without interruption, insofar as practicable, to prevent casing pipe from becoming firmly set in embankment.
- M. Remove and replace any casing pipe damaged in jacking operations.
- N. Backfill pits or trenches excavated to facilitate jacking operations immediately after completion of jacking of casing pipe.
- O. Grout annular space when loss of embankment occurs or when clearance of two inches is exceeded.

3.07 SPACER INSTALLATION

- A. There must be no inadvertent metallic contact between casing and carrier pipe. Spacing of spacers should ensure that carrier pipe is adequately supported throughout its length, particularly at ends, to offset settling and possible electrical shorting. End spacer must be within 6 inches of end of casing pipe, regardless of size of casing and carrier pipe or type of spacer used. Casing spacers are designed to withstand much greater loads than can be safely applied to most coatings. Therefore, spacing between spacers depends largely on load bearing capabilities of pipe coating and flexibility of pipe.
- B. Bottom of trench adjacent to each end of casing should be graded to provide firm, uniform and continuous support for carrier pipe. If trench requires some backfill to establish final trench bottom grade, backfill material should be placed in 6-inch lifts and each layer properly compacted.
- C. Casing spacers shall be installed in accordance with manufacturer's instructions. Special care shall be taken to ensure that all subcomponents are correctly assembled and evenly tightened, and that no damage occurs during tightening of spacers or carrier pipe insertion.
- D. Annulus between carrier pipe and casing should be sealed with casing end seals at each end of casing.
- E. Spacing for Casing Spacers:

1. Spacing shall be as shown on Drawings with maximum distance between spacers to be 10 feet for PVC pipe sizes 4 to 14 inches and 6 feet for PVC pipe sizes 16 to 30 inches. Maximum spacing shall be 6 feet for all Ductile Iron pipe sizes.
2. For ductile iron pipe, flanged pipe, or bell-and-spigot pipe, spacers should be installed within one foot on each side of bell or flange and one in center of joint when 18 to 20-foot long joints are used.
3. If casing or carrier pipe is angled, bent or dented, spacing should be reduced.

3.08 CLEANUP

- A. Conform to applicable provisions of Section 01564 - Waste Material Disposal.

3.09 FILLING ANNULAR SPACE

- A. Allowable variation from line and grade shall be as specified under "Jacking." Block void space around pipe in augered hole with approximately 12 inches of packed clay or similar material approved by the Engineer, to prevent bedding or backfill from entering the void around the pipe in the augered hole when compacted. For pipe diameters 4 inches through 8 inches use minimum 1/2 cubic foot clay for pipe diameters 12 inches through 16 inches use minimum 3/4 cubic foot clay.

END OF SECTION

SECTION 02521

CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Portland Cement Concrete Paving.

1.02 UNIT PRICES

- A. Measurement for concrete paving is on square yard basis. Separate measurement will be made for each different required thickness of pavement.
- B. Measurement for high early strength concrete is on a square yard basis.
- C. Zero cutback at locations designated by the Contractor's Urban Forester and approved by the Engineer will be paid for by the linear foot measured along the curb. This will include the extra material, including reinforcing, shown on the details in the plans.
- D. The unit price for each item shall also include the elevation survey of forms and any corrections required by the Engineer.
- E. Refer to Section 01025 - Measurement and Payment for unit price procedures.
- F. Refer to Paragraph 3.15 for unit price adjustments.

1.03 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Submit proposed mix design and test data for each type and strength of concrete in Work. Include proportions and actual compressive strength obtained from design mixes at required test ages.
- C. Submit manufacturer's description and characteristics for mixing equipment, and for traveling form paver, if proposed for use, for approval.
- D. Submit manufacturer's certificates giving properties of reinforcing steel. Provide specimens for testing when required by the Engineer.
- E. Submit elevation of forms for approval by the Engineer a minimum of 36 hours prior to paving.

1.04 HANDLING AND STORAGE

- A. Do not mix different classes of aggregate without written permission of the Engineer.
- B. Class of aggregate being used may be changed before or during Work with written permission of the Engineer. New class shall comply with specifications.
- C. Segregated aggregate will be rejected. Before using aggregate whose particles are separated by size, mix them uniformly to grading requirements.
- D. Aggregates mixed with dirt, weeds or foreign matter will be rejected.
- E. Do not dump or store aggregate in roadbed.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Portland Cement:
 - 1. Sample and test cement to verify compliance with Standards of ASTM C150, Type I or Type III.
 - 2. Bulk cement which meets referenced standards may be used if the method of handling is approved by the Engineer. When using bulk cement, provide satisfactory weighing devices.
 - 3. Fly ash which meets standards of ASTM C618 may be used as mineral fill if the method of handling is approved by the Engineer.
- B. Water: Conform to requirements for water in ASTM C94.
- C. Coarse Aggregate: Crushed stone or gravel, or combination thereof, which is clean, hard, durable, conforms to requirements of ASTM C33, and has abrasion loss not more than 45 percent by weight when subjected to Los Angeles Abrasion Test (ASTM C131).
 - 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 .05

is of importance

All other concrete 1.0

* In case of manufactured sand, if material is 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. Coarse aggregate (size 1-1/2 inch to No. 4 sieve) shall conform to requirements of ASTM C33. Gradation shall be within following limits when graded in accordance with ASTM C136:

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, if material finer than 200 sieve is dust of fracture essentially free from clay or shale as established by Part III of 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. Fine

aggregate for concrete shall conform to requirements of ASTM C33. Gradation shall be within following limits when graded in accordance with ASTM C136:

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 C40), 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: Class C fly ash of acceptable quality and meeting requirements of ASTM C618 may be used as mineral admixture in concrete mixture. When fly ash mineral filler is used, it shall be stored and inspected in accordance with ASTM C618. Fly ash shall not be used in amounts to exceed 30 percent by absolute volume of cementitious material in mix design. Cement content may be reduced if strength requirements can be met. Note: When fly ash is used, the term "cement" is defined as cement plus fly ash.
- F. Air Entraining Agent: Furnish an air entraining agent conforming to requirements of ASTM C260.
- G. Water Reducer: Water reducing admixture conforming to requirements of ASTM C494 may be used if required to improve the workability of concrete. Amount and type of such admixture shall be subject to approval by the Engineer.
- H. Reinforcing Steel:

1. Provide new billet steel manufactured by open hearth process and conforming to ASTM A615, 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.

2.02 EQUIPMENT

- A. Equipment: Conform to requirements of ASTM C94.

2.03 MIXING

- A. Employ and pay certified testing laboratory to prepare mix designs. Compressive strength shall be as specified using test specimens prepared in accordance with ASTM C31 and tested in accordance with ASTM C39. Contractor shall determine and measure batch quantity of each ingredient, including all 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 compressive strength of 3000 psi at 7 days and 3500 psi at 28 days. When high-early-strength cement is used, it shall reach at least 3250 psi at 72 hours and 3500 psi at 28 days. Slump of concrete shall be at least 1 inch, but no more than 4 inches, when tested in accordance with ASTM C143.
 1. Concrete pavement 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). Cement content shall be determined in accordance with ASTM C138. 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. Air content shall be determined by testing in accordance with ASTM C231.
 4. Use retardant when temperature exceeds 90 degrees F. Proportion shall be 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 at locations shown in drawings or determined by Engineer. Design to meet the following:
 - 1. Concrete Mix: Compressive strength greater than or equal to 3250 psi at 72 hours.
 - 2. Cement: Minimum 7 sacks of cement per cubic yard of concrete.
 - 3. Water-Cement Ratio maximum of 0.45. Slump of concrete shall be a maximum of 5 inches, when tested in accordance with ASTM C143.
 - 4. Other requirements for proportioning, mixing, execution, testing, etc., shall be in accordance with this Section.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify compacted base is ready to support imposed loads and meets compaction requirements.
- B. Verify lines and grades are correct.

3.02 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.

3.03 EQUIPMENT

- A. Alternate equipment and methods, other than those required by this article, may be used provided the Contractor demonstrates that 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 at all times, and have such 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 such 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 a 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 if 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. Belt Finishing: While concrete is still workable, give surface final belting to produce a uniform surface of gritty texture. Perform belting with short rapid transverse strokes having sweeping longitudinal motion.
- 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.

Requirements of this specification for subgrade, pavement tolerances, pavement depth, alignments, consolidation, finishing and workmanship shall be met. If traveling form paver does not provide concrete paving that meets the compaction, finish and

tolerances requirements of this specification, its use shall be immediately discontinued when so ordered by the Engineer and conventional methods shall be used.

1. Equip traveling paver with longitudinal transangular finishing float adjustable to crown and grade. Float shall be long enough to extend across pavement to side forms or edge of slab.
2. Insure 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 any pavement in which tie bars assume final position other than that shown on Drawings, unless corrective alternates are authorized in writing by the Engineer.

3.04 FORMS

A. Side Forms: Use metal forms of approved shape and section. Preferred depth of form shall be 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 is 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. All forms shall be approved by the Engineer. 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 reasonable 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 the Engineer.

2. Adjacent slabs may be used instead of forms, provided that concrete is well protected from possible damage by finishing equipment. These adjacent slabs shall not be used for forms until concrete has aged at least 7 days.
3. A minimum of 36 hours prior to placing concrete, the Contractor is to submit grades on forms by a licensed surveyor to Engineer for review and approval. Any corrections shall be completed and approved prior to pouring concrete.

3.05 REINFORCING STEEL AND JOINT ASSEMBLIES

- A. Accurately place reinforcing steel and joint assemblies and position them 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. Place all reinforcing steel and secure to chairs.
- B. Place pavement joint assemblies at required locations and elevations, and rigidly secure all parts in required positions. Install dowel bars accurately in joint assemblies as shown, each parallel to pavement surface and to center line of pavement. Rigidly secure in required position to prevent displacement during placing and finishing of concrete. Accurately cut header boards, joint filler and other material used for forming joints to receive each dowel bar. Drill dowels into existing pavement, secure with epoxy, and provide paving headers, as required, to provide rigid pavement sections.
- C. 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 ¼ inch.

3.06 PLACEMENT

- A. Contractor shall notify Engineer 24 hours prior to placement of concrete to allow for inspection and approval of forms, steel and subgrade.
- B. Place concrete only when air temperature taken in shade and away from artificial heat is above 35 degrees F and rising. Concrete shall not be placed when temperature is below 40 degrees F and falling.

When concrete temperature is 85 degrees F or above, do not exceed 60 minutes between introduction of cement to the aggregates and discharge. When the weather is such that the concrete temperature would exceed 90 degrees F, employ effective means, such as pre-cooling of aggregates and mixing water, using ice or placing at night, as necessary to maintain concrete temperature, as placed, below 90 degrees F.

- C. Place concrete within 60 minutes of mixing. Remove and dispose of concrete not placed within this period.
- D. Concrete slump during placement shall be 1 to 4 inches, except when using traveling-form paver slump shall be maximum of 2 inches.
- E. Deposit concrete rapidly and continuously on subgrade or subbase in successive batches. Distribute concrete to required depth and for entire width of placement 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 end of day or in case of unavoidable interruption of more than 30 minutes, place transverse construction joint at point of stopping work. Remove and replace sections less than 10 feet long.
- F. 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.

3.07 COMPACTION

- A. Consolidate the concrete using mechanical vibrators as specified herein. Extend a vibratory unit across the 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.

3.08 FINISHING

- A. Finish concrete pavement with power-driven transverse finishing machines or by hand finishing methods.
 - 1. Use transverse finishing machine to make at least two trips over each area. Make last trip continuous run of not less than 40 feet. After transverse screeding, use hand-operated longitudinal float to test and level surface to

required grade.

2. Hand finish with mechanical strike and tamping template as wide as pavement to be finished. Shape template to pavement section. Move strike template forward in direction of placement, maintaining slight excess of material in front of cutting edge. Make at least 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. While concrete is still workable, give surface final belting to produce a uniform surface of gritty texture. Perform belting with short rapid transverse strokes having sweeping longitudinal motion.

3.09 JOINTS AND JOINT SEALING

- A. Conform to requirements of Section 02523.

3.10 CONCRETE CURING

- A. Conform to requirements of Section 02525.

3.11 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 any depressions and touch all 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 requirements of this paragraph to meet surface test requirements. Restore texture by grooving concrete to meet surface finishing specifications.

3.12 FIELD QUALITY CONTROL

- A. Testing will be performed under provisions of Section 01410 - Testing Laboratory Services.
- B. Compressive Strength Test Specimens: Four test specimens for compressive strength

test will be made for each 150 cubic yards or less of pavement that is placed in one day. Two specimens will be tested at 7 days or at number of hours as directed by the Project Manager for high early strength concrete. Test the remaining two specimens at 28 days. Specimens will be made, cured and tested in accordance with ASTM C-39. Minimum compressive strength shall be 3000 pounds per square inch at 7 days and 3500 pounds per square inch at 28 days.

- C. Yield test will be made in accordance with ASTM C138 for cement content per cubic yard of concrete. If such 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. Minimum of one 4-inch core will be taken at random locations per 1,000 feet per lane or 500 square yards of pavement to measure in-place depth. Each core may be tested for 28-day compressive strength according to methods of ASTM C42. The 28-day compressive strength of each core tested shall be a minimum of 3500 pounds per square inch. Compressive strength shall not be utilized to satisfy the flexural strength requirements.
- E. Contractor may, at his own expense, request three additional cores in vicinity of cores indicating nonconforming in-place depths. 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.

3.13 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 unless accepted by the Engineer.
- B. Nonconforming pavement sections shall be replaced at no cost to City.

3.14 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 bid.
 - 2. Adjustment shall apply to lower limit of 90 percent of unit price bid.
 - 3. No adjustment will be made for excess thickness.

3.15 PAVEMENT MARKINGS

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- A. Restore pavement markings to match those existing in accordance with standard specifications and details and the Engineer's requirements.

3.16 PROTECTION

- A. Barricade pavement section from use until concrete has attained minimum design strength.
- B. 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. Such opening of pavement to traffic shall not relieve Contractor from his responsibility for Work.
- C. Maintain concrete paving in good condition until completion of Work.
- D. Repair defects by replacing concrete to full depth. Minimum full depth repair area shall be 2' x 2'.
- E. Contractor shall have on hand enough plastic to cover freshly poured concrete in case of inclement weather.

END OF SECTION

SECTION 02523

CONCRETE JOINTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Joints for concrete paving; concrete sidewalks; and curbs, and curb and gutter.
- B. Saw-cutting existing concrete or asphalt pavements for new joints.

1.02 UNIT PRICES

- A. No separate payment will be made for concrete joints under this Section. Include payment in unit price for Section 02521 - Concrete Paving.
- B. 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.
- C. No separate payment will be made for joints for Curb, Curb and Gutter, Concrete Sidewalks, and Concrete Driveways. Include payment in unit price for Curb and Gutter; Concrete Sidewalks, and Concrete Driveways.
- D. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 SUBMITTALS

- A. Submit product data and samples in accordance with requirements of Section 01300 - Submittals.
- 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.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Board Expansion Joint Material: Filler board of selected stock. Use wood of density and type as follows:
 - 1. Clear, all-heart cypress weighing no more than 40 pounds per cubic foot, after being oven dried to constant weight.

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- 2. Clear, all-heart redwood weighing no more than 30 pounds per cubic foot, after being oven dried to constant weight.
 - 3. Use wood only when part of a load transmission device assembly.
 - B. Preformed Expansion Joint Material: Bituminous fiber and bituminous mastic composition material conforming to ASTM D994 and ASTM D1751.
 - C. Joint Sealing Compound:
 - 1. Self-leveling Low Modulus Silicone sealant single component meeting the requirements of TxDOT Specification 433.2, Class 5.
 - D. Load Transmission Devices:
 - 1. Smooth, steel dowel bars conforming to ASTM A615, 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.
 - 2. Deformed steel tie bars conforming to ASTM A615, Grade 60.
 - E. Metal Supports for Reinforcing Steel and Joint Assembly: Employ metal supports of approved shape and size that will secure reinforcing steel and joint assembly in correct position during placing and finishing of concrete. Space supports as directed by the Engineer.

PART 3 EXECUTION

3.01 PLACEMENT

- A. When new work is adjacent to existing concrete, place joints at same location as existing joints in adjacent pavement.
- B. If the limit of removal of existing concrete or asphaltic pavement does not fall on existing joint, saw cut existing pavement minimum of 1-1/2 inches deep to provide straight, smooth joint surface without chipping, spalling or cracks.

3.02 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. 5 deformed tie bars, 30 inches long and spaced 18 inches on centers.

3.03 EXPANSION JOINTS

- A. Place 3/4-inch expansion joints at locations shown on drawings. 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. Seal with joint sealing compound.

3.04 CONTRACTION JOINTS

- A. Place contraction joints at same locations as in adjacent pavement or at spaces indicated on Drawings. Spacing of contraction/construction joints shall be 20 feet. Seal groove with joint sealing compound.

3.05 LONGITUDINAL WEAKENED PLANE JOINTS

- A. Place longitudinal weakened plane joints at spaces indicated on Drawings. Seal groove with joint sealing compound.

3.06 SAWED JOINTS

- A. Contractor may use sawed joints as an alternate to contraction and weakened plane joints. Circular cutter shall be capable of cutting straight line groove minimum of 3/8 inch wide. Depth shall be one quarter of pavement thickness plus 1/2 inch. Commence sawing as soon as concrete has hardened sufficiently to permit cutting without chipping, spalling or tearing and prior to initiation of cracks. Once sawing has commenced, it shall be continued until completed. Make saw cut with one pass. Complete sawing within 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. Provide at least one standby saw in good working order. Maintain an ample supply of saw blades at work site at all times during sawing operations. Sawing equipment shall be on job at all times during concrete placement.

3.07 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. Provide a 1/2 inch smooth bar, 10-inch long through expansion board. Sleeve one end so concrete will not bond to bar.

3.08 JOINTS FOR CONCRETE SIDEWALKS

- A. Provide 3/4-inch expansion joints conforming to ASTM A1751 along and across sidewalk at back of curbs, at intersections with driveways, steps, and walls; and across walk at

intervals not to exceed 20 feet. Provide expansion joint material conforming to ASTM D994 for small radius curves and around fire hydrants and utility poles. Extend the expansion joint material full depth of the slab. Reinforcing bars (1/2 inch smooth bar) shall extend 10 inches beyond the expansion joint and then shall be wrapped with approved sleeves, so that the 10 inches shall not be bonded to the concrete.

3.09 JOINTS FOR CONCRETE DRIVEWAYS

- A. Provide 3/4-inch expansion joints conforming to ASTM D1751 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. Provide a 1/2 inch smooth bar, 10-inch long through expansion board. Sleeve one end so concrete will not bond to bar.

3.10 JOINT SEALING

- A. Seal joints only when surface and joints are dry, ambient temperature is above 50°F and less than 85°F, and weather is not foggy or rainy.
- B. Joint sealing equipment shall be in first-class working condition, and be approved by the Engineer. 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. 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 below 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 02525

CONCRETE PAVEMENT CURING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Curing of Portland Cement Concrete Paving.

1.02 UNIT PRICES

- A. No separate payment will be made for concrete curing under this Section. Include payment in unit price for Concrete Paving; Concrete Sidewalks; Curb, Curb and Gutter; and Concrete Driveways.

1.03 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Submit manufacturer's product data for cover materials and liquid membrane-forming compounds

PART 2 PRODUCTS

2.01 COVER MATERIALS FOR CURING

- A. Curing materials shall conform to one of following:
 - 1. Polyethylene Film: Opaque pigmented white film conforming to requirements of ASTM C171.
 - 2. Waterproofed Paper: Paper conforming to requirements of ASTM C171.
 - 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. Mats shall be stitched so that mat will contact surface of pavement at all points when saturated with water.

2.02 LIQUID MEMBRANE-FORMING COMPOUNDS

- A. Liquid membrane-forming compounds shall conform to ASTM C309. Membrane shall restrict loss of water to not more than 0.55 kg/m² of surface in 72 hours.

PART 3 EXECUTION

3.01 GENERAL

- A. Concrete pavement shall be cured by protecting it 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 asphaltic concrete.
- B. Where curing requires use of water, curing shall have prior right to all water supply or supplies. Failure to provide sufficient cover material shall be cause for immediate suspension of concreting operations.

3.02 POLYETHYLENE FILM CURING

- A. Immediately after finishing surface, and after concrete has taken its initial set, apply water in the form of a fine spray. Cover surface with polyethylene film so film will remain in intimate contact with surface during specified curing period.
- B. Cover entire surface and both edges of pavement slab. Joints in film sheets shall overlap minimum of 12 inches. Immediately repair tears or holes occurring during curing period by placing acceptable moisture-proof patches or by replacing.

3.03 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 intimate 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. Joints in blankets caused by joining paper sheets shall lap not less than 5 inches and shall be securely sealed with asphalt cement having melting point of approximately 180°F. Place blankets to secure an overlap of at least 12 inches. Tears or holes appearing in paper during curing period shall be immediately repaired by cementing patches over defects.

3.04 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, in such manner that they will contact surface of pavement equally at all points.
- B. Mats shall remain 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.

3.05 LIQUID MEMBRANE-FORMING COMPOUNDS

- A. Immediately after finishing surface, and after concrete has taken its initial set, apply liquid membrane-forming compound in accordance with manufacturer's instructions.

END OF SECTION

SECTION 02530

CONCRETE SIDEWALKS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Reinforced concrete sidewalks.

1.02 UNIT PRICES

- A. Measurement for removal and replacement or new concrete sidewalks is on square foot basis and includes removal and disposal, select fill subgrade and all reinforcing and dowels. Restoration of areas where sidewalk is removed and not replaced will be included in final right of way grading bid item.
- B. Removal and replacement of new wheelchair ramps is on a per each basis and includes sawcut, removal and disposal, select backfill subgrade, all reinforcing and dowels and truncated dome pavers.
- C. Measurement for placement of retaining walls along sidewalks is on a linear foot basis of the height shown and includes all reinforcing and all materials for weephole.
- D. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Submit proposed mix design and test data for each type and strength of concrete in Work. Include proportions and actual compressive strength obtained from design mixes at required test ages.
- C. Submit manufacturer's certificates giving properties of reinforcing steel. Provide specimens for testing when required by the Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete: Conform to material and proportion requirements for concrete of Section 02521.

- B. Reinforcing Steel: Conform to material requirements for reinforcing steel of Section 02521.
- C. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Section 02523.
- D. Joint Sealing Compound: Conform to material requirements of Section 02523.
- E. Sand Bed: Conform to material requirements for select fill of Section 02229.

PART 3 EXECUTION

3.01 REPLACEMENT

- A. Replace sidewalks which are removed or damaged during construction with sidewalk of thickness and width equivalent to one removed or damaged.
- B. Provide replaced and new sidewalks with wheelchair ramps if sidewalk intersects curb at street or driveway intersection.

3.02 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 Section 02100.
- D. Determine sidewalk horizontal and vertical alignment to facilitate drainage and prevent ponding. Location and slope must be in conformance with the Texas Department of Licensing and Regulation (TDLR) Texas Accessibility Standards (TAS), latest edition and revisions.
- E. Excavate subgrade 6 inches beyond outside lines of sidewalk and 6 inches below the bottom of concrete. Shape to the line, grade and cross section. Compact 6 inches of select fill (per Section 02229) subgrade to minimum of 95 percent maximum dry density at optimum to 2 percent above optimum moisture content, as determined by ASTM D698.

3.03 PLACEMENT

- A. Forms: Straight, unwarped wood or metal forms with nominal 4-inch depth. Securely stake forms to line and grade, and maintain in true position during concrete placement.

- B. Reinforcement: Install No. 4 reinforcing steel bars spaced in accordance with Drawing detail. Lay longitudinal bars in walk continuously, through expansion joints in accordance with Section 02523. Support reinforcement in manner to maintain reinforcement in center of slab vertically during placement.
- C. Expansion Joints: Install expansion joints in accordance with Section 02523.
- D. Place concrete in forms to specified depth and tamp thoroughly with "jitterbug" tamp, or other acceptable method. Bring mortar to surface.
- E. Strike off to smooth finish with wood strike board. Finish smoothly with wood hand float. Brush across sidewalk lightly with fine-haired brush.
- F. Unless otherwise indicated on Drawings, mark off joints 1/8 inch deep, at spacing equal to width of walk. Use joint tool equal in width to edging tool.
- G. Finish edges with tool having 1/4-inch radius.
- H. After concrete has set sufficiently, refill space along sides of sidewalk to top of walk with suitable material. Tamp unit firm and solid. Dispose of excess material in accordance with Section 01564.

3.04 CURING

- A. Conform to requirements of Section 02525.

3.05 PROTECTION

- A. Maintain sidewalks in good condition until completion of Work.
- B. Replace damaged sidewalks in accordance with Paragraph 3.01 in this Section.

END OF SECTION

SECTION 02531

CONCRETE DRIVEWAYS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Portland cement concrete driveways.

1.02 UNIT PRICES

- A. Measurement for concrete driveways is on square yard basis and includes removal of existing driveway, placement of driveway, driveway curbs, and decorative borders matching existing materials, select fill subgrade, and all reinforcing and dowels. Decorative colors, textures and patterns to match existing driveway are included in the unit price.
- B. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Submit proposed mix design and test data for each type and strength of concrete in Work. Include proportions and actual compressive strength obtained from design mixes at required test ages.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete: Conform to material and proportion requirements for concrete of Section 02521.
- B. Reinforcing Steel: Conform to material requirements of Section 02521.
- C. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Section 02523.
- D. Joint Sealing Compound: Conform to material requirements of Section 02523.

PART 3 EXECUTION

3.01 PREPARATION

-
- A. Prepare subgrade in accordance with applicable portions of Sections 02221 through 02227 and 02241.
 - B. Flare or radius to match existing driveway, minimum radius shall be five feet.
- 3.02 PLACEMENT
- A. Place and finish concrete in accordance with applicable portions of Section 02521.
- 3.03 JOINTS
- A. Install joints in concrete driveway in accordance with Section 02523.
- 3.04 CONCRETE CURING
- A. Cure concrete driveway in accordance with Section 02525.
- 3.05 PROTECTION
- A. Conform to applicable requirements of Section 02525.

END OF SECTION

SECTION 02532

CURB, CURB & GUTTER, & HEADERS

PART 1 GENERAL

1.01 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.

1.02 UNIT PRICES

- A. Measurement for curbs and for curbs and gutter is on linear foot basis measured along face of curb.
- B. Measurement 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.
- C. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Submit details of proposed formwork for approval.
- C. Submit proposed mix design and test data for each type and strength of concrete in Work. Include proportions and actual compressive strength obtained from design mixes at required test ages.
- D. Submit manufacturer's certifications giving properties of reinforcing steel. Provide specimens for testing when required by the Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete: Conform to material and proportion requirements for concrete of Section 02521.

- B. Reinforcing Steel: Conform to material requirements for reinforcing steel of Section 02521.
- C. Grout: Nonmetallic, non-shrink grout containing no chloride producing agents conforming to the following requirements.

Compressive strength, psi	
at 7 days	3500
at 28 days	8000
Initial set time, minutes	45
Final set time, hours	1.5

- D. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Section 02523.
- E. Joint Sealing Compound: Conform to material requirements of Section 02523.
- F. Mortar: Mortar finish composed of one part Portland cement and 1-1/2 parts of fine aggregate. Use only when approved by the Engineer.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prepare subgrade or base in accordance with applicable portions of Sections 02221 and 02225.

3.02 PLACEMENT

- A. Guideline: Set to follow top line of curb. Attach indicator to provide constant comparison between top of curb and guideline. Insure flow lines for monolithic curb and gutters conform to slopes indicated on Drawings.
- B. Forms: Brace sufficiently to maintain position during pour. Use metal templates cut to section shown on Drawings.
- C. Reinforcement: Secure in proper position so that steel will remain in place throughout placement.

- D. Joints: Place in accordance with Section 02523. Place dummy groove joints at right angles to curb lines in line with pavement joints. Cut dummy grooves 1/4 inch deep using an 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.

3.03 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-handed 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.

3.04 MECHANICAL FINISHING

- A. Mechanical curb forming and finishing machines may be used instead of, or in conjunction with, previously described methods, if approved by the Engineer. Use of mechanical methods shall provide specified curb design and finish.

3.05 CURING

- A. Immediately after finishing operations, cure exposed surfaces of curbs and gutters in accordance with Section 02525.

3.06 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 a 10-foot long straightedge laid along them, except at grade changes.

3.07 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 02540
POINT REPAIR OF EXISTING CONCRETE PAVEMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Full-depth repair of existing section of Portland cement concrete pavement, removing the old concrete and replacing it with concrete as herein specified, in conformance with the typical sections shown on the Drawings.

1.02 UNIT PRICES

- A. Refer to Section 01025 – Measurement and payment for unit price procedures.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete shall conform to the requirements of Section 02751, "Sitework Concrete".
- B. Reinforcing steel shall conform to the requirements of Section 02751, "Sitework Concrete".
- C. Subgrade material shall conform to the material requirements of Section 02252.

PART 3 EXECUTION

3.01 EXAMINATION

- A. The Contractor shall survey the area determined by the Engineer as described in Section 01050, Field Surveying. The Engineer will review the survey data and provide final limits and elevations for the proposed repairs.
- B. The areas to be repaired shall be outlined by the contractor and approved by the Engineer, prior to saw cutting, if required.
- C. The areas will be determined after the removal of the asphaltic concrete. The removal of the asphalt will be in accordance with Section 02500

3.02 PREPARATION

- A. Make required saw cuts as approved by the Engineer around the perimeter of the repair area. Remove the distressed area, taking care not to spall or fracture the adjacent concrete. Install the dowels or prepare the undercut and complete the patch as shown on the Drawings.

3.03 GENERAL

- A. Dispose of removed concrete at sites which are obtained by the Contractor.
- B. Replacement of transverse joints will be required where the failed area necessitates the removal of an existing joint.
- C. When a point repair includes portions of more than one lane of traffic, only one lane shall be repaired at a time. The adjacent lane shall not be repaired until such time as traffic can travel on the first lane repaired. Provisions shall be made to include steel in first pour for tie to second pour.
- D. On concrete streets, where existing asphalt overlay is being removed prior to pavement repair, the Contractor shall be aware that additional or less point repairs may be required, once the condition of the presently covered concrete street is known. After removal of the asphalt overlay, the Contractor shall outline the limits of point repair, on the existing concrete pavement, with spray paint, so that the City may reevaluate the limits of the point repair. The Contractor shall allow sufficient time for the City to determine required point repair adjustments, prior to proceeding with the point repairs. The point repair quantity may be adjusted.
- E. After removal of the concrete in the point repair area, the Engineer will determine the type of point repair required. The Engineer will determine if the subgrade requires removal and replacement or if the existing subgrade can be reused.
- F. The condition of the existing concrete streets within this project may be very deteriorated and cracked. During the point repair process, the Contractor shall remove pieces of unstable concrete which exist beyond and adjacent to the limits of point repair indicated on the drawings. Unsuitable concrete shall be that which is loose from the existing concrete pavement or that which "rocks" when surface pressure is applied. The purpose for removing these pieces will be to provide a firm solid pavement adjacent to the new point repair. Measurement and payment will include the unstable areas as approved by the Engineer.
- G. The Contractor shall be aware that due to the deteriorated state of the existing concrete pavement, vehicular or construction traffic adjacent to point repair excavation may aggravate and worsen the cracked pavement condition. This can cause concrete considered stable at the time of excavation to become unstable. The Contractor shall be responsible for removing and replacing such unstable concrete with new paving material at no additional cost to the City.

3.04 PLACEMENT

- A. The requirements of Section 02751, "Sitework Concrete", shall govern the placing of the concrete. Immediately prior to placing the concrete, the subbase and each face of existing concrete shall be wetted. Approved, hand manipulated, mechanical vibrators shall be used to insure proper consolidation of the concrete. The concrete shall be screeded off to the elevation of the adjacent concrete pavement and checked with a straightedge to ensure that the riding surface will be satisfactory. The concrete shall be finished with a broom finish, as directed by the Engineer.

3.05 OPENING TO TRAFFIC

- A. The repaired area may be opened to traffic when the pavement has attained a flexural strength of 500 pounds per square inch. All test specimens, representing tests for opening to traffic, shall be cured using the same methods and under the same conditions as the concrete represented.

3.06 FIELD QUALITY CONTROL

- A. Testing will be performed under provisions of Section 01410 - Testing Laboratory Services.
- B. Any modifications in the construction methods requested by the Contractor must be submitted to the Engineer, in writing, for his approval.

END OF SECTION

SECTION 02571

PAVEMENT REPAIR FOR UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Repairing and resurfacing streets, highways, driveways, sidewalks, curbs and gutters, and other pavements that have been cut, broken, or damaged during construction.
 - 1. Parking areas, service drives, driveways, and sidewalks: Replace with material equal to or better than existing or as indicated on Drawings.
 - 2. Street pavements and curbs, curbs and gutters: Match general pavement type and provide subgrade, base, and surface materials as indicated on the Drawings and as specified in this Section.
- B. Repair State highway crossings in accordance with the highway department permit and within 1 week after utility work is installed.
- C. Conform to Section 02076 - Removing Existing Pavement and Structures, for removal of existing pavements.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment for other unit price procedures.

1.03 NONCONFORMING PAVEMENT

- A. Remove and replace areas of non-conforming Portland cement concrete or asphaltic concrete pavement found deficient in thickness by more than 10 percent, or that fail specified tests, unless accepted by Engineer.

1.04 UNIT PRICE ADJUSTMENT

- A. For non-conforming pavement, accepted by the Engineer, unit price adjustments shall be made for actual 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 bid.
 - 2. Adjustment shall apply to lower limit of 90 percent of unit price. No adjustments in price will be made for excess thickness.

1.05 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Submit test results or other data confirming that materials meet the specified requirements for:
 - 1. Fill, backfill and subgrade materials
 - 2. Base course materials
 - 3. Asphalt materials and mix designs
 - 4. Concrete materials and mix design
 - 5. Joint material

PART 2 PRODUCTS**2.01 SUBGRADE**

- A. Provide fill and backfill materials beyond the limits of the utility trench as indicated on the Drawings and conforming to the following classifications. The classifications follow Unified Soil Classification Symbols as defined in ASTM D2487. Use soils with dual designation according to ASTM D2487 according to the least restrictive class.
 - 1. Class I: Well graded sands and gravels, gravel-sand mixtures, crushed well graded rock, little or no fines (GW, SW)
 - a. Plasticity Index – Non-plastic.
 - b. Gradation - D_{60}/D_{10} - greater than 4 percent passing No. 200 Sieve - less than or equal to 5 percent.
 - 2. Class II: Poorly graded gravels and sands, silty sands and gravels, little to moderate fines (GM, GP, SP, SM).
 - a. Plasticity Index: Non-plastic to 4 percent.
 - b. Gradation: percent passing No. 200 Sieve - less than 5 percent (GP, SP).
 - c. Gradation: percent passing No. 200 Sieve - between 12 percent and 50 percent (GM, SM).
 - 3. Class III: Clayey gravels and sands, poorly graded mixtures of sand, gravel, and clay (GC, SC).
 - a. Plasticity Index: greater than 7.
 - b. Gradation: percent passing No. 200 Sieve between 12 percent and 50 percent.
 - 4. Backfill Material: Conform to requirements of Section 02229 – Utility Backfill Material.
 - 5. Lime Stabilized Subgrade: Lime for subgrade stabilization shall conform to the following:

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- a. Type A - Hydrated lime: Dry material consisting essentially of calcium hydroxide or mixture of calcium hydroxide and an allowable percentage of calcium oxide and magnesium hydroxide.
- b. Type B - Commercial lime slurry: Liquid mixture consisting essentially of lime solids and water in slurry form. Water or liquid portion shall not contain dissolved material in sufficient quantity to be injurious or objectionable for purpose intended.
- c. Lime shall conform to following requirements:

<u>Chemical Composition</u>	<u>Type A</u>	<u>Type B</u>
Active lime content, % by weight Ca(OH) ₂ + CaO	90.0 min ⁽¹⁾	87.0 min ⁽²⁾
Non-hydrated lime content, % by weight CaO	5.0 max	---
Free water content, % by weight H ₂ O	5.0 max	---

Sizing

Wet Sieve, as % by weight residue retained:		
No. 6	0.2 max	0.2 max ⁽²⁾
No. 30	4.0 max	4.0 max ⁽²⁾
Dry sieve, as % by weight residue retained:		
1-inch	---	---
¾-inch	---	---

Notes:

⁽¹⁾ Maximum 5.0 percent by weight CaO shall be allowed in determining total active lime content.

⁽²⁾ Maximum solids content of slurry

- d. Lime slurry may be delivered to the job site as commercial lime, or may be prepared at the job site by using hydrated lime or quicklime. The slurry shall be free of liquids other than water and shall be of a consistency that can be handled and uniformly applied without difficulty.
6. Concrete Backfill: Conform to Class B (2000 psi) concrete as specified in Section 03305 - Concrete for Utility Construction or Section 03310 - Structural Concrete, as applicable.

2.02 BASE COURSE MATERIALS

- A. Crushed Stone Flexible Base Course Materials
1. Crushed Stone: Material retained on the No. 40 Sieve meeting the following requirements:
 - a. Durable particles of crusher-run broken limestone, sandstone, or granite obtained from an approved source.
 - b. Los Angeles abrasion test percent of wear not to exceed 40 when tested in accordance with ASTM C131.
 2. Soil Binder: Material passing the No. 40 Sieve meeting the following requirements when tested in accordance with ASTM D4318.
 - a. Maximum Liquid Limit: 40
 - b. Maximum Plasticity Index: 12
 - c. Maximum Lineal Shrinkage: 7 (when calculated from volumetric shrinkage at liquid limit).
- B. Mixed Materials shall have a minimum compressive strength of 35 psi at 0 psi lateral pressure and 175 psi at 15 psi lateral pressure using triaxial testing procedures. Mixed materials shall be graded as follows:

<u>Sieve</u>	<u>Percent Retained</u>
1 $\frac{3}{4}$ -inch	0 to 10
No. 4	45 to 75
No. 40	60 to 85

2.03 ASPHALTIC CONCRETE

- A. Coarse Aggregate: Gravel, crushed stone or a combination of the two, 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. Aggregate shall conform to ASTM C33 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 C131.
- B. Fine Aggregate: Sand or stone screenings or combination of both passing No. 10 sieve. Use aggregate conforming to ASTM C33, 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. Confirm a Plasticity Index of not more than 6 for fine aggregate passing the No. 40 sieve when tested by Tex-106-E. The sand equivalent shall have a minimum value of 45 when tested by Tex-203-F.
- C. Composite Aggregate: Conform to following limits when graded in accordance with ASTM C136.

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Gradation of Composite Aggregate

<u>Sieve Size</u>	<u>Percent Passing</u>
1/2-inch	100
3/8-inch	85 to 100
#4	50 to 70
#10	32 to 42
#40	11 to 26
#80	4 to 14
#200	1 to 8

- D. Asphaltic Material: Moisture-free homogeneous material which will not foam when heated to 347 degrees F. Material shall not be cracked. City Engineer will approve grade of asphalt to use after design tests have been made. Use only one grade of asphalt after grade is determined by test design for project and shall meet the following requirements:

<u>Test</u>	<u>AC-10</u>		<u>AC-20</u>	
	<u>Min</u>	<u>Max</u>	<u>Min</u>	<u>Max</u>
Viscosity, (140°F) poises	800	1,200	1,600±	
Viscosity, (275°F) cs	150	---	210	---
Penetration, (77°F), 100 g, 5 sec.	70	---	40	---
Flash Point, COC, (°F)	425	---	450	---
Solubility in trichloroethylene, %	99.0	---	99.0	---
<u>Tests on residues from thin film oven tests</u>	<u>Min</u>	<u>Max</u>	<u>Min</u>	<u>Max</u>
Viscosity, (140°F) stokes	---	4,000	---	8,000
Ductility, (77°F), 5 cms per min	50	---	20	---
Spot tests	Negative for all grades			

- E. Prime Coat

1. Cutback Asphalt Prime Coat. Moisture-free homogeneous material (MC-30 or MC-70) which will not foam when heated to 347 degrees F and which meets the following requirements:

<u>Type – Grade Properties</u>	<u>MC-30</u>		<u>MC-70</u>	
	<u>Min</u>	<u>Max</u>	<u>Min</u>	<u>Max</u>
Water, percent	---	0.2	---	0.2
Flash Point, TOC, °F	100	---	100	---
Kinematic Viscosity at 140°F, cst	30	60	70	140
	<u>MC-30</u>		<u>MC-70</u>	
	<u>Min</u>	<u>Max</u>	<u>Min</u>	<u>Max</u>
Distillate expressed as percent by volume				

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of total distillate to 680°F

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, %	50	---	55	---
--	----	-----	----	-----

Tests on Distillation Residue:

Penetration at 77°F, 100 g, 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 if its ductility at 60 degrees F is more than 100.

2. Emulsified Petroleum Resin Prime Coat (EPR-1 Prime): Slow curing emulsion of petroleum resin and asphalt cement conforming to the following requirements. For use, EPR-1 may be diluted with water up to a maximum of three parts water to one-part EPR-1 in order to achieve the desired concentration of residual resin/asphalt and facilitate application.

<u>Properties</u>	<u>Min.</u>	<u>Max.</u>
Furol Viscosity at 77°F, sec	14	40
Residue by Evaporation, % by weight	60	---
Sieve Test, %	---	0.1
Particle Charge Test		Positive
Tests on the Distillation Residue:		
Flash Point, COC (°F)	400	---
Kinematic Viscosity @ 140°F (cst)	190	350

F. Tack Coat

1. Cutback Asphalt Tack Coat

Moisture-free homogeneous asphalt material (RC-250) which will not foam when heated to 347°F and which meets the following requirements:

<u>Properties</u>	<u>Min.</u>	<u>Max.</u>
Water, percent	---	0.2

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Flash Point, TOC, (°F)	80	---
Kinematic Viscosity at 140°F, cst	250	400
Distillate: Expressed as percent by volume of total distillate to 680°F:		
to 437°F	40	75
to 500°F	65	90
to 600°F	85	---
Residue from 680°F Distillation, Volume, percent	70	---
Tests on Distillation Residue:		
Penetration at 77°F, 100 g, 5 sec.	100	150
Ductility at 77°F, 5 cm/min. cms	100	---
Solubility in Trichloroethylene	99	---
Spot Test	All Negative	

2. Emulsified Tack Coat

Homogeneous material which shows no separation of asphalt after mixing and shall meet the viscosity requirements at any time within 30 days after delivery. Emulsion material (SS-1) for tack coat shall meet the following:

<u>Properties</u>	<u>Min.</u>	<u>Max.</u>
Furol Viscosity at 77°F, sec.	30	100
Residue by Distillation, %	60	---
Oil Portion of Distillate, %	---	2
Sieve Test, %	---	0.1
Miscibility (Standard Test)	Passing	Passing
Cement Mixing, %	---	0.2
Storage Stability, 1 Day, %	---	1
Test on Residue:		
Penetration at 77°F, 100 g, 5 sec	120	160
Solubility in Trichloroethylene, %	97.5	---
Ductility at 77°F, 5 cm/min, cms	100	---

- G. Asphalt Concrete Pavement Mixes. Employ and pay certified testing laboratory to prepare design mixes. Test or certify test on the proposed mixes have been performed on similar materials in accordance with Tex-126-E or Tex-204-F and Tex-208-F.

Density and
Stability
Requirements:
Percent Density

HVEEM Stability Percent

<u>Min.</u>	<u>Max.</u>	<u>Optimum</u>	<u>Not Less Than</u>
94.5	97.5	96	35

1. Proportions for Asphaltic Material: Provide 4 to 8 percent of mixture by weight. Aggregate by weight shall not contain more than 1.0 percent by weight of fine dust, clay-like particles or silt present when tested in accordance with Tex-217-F, Part II.

2.04 PORTLAND CEMENT CONCRETE PAVING MATERIALS

- A. Concrete shall conform to requirements for Class A concrete as specified in Section 03305 - Concrete for Utility Construction or Section 03310 - Structural Concrete, as applicable.
- B. Reinforcing shall conform to requirements for bars and welded wire fabric as specified in Section 03305 - Concrete for Utility Construction or Section 03210 - Reinforcing Steel, as applicable.

2.05 JOINT MATERIALS

- A. Board Expansion Joint Material: Filler board of selected stock. Use wood of density and type as follows:
 1. Clear, all-heart cypress weighing no more than 40 pounds per cubic foot, after being oven dried to constant weight.
 2. Clear, all-heart redwood weighing no more than 30 pounds per cubic foot, after being oven dried to constant weight.
- B. Preformed Expansion Joint Material: Bituminous fiber and bituminous mastic composition material conforming to ASTM D994 and ASTM D1751.
- C. Joint Sealing Compound: Hot-poured rubber-asphalt compound conforming to ASTM D3405.
- D. Load Transmission Devices:
 1. Smooth, steel dowel bars conforming to ASTM A615, 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.
 2. Deformed steel tie bars conforming to ASTM A615, Grade 60.

- E. Metal Supports for Reinforcing Steel and Joint Assembly: Employ metal supports of approved shape and size that will secure reinforcing steel and joint assembly in correct position during placing and finishing of concrete.

2.06 SIDEWALK AND DRIVEWAY MATERIALS

- A. Sand bed shall be bank run sand, classified as SW, SP, or SM by the Unified Soil Classification System of ASTM D2487, with the following:
 - 1. Less than 0.5 percent clay lumps (ASTM C142).
 - 2. Less than 5.0 percent lightweight pieces (ASTM C123).
 - 3. Organic impurities, color no darker than standard color (ASTM C40).
 - 4. Plasticity index of 4 or less per ASTM D4318.
- B. Portland cement concrete shall conform to requirements for Portland cement concrete paving in this Section.
- C. Asphaltic concrete shall conform to requirements for asphaltic concrete paving in this Section.
- D. Gravel paving shall conform to the requirements of Class II backfill in this section but with a gradation to match the gravel surface being replaced.

PART 3 EXECUTION

3.01 EQUIPMENT

- A. Alternate equipment and methods, other than those required by this section, may be used provided the Contractor demonstrates that equal or better results will be obtained. Maintain equipment for preparing subgrade and for finishing and compacting pavement in good working order.

3.02 SUBGRADE

- A. Preparation
 - 1. Verify backfill of new utilities is complete, in accordance with Section 02227 - Excavation and Backfill for Utilities.
 - 2. Correct subgrade deviations 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.
 - 3. Prepare sufficient subgrade in advance of base course operations.

- B. Unstabilized Subgrade. Replace and compact unstabilized subgrade in accordance with the requirements for compaction, tolerance, testing and protection of lime stabilized subgrade.
- C. Lime Stabilized Subgrade
 - 1. Scarify or excavate to bottom elevations to receive stabilized subgrade as indicated on the drawings. Remove material or windrow to expose secondary grade. Correct wet or unstable material below secondary grade by scarifying, adding lime, and compacting. Obtain uniform stability.
 - 2. Lime Slurry Application
 - a. Mix hydrated lime with water to form a slurry of the solids content specified. Commercial lime slurry shall have dry solids content as specified.
 - b. Apply slurry with a distributor truck equipped with an agitator to keep lime and water in a consistent mixture. Make successive passes over measured section of roadway to attain proper moisture and lime content. Limit spreading to an area where preliminary mixing operations can be completed on the same working day.
 - c. Apply so that dry subgrade will contain a minimum lime content of 5 percent by weight of dry subgrade unless otherwise instructed by Testing Laboratory.
 - 3. Preliminary Mixing
 - a. Do not mix and place material when temperature is below 40 degrees F and falling. Base may be placed when temperature taken in shade and away from artificial heat is above 35 degrees F and rising.
 - b. Use approved single-pass or multiple-pass rotary speed mixers to mix soil, lime, and water to required depth. Obtain a homogeneous friable mixture free of clods and lumps.
 - c. Mix and pulverize until all material passes a 1-3/4 inch sieve; a minimum of 85 percent, excluding nonslacking fractions, passes a 3/4 inch sieve; and a minimum of 60 percent excluding nonslacking fractions pass a No. 4 sieve.
 - d. Shape mixed subgrade to final lines and grades.
 - e. Seal subgrade as a precaution against heavy rainfall by rolling lightly with light pneumatic rollers.

- f. Cure soil-lime material for 1 to 4 days. Keep subgrade moist during cure.
- 4. Compaction
 - a. Aerate or sprinkle to attain optimum moisture content. Remove and reconstruct sections where average moisture content exceeds ranges specified at time of final compaction.
 - b. Start compaction immediately after final mixing, unless approved by Engineer.
 - c. Spread and compact in two or more approximately equal layers where total compacted thickness is to be greater than 8 inches.
 - d. Compact with approved heavy pneumatic or vibrating rollers, or a combination of tamping rollers and light pneumatic rollers. Begin compaction at the bottom and continue until entire depth is uniformly compacted.
 - e. Do not allow stabilized materials to mix with underlying material. Correct irregularities or weak spots immediately by replacing material and recompact.
 - f. Compact to following minimum densities at a moisture content of optimum to 3 percent above optimum as determined by ASTM D698, unless otherwise indicated on the Drawings:
 - (1). Areas to receive pavement without subsequent base course: Minimum density of 98 percent of maximum dry density.
 - (2). Areas to receive subsequent base course: Minimum density of 95 percent of maximum dry density.
 - g. Seal with approved light pneumatic tired rollers: Prevent surface hairline cracking. Rework and recompact at areas where hairline cracking develops.
- 5. Curing
 - a. Moist cure for a minimum of 3 days before placing base or surface course. Time may be adjusted as approved by Engineer. Subgrade may be opened to traffic after 2 days if adequate strength has been attained to prevent damage. Restrict traffic to light pneumatic rollers or vehicles weighing less than 10 tons.

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- b. Keep subgrade surface damp by sprinkling. Roll with light pneumatic roller to keep surface knit together.
 - c. Place base, surface, or seal course within 14 days after final mixing and compaction unless prior approval is obtained from Engineer.
- D. Backfill Material. Where indicated on the Drawings, provide cement stabilized subgrade in accordance with Section 02229 – Utility Backfill Materials.
- E. Tolerances
 - 1. Completed surface shall be smooth and conform to typical section and established lines and grades.
 - 2. Top of compacted surface: plus or minus 1/4 inch in cross section, or in 16-foot length.
- F. Field Quality Control
 - 1. Testing will be performed under provisions of Section 01410 - Testing Laboratory Services.
 - 2. A minimum of one core will be made at random locations per 1000 linear feet per lane of roadway or 500 square yards of subgrade to determine in-place depth. For areas less than 500 square yards, the Engineer may waive the in-place depth test provided the Contractor can demonstrate by measurement the thickness of the subgrade stabilized.
 - 3. Contractor may obtain and pay for additional cores in the vicinity of cores indicating nonconforming in-place depths. If the average of the tests falls below the required depth, place and compact additional material at no cost to the City.
 - 4. Compaction testing will be performed in accordance with ASTM D1556 or ASTM D2922 and ASTM D3017 at random locations near depth determination tests. Rework and recompact areas that do not conform to compaction requirements at no cost to the City.
 - 5. Fill test sections with new compacted lime stabilized subgrade.
- G. Protection
 - 1. Maintain subgrade to lines and grades and in good condition until placement of base or surface course.
 - 2. Repair defects immediately by replacing material to full depth.

3.03 BASE COURSE**A Placement**

1. Spread and shape base in lifts to compacted thickness not to exceed 6 inches. Complete spreading, shaping, and compacting on same day material is deposited.
2. Place base so that projecting reinforcing steel from curbs or pavement remain at approximate center of base or pavement as indicated on the Drawings.
3. Start compaction operations as soon as possible after placement. Use sheep foot, steel, or pneumatic rollers or other equipment, as approved.
4. Maintain moisture between optimum and 3 percent above optimum moisture.
5. Compact to 95 percent of Modified Proctor density in accordance with ASTM D1557, unless otherwise indicated on the Drawings.
6. Finish to grade and compact lift before placing any successive lift.
7. Maintain shape by grading throughout operation.
8. Provide total thickness indicated on Drawings.

B. Tolerances

1. Completed base surface shall be smooth and conform to typical section and established lines and grades.
2. Top surface of embankment: Plus or minus 1/4 inch in cross section, or in 16-foot length.

C Field Quality Control

1. Testing will be performed under provisions of Section 01410 - Testing Laboratory Services.
2. A minimum of one core will be taken at random locations per 1000 linear feet per lane of roadway or 500 square yards of base or at least once per location of base placement to determine in-place depth. For areas of less than 500 square yards, the Engineer may waive the depth core test, provided the contractor can demonstrate by measurement the thickness of the base.
3. Contractor may obtain and pay for additional cores in the vicinity of cores indicating nonconforming in-place depths. If the average of the tests falls below

the required depth, place and compact additional material at no additional cost to the City.

4. Compaction Testing will be performed in accordance with ASTM D1556 or ASTM D2922 and ASTM 3017 at a random location near each depth determination. Rework and recompact areas that do not conform to compaction requirements.
5. Fill cores and density test sections with new compacted crushed stone flexible base.

D. Protection

1. Sprinkle to prevent excessive loss of moisture.
2. Restrict construction traffic on finished base to equipment required to complete the work.

3.04 ASPHALTIC CONCRETE PAVEMENT

A. Preparation

1. Thoroughly clean base course surface of loose material by brooming prior to application of tack coat.
2. Prepare sufficient base in advance of paving for efficient operations.

B. General Prime Coat Application

1. Apply prime coat with approved type of self-propelled pressure distributor or other approved equipment. Distribute prime coat evenly and smoothly under pressure necessary for proper distribution.
2. Keep all storage tanks, piping, retorts, booster tanks and distributors used in handling asphaltic materials clean and in good operating conditions. Conduct operations so that asphaltic material does not become contaminated.
3. If yield of asphaltic material appears to be in error, recalibrate distributor prior to continuing Work.
4. Maintain the surface until Work is accepted by City.
5. No traffic or placing of subsequent courses shall be permitted over freshly applied prime coat until authorized by Engineer.

C. Cutback Asphalt Prime Coat Application

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1. Do not use cutback asphalt during the period of April 16 to September 15.
2. 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.
3. Distribute at rate of 0.25 to 0.35 gallons per square yard.
4. Provide facilities for determining 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. Provide and maintain in good working order, recording thermometer at storage heating unit.
5. Temperature of application shall be based 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.

<u>Prime Coat Type</u>	<u>Minimum (F)</u>	<u>Maximum (F)</u>
MC-30	70	150
MC-70	125	175

6. Do not allow temperature of MC-30 to exceed 175 degrees F at any time.
7. Do not allow temperature of MC-70 to exceed 200 degrees F at any time.

D. Emulsified Prime Coat Application

1. Do not place prime coat when air temperature is below 36 degrees F and falling.
2. Distribute at rate of 0.15 to 0.25 gallons per square yard.

E. Tack Coat Application

1. Apply tack coat uniformly by use of approved distributor at rate not to exceed 0.05 gallons per square yard of surface. Where the asphaltic concrete mixture will adhere to the surface on which it is placed without the use of a tack coat, the tack coat may be eliminated if approved by the Engineer.
2. Paint contact surfaces of curbs and structures and joints with thin uniform coat of tack coat.
3. Application:

- a. Do not use cutback asphalt during the period of April 16 to September 15.
 - b. Do not place tack coat when air temperature is below 50 degrees F and falling. Materials may be placed when air temperature taken in shade and away from artificial heat is above 40 degrees F and rising.
 - c. Temperature of tack coat shall be between 125 degrees F and 180 degrees F when applied.
 - d. Do not heat tack coat above 200 degrees F at any time.
 4. Tack Coat Protection. No traffic or placing of subsequent courses shall be permitted over freshly applied tack coat until authorized by Engineer.
- F. Placement of Asphaltic Concrete
1. Do not place asphaltic mixture when air temperature is below 50 degrees F and falling. Mixture may be placed when air temperature taken in shade and away from artificial heat is above 40 degrees F and rising.
 2. Haul prepared and heated asphaltic concrete mixture in tight vehicles previously cleaned of foreign material. Mixture shall be at temperature between 250 degrees F and 325 degrees F when laid.
 3. For large areas, spread material into place with approved mechanical spreading and finishing machine of screening or tamping type. Use track-mounted finish machine to place base course directly on subgrade or base as shown on the Drawings.
 4. In restricted areas where use of paver is impractical, spread and finish asphalt by mechanical compactor. Use wood or steel forms, rigidly supported to assure correct grade and cross section. Carefully place materials to avoid segregation of mix. Do not broadcast material. Remove any lumps that do not break down readily. Place asphalt courses in same sequence as if placed by machine.
 5. Surface Course Material: Surface course 2 inches or less in thickness may be spread in one lift. Spread lifts in such manner that, when compacted, finished course will be smooth, of uniform density, and will be to section, line and grade as shown.
 6. Place courses as nearly continuously as possible. 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.

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7. When new asphalt is laid against existing or old asphalt, existing or old asphalt shall be saw cut full depth to provide straight smooth joint.
- G. Compaction of Asphaltic Concrete
1. Begin rolling while pavement is still hot and as soon as it will bear roller without undue displacement or hair cracking. Keep wheels properly moistened with water to prevent adhesion of surface mixture. Do not use excessive water.
 2. Compress surface thoroughly and uniformly, first with power-driven, 3-wheel, or tandem rollers weighing from 8 to 10 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 mixture temperature drops below 175 degrees F.
 3. 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.
 4. Along walls, curbs, headers and similar structures, and in locations not accessible to rollers, compact mixture thoroughly with lightly oiled tamps.
 5. Compact binder course and surface course to density not less than 93 percent of the maximum possible density of voidless mixture composed of same materials in like proportions.
- H. Tolerances
1. Furnish templates for checking surface in finished sections. Maximum deflection of templates, when supported at center, shall not exceed 1/8 inch.
 2. Completed surface, when tested with 10-foot straightedge laid parallel to centerline of pavement, shall show no deviation in excess of 1/8 inch in 10 feet. Correct any surface not meeting this requirement.
- I. Field Quality Control
1. Testing will be performed under provisions of Section 01410 - Testing Laboratory Services.
 2. Minimum of one core will be taken at random locations per 1000 feet per lane of roadway or 500 square yards of pavement or at least once per location of pavement placement to determine in-place depth and density. For areas less than 500 square yards the Engineer may waive the in-place depth test provided

the Contractor can demonstrate by measurement the thickness of the pavement placed.

3. In-place density will be determined in accordance with Tex-207-F and Tex-227-F from cores or sections of asphaltic base located near each depth determination. Other methods of determining in-place density, which correlate satisfactorily with results obtained from roadway specimens, may be used when approved by Engineer.
4. Contractor may obtain and pay for three additional cores in vicinity of cores indicating nonconforming in-place depths. In-place depth at these locations shall be average depth of four cores.
5. Fill cores and density test sections with new compacted asphaltic pavement.

J. Protection

1. Do not open pavement to traffic until 12 hours after completion of rolling, or as shown on Drawings.
2. Maintain asphaltic concrete pavement in good condition until completion of Work.
3. Repair defects immediately by replacing asphaltic concrete pavement to full depth.

3.05 PORTLAND CEMENT CONCRETE PAVING

A. Preparation

1. Properly prepare, shape and compact each section of subgrade before placing forms, reinforcing 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.
2. Remove subgrade that will not support loaded form. Replace and compact subgrade to required density.

B. Concrete Paving Equipment

1. Subgrade Planer and Template:
 - a. For large areas, use subgrade planer with adjustable cutting blades to trim subgrade to exact section shown on Drawings. Select planer mounted on rollers which ride on forms. Planer frame must have sufficient weight so that it will remain on form at all times, and have

such 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.

- b. For restricted areas, where planer is impractical, prepare the subgrade by mechanical tampers and other equipment as approved by the Engineer.
 - c. Provide template for checking contour of subgrade. Template shall be long enough to rest upon side forms and have such 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.
- 2. Machine Finisher: For large areas, provide a 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 if it operates on concrete pavement.
 - 3. Hand Finishing: For restricted areas, provide mechanical strike and tamping template 2 feet longer than width of pavement to be finished. Shape template to pavement section. Also, provide two bridges to ride on forms and span pavement for finishing expansion and dummy joints. Provide floats and necessary edging and finishing tools.
 - 4. Burlap Drag for Finishing Slab: Furnish four plies of 10-ounce burlap material fastened to bridge to form continuous strip of burlap full width of pavement. The 3-foot width of burlap material shall be in contact with pavement surface. Keep burlap drags clean and free of encrusted mortar.
 - 5. Vibrators: For large areas, 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. For restricted areas, hand operated vibrators may be utilized.
 - 6. Traveling Form Paver: Approved traveling form paver may be used in lieu of construction methods employing forms, consolidating, finishing and floating equipment. Requirements of this specification for subgrade, pavement

tolerances, pavement depth, alignments, consolidation, finishing and workmanship shall be met. If traveling form paver does not provide concrete paving that meets the compaction, finish and tolerance requirements of this specification, its use shall be immediately discontinued when so ordered by Engineer and conventional methods shall be used.

- a. Equip traveling paver with longitudinal transangular finishing float adjustable to crown and grade. Float shall be long enough to extend across pavement to side forms or edge of slab.
- b. Insure 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.
- c. 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 any pavement in which tie bars assume final position other than that shown on Drawings, unless corrective alternates are authorized in writing by Engineer.

C Forms

1. Side Forms: Use metal forms of approved shape and section. Preferred depth of form shall be 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 is 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 Engineer. 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 reasonable 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.

2. Form Setting: Rest forms directly on subgrade. Do not shim with rocks 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. For large areas, set forms and check grade for at least 300 feet ahead of placement or as approved by Engineer. Adjacent slabs may be used instead of forms, provided that concrete is well protected from possible damage by finishing equipment. These adjacent slabs shall not be used for forms until concrete has aged at least 7 days.

D. Reinforcing Steel and Joint Assemblies

1. Accurately place reinforcing steel and joint assemblies and position them 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. Place reinforcing steel and secure to chairs.
2. Place pavement joint assemblies at required locations and elevations, and rigidly secure parts in required positions. Install dowel bars accurately in joint assemblies as shown, each parallel to pavement surface and to centerline of pavement. Rigidly secure in required position to prevent displacement during placing and finishing of concrete. Accurately cut header boards, joint filler and other material used for forming joints to receive each dowel bar. Where indicated on the drawings, drill dowels into existing pavement, secure with epoxy, and provide paving headers, as required, to provide rigid pavement sections.

E. Placement

1. Place concrete only when air temperature taken in shade and away from artificial heat is above 35 degrees F and rising. Concrete shall not be placed when temperature is below 40 degrees F and falling.
2. Place concrete within 60 minutes of mixing. Remove and dispose of concrete not placed within this period.
3. Concrete slump during placement shall be 1 to 4 inches, except when using traveling-form paver slump shall be maximum of 2 inches.

4. Deposit concrete rapidly and continuously on subgrade or base in successive batches. Distribute concrete to required depth and for entire width of placement 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 end of day or in case of unavoidable interruption of more than 30 minutes, place transverse construction joint at point of stopping work. Remove and replace sections less than 10 feet long.
5. 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.

F. Compaction

1. Consolidate the concrete using mechanical vibrators. Extend a vibratory unit across the 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.
2. Furnish enough hand-manipulated mechanical vibrators for proper consolidation of concrete along forms, at joints and in areas not covered by mechanically controlled vibrators.

G. Finishing

1. Finish concrete pavement with power-driven transverse finishing machines or by hand finishing methods.
 - a. Use transverse finishing machine to make at least two trips over each area. Make last trip continuous run of not less than 40 feet. After transverse screening, use hand-operated longitudinal float to test and level surface to required grade.
 - b. Hand finish with mechanical strike and tamping template as wide as pavement to be finished. Shape template to pavement section. Move strike template forward in direction of placement, maintaining slight excess of material in front of cutting edge. Make at least 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.

2. 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.
3. After completion of straightedge operation, make first pass of burlap drag 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.

H. Joints and Joint Sealing

1. Placement
 - a. When new work is adjacent to existing concrete, place joints at same location as existing joints in adjacent pavement.
 - b. If the limit of removal of existing concrete or asphaltic pavement does not fall on existing joint, saw cut existing pavement minimum of 1-1/2 inches deep to provide straight, smooth joint surface without chipping, spalling or cracks.
2. Construction Joints. 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. Expansion Joints. 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 60 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. Seal with joint sealing compound.
4. Contraction Joints. 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.

5. Longitudinal Weakened Plane Joints. Place longitudinal weakened plane joints at spaces indicated on Drawings. Seal groove with joint sealing compound.
6. Sawed Joints
 - a. Contractor may use sawed joints as an alternate to contraction and weakened plane joints. Circular cutter shall be capable of cutting straight line groove minimum of 1/2 inch wide. Depth shall be one quarter of pavement thickness plus 1/2 inch. Commence sawing as soon as concrete has hardened sufficiently to permit cutting without chipping, spalling or tearing and prior to initiation of cracks. Once sawing has commenced, it shall be continued until completed. Make saw cut with one pass. Complete sawing within 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. Provide at least one standby saw in good working order. Maintain an ample supply of saw blades at work site at all times during sawing operations. Sawing equipment shall be on job at all times during concrete placement.
7. Joints for Curb, Curb and Gutter. 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.
8. Joints for Concrete Sidewalks. Provide 3/4-inch expansion joints conforming to ASTM D1751 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 D994 for small radius curves and around fire hydrants and utility poles. Extend the expansion joint material full depth of the slab.
9. Joints for Concrete Driveways. Provide 3/4-inch expansion joints conforming to ASTM D1751 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.
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. Joint sealing equipment shall be in first-class working condition, and be approved by Engineer.
- c. Clean joints of loose scale, dirt, dust and curing compound. Remove loose material from concrete surfaces adjacent to joints. Use concrete grooving machine or power-operated wire brush and other equipment such as plow, brooms, brushes, blowers or hydro- or abrasive-cleaning machines, as required to produce satisfactory results.
- 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 below level of adjacent surface or at elevation as directed.

11. Protection

- a. Maintain joints in good condition until completion of Work.
- b. Replace damaged joints material with new material.

I. Concrete Curing. Conform to requirements of Section 03305 - Concrete for Utility Construction or Section 03310 - Structural Concrete.

J. Tolerances. 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 any 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 requirements of this paragraph to meet surface test requirements. Restore texture by grooving concrete to meet surface finishing specifications.

K. Field Quality Control

- 1. Testing will be performed under provisions of Section 01410 - Testing Laboratory Services.
- 2. Flexural Strength Test Specimens: Four test specimens for flexural strength test will be made for each 150 cubic yards or less of pavement that is placed in one day. Two specimens will be tested at 7 days. For failed 7-day tests, remaining two specimens will be tested at 28 days. Specimens will be made, cured and tested in accordance with ASTM C78 (using simple beam with third point loading). Minimum flexural strength (modulus of rupture) shall be 500 pounds per square inch at 7 days and 600 pounds per square inch at 28 days.
- 3. Yield test will be made in accordance with ASTM C138 for cement content per

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cubic yard of concrete. If such 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.

4. Minimum of one 4-inch core to measure in-place depth will be taken at random locations per 1000 feet per lane or 500 square yards of pavement or at least once per location of pavement placement. Each core may be tested for 28-day compressive strength according to methods of ASTM C42. The 28-day compressive strength of each core tested shall be a minimum of 3000 pounds per square inch. Compressive strength shall not be utilized to satisfy the flexural strength requirements.
5. For areas less than 500 square yards, the Engineer may waive the in-place depth test provided the Contractor can demonstrate by measurement the thickness of the pavement placed. Compressive strength cylinders may be made as indicated in Section 03305 - Concrete for Utility Construction or Section 03310 - Structural Concrete if the core for in place depth determination is not required.
6. Contractor may obtain and pay for three additional cores in vicinity of cores indicating nonconforming in-place depths. In-place depth at these locations shall be average depth of four cores.
7. Fill cores and density test sections with new concrete paving or non-shrink grout.

L Protection

1. Barricade pavement section from use until concrete has attained minimum design strength.
2. To provide access at driveways, city street intersections, esplanades, and other locations approved by Engineer; Contractor may use high-early-strength cement or place an additional 2 inches of concrete pavement on untreated subgrade in lieu of specified concrete pavement depth on stabilized base or lime treated subgrade. Additional depths of concrete placement shall be paid for under original specified concrete depth.
3. 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. Such opening of pavement to traffic shall not relieve Contractor from responsibility for the Work.
4. Maintain concrete paving in good condition until completion of Work.
5. Repair defects by replacing concrete to full depth.

3.06 PAVEMENT MARKINGS

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- A. Restore pavement markings to match those existing or as indicated on the Drawings and details.

3.07 SIDEWALKS AND DRIVEWAYS**A. Replacement**

1. Replace sidewalks and driveways which are removed or damaged during construction with paving of the same type and with thickness and width equivalent to one removed or damaged. Asphaltic concrete and Portland cement concrete shall meet the requirements of this Section.
2. Provide replaced and new sidewalks with wheelchair ramps if sidewalk intersects curb at street or driveway intersection.

B. Preparation and Placement

1. Identify and protect utilities which are to remain.
2. Protect living trees, other plant growth, and features designated to remain.
3. Excavate subgrade 6 inches beyond outside lines of sidewalk or driveway. Shape to the line, grade, and cross section. For soils with plasticity index above 40 percent, stabilize soil with lime. Compact subgrade to minimum of 90 percent maximum dry density as determined by ASTM D698.
4. For concrete surface, immediately after subgrade is prepared, cover with 2-inch-thick compacted sand bed. Place concrete as indicated below.
5. For asphaltic concrete surface, place and compact directly on prepared subgrade.
6. For gravel surface, place and compact gravel directly on prepared subgrade.

C. Concrete Placement

1. Forms: Straight, unwarped wood or metal forms with nominal 4-inch depth. Securely stake forms to line and grade, and maintain in true position during concrete placement.
2. Reinforcement: Unless shown otherwise on the drawings, install No. 3 reinforcing steel bars on 18-inch centers longitudinally and transversely. Lay longitudinal bars in walk continuously, except through expansion joints. Support reinforcement in manner to maintain reinforcement in center of slab vertically during placement.
3. Expansion Joints: Install expansion joints in accordance with Section.

4. Colored concrete: Where indicated on the drawings, apply coloring agent in accordance with manufacturers' instructions.
 5. Place concrete in forms to specified depth and tamp thoroughly with "jitterbug" tamp, or other acceptable method. Bring mortar to surface.
 6. Strike off to smooth finish with wood strike board. Finish smoothly with wood hand float. Brush across sidewalk lightly with fine-haired brush.
 7. Unless otherwise indicated on Drawings, mark off joints 1/8 inch deep, at spacing equal to width of walk. Use joint tool equal in width to edging tool.
 8. Finish edges with tool having 1/4-inch radius.
 9. After concrete has set sufficiently, refill space along sides of sidewalk to top of walk with suitable material. Tamp fill firm and solid.
- D. Protection
1. Maintain sidewalks and driveway in good condition until completion of Work.
 2. Replace sidewalks and driveway subsequently damaged by Contractor's operations.

END OF SECTION

SECTION 02603
FRAMES, GRATES, RINGS, AND COVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Iron castings for manhole frames and covers, inlet frames and grates, catch basin frames and grates, meter vault frames and covers, adjustment rings and extensions.
- B. Ring grates.

1.02 UNIT PRICES

- A. No payment will be made for frames, grates, rings, covers, and seals under this Section. Include payment in unit price for related item.

1.03 SUBMITTALS

- A. Submit product data in accordance with Section 01300 - Submittals.
- B. Provide copies of manufacturer's specifications, load tables, dimension diagrams, anchor details, and installation instructions.
- C. Provide shop drawings for fabrication and erection of casting assemblies. Include plans, elevations, sections and connection details. Show anchorage and accessory items. Include setting drawings for location and installation of castings and anchorage devices.

PART 2 PRODUCTS

2.01 CASTINGS

- A. Castings for frames, grates, rings and covers shall conform to ASTM A48, Class 35B. Provide locking covers if indicated on Drawings.
- B. Castings shall be capable of withstanding the application of a 40,000 pound proof load test as outlined in AASHTO M306 without permanent deformation.
- C. Fabricate castings to conform to the shapes, dimensions, and with wording or logos shown on the Drawings.
- D. Castings shall be clean, free from blowholes and other surface imperfections. Cast holes in covers shall be clean and symmetrical, free of plugs.

- E. Castings shall be made in U.S.A.

2.02 BEARING SURFACES

- A. Machine bearing surfaces between covers or grates and their respective frames so that even bearing is provided for any position in which the casting may be seated in the frame.

2.03 SPECIAL FRAMES AND COVERS

- A. Where indicated on the Drawings, provide watertight manhole frames and covers with a minimum of four bolts and a gasket designed to seal cover to frame. Supply watertight manhole covers and frames, Model V-1420 by East Jordan Iron Works, or approval equal.

2.04 FABRICATED RING GRATES

- A. Ring grates shall be fabricated from reinforcing steel conforming to ASTM A615.
- B. Welds connecting the bars shall conform to AWS D12.1.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install castings according to approved shop drawings, instructions given in related specifications, and applicable directions from the manufacturer's printed materials.
- B. Set castings accurately at required locations to proper alignment and elevation. Keep castings plumb, level, true and free of rack. Measure location accurately from established lines and grades. Brace or anchor frames temporarily in formwork until permanently set.
- C. Ring grates shall be fabricated in accordance with drawings and shall be set in mortar in the mouth of the pipe bell.

END OF SECTION

SECTION 02604

VALVE BOXES, METER BOXES, AND METER VAULTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Valve boxes for water service.
- B. Meter boxes for water service.
- C. Meter vaults for water service.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment unit price procedures.

1.03 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Submit manufacturer's product data for following items for approval:
 - 1. Each type of valve box and lid.
 - 2. Each type of meter box and cover.
 - 3. Each type of meter vault frame and cover.
- C. Submit shop drawings for cast-in-place meter vaults for approval if proposed construction varies from Drawings.

PART 2 PRODUCTS

2.01 VALVE BOXES

- A. Provide Type "A", cast-iron, slide-type, valve boxes as manufactured by Sigma Corporation, East Jordan Iron Works, Inc. or approved equal. Design of valve box shall minimize stresses on valve imposed by loads on box lid.
- B. Cast a letter "W" into lid, 1/2 inch in height and raised 3/32 inch, for valves serving potable water lines.
- C. Coat boxes, bases, and lids by dipping in hot bituminous varnish.
- D. Provide 6-inch PVC, Class 150, DR 18, riser pipes unless noted as D.I. pipe on the project details.

- E. Concrete for valve box placement:
 - 1. For locations in new concrete pavement, use strength and mix design of new pavement.
 - 2. For other locations use Class A concrete conforming to requirements of Section 03305 - Concrete for Utility Construction.

2.02 METER BOXES

- A. For Single Service: DFW Plastics, Inc., Model No. DFW37C, 17-inch x 11-inch, Medium C Series.
- B. For Dual Service: DFW Plastics, Inc., Model No. DFW38C, 17-inch x 15-inch, Medium C Series.

2.03 METER VAULTS

- A. Meter vaults may be constructed of precast concrete, cast-in-place concrete, or solid masonry unless a specific type of construction is required by Drawings.
- B. Concrete for meter vaults: Class A concrete, conforming to requirements of Section 03305 - Concrete for Utility Construction, with minimum compressive strength of 4,000 psi at 28 days.
- C. Reinforcing steel for meter vaults: Conform to requirements of Section 03305 - Concrete for Utility Construction.
- D. Grates and Covers: Conform to requirements of Section 02603 - Frames, Grates, Rings, and Covers.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Obtain approval from the Engineer for location of meter vault.
- B. Verify lines and grade are correct.
- C. Verify compacted subgrade will support loads imposed by vaults.

3.02 VALVE BOXES

- A. Provide riser pipe with suitable length for depth of cover indicated on Drawings or to accommodate actual finish grade.
- B. Install valve box and riser piping plumbed in a vertical position. Provide 6-inches telescoping freeboard space between riser pipe top butt end, and interior contact

flange of valve box, for vertical movement damping. Riser may rest on valve flange, or provide suitable footpiece to support riser pipe.

- C. After valve box has been set, aligned, and adjusted so that lid is level with final grade, pour a 18-inch by 18-inch by 6-inch thick concrete block around valve box. Center valve box horizontally within concrete block.
- D. Paint covers of new valve boxes in "Fluorescent Orange" when installed. After completion and acceptance by City, repaint covers in "Blue". This work is incidental and no separate payment will be made.

3.03 METER BOXES

- A. Install meter boxes in accordance with manufacturer's instructions.
- B. Adjust top of meter boxes to conform to cover elevations specified in paragraph of this section for Frame and Cover for Meter Vaults.
- C. Do not locate under paved areas unless approved by Engineer. Use approved traffic-type box with cast iron lid when meter must be located in paved areas.

3.04 METER VAULTS

- A. Construct concrete meter vaults to dimensions and requirements shown on drawings. Do not cast in presence of water. Make bottom as uniform as practicable.
- B. Precast Meter Vaults:
 - 1. Install precast vaults in accordance with manufacturer's recommendations. Set level on a minimum 9-inch thick bed of crushed rock conforming to the requirements of Section 02229 - Utility Backfill Materials.
 - 2. Seal lifting holes cement-sand mortar or non-shrink grout.
- C. Meter Vault Floor Slab:
 - 1. Construct floor slabs of 6-inch-thick reinforced concrete. Slope floor 1/4 inch per foot toward sump. Make sump 12 inches in diameter, or 12 inches square, and 4 inches deep, unless other dimensions are required by Drawings. Install dowels at maximum of 18 inches, center-to-center, or install mortar trench for keying walls to floor slab.
 - 2. Precast floor slab elements may be used for precast vault construction.
- D. Cast-in-Place Meter Vault Walls:
 - 1. Key walls to floor slab and form to dimensions shown on Drawings. Minimum wall thickness shall be 4 inches.

2. Cast walls monolithically. One cold joint will be allowed when vault depth exceeds 12 feet.
3. Set frame for cover while concrete is still green.

3.05 FRAME AND COVER FOR METER VAULTS

- A. Set cast iron frame in a mortar bed and adjust elevation of cover as follows:
 1. In unpaved areas, set top of meter box or meter vault cover 2 to 3 inches above natural grade.
 2. In sidewalk areas, set top of meter box or meter vault cover 1/2 to 1 inch above adjacent concrete.

3.06 BACKFILL

- A. Backfill and compact in accordance with Section 02227 - Excavation and Backfill for Utilities.
- B. In unpaved areas, slope backfill around meter boxes and vaults to provide a uniform slope 1 to 5 from top to natural grade.
- C. In sidewalk areas slope concrete down from meter boxes to meet adjacent concrete.

END OF SECTION

SECTION 02607

ADJUSTING MANHOLES, INLETS, AND VALVE BOXES TO GRADES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Adjusting elevation of manholes, inlets, and valve boxes to new grades.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment for unit price procedures.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

- A. For cast in place concrete, refer to Section 03305 - Concrete for Utility Construction.
- B. For precast concrete manhole sections and adjustment rings, refer to Section 02601 - Precast Concrete Manholes.
- C. For mortar mix, conform to requirements of ASTM C 270, Type S using Portland Cement.

2.02 CAST IRON ADJUSTING RINGS

- A. For cast iron adjusting rings, refer to Section 02603 - Frames, Grates, Rings and Covers.

2.03 PIPING MATERIALS

- A. For riser pipes and fittings, refer to applicable piping materials specifications in Sections 02610 through 02620.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine existing structure, valve box, frame and cover or inlet box, frame and cover or inlet, and piping and connections for damage or defects that would affect adjustment to grade. Report such damage or defects to the Engineer.

3.02 ESTABLISHING GRADE

- A. Coordinate grade related items with existing grade and finished grade or paving, and relate to established benchmark or reference line.

3.03 ADJUSTING MANHOLES AND INLETS

- A. Elevation of manhole or inlet can be raised using precast concrete rings or metal adjusting rings. Use of brick for adjustment of sanitary sewer manholes to grade is prohibited. Elevation of manhole or inlet can be lowered by removing existing masonry, adjusting rings or the top section of the barrel below the new elevation and then rebuilding or raising the elevation to the proper height.
- B. Grout inside and outside adjusting ring joints.
- C. Salvage and reuse cast iron frame and cover or grate.
- D. Protect or block off manhole or inlet bottom using wood forms shaped to fit so that no debris or soil falls to the bottom during adjustment.
- E. Set the cast iron frame for the manhole cover or grate in a full mortar bed and adjust to the established elevation. In streets, adjust covers to be 3/8 inch below pavement.
- F. Verify that manholes and inlets are free of visible leaks as a result of reconstruction. Repair leaks in a manner subject to the Engineer's approval.

3.04 ADJUSTING VALVE BOXES

- A. Salvage and reuse valve box and surrounding concrete block.
- B. Remove and replace 6-inch ductile iron riser pipe with suitable length for depth of cover required to establish the adjusted elevation to accommodate actual finish grade.
- C. Reinstall valve box and riser piping plumbed in vertical position. Provide minimum 6 inches telescoping freeboard space between riser pipe top butt end and interior contact flange of valve box for vertical movement damping.
- D. After valve box has been set, aligned, and adjusted so that top lid is level with final grade, pour a 18-inch by 18-inch by 6-inch thick concrete pad around valve box. Center valve box horizontally within concrete slab.

3.05 BACKFILL AND GRADING

- A. Backfill the area of excavation surrounding each adjusted manhole, inlet, and valve box and compact according to requirements of Section 02227 - Excavation and Backfill for Utilities.

- B. Grade the ground surface to drain away from each manhole and valve box. Place earth fill around manholes to the level of the upper rim of the manhole frame. Place earth fill around the valve box concrete block.
- C. In unpaved areas, grade surface at a uniform slope of 1 to 5 from the manhole frame to natural grade. Provide a minimum of 4 inches of topsoil conforming to requirements of Section 02920 - Topsoil and sod in accordance with Section 02935 - Sodding.

END OF SECTION

SECTION 02610

DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Ductile iron pipe and fittings for water mains, wastewater force mains, gravity sanitary sewers, and storm sewers.

1.02 UNIT PRICES

- A. No separate payment will be made for ductile iron pipe and fittings under this Section. Include cost in unit price for water mains, force mains, gravity sanitary sewers, and storm sewers.

1.03 SUBMITTALS

- A. Conform to requirements of Section 01300 - Submittals.
- B. Submit shop drawings showing design of new pipe and fittings indicating alignment and grade, laying dimensions, fabrication, fitting, flange, and special details. Show station numbers for pipe and fittings corresponding to Drawings. Production of pipe and fittings prior to review by the Engineer is at Contractor's risk.

1.04 QUALITY CONTROL

- A. Provide manufacturer's certifications that all ductile iron pipe and fittings meet provisions of this Section and have been hydrostatically tested at factory and meet requirements of ANSI A21.51.
- B. Provide certifications that all pipe joints have been tested and meet requirements of ANSI A21.11.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE

- A. Ductile iron pipe barrels: ANSI A21.15, ANSI A21.50 or ANSI A21.51; bear mark of Underwriters' Laboratories approval; pressure classes as shown on the Drawings and/or Bid Proposal.

- B. Provide pipe sections in standard lengths, not less than 18 feet long, except for special fittings and closure sections as indicated on shop drawings.

2.02 JOINTS

- A. Joint types: ANSI A21.11 push-on; ANSI A21.11 mechanical joint; or ANSI A21.15 flanged end. Provide push-on joints unless otherwise indicated on the Drawings or required by these specifications. For bolted joints, bolts shall conform to requirements of AWWA C111.
- B. Where restrained joints for buried service are required by Drawings, provide Series 1100 (MEGALUG) by EBAA Iron Inc., or equal.
- C. Threaded or grooved type joints which reduce pipe wall thickness below minimum required are not acceptable.
- D. Provide for restrained joints designed to meet test pressures required under Section 02676- Hydrostatic Testing of Pipelines or Section 02731 - Sanitary Sewage Force Mains, as applicable.
- E. Where ductile iron water main is cathodically protected from corrosion, bond rubber gasketed joints as shown on Drawings to provide electrical continuity along entire pipeline, except where insulating flanges are required by Drawings.

2.03 GASKETS:

- A. Furnish, when no contaminant is identified, plain rubber (SBR) gasket material; for flanged joints 1/8-inch thick gasket in accordance with ANSI A21.15.
- B. Pipes to be installed in potentially contaminated areas, especially where free product is found near the elevation of the proposed pipeline, shall have the following gasket materials for the noted contaminants:

Contaminant	Gasket Material Required
Petroleum (diesel, gasoline)	Nitrile Rubber
Other contaminants	As recommended by the pipe manufacturer

2.04 FITTINGS

- A. 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 serve.

- B. Push-on Fittings will not be allowed.
- C. Flanged Fittings: ANSI A21.10; ANSI B16.1 cast or ductile iron. Flanges: ANSI B16.1, Class 125; pressure rated at 250 psig.
- D. Mechanical Joint Fittings: ANSI A21.10 (AWWA C110); pressure rated at 250 psi.
- E. Ductile Iron Compact Fittings for Water Mains: ANSI A21.53 (AWWA C153); 4-inch through 12-inch diameter; fusion bonded epoxy-lined or cement-mortar lining; conform to requirements of Section 02630 - Polyethylene Wrap.

2.05 COATINGS AND LININGS

- A. Water Main Interiors: ANSI A21.4, cement lined with seal coat.
- B. Sanitary Sewer and Force Main Interiors:
 - 1. Preparation: Commercial blast cleaning conforming to SSPC-SP6.
 - 2. Liner thickness: Nominal 40 mils, minimum 35 mils, for pipe barrel interior; minimum 6 - 10 mils at gasket groove and outside spigot end to 6-inches back from end.
 - 3. Testing: ASTM G62, Method B for voids and holidays; provide written certification.
 - 4. Acceptable Lining Materials:
 - a. Virgin polyethylene conforming to ASTM D1248, with inert fillers and carbon black to resist ultraviolet degradation during storage heat bonded to interior surface of pipe and fittings; APolyline® by American Cast Iron Pipe Company; or equal.
 - b. Polyurethane: Corro-pipe II by Madison Chemicals.
 - c. Ceramic Epoxy: Protecto-401 by Enduron Protective Coatings.
- C. 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 A21.4. For pipes which will not be provided with named liner, provide pipe as specified in Paragraph 2.05B.
- D. Exterior:
 - 1. Water Lines

- a. Auger Holes: Conform to requirements of Section 02629 - Polyurethane Coatings on Steel or Ductile Iron Pipe.
- b. Above Ground (or Exposed): Conform to the following:
 - 1) Provide a 3-coat epoxy/polyurethane coating system as designated below.

Surface Preparation	SSPC SP10 Near White Blast Clean 2.0 to 3.0 mils surface profile
Prime Coat 2.0 to 4.0 mils DFT	ACRO 4422 Inhibitive Epoxy Primer, or approved equal
Intermediate Coat 4.0 to 6.0 mils DFT	ACRO 4460 Chemical Resistant Epoxy, or approved equal
Finish Coat 1.5 to 2.0 mils DFT	ACRO 4428 Polyurethane, Or approved equal

- c. Total minimum allowable dry film thickness for system: 10 mils.
- d. All materials shall be from same manufacturer.
- 2. Sanitary Sewers: Prime coat and outside asphaltic coating conforming to ANSI A21.10, ANSI A21.15, or ANSI A21.51 for pipe and fittings in open cut excavation and in casings.
- E. Polyethylene Wrap: For buried water lines and sanitary sewers, including point repairs, provide polyethylene wrap unless otherwise specified or shown. Provide Polyethylene Wrap for all buried ductile iron pipe, including polyurethane coated pipe. Conform to requirements of Section 02630 - Polyethylene Wrap.
- F. For flanged joints in buried service, provide petrolatum wrapping system, Denso, or

Standard Specifications

DUCTILE IRON PIPE AND FITTINGS

equal, for the complete joint and all alloy steel fasteners. Alternatively, provide bolts made of Type 304 Stainless Steel.

- G. Pipe to be installed in potentially contaminated areas shall have coatings and linings recommended by the manufacturer as resistant to the contaminants.

2.06 MANUFACTURERS

- A. Pre-approved manufacturers of ductile iron are American Cast Iron Pipe Co., McWane Cast Iron Pipe Co., and U. S. Pipe and Foundry Co.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Conform to installation requirements of Sections 02664 - Water Mains, 02730 - Gravity Sanitary Sewers, and 02731 - Sanitary Sewage Force Mains, except as modified in this Section.
- B. Install in accordance with AWWA C600 and manufacturer's recommendations.
- C. Install all ductile iron pipe in polyethylene wrap, unless cathodic protection is provided. Do not use polyethylene wrap with a cathodic protection system.
- D. Holiday Testing
1. Polyurethane: Conform to requirements of Section 02629 - Polyurethane Coatings for Steel or Ductile Iron Pipe.
 2. Fusion Bonded Epoxy: Conform to requirements for new fittings in ANSI A21.16.

3.02 GRADE

- A. Unless otherwise specified on Drawings, install ductile iron pipe for water service to clear utility lines with following minimum cover:

Diameter	Depth of Cover
<u>(Inches)</u>	<u>(Feet)</u>
16 and 24	5
12 and smaller	3.5

3.03 FIELD REPAIR OF COATINGS

- A. Polyurethane: Conform to requirements of Section 02527 - Polyurethane Coatings for Steel or Ductile Iron Pipe.
- B. Fusion Bonded Epoxy: Conform to requirements for new fittings in ANSI A21.16.

END OF SECTION

SECTION 02611

STEEL PIPE AND FITTINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. New steel pipe and fittings for water mains, pumping facilities, and casings.

1.02 UNIT PRICES

- 1. No payment will be made for steel pipe and fittings under this section. Include cost in unit price for water mains, pumping facilities and casings.

1.03 SUBMITTALS

- A. Submit shop drawings, in accordance with requirements of Section 01300 - Submittals.
 - 1. For aerial crossings and water plant/facilities, include design of new pipe and fittings indicating alignment and grade, laying dimensions, lining and coating systems, proposed welding procedures, fabrication, fitting, flange, and special details. Show location for pipe and fittings corresponding to Drawings.
 - 2. Production of pipe and fittings prior to review by the Engineer shall be at Contractor's risk.

1.04 QUALITY CONTROL

- A. Provide manufacturer's certifications that all pipe and fittings have been hydrostatically tested at factory in accordance with AWWA C200, Section 3.4.
- B. Provide manufacturer's affidavits that polyurethane coatings, linings and tape coatings comply with applicable requirements of this section and that coatings were applied and allowed to cure at a temperature 5 degrees above the dew point.
- C. Provide manufacturer's affidavits that mortar coatings and linings comply with applicable requirements of this section and that linings were applied and allowed to cure at a temperature above 32 degrees F.
- D. Prior to work being started, provide proof of certification of qualification for all welders employed for type of work, procedures and positions involved. Qualifications shall be in accordance with AWWA C206.

PART 2 PRODUCTS

2.01 STEEL PIPE

- A. Provide steel pipe designed and manufactured in conformance with AWWA C200 and AWWA M11 except as modified herein. Steel shall be minimum of ASTM A 36, ASTM A570 Grade 36, ASTM A 53 Grade B, ASTM A135 Grade B, or ASTM A139 Grade B.
- B. Minimum Allowable Steel-Wall Thickness: In accordance with following table for HS-20 live loads and depths of bury of up to 16 feet and AWWA C200 new uncoated welded steel.

GENERAL PURPOSE CARBON STEEL PIPE
Min. Wall

Pipe Size	O.D.	Thick.
8"	8.625"	0.322"
10"	10.750"	0.365"
12"	12.750"	0.375"
14"	14.000"	0.375"
16"	16.000"	0.375"
20"	20.000"	0.375"
24"	24.000"	0.375"
30"	30.000"	0.375"

CASING PIPE
(ENCASEMENT SLEEVES)

Casing Pipe Size	O.D.	Thick.
8"	8.625"	0.250"
10"	10.750"	0.250"
12"	12.750"	0.250"
14"	14.000"	0.250"
16"	16.000"	0.250"
20"	20.000"	0.250"
24"	24.000"	0.312"
30"	30.000"	0.312"

- C. Provide pipe sections in lengths of no less than 20 feet except as required for special fittings or closure sections.
- D. Fittings: Factory forged for sizes 4 inches through 24 inches; long radius bends; beveled ends for field butt welding; wall thickness: equal to or greater than pipe to which fittings is to be welded; unless otherwise shown on the drawings.
- E. Joints:

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STEEL PIPE AND FITTINGS

1. Standard field joint for steel pipe: AWWA C206.
 - a. Single-welded, lap joint.
 - b. Double-welded, butt joint.
 2. Provide mechanically coupled or flanged joints where required for valves and fittings, and as shown on Drawings. Flanges: AWWA C207, Class D; same diameter and drilling as Class 125 cast iron flanges ASA B16.1. Maintain electrically isolated flanged joints between steel and cast iron by using epoxy-coated bolts, nuts, washers and insulating type gasket unless otherwise approved by Engineer.
- F. Make curves and bends by use of beveled joints unless otherwise indicated on Drawings. Contractor may submit details of other methods of providing curves and bends for consideration by the Engineer. If other methods are deemed satisfactory, install at no additional cost to City.
- G. Provide shop coated and shop lined steel pipe with minimum of one coat of shop applied primer approved for use in potable water transmission on all exposed steel surfaces. Primer for tape coated steel pipe to be used for field-applied coatings shall have no less than 5 percent solids. Provide primer compatible with coating system and in accordance with coating manufacturer's recommendations.
- H. Standard or Special Sections: Within 1/8 inch + of specified or theoretical lengths. Flanges: Square with pipe with bolt holes straddling both horizontal and vertical axis. Provide 1/2-inch gap between pipe ends where pipe is to be coupled with sleeve couplings.

2.02 EXTERNAL COATING SYSTEMS FOR BURIED STEEL PIPE

- A. General: Supplied with either tape coatings or cement-mortar coatings as specified herein.
1. Tape Coating: AWWA C214; 80-mil shop-applied, Polyken YG-III, Tek-Rap Yard-Rap, or equal, except as modified herein. Components: primer, one 20-mil layer of inner-layer tape for corrosion protection and two 30-mil layers of outer-layer tape for mechanical protection. Primer: compatible with tape coating, supplied by coating-system manufacturer. Provide pipe with shop coatings cut back from joint ends to facilitate joining and welding of pipe. Taper successive tape layers by 1-inch staggers to facilitate field wrapping of joints. Cutback approximately 4 to 4-1/2 inches to facilitate welding. Inner and outer tape widths:

Diameter
4" – 6"

Tape Width
6"

8" – 12"	9"
14" – 16"	12"
18" – 24"	18"

2. Cement-Mortar Coating: AWWA C205; shop-applied, cement-mortar coating except as modified herein; 1-inch minimum thickness; cut back coating from joint ends no more than 2 inches to facilitate joining and welding of pipe.

2.03 EXTERNAL COATING SYSTEM FOR STEEL PIPE IN TUNNEL, CASING OR AUGER HOLES

- A. Provide exterior coating system of pipe in augered holes or casing, without annular grout, as specified in Section 02629, Polyurethane Coatings on Steel or Ductile Iron Pipe. No additional exterior coating is required for mortar coated pipe.

2.04 EXTERNAL COATING SYSTEM FOR STEEL PIPE INSTALLED ABOVEGROUND (OR EXPOSED)

- A. Provide a 3-coat epoxy/polyurethane coating system as designated below.

Surface Preparation	SSPC SP10 Near White Blast Clean 2.0 to 3.0 mils surface profile
Prime Coat 2.0 to 4.0 mils DFT	ACRO 4422 Inhibitive Epoxy Primer, or approved equal
Intermediate Coat 4.0 to 6.0 mils DFT	ACRO 4460 Chemical Resistant Epoxy, or approved equal
Finish Coat 1.5 to 2.0 mils DFT	ACRO 4428 Polyurethane, Or approved equal

- B. Total minimum allowable dry film thickness for system: 10 mils.
- C. All materials shall be from same manufacturer.

2.05 INTERNAL LINING SYSTEMS FOR STEEL PIPE

- A. General: Supply steel pipe with either epoxy lining or shop applied cement mortar lining, capable of conveying water at temperatures not greater than 140°F. All linings shall conform to American National Standards Institute/National Sanitation Foundation (ANSI/NFS) Standard 61 and certified by an organization accredited by ANSI. Unless otherwise noted, coat all exposed (wetted) steel parts of flanges, blind flanges, bolts, access manhole covers, etc., with epoxy lining, as specified herein.
- B. Epoxy Lining: AWWA C210-92 - White, or approved equal for shop and field joint applied, except as modified herein.

1. Surface Preparation: SSPC-SP-10(64); Near White Blast Clean; 2.0 to 3.0 mils surface profile.
 2. Prime Coat: ACRO 4460 NSF Certified Epoxy - Buff; 4.0 to 6.0 mils DFT or approved equal.
 3. Intermediate Coat: ACRO 4460 NSF Certified Epoxy - Buff; 4.0 to 6.0 mils DFT or approved equal.
 4. Finish Coat: ACRO 4460 NSF Certified Epoxy - White 4.0 to 6.0 mils DFT or approved equal.
 5. Minimum allowable dry film system thickness: 12.0 mils.
 6. Maximum allowable dry film system thickness: 18.0 mils.
 7. Minimum field adhesion: 700 psi.
 8. Dry film thicknesses for approved alternate products in accordance with the product manufacturer's recommendations.
 9. The lining system may consist of three or more coats of the same approved alternate epoxy lining without the use of a separate primer.
 10. Provide materials from the same manufacturer.
- C. Shop Applied Cement Mortar Lining: AWWA C205; shop-applied cement mortar linings, except as specified herein 3/8 inch minimum thickness for pipe diameters 24 inches and smaller. Pipe with cut back lining from joint ends no more than 2 inches to facilitate joining and welding of pipe.

2.06 MORTAR FOR EXTERIOR JOINTS

- A. Cement Mortar: One part cement to two parts of fine, sharp clean sand; mix with water to a consistency of thick cream.
- B. Portland Cement: ASTM C150, Type II.
- C. Sand:
 1. Inside joints: AWWA C602; fine graded natural sand.
 2. Outside joints: ASTM C33; natural sand with 100 percent passing No. 16 sieve.
- D. Water: ASTM D1888, Method A; total dissolved solids less than 1000 mg/l; ASTM D512 chloride ions less than 100 mg/l for slurry and mortar cure; ASTM D1293 pH greater than 6.5.

PART 3 EXECUTION**3.01 PIPING INSTALLATION**

- A. Conform to applicable provisions of Section 02664 - Water Mains except as modified herein.

3.02 EXTERNAL COATING SYSTEM FOR BURIED STEEL PIPE

- A. Tape Coating System:

1. Inspect pipe, prior to shipment, for holidays and damage to coating. Perform electrical holiday test of minimum of 6,000 volts with a 60 cycle current audio detector. If test indicates no holidays and outer wrap(s) is torn, remove damaged layers of outer wrap by carefully cutting with sharp razor-type utility knife. Wash with Xylol area to be patched and at least 4 inches of undamaged tape where hand-applied tape wrap will overlap. AWWA C209 cold-applied tape; compatible with tape-wrapping system applied for each layer of outer-wrap tape that has been removed. If damaged area shows holiday when tested, remove outer layers and expose inner wrap. Prime exposed area and overlaps with light coat of primer. Firmly press into place patch of inner wrap of sufficient size to extend 4 inches from holidays in all directions. Holiday test patch to verify that it is installed satisfactorily. Retrim outer layer of tape to expose first wrap of outer-wrap tape sufficiently to allow minimum lap of 2 inches in all directions. Wash exposed outer wrap tape with Xylol and prime. Apply two layers of AWWA C209 outer wrap with 35 mils minimum thickness.
2. Regardless of results of electrical holiday test, bubbles in tape coating system are not allowed. Cut out bubbles and patch as detailed above.
3. Field repairs and applications of coatings: AWWA C209 around joint cutbacks except as modified herein. Field-welded joints: clean shop-primed ends of weld splatter, damaged primer and rust to achieve required surface preparation prior to field repair of linings and coatings.
 - a. Immediately prior to placing joint in trench, remove shop-applied primer by abrasive blasting, solvent or other method as approved by the Engineer. Avoid damage to adjacent existing coatings. Clean surfaces to achieve surface preparation at least equivalent to SSPC SP6 in accordance with AWWA C209. Solvent: environmentally safe and compatible with coating-system primer.
 - b. Apply primer immediately prior to application of first layer of tape to achieve maximum bond. Apply tape while primer is still "tacky" with 3-inch minimum overlap over shop-applied coating.

4. Do not expose tape coatings to harmful ultraviolet light for more than 90 days. Discard (remove) and replace outer layer of tape coating when exposure exceeds 90 days. In case of factory applied coatings, remove joint from site for removal and reapplication of outer layer of tape coatings.
 - B. At City's option, coating system and application may be tested and inspected at plant site in accordance with AWWA C214.
 - C. Cement Mortar Coating: AWWA C205; 1-inch minimum thickness; cut back from joint ends no more than 2 inches to facilitate joining and welding of pipe.
- 3.03 EXTERNAL COATING SYSTEM FOR STEEL PIPE INSTALLED ABOVEGROUND, IN VAULTS, TUNNELS OR CASINGS, AND INTERNAL LINING FOR ALL INSTALLATIONS
- A. Cement Mortar Lining: AWWA C205; 1/2-inch minimum thickness; cut back from joint ends to facilitate joining and welding of pipe.
 - B. Safety: Paints, coatings, and linings specified herein are hazardous materials. Vapors may be toxic or explosive. Protective equipment, approved by appropriate regulatory agency, is mandatory for all personnel involved in painting, coating, and lining operations.
 - C. Workmanship:
 1. Application: By qualified and experienced workers who are knowledgeable in surface preparation and application of high-performance industrial coatings.
 2. Paint Application Procedures: SSPC Good Painting Practices, Volume 1.
 - D. Surface Preparation:
 1. Prepare all surfaces for painting with abrasive blasting.
 2. Schedule cleaning and painting so that detrimental amounts of dust or other contaminants do not fall on wet, newly painted surfaces. Protect surfaces not intended to be painted from effects of cleaning and painting operations.
 3. Prior to blasting, clean surfaces to be coated or lined of grease, oil and dirt by steaming or detergent cleaning in accordance with SSPC SP1.
 4. Metal and Weld Preparation: Remove all surface defects such as gouges, pits, welding and torch-cut slag, welding flux and spatter by grinding to 1/4-inch minimum radius.
 5. Abrasive Material:
 - a. Blast only as much steel as can be coated same day of blasting.

- b. Use sharp, angular, properly graded abrasive capable of producing depth of profile specified herein. Transport abrasive to jobsite in moisture-proof bags or airtight bulk containers. Copper slag abrasives are not acceptable.
 - c. After abrasive blast cleaning, verify surface profile with replica tape such as Tes-Tex Coarse or Extra Coarse Press-O-Film Tape, or approved equal. Furnish tapes to City for filing and future reference.
 - d. Do not blast if metal surface may become wet before priming commences, or when metal surface is less than 5 degrees F above dew point.
 - 6. Remove all dust and abrasive residue from freshly blasted surfaces by brushing or blowing with clean, dry air.
- E. Coating and Lining Application:
 - 1. Environmental Conditions: Do not apply coatings or linings when metal temperature is less than 50 degrees F; when ambient temperature is less than 5 degrees F above dew point; when expected weather conditions are such that ambient temperature will drop below 40 degrees F within 6 hours after application of coating; or when relative humidity is above 85 percent. Measure relative humidity and dew point by use of sling psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychrometric Tables. Provide dehumidifiers for all field-applied coatings and linings to maintain proper humidity levels.
 - 2. Application Procedures:
 - a. Apply coatings and linings in accordance with manufacturer's recommendations and requirements of this section. Provide a finish free of runs, sags, curtains, pinholes, orange peel, fish eyes, excessive overspray or delaminations.
 - b. Thin materials only with manufacturer's recommended thinners. Thin only amount required to adjust viscosity for temperature variations, proper atomization and flow-out. Mix material components using mechanical mixers.
 - c. Discard catalyzed materials remaining at end of day.
 - 3. Apply primer immediately after surface has been cleaned. Thoroughly dry pipe before primer is applied. Apply succeeding coats before contamination of under surface occurs.

4. Allow each coat of paint either to dry or cure amount of time recommended by coating or lining manufacturer before successive coats of paint are applied. Apply all successive coats of paint within recoat threshold time as recommended by coating or lining manufacturer on printed technical data sheets or through written communications.

3.04 INSPECTION

- A. Procure services of an independent testing laboratory or inspection service, approved by the Engineer, to perform tests on all portions of coating and lining applications. Laboratory shall supply services of NACE Certified Coatings Inspectors having Level III Certification for all coating and linings inspection work. Include cost of such testing in contract unit price bid for water main. Furnish copies of all test reports to the Engineer for review. If defective coatings or lining are revealed, cost of repair and testing of repair will be paid for by Contractor. The Engineer shall have full and final decision as to suitability of all coatings and linings tested.
- B. For all field applied coatings and linings, including joints, notify City sufficiently in advance of work so that City can perform examination of and acceptance of surface preparation and application of each coat prior to application of next coat. Furnish appropriate test data to City verifying compliance with requirements of this section of each coat prior to proceeding with next coat. Recoat or repair runs, overspray, roughness and/or abrasives in coating, or other indications of improper application in accordance with coating or lining manufacturer's and the Engineer's instructions.
- C. Repairs, surface preparation and painting will be subject to inspection by City. Guidelines published by Steel Structures Painting Council will be used as basis for acceptance or rejection of cleaning, painting or coating application. SSPC VIS1, Pictorial Surface, along with single-probe magnetic pull-off type dry film thickness gages, electrical holiday detectors, and standard wet film thickness gages will be used to determine acceptability of paint applications.
- D. Check film thickness with nondestructive magnetic pull-off gage such as Mikrotest Model DFG-100 or electronic thickness gage. National Bureau of Standards certified thickness calibration plates will be used to verify accuracy of thickness gage. Determine maximum and minimum thickness in accordance with SSPC PA2 for frequency and method. Evaluate each length of pipe under SSPC PA2. Consider each field joint area separate and discrete for purpose of DFT measurements. Perform five spot DFT measurements on each field joint area (15 individual readings). Check thickness of each individual coat as well as thickness of overall system with respect to compliance with this Section. Failure to meet either overall system thickness requirements or requirements of component coats shall be cause for rejection and recoat or repair of entire joint or length of pipe.
- E. Holiday Test:

1. Begin inspection after coating has sufficiently cured, usually one to five days. (Consult coating manufacturer for specific curing schedule.)
2. Use high-voltage d-c holiday detector such as D.E. Stearns Company Model 14/20 or Tinker & Rasor Model AP/W. Use 1600 volts, plus or minus 100 volts. Use brass brush type electrode.
3. Ground high-voltage d-c holiday detector to metal being inspected. Earth-type ground tape is not acceptable. Mark detected defects with white chalk, repair and reinspect.
4. Adhesion Tests: ASTM D4541; pull-off testing using an Elcometer Model 106 Fixed Alignment Adhesion Tester. Adhesion testing may be directed by the Engineer on any length of pipe or joint which exceeds maximum coating thickness limitations specified in this Section.

3.05 COATINGS AND LININGS INSPECTION

- A. City reserves right to inspect or acquire service of independent third-party inspector who is fully knowledgeable of, and qualified to inspect, surface preparation and application of high-performance coatings to inspect any and all phases of all coatings and linings work, whether field or shop applied. Contractor responsible for application and performance of coating and lining whether or not City provides such inspection.

END OF SECTION

SECTION 02620

PVC PIPE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Polyvinyl chloride pressure pipe for water distribution in nominal diameters 4 inches through 16 inches.
- B. Polyvinyl chloride sewer pipe for gravity sanitary sewers in nominal diameters 4 inches through 48 inches.
- C. Polyvinyl chloride pressure pipe for gravity sanitary sewers and force mains in nominal diameters 4 inches through 36 inches.
- D. Polyvinyl chloride sewer pipe for gravity storm sewer drain extensions to existing or proposed structures (all sizes).

1.02 UNIT PRICES

- A. No separate payment will be made for PVC pipe under this section. Include cost in unit price for water mains, gravity sanitary sewer, and force mains.
- B. Yard drain adjustments will paid per the linear foot of adjustment and will include connections, bends, joints and clean outs required to complete the work.

1.03 SUBMITTALS

- A. Conform to requirements of Section 01300 - Submittals.
- B. Submit shop drawings showing design of new pipe and fittings indicating alignment and grade, laying dimensions, fabrication, fittings, flanges, and special details.

1.04 QUALITY CONTROL

- A. Submit manufacturer's certifications that PVC pipe and fittings meet requirements of this Section and AWWA C 900 for pressure pipe applications, or the appropriate ASTM standard specified for gravity sewer pipe.
- B. Submit manufacturer's certification that PVC pressure pipe has been hydrostatically tested at the factory in accordance with AWWA C 900 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 any other source is not acceptable. Furnish copies of test reports to the Engineer for review. Cost of testing shall be borne by Contractor or Supplier.

PART 2 PRODUCTS

2.01 MATERIAL

- A. Use PVC compounds in the manufacture of pipe that contain no ingredient in an amount that has been demonstrated to migrate into water in quantities considered to be toxic.
- B. Furnish PVC pressure pipe manufactured from Class 12454-A or Class 12454-B virgin PVC compounds as defined in ASTM D 1784. Use compounds qualifying for a rating of 4000 psi for water at 73.4 degrees 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. For PVC pressure pipe used for water mains, 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.
- D. Gaskets:
1. Gaskets shall meet the requirements of ASTM F 477. Use elastomeric factory-installed gaskets to make joints flexible and watertight.
 2. Pipes to be installed in potentially contaminated areas, especially where free product is found near the elevation of the proposed sewer, shall have the following gasket materials for the noted contaminants.

CONTAMINANT	GASKET MATERIAL REQUIRED
Petroleum (diesel, gasoline)	Nitrile Rubber
Other Contaminants	As recommended by the pipe manufacturer

- E. 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.

2.02 WATER SERVICE PIPE

- A. Pipe 4-inch through 12-inch: AWWA C 900, Class 235, DR 18; nominal 20-foot lengths; cast iron equivalent outside diameters.
- B. Pipe 16-inch: AWWA C 900; Class 235; DR 18; nominal 20-foot lengths; cast iron equivalent outside diameter.
- C. Joints: ASTM D 3139; push-on type joints in integral bell or separate sleeve couplings. Do not use socket type or solvent weld type joints.
- D. Make curves and bends by deflecting the joints. Do not exceed maximum deflection recommended by the pipe manufacturer. Submit details of other methods of providing curves and bends for review by the Engineer.
- E. Hydrostatic Test: AWWA C 900, ANSI A21.10 (AWWA C110); at point of manufacture; submit manufacturer's written certification.

2.03 BENDS AND FITTINGS FOR PVC PRESSURE PIPE

- A. Bends and Fittings: ANSI A21.10, ductile iron; ANSI A21.11 single rubber gasket push-on type joint; minimum 150 psi pressure rating.
- B. Coatings and Linings: Conform to requirements of Section 02610 - Ductile-Iron Pipe and Fittings.
- C. Restraints for large diameter PVC pipe (AWWA C900) at the bell shall consist of the following:
 - 1. The restraint shall be manufactured of ductile iron conforming to ASTM A536.
 - 2. A backup ring shall be utilized behind the PVC bell.
 - 3. A restraint ring, incorporating a plurality or individually actuating gripping surfaces, shall be used to connect the bell ring and gripping ring.
 - 4. The restraint shall be the Series 2800 as manufactured by EBAA Iron, Inc., or approved equal.

2.04 GRAVITY SANITARY SEWER PIPE

- A. PVC gravity sanitary sewer pipe shall be in accordance with the provisions in the following table:

WALL CONSTRUCTION	MANUFACTURER	PRODUCT OPTIONS	ASTM DESIGNATION	SDR (Max.)/ STIFFNESS	DIAMETER SIZE RANGE
Solid	J-M Manufacturing Co, Inc.	Approved	D3034	SDR 26 / PS 115	6" to 15"
	CertainTeed	Approved	F679 (T-1)	SDR 26 / PS 115	18" to 24"
	Can-Tex				
	Carlson Company	Approved	F679 (T-1)	SDR 35 / PS 46	27" to 36"
	Diamond Plastics Corp				
	North American Pipe Corporation (NAPCO)	Approved	AWWA C900	DR 18 / N/A	4" to 12"
		Approved	AWWA C900	DR 18 / N/A	14" to 36"

- B. When solid wall PVC pipe 18 inches to 27 inches in diameter is required in SDR 26, provide pipe conforming to ASTM F679, except provide wall thickness as required for SDR 26 and pipe strength of 115 psi.
- C. For sewers up to 12-inch-diameter crossing over waterlines, or crossing under waterlines with less than 2 feet separation, provide minimum 150 psi pressure-rated pipe conforming to ASTM D 2241 with suitable PVC adapter couplings.
- D. Joints: Spigot and integral wall section bell with solid cross section elastometric or rubber ring gasket conforming to requirements of ASTM D 3212 and ASTM F 477, or ASTM D 3139 and ASTM F 477, shall be provided. Gaskets shall be factory-assembled and securely bonded in place to prevent displacement. The manufacturer shall test a sample from each batch conforming to requirements ASTM D2444.
- E. 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.

2.05 SANITARY SEWER FORCE MAIN PIPE

- A. Provide PVC pressure pipe conforming to the requirements for water service pipe, and conforming to the minimum working pressure rating specified in Section 02731 - Sanitary Sewage Force Mains.

- B. Acceptable pipe joints are integral bell-and-spigot, containing a bonded-in elastomeric sealing ring meeting the requirements of ASTM F 477. In designated areas requiring restrained joint pipe and fittings, use EBAA Iron Series 2000PV, Uniflange Series 1350 restrainer, or equal joint restraint device conforming to UNI-B-13, for PVC pipe 12-inch diameter and less.
- C. Fittings: Provide ductile iron fittings as per Paragraph 2.03, except furnish all fittings with one of the following internal linings:
 - 1. Nominal 40 mils (35 mils minimum) virgin polyethylene complying with ASTM D 1248, heat fused to the interior surface of the fitting, as manufactured by American Cast Iron Pipe "Polybond", or U.S. Pipe "Polyline".
 - 2. Nominal 40 mils (35 mils minimum) polyurethane, Corro-pipe II by Madison Chemicals, Inc.
 - 3. Nominal 40 mils (35 mils minimum) ceramic epoxy, Protecto 401 by Enduron Protective Coatings.
- D. Exterior Protection: Provide polyethylene wrapping of ductile iron fittings as required by Section 02630 - Polyethylene Wrap.
- E. Hydrostatic Tests: Hydrostatically test pressure rated pipe in accordance with Paragraph 2.02 E.

PART 3 EXECUTION

3.01 PROTECTION

- A. Store pipe under cover out of direct sunlight and protect from excessive heat or harmful chemicals in accordance with the manufacturer's recommendations.

3.02 INSTALLATION

- A. Conform to requirements of Section 02664 - Water Mains, Section 02730 - Gravity Sanitary Sewers, Section 02731 - Sanitary Sewage Force Mains, and Section 02763 - Point Repairs to Sanitary Sewers, as applicable.
- B. Install PVC pipe in accordance with Section 02227 - Excavation and Backfill for Utilities, ASTM D 2321, and manufacturer's recommendations.
- C. Water service pipe 12 inches in diameter and smaller: Installed to clear utility lines and have minimum 4 feet of cover below lowest property line grade of street, unless otherwise required by Drawings.

- D. For water service, exclude use of PVC within 200 feet (along the public right-of-way) of underground storage tanks or in undeveloped commercial acreage. Underground storage tanks are primarily located on service stations but can exist at other commercial establishments.
- E. Avoid imposing strains that will overstress or buckle the pipe when lowering pipe into trench.
- F. Hand shovel pipe bedding under the pipe haunches and along the sides of the pipe barrel and compact to eliminate voids and ensure side support.

END OF SECTION

SECTION 02626

TAPPING SLEEVES AND VALVES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tapping sleeves and valves for connections to existing water system.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 SUBMITTALS

- A. Submit product data in accordance with requirements of Section 01300 - Submittals.

1.04 QUALITY CONTROL

- A. Provide manufacturer's affidavit that all valves purchased for tapping of existing waterlines conform to Section 02640 - Gate Valves and to applicable requirements of AWWA C500 and that they have been satisfactorily tested in accordance with AWWA C500.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Tapping Sleeves:
 - 1. Tapping Sleeve Bodies: AWWA C110 cast or ductile iron; AWWA C200 carbon steel; in two sections to be bolted together with high-strength, corrosion-resistant, low-alloy, steel bolts; mechanical joint ends.
 - 2. Branch Outlet of Tapping Sleeve: Flanged; machined recess; AWWA C207, Class D, ANSI 150 pound drilling. Gasket: Affixed around recess of tap opening to preclude rolling or binding during installation.
- B. Welded-steel tapping-sleeve bodies may be used in lieu of cast or ductile iron bodies for following sizes and with following restrictions.
 - 1. Flange: AWWA C207, Class D, ANSI 150 pound drilling. Gasket: Affixed around recess of tap opening to preclude rolling or binding during installation.

2. Steel sleeves are restricted to use on pipe sizes 6-inch and larger.
 3. Body: Heavy, welded-steel construction; top half grooved to retain neoprene O-ring seal permanently against O.D. of pipe.
 4. Bolts: AWWA C500 Section 3.5; coated with 100 percent vinyl resin or corrosive resistant material.
 5. Steel Sleeves: Fusion-bonded epoxy coated to minimum 12-mil thickness. Finished epoxy coat: Free of laminations and blister; not peel; and remain pliant and resistant to impact. Ship steel sleeves in wooden crates that provide protection from damage to epoxy coating during transport and storage.
 6. Acceptable steel tapping sleeve manufacturers are JCM and Rockwell, or approved equal.
 7. Tapping Sleeves: Provide with 3/4-inch NPT test opening for testing prior to tapping. Provide 3/4-inch bronze plug for opening.
 8. Do not use steel sleeves for taps greater than 75 percent of pipe diameter.
 9. Comply with AWWA C223 - Fabricated Steel and Stainless Steel Tapping Sleeves.
- C. Tapping Valves: Meet all requirements of Section 02640 - Gate Valves with following exceptions:
1. Inlet Flanges:
 - a. AWWA C110; Class 125.
 - b. AWWA C110; Class 150 and higher: Minimum eight hole flange.
 2. Outlet: Standard mechanical joint; to fit any standard tapping machine.
 3. Valve Seat Opening: Accommodate full-size shell cutter for nominal size tap without any contact with valve body.
- D. Valve Boxes: Furnish and install according to Section 02604 - Valve Boxes, Meter Boxes, and Meter Vaults.

PART 3 EXECUTION

3.01 GENERAL

- A. Install tapping sleeves and valves at locations and of sizes as shown on Drawings.

- B. Thoroughly clean tapping sleeve, tapping valve and pipe prior to installation and in accordance with manufacturer's instructions.
- C. Hydrostatically test installed tapping sleeve to 150 psig for a minimum of 15 minutes. Inspect sleeve for leaks, and remedy leaks prior to tapping operation.
- D. When tapping concrete pressure pipe, size on size, use shell cutter one standard size smaller than waterline being tapped.
- E. Do not use Large End Bell (LEB) increasers with a next size tap unless existing pipe is asbestos-cement.

3.02 INSTALLATION

- A. Tighten bolts in proper sequence so that undue stress is not placed on pipe.
- B. Align tapping valve properly and attach it to tapping sleeve.
- C. Make tap with sharp, shell cutter:
 - 1. For 12-inch and smaller tap, use minimum cutter diameter one-half inch less than nominal tap size.
 - 2. For 16-inch and larger tap, use manufacturer's recommended cutter diameter.
- D. Withdraw coupon and flush all cuttings from newly made tap.
- E. Wrap completed tapping sleeve and valve in accordance with Section 02664 - Water Mains.
- F. Place concrete thrust block behind tapping sleeve (NOT over tapping sleeve and valve).
- G. Request inspection of installation prior to backfilling.
- H. Backfill in accordance with Section 02227 - Excavation and Backfill for Utilities.

END OF SECTION

SECTION 02629

POLYURETHANE COATINGS ON STEEL OR DUCTILE IRON PIPE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Two-component polyurethane coating system for use as an internal or external coating for steel or ductile iron pipe.

1.02 UNIT PRICES

- A. No separate payment will be made for work performed under this section. Include cost of polyurethane coatings in contract unit prices for steel pipe or ductile iron pipe.

1.03 SAFETY

- A. Secure, from manufacturer, Material Safety Data Sheet (MSDS) for polyurethane coatings and repair materials listed in this section.
- B. Safety requirements stated in this specification and in related sections apply in addition to applicable federal, state and local rules and regulations. Comply with instructions of coating manufacturer and requirements of insurance underwriters.
- C. Adhere to handling and application practices of SSPC-PA Guide 3; SSPC-PS Guide 17.00; Coating Manufacturer's Material Safety Data Sheet.

1.04 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals
- B. Submit coating manufacturer's catalog sheets and technical information for approval, prior to delivery of pipe.
- C. Obtain from coating manufacturer and furnish to Engineer, a coating "affidavit of compliance" to requirements of this section stating that coatings were applied in factory and in accordance with manufacturer's minimum requirements.

PART 2 PRODUCTS

2.01 COATING MATERIAL

- A. Coating Standard: ASTM D16.

- B. Coating System: Use a Coating Standard ASTM D16 Type, V system which is a 2-package polyisocyanate, polyol-cured urethane coating. The components are mixed in 1:1 ratio at time of application. The components are balanced viscosities in their liquid state and do not require agitation during use.
- C. Exterior Coating Material: CORROPIPE II-TX and Joint Coating Material CORROPIPE II-PW, as manufactured by Madison Chemical Industries, Inc., 5673 Old Dixie Road, Forest Park, Georgia 30050, or approved equal.
- D. Internal Coating Material: Exterior Coating Material, CORROPIPE II-TX and Joint Coating Material CORROPIPE II-PW, as manufactured by Madison Chemical Industries, Inc., 5673 Old Dixie Road, Forest Park, Georgia 30050, or approved equal.
- E. Cured Coating Properties:
 - 1. Conversion to Solids by Volume: 97 percent plus or minus 3 percent.
 - 2. Temperature Resistance: Minus 40 degrees F and plus 130 degrees F.
 - 3. Minimum Adhesion: 500 psi, when applied without primer to ductile iron pipe which has been blasted to comply with SSPC-SP10.
 - 4. Cure Time: For handling in 1 minute at 120 degrees F, and full cure within 7 days at 70 degrees F.
 - 5. Maximum Specific Gravities: Polyisocyanate resin, 1.20. Polyol resin, 1.15.
 - 6. Minimum Impact Resistance: 80 inch-pounds using 1-inch diameter steel ball where coating is applied at 30 mils to ductile iron pipe surface which has been blasted to SSPC No. 10 finish.
 - 7. Minimum Tensile Strength: 2000 psi.
 - 8. Hardness: 55 plus or minus 5 Shore D at 70 degrees F.
 - 9. Flexibility Resistance: ASTM D1737 using 1-inch mandrel. Allow coating to cure for 7 days. Perform testing on test coupons held for 15 minutes at temperature extremes specified in Paragraph 2.01E.

2.02 REPAIR AND/OR TOUCHUP MATERIAL

- A. CORROPIPE II PW - TOUCHUP (two-component, brush applied); mix in accordance with coating manufacturer's recommendations.

2.03 PACKAGING AND LABELING

- A. Containers: Standard containers to prevent gelling, thickening deleteriously or forming of gas in closed containers within period of one year from date of manufacture.
- B. Labeling: Label each container of separately packaged component clearly and durably to indicate date of manufacture, manufacturer's batch number, quantity, color, component identification and designated name or formula specification number of coating together with special instructions. Do not use coating components older than one year.

2.04 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver coating materials to pipe manufacturer in sealed containers showing designated name, batch number, color, date of manufacture and name of coating manufacturer.
- B. Storage: Store material on site in enclosures, out of direct sunlight in warm, ventilated and dry area.
- C. Protection: Prevent puncture, inappropriate opening or other action which may lead to product contamination.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

- A. Remove deposits of oil, grease or other organic contaminants before blast cleaning by using solvent wash as specified in SSPC-SP1. Clean and dry surfaces making them completely dry, free of moisture, dust, grit, oil, grease or any other deleterious substances prior to application of coating.
- B. Exterior and Interior Surfaces: SSPC-SP10; near-white metal blast cleaning. The blasting shall be done with clean, hard, sharp cutting abrasives with no steel or cast iron shot in the mix.
- C. Ductile Iron Pipe: Prior to the start of production blasting, the Contractor shall prepare specimens for a white metal blast and a near-white metal blast using the equipment and abrasives proposed for the work. During preparation of the specimens, the blasting intensity and abrasive shall be changed as necessary to provide the degree of cleaning required by SSPC-SP10, except that the color of the blasted substrate is not expected to match the color of blasted steel. After examination and concurrence by the Engineer, the production blasting may begin. The production blasting shall be monitored and controlled by the Contractor so that production pipe surfaces match the surface of the approved blasting specimens.

3.02 THICKNESS

- A. External Coatings: Minimum DFT of 25 mils (0.025 inch).
- B. Internal Coatings: Minimum DFT of 35 mils.
- C. Thickness Determinations: Use Type 1 magnetic thickness gage as described in SSPC-PA2 specification. Individual readings below 90 percent of specified minimum are not acceptable. Average individual spot readings (consisting of three point measurements within 3 inches of each other) less than 95 percent of minimum are not acceptable. Average of all spot readings less than minimum thickness specified are not acceptable.

3.03 FACTORY APPLICATION OF POLYURETHANE COATING

- A. Equipment: Two-component, 1:1 mix ratio, heated airless spray unit.
- B. Temperature: Minimum 5 degrees F above dew point temperature. The temperature of the surface shall not be less than 60 degrees F during application.
- C. Humidity: Heating of pipe surfaces may be required to meet requirements of 2.01E if relative humidity exceeds 80 percent.
- D. Do not thin or mix resins; use as received. Store resins at a temperature above 55 degrees F at all times.
- E. Application: Conform to coating manufacturer's recommendations. Apply directly to substrate to achieve specified thickness. Multiple-pass, one-coat application process is permitted provided maximum allowable recoat time specified by coating manufacturer is not exceeded.
- F. Recoating: Recoat only when coating has cured less than maximum time specified by coating manufacturer. When coating has cured for more than recoat time, brush-blast or thoroughly sand coating surface. Blow-off cleaning using clean, dry, high-pressure compressed air.
- G. Curing: At ambient temperature above 0 degrees F. Do not handle pipe until coating has been allowed to cure as follows:

<u>Ambient Temperature</u>	<u>Minimum Full Cure Time</u>
Over 70°F	7 days
50 to 70°F	9 days

0 to 50°F

12 days

3.04 JOINTS

- A. Apply coating to unlined pipe surfaces including inside of bell socket and outside of spigot.
- B. Joint Coating Materials: CORROPIPE II PW (instant-set, two-component material, plural component spray applied), or CORROPIPE II PW -TOUCHUP (two-component, brush applied).
- C. Coating thickness on sealing areas of spigot end of pipe exterior: Minimum 8 mils (0.008 inch), maximum of 10 mils (0.010 inch). Maximum 10 mils may be exceeded in spigot end provided maximum spigot diameter as specified by pipe manufacturer is not exceeded.

3.05 INSPECTION

- A. Engineer may inspect coatings at coating applicator's facilities.
- B. Holiday Inspection: AWWA C210, Section 5.3.3.1. Follow coating manufacturer's recommendation. Conduct inspection any time after coating has reached initial cure. Repair in accordance with paragraph 3.07, Repair and Field Touchup.

3.06 PIPE INSTALLATION

- A. For wastewater projects, provide services of manufacturer's representative for period of not less than 2 weeks at beginning of actual pipe laying operations to advise Contractor regarding installation including but not limited to handling and storing, cleaning and inspecting, coatings repairs, and general construction methods as to how they may affect pipe coatings.
- B. Handling, Shipment, and Storage: Nylon straps, padded lifts and padded storage skids are required. Field cuts should be kept to minimum. Repair damage to coating due to handling or construction practices at no additional cost to. See Section 02610 - Ductile Iron Pipe and Fittings and Section 02611 - Steel Pipe and Fittings for additional requirements.
- C. Just before each section of pipe is to be placed into the trench, conduct a visual and holiday inspection. Defects in the coating system shall be repaired before the pipe is installed.

3.07 REPAIR AND FIELD TOUCHUP

- A. Apply repair/touchup materials in conformance with factory application of polyurethane coating requirements specified in this section, excluding equipment requirements.
- B. Repair Procedure - Holidays:
 - 1. Remove all traces of oil, grease, dust, dirt, etc.
 - 2. Roughen area to be patched by sanding with rough grade sandpaper (40 grit).
 - 3. Apply one coat of repair material described above. Work repair material into scratched surface by brushing.
- C. Repair Procedure - Field Cuts or Large Damage:
 - 1. Remove burrs from field cut ends or handling damage and smooth out edge of polyurethane coating.
 - 2. Remove all traces of oil, grease, dust, dirt, etc.
 - 3. Roughen area to be patched with rough grade sandpaper (40 grit). Feather edges and include overlap of 1 inch to 2 inches of roughened polyurethane in area to be patched.
 - 4. Apply thick coat of repair material described above. Work repair material into scratched surface by brushing. Feather edges of repair material into prepared surface. Cover at least 1 inch of roughened area surrounding damage, or adjacent to field cut.
- D. For Wastewater Projects; Repair Procedure - Thermite Brazed Connection Bonds:
 - 1. Remove polyurethane coating from area on metal surface which is to receive thermite brazed connection with power wire brush.
 - 2. Grind metal surface to shiny metal with power grinder and coarse grit grinding wheel.
 - 3. Apply thermite brazed connection using equipment, charge and procedure recommended by manufacturer of thermite equipment.
 - 4. After welded surface has cooled to temperature below 130 F, apply protective coating repair material to weld, exposed pipe surface and damaged areas of polyurethane coating.

5. Do not cover or backfill freshly repaired areas of coating at thermite brazed connection until repair material has completely cured. Allow material to cure in conformance with manufacturer's recommendations.

END OF SECTION

SECTION 02630

POLYETHYLENE WRAP

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Polyethylene wrap for cast and ductile iron pipe to be used only in open-cut construction when cathodic protection system is not required by Drawings.

1.02 UNIT PRICES

- A. No separate payment will be made for polyethylene wrap. Include cost of polyethylene wrap in unit price for items wrapped.

1.03 SUBMITTALS

- A. Submit product data in accordance with Section 01300 - Submittals.
- B. Submit product data for proposed film and tape for approval.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Polyethylene Film: Tubular or sheet form without tears, breaks, holidays or defects; conforming with requirements of AWWA C 105, 2.5 to 3 percent carbon black content, either low- or high-density:
 - 1. Low-density polyethylene film. Low-density polyethylene film shall be manufactured of virgin polyethylene material conforming to the following requirements of ASTM D 1248.
 - a. Raw material.
 - (1) Type : I
 - (2) Class: C (black)
 - (3) Grade: E-5
 - (4) Flow rate (formerly melt index): 0.4 g/10 minute, maximum
 - (5) Dielectric strength: Volume resistivity, 10^{15} ohm-cm, minimum
 - b. Physical properties.
 - (1) Tensile strength: 1200 psi, minimum
 - (2) Elongation: 300 percent, minimum
 - (3) Dielectric strength: 800 V/mil thickness, minimum

- c. Thickness: Low-density polyethylene film shall have a nominal thickness of 0.008 inch. The minus tolerance on thickness is 10 percent of the nominal thickness.
- 2. High-density, cross-laminated polyethylene film: High-density, cross laminated polyethylene film shall be manufactured of virgin polyethylene material conforming to the following requirements of ASTM D 1248
 - a. Raw material.
 - (1) Type: III
 - (2) Class: C (black)
 - (3) Grade: P33
 - (4) Flow rate (formerly melt index): 0.4 to 0.5g/10 minute, maximum
 - (5) Dielectric strength: Volume resistivity, 10^{15} ohm-cm, minimum
 - b. Physical properties.
 - (1) Tensile strength: 5000 psi, minimum
 - (2) Elongation: 100 percent, minimum
 - (3) Dielectric strength: 800 V/mil thickness, minimum
 - c. Thickness: Film shall have a nominal thickness of 0.004 inch. The minus tolerance of thickness is 10 percent of the nominal thickness.
- B. Polyethylene Tape: Provide 3-inch wide, plastic-backed, adhesive tape; Polyken No. 900, Scotchwrap No. 50, or equal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Preparation:
 - 1. Remove all lumps of clay, mud, cinders, etc., on pipe surface prior to installation of polyethylene encasement. Prevent soil or embedment material from becoming trapped between pipe and polyethylene.
 - 2. Fit polyethylene film to contour of pipe to effect a snug fit, but not tight; encase with minimum space between polyethylene and pipe. Provide 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.
 - 3. For installations below water table and/or in areas subject to tidal actions, seal both ends of polyethylene tube with adhesive tape at joint overlap.

- B. Tubular Type (Method A):
 - 1. Cut polyethylene tube to length approximately 2 feet longer than pipe section. Slip tube around pipe, centering it to provide 1-foot overlap on each adjacent pipe section, and bunching it accordion-fashion lengthwise until it clears pipe ends.
 - 2. Lower pipe into trench and make up pipe joint with preceding section of pipe. Make shallow bell hole at joints to facilitate installation of polyethylenetube.
 - 3. After assembling pipe joint, make overlap of polyethylene tube. Pull bunched polyethylene from preceding length of pipe, slip it over end of new length of pipe, and secure in place. Then slip end of polyethylene from new pipe section over end of first wrap until it overlaps joint at end of preceding length of pipe. Secure overlap in place. Take up slack width at top of pipe to make a snug, but not tight, fit along barrel of pipe, securing fold at quarter points.
 - 4. Repair cuts, tears, punctures, or other damage to polyethylene. Proceed with installation of next section of pipe in same manner.

- C. Tubular Type (Method B):
 - 1. Cut polyethylene tube to length approximately 1 foot shorter than pipe section. Slip tube around pipe, centering it to provide 6 inches of bare pipe at each end. Take up slack width at top of pipe to make a snug, but not tight, fit along barrel of pipe, securing fold at quarter points; secure ends.
 - 2. Before making up joint, slip 3-foot length of polyethylene tube over end of preceding pipe section, bunching it accordion-fashion lengthwise. After completing joint, pull 3-foot length of polyethylene over joint, overlapping polyethylene previously installed on each adjacent section of pipe by at least 1 foot; make each end snug and secure.
 - 3. Repair cuts, tears, punctures, or other damage to polyethylene. Proceed with installation of next section of pipe in same manner.

- D. Sheet Type:
 - 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 it until it clears pipe ends. Wrap polyethylene around pipe so that 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.

- 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 under appurtenance and bringing it up around body. Make seams by bringing edges together, folding over twice, and taping down. Tape polyethylene securely in place at valve stem and other penetrations.
- G. 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.
- H. Openings in Encasement: Provide openings for branches, 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. Service taps may also be made directly through polyethylene, with any resulting damaged areas being repaired as described above.
- I. 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 distance of at least 3 feet. Secure end with circumferential turns of tape. Wrap service lines of dissimilar metals with polyethylene or suitable dielectric tape for minimum clear distance of 3 feet away from cast or ductile iron pipe.

END OF SECTION

SECTION 02640

GATE VALVES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnishing and installing gate valves and boxes.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Submit manufacturer's product data for proposed valves for approval.

1.04 QUALITY CONTROL

- A. Provide manufacturer's affidavit that all gate valves have been satisfactorily tested in the United States in accordance with AWWA C500, C509, and C515.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Gate Valves: AWWA C500, C509, C515 and additional requirements of this Section; direct bury and in subsurface vaults open counterclockwise.
- B. If type of valve is not indicated on Drawings, gate valves shall be used as line valves for sizes less than 16-inches. When type of valve is specified, no substitute will be allowed.
- C. Gate Valves 1-1/2-inches in diameter and smaller: 125 psig; bronze; non-rising-stem; single-wedge; disc type; screwed ends; Nibco T-133, or equal.
- D. Coatings for Gate Valves 2-inches and larger: AWWA C550; Indurall 3300 or approved equal; non-toxic; not impart taste to water; function as physical, chemical, and electrical barrier between base metal and surroundings; minimum 8-mil-thick; fusion-bonded epoxy; prior to assembly of valve, apply protective coating to interior and exterior surfaces of body.
- E. Gate Valves 2-inches and 2-1/2-inches in diameter: Iron body; double disk gate; non-rising stem; 200-pound test; 2-inch square nut, Mueller, American Darling or approved equal, operating counterclockwise to open (open left).

- F. Gate Valves 4-inches to 12-inches in diameter: Non-directional; resilient wedge gate valves (AWWA C509 or C515); 200 psig; bronze mounting; mechanical joint and nut operated unless otherwise specified; Mueller or American Darling resilient wedge valve or approved equal; and comply with following:
1. Design: Fully encapsulated rubber wedge or rubber seat ring mechanically attached with minimum 304 stainless steel fasteners or screws; threaded connection isolated from water by compressed rubber around opening.
 2. Body: Cast or ductile iron; flange bonnet and stuffing box together with ASTM A307 Grade B bolts. Cast in body manufacturer's initials, pressure rating, and year manufactured.
 3. Bronze: Valve components in waterway to contain not more than 15 percent zinc and not more than 2 percent aluminum.
 4. Stems: ASTM B763 bronze, alloy number 995 minimum yield strength of 40,000 psi; minimum elongation in 2-inches of 12%; non-rising.
 5. "O" Rings: AWWA C509, Sections 2.2.6 and 4.8.2 or AWWA C515, Section 4.2.2.5.
 6. Stem Seals: Consist of three "O" rings, two above and one below thrust collar with anti-friction washer located above thrust collar for operating torque.
 7. Stem Nut: Independent or integrally cast of ASTM B62 bronze.
 8. Resilient Wedge: Molded; synthetic rubber; vulcanized and bonded to cast or ductile iron wedge or attached with 304 stainless steel screws tested to meet or exceed ASTM D429 Method B; seat against epoxy-coated surface in valve body.
 9. Bolts: AWWA C509, Section 4.4 or AWWA C515, Section 4.4.4; stainless steel; cadmium plated, or zinc coated.
- G. Gate Valves 14-inches to 24-inches in diameter: Non-directional; resilient wedge gate valves (AWWA C515); 250 psig; bronze mounting; mechanical joint and nut operated unless otherwise specified; Mueller or American Darling resilient wedge valve or approved equal; and comply with following:
1. Body: Ductile iron; flange together bonnet and stuffing box with ASTM A307 Grade B bolts. Cast in body manufacturer's initials, pressure rating, and year manufactured.
 2. Stems: ASTM B763 bronze, alloy number 995 minimum yield strength of 40,000 psi; minimum elongation in 2-inches of 12%; non-rising.

3. Stem Seals: Consist of three "O" rings, two above and one below thrust collar with anti-friction washer located above thrust collar for operating torque.
 4. "O" Rings: AWWA C515, Section 4.2.2.5.
 5. Stem Nut: Independent or integrally cast of ASTM B62 bronze.
 6. Resilient Wedge: Molded; synthetic rubber; vulcanized and bonded to ductile iron wedge or attached with 304 stainless steel screws tested to meet or exceed ASTM D429 Method B; seat against epoxy-coated surface in valve body.
 7. Bolts: AWWA C515, Section 4.4.4; stainless steel; cadmium plated, or zinc coated.
- H. Gate Valves 20-inches and larger: Furnish and equip with bypass valves.
1. Sizes: Provide 3-inch bypass valves for 20-inch gate valves. Provide 4-inch bypass valves for 24-inch gate valves.
- I. Valves 4-inches through 12-inches for Installation in Vertical Pipe Lines: Double disc, square bottom.
- J. Valves 14-inches and Larger for Installation in Horizontal Pipe Lines: Equipped with bronze shoes and slides.
- K. Gate Valves Installed at Greater than 4-foot Depth: Provide non-rising, extension stem having coupling sufficient to attach securely to operating nut of valve. Upper end of extension stem shall terminate in square wrench nut no deeper than 4 feet from finished grade.
- L. Gate Valves in Factory Mutual (Fire Service) Type Meter Installations: Conform to provisions of this specification; outside screw and yoke valves; carry label of Underwriters' Laboratories, Inc.; flanged, Class 125; clockwise to close.
- M. Provide flanged joints when valve is connected to steel.

PART 3 EXECUTION

3.01 EARTHWORK

- A. Conform to applicable provisions of Section 02227 - Excavation and Backfilling for Utilities.

3.02 SETTING VALVES AND VALVE BOXES

- A. Remove foreign matter from within valves prior to installation. Inspect valves in open and closed positions to verify that all parts are in satisfactory working condition.

- B. Install valves and valve boxes where shown on Drawings or as located by the Engineer. 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 if less than 4 feet. Install valves completely closed when placed in water line.
- C. For pipe section of each valve box riser, provide 6-inch PVC, Class 150, DR 18, riser pipe, unless noted as ductile iron pipe on the project details, pipe cut to proper length. Riser must be installed to allow complete access for future operation of valve. Assemble and brace box in vertical position as indicated on drawings.

3.03 DISINFECTION AND TESTING

- A. Disinfect valves and appurtenances as required by Section 02675 - Disinfection of Water Lines.

3.04 PAINTING OF VALVES

- A. Paint valves in vaults, stations and aboveground using ACRO Paint No. 2215 or approved equal, unless otherwise directed.

3.05 OPERATION

- A. Once the water valve is in operation the City must be contacted in order to operate the valve. Only personnel designated by the City shall operate water valves once they are placed in service.

END OF SECTION

SECTION 02645

FIRE HYDRANT ASSEMBLY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire hydrants.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 SUBMITTALS

- A. Submit product data in accordance with Section 01300 - Submittals.
 - 1. Control drawing(s) for proposed hydrant: Include model number, parts list, and material specifications, unique drawing number and descriptive legend identifying hydrant. Such drawing(s) should be same as approval drawing(s) on file with the City.
 - 2. Material safety data sheets for lubricants.
 - 3. Affidavit of compliance for coating materials.
 - 4. Certified hydraulic performance test report for proposed hydrant.

PART 2 PRODUCTS

2.01 HYDRANT MATERIALS

- A. Hydrants: AWWA C502; dry barrel design; tamper resistant; same manufacturer throughout project.
 - 1. "O" Ring Seal Packing: Prevent water leakage between barrel and lubrication chamber. Provide dynamic seals of Buna "N" or other oil resistant material and static seals of Buna "N" or other approved synthetic rubber.
 - 2. Bronze: Hydrant components in waterway to contain not more than 15 percent zinc and not more than 0.25 percent lead.
 - 3. Acceptable Manufacturer: Mueller Super Centurian 250, or approved equal.

- B. Operating Stems: Everdur, or other high-quality non-corrodible metal where threads are located in barrel or waterway. Bronze-to-bronze working parts in waterway; genuine wrought iron or steel where threads are not located in barrel or waterway, bronze bushed at penetration of stuffing box; seal threads against contact with water regardless of open or closed position of main valve. Connect operating stems with breakable coupling.
- C. Main Valve (shut-off valve): Circular; compression-type; closes with line pressure; minimum opening of 5-1/4 inches in diameter. Seal bottom end of stem threads from contact with water with cap nut. Valve shall open counterclockwise (open left).
- D. Valve Mechanism: Bronze valve seat ring threaded into bronze drain ring; seat ring and main valve assembly removable from above ground through upper barrel with lightweight seat removal wrench; breakable stem coupling opposite barrel breakaway; bronze or corrosion-resistant pins and locking devices; bronze valve stem sleeve, O-ring seals and travel stop; sealed lubricating reservoir at top and bottom which fully lubricates threads and bearing surfaces when opening or closing main valve; thrust bearing or lubricated thrust collar for operating assembly. Lubricants: Food Grade. Valve Seat: Molded "Natural" rubber; scale durometer rating of 90 ± 5 ; minimum thickness of 1/2-inch. Natural Rubbers: Resistant to microbiological attack.
- E. Lower Hydrant Barrel: Single piece coupled to upper barrel to allow 360-degree rotation of upper barrel. Bury Length: Distance from bottom of inlet to ground line as specified. Ground Line: Clearly marked on barrel. Indicate inside diameter and wall thickness (with tolerances) for upper barrel, lower barrel, and bonnet sections. Show dimensions at minimum sections to demonstrate compliance with Paragraph 3.2.6 of AWWA C502.
- F. Extensions: Permit use of one or more standard extensions available from manufacturer in lengths from 6 inches to 60 inches in 6 inch increments.
- G. Provide hydrants with automatic, positively operating, non-corrodible drain or drip valve to drain hydrant completely when main valve is shut. Bronze or corrosion resistant drain line. Tapping of drain holes is not required.
- H. Inlet Connection: Elbow with AWWA Standard bell designed for 6 inch mechanical joint: ANSI A21.11; AWWA C111.
- I. Operating Nut and Hold-down Nuts: Stainless steel or cast or ductile iron with bronze inserts or, as an alternative, provide security device with bronze operating nut. Any such security devices shall not require special tools for normal off/on operation of hydrant. Fabricate hold-down assemblies of suitable metallic materials for service intended.

- J. Field-Replaceable Nozzles: NFPA No. 194, ANSI B26-1925; mechanically attached to hydrant body counterclockwise; sealed with "O" rings and mechanically located into place; provide two (2) hose nozzles with 2-1/2 inch nominal inside diameter and one (1) pumper nozzle with 4-1/4 inch nominal inside diameter; Pumper nozzle threads will be 4 threads per inch and a 4.92 pitch diameter.; lock in place with security device.
- K. Pumper Nozzle: Allow a minimum unobstructed radius of 10 inches from threaded surface of nozzle throughout path of travel of wrench or other device used to fasten hose to nozzle.
- L. Nozzle Caps: Security chains to hydrant barrel, minimum 1/8-inch diameter; "Natural" rubber or neoprene gasket seals.
- M. Hydrant shoe with 6 inch cast or ductile iron pipe diameter inlet, flanged, swivel or slip joint with harnessing lugs for restrained joints. Underground flanging shall incorporate minimum of six full 3/4-inch diameter electro-galvanized or cadmium coated steel bolts or four 5/8-inch diameter stainless or cadmium coated steel bolts.
- N. Provide traffic model hydrants equipped with safety flange on hydrant barrel and stem. Equip body of hydrant with breakable flange, or breakable bolts, above finish grade.
- O. Lubricate hydrants with food grade oil or with grease meeting requirements of FDA 21 CFR 178.3570 and manufactured with FDA approved oxidation inhibitors.
- P. Accomplish replenishment of lubricant for hydrant working parts without removing hydrant bonnet. Store lubricant system in reservoir. Lubricate bearing surfaces and working parts during normal operation of fire hydrant.
- Q. Hydrant Painting: Shop coated as follows:
 - 1. Exterior Above Traffic Flange (including bolts and nuts)
 - a. Surface Preparation: SSPC-SP10 (NACE 2); near white blast cleaned surface.
 - b. Coat with a three (3) coat alkyd/silicone alkyd system with a total dry film thickness (DFT) of 6 - 9 mils as follows:
 - (1). Prime Coat: Oil Modified Alkyd Primer to be in conformance with SSPC Paint Specification No. 25. Total dry film thickness (DFT): 2 - 3 mils.

- (2). Intermediate Coat: Heavy Duty Industrial Alkyd Enamel to be in conformance with SSPC Paint Specification No. 104 and Federal Standard A-A-2962A. Total dry film thickness (DFT): 2 - 3 mils.
 - (3). Finish Coat: Silicone Alkyd Resin Enamel to be in conformance with SSPC Paint Specification No. 21. Total dry film thickness (DFT): 2 - 3 mils.
 - (4). Colors: Primer: Manufacturer's standard color. Finish coat of Red.
2. Exterior Below Traffic Flange:
 - a. Surface Preparation: SSPC-SP10 (NACE 2); near white blast cleaned surface.
 - b. Coat with a three (3) coat system as follows:
 - (1). Primer and Intermediate Coat: Coal tar epoxy to be in conformance with SSPC Paint Specification No. 16. Apply two (2) coats with a dry film thickness (DFT) of 8 - 10 mils each for a total dry film thickness (DFT) of 16 - 20 mils.
 - (2). Finish Coat: Water based vinyl acrylic mastic. Apply one (1) coat with a dry film thickness (DFT) of 6 - 8 mils. Finish coat color to be same as finish coat for exterior above traffic flange.
3. Interior Surfaces Above and Below Main Valve:
 - a. All materials used for internal coating of hydrant interior ferrous surfaces must conform to ANSI/NSF Standard 61-G as suitable for contact with potable water as required by Chapter 290, Rules and Regulations for Public Water Systems, Texas Commission on Environmental Quality (TCEQ).
 - b. Surface Preparation: SSPC-SP10 (NACE 2); near white blast cleaned surfaces.
 - c. Coating: Liquid or powder epoxy system; AWWA Standard C550, latest revision. Coating may be applied in two (2) or three (3) coats, according to manufacturer's recommendations, for a total dry film thickness (DFT) of 12 - 18 mils.

4. General Coating Requirements:
 - a. Coatings: Applied in strict accordance with the manufacturer's recommendations. No requirements of this specification shall cancel or supersede written directions and recommendations of specific manufacturer so as to jeopardize integrity of applied system.
 - b. Hydrant supplier shall furnish an affidavit of compliance that all materials and work furnished complies with requirements of this specification and applicable standards referenced herein.

2.02 HYDRANT PERFORMANCE STANDARDS

- A. Hydraulic Performance Standards:
 1. Provide hydrants capable of a free discharge of 1,500 gpm or greater from single pumper nozzle at a hydrant inlet static pressure not exceeding 20 PSIG as measured at or corrected to hydrant inlet at its centerline elevation.
 2. Provide hydrants capable of a discharge of 1,500 gpm or greater from single pumper nozzle at a maximum permissible head loss of 8.0 psig (when corrected for inlet and outlet velocity head) for an inlet operating pressure not exceeding 37 psig as measured at or corrected to hydrant inlet at its centerline elevation.
- B. Hydraulic Performance Testing: AWWA C502; conduct certified pressure loss and quantity of flow test by qualified testing laboratory on production model (5-foot bury length) of hydrant (same catalog number) proposed for certification. Submit certified test report containing following information:
 1. Date of test, no more than five years prior to date of proposed use, on fire hydrant with similar hydraulic characteristics.
 2. Name, catalog number, place of manufacture, and date of production of hydrant(s) tested.
 3. Schematic drawing of testing apparatus, containing dimensions of piping elements including:
 - a. Inside diameter and length of inlet piping.
 - b. Distance from flow measuring points to pressure measurement point.
 - c. Distance from flow and pressure monitoring points to hydrant inlet.
 - d. Distance from pressure monitoring point to nozzles.
 - e. Inside diameter and length of discharge tubing.

4. Elevation of points of measurement, inlet, and reports or certificates documenting accuracy of measuring devices used in test.
 5. Reports, or certificates documenting accuracy of measuring devices used in test.
 6. Conduct test on at least three separate hydrants of same fabrication design. Inlet water temperature: 70° F ± 5° F.
- C. Provide hydrants equipped with breakable barrel feature and breakable valve stem coupling such that vehicular impact will result in clean and complete break of barrel and valve stem at breakable feature. Provide hydrant shutoff valve which remains closed and tight against leakage upon impact.

2.03 LEADS

- A. Branches (Leads): Conform to requirements of Section 02610 - Ductile-Iron Pipe and Fittings, Section 02611 - Steel Pipe and Fittings, and Section 02620 - PVC Pipe.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Set fire hydrant plumb and brace at locations and grades as shown on Drawings. When barrel of hydrant passes through concrete slab, place a piece of standard sidewalk expansion joint material, 3/4-inch thick, around section of barrel passing through concrete.
- B. Fire hydrant grade should be set to the bury depth line marking on the fire hydrant barrel.
- C. Locate nozzle centerline minimum 18 inches above finish grade.
- D. Place 12-inch x 12-inch yellow indicators (plastic, sheet metal, plywood, or other material approved by Engineer) on pumper nozzles of new or relocated fire hydrants installed on new mains not in service. Remove indicators after new main is tested and approved by Engineer.
- E. Do not cover drain ports when placing concrete thrust block.
- F. All changes in profile from approved plans due to obstructions not shown on plans which require a change in depth of bury of fire hydrant shall be approved in writing by Engineer for design prior to installation of hydrant. Any adjustment required in flow line of water main or to barrel length of fire hydrant shall be incidental to unit price of fire hydrant and no separate payment shall be made for such adjustments.
- G. Remove and salvage existing fire hydrants shown on Drawings.

- H. City may, at any time prior to or during installation of hydrants for a specific project, randomly select a furnished hydrant for disassembly and laboratory inspection, at City's expense, to verify compliance with City's requirements. If such hydrant is found to be non-compliant, replace at Contractor's expense, all or a portion of furnished hydrants with hydrants that comply with City's requirements.
- I. Install branches (leads) in accordance with Section 02664 - Water Mains.

END OF SECTION

SECTION 02664

WATER MAINS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Installation of water mains.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Conform to submittal requirements of applicable specification section for type of pipe used.
- C. Submit preconstruction and post construction photographs conforming to requirement of Section 01380 - Construction Photographs.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

- A. Install pipe materials (as per this section) which conform to following:
 - 1. Section 02610 - Ductile Iron Pipe (DIP) and Fittings.
 - 2. Section 02611 - Steel Pipe and Fittings.
 - 3. Section 02620 - Polyvinyl Chloride (PVC) Pipe.
- B. Conform to American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 61-G and have certified by an organization accredited by ANSI. Plastic pipe must bear the National Sanitation Foundation Seal of Approval (NSF pw-G).
- C. Type of pipe materials used are identified on Drawings.

PART 3 EXECUTION

3.01 GENERAL

- A. Conform to applicable specification sections 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. Lay pipe with bell ends facing in direction of laying.
- C. Lay pipe to lines and grades shown on drawings. Use adequate surveying methods and equipment and 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 50 feet on site record drawings.
- D. Confirm that separation from gravity sanitary sewers and manholes or force mains have minimum clearance of nine feet in all directions unless a special design is provided for on the drawings.
- E. Where above clearance cannot be attained, and a special design has not been provided on Drawings, obtain direction from Engineer before proceeding with construction.
- F. Inform Engineer if any unmetered sprinkler or fire line connections exist which are not shown on Drawings to be transferred to new main. Make transfer only after approval by Engineer.
- G. Keep pipe trenches free of water which might impair pipe laying operations. Prevent pipe bells from coming in contact with subgrade. Grade pipe trenches to provide uniform support along bottom of pipe. Excavate for bell holes for proper sealing of pipe joints after bottom has been graded and in advance of placing pipe. Lay not more than a nominal city block length of 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 all 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.
- H. City will handle, at no cost to Contractor, all operations involving opening and closing valves for wet connections and for chlorination. Contractor is responsible for handling all necessary installations and removal of all 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 Asbestos-Cement Pipe." Contractor shall also strictly adhere to OSHA Standards regarding A.C. pipes. Contractor is responsible for the proper handling and disposal of the A.C. pipes.

3.02 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. Pipe and Fittings: Loaded, transported, unloaded and otherwise handled in manner and by methods which will prevent damage of any kind thereto. 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. Use every precaution 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 using carpet or some other suitable type of 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.
 5. Repair damage to pipe or protective lining and coating before final acceptance by City at no additional cost to City.
 6. Reject pipe with visible cracks 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 all pipe laying and joining operations are completed, clean inside of pipe and remove all 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.

3.03 EARTHWORK

- A. Conform to applicable provisions of Section 02227 - Excavation and Backfill for Utilities and Section 02317 - Augering Pipe for Water Lines.
- B. Bedding: Use bedding materials in conformance with Section 02229 - Utility Backfill Materials and details in Drawings.

- C. Backfill: Use bank run sand or earth or native soil as specified in Section 02229 - Utility Backfill Materials and in accordance with details in Drawings. 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. Take laboratory field density tests at Engineer's discretion.
- E. Pipe Zone: Including 6-inch pipe bedding and backfill to 12-inches above top of pipe.

3.04 PIPE CUTTING

- A. Cut pipe 12-inch and smaller with standard wheel pipe cutters. Cut pipe larger than 12-inch in manner approved by Engineer. Make all cuts smooth and at right angles to axis of pipe. Bevel plain end with heavy file or grinder to remove sharp edges.

3.05 PIPING INSTALLATION

- A. Do not lay pipe unless subgrade is free of water. Do not lay pipe when it is raining or when trench is muddy or soft. Make adjustments of pipe to line and grade by scraping away subgrade or filling in with granular material. Wedging or blocking up bell will not be acceptable.
- B. Install pipe continuously and uninterrupted along each street on which work is to be performed.
- C. Do not install pipe at greater depth than its design allows.
- D. Protection of Pipeline: Securely place stoppers or bulkheads in all openings and in end of line when construction is stopped temporarily and at end of each day's work.
- E. Perform Critical Locations as shown on Drawings. Refer to Section 02227 - Excavation and Backfill for Utilities for additional requirements at Critical Locations.
- F. For nonmetallic pipe, install tracer wire or magnetic locator tape continuously along the top of the pipe.

3.06 JOINTS AND JOINTING

- A. Rubber Gasketed Bell-and-Spigot Joints (PVC and DIP):
 - 1. Lubricate gaskets with nontoxic water-soluble lubricant before pipe units are joined.
 - 2. Fit pipe units together in manner to avoid twisting or otherwise displacing or damaging rubber gasket.

3. After the 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.
4. Where preventing movement of pipe due to thrust is necessary, use restrained joints as shown on Drawings as follows:
 - a. Ductile-Iron Pipe:
 - (1). Super-Lock Joint by Clow Corporation.
 - (2). Flex-Ring or Lok-Ring by American Cast Iron Pipe Company.
 - (3). TR-Flex or Field-Lok Joint by U.S. Pipe and Foundry Company
 - (4). MEGALUG by EBAA Iron Sales, Inc.
 - b. PVC Pipe:
 - (1). Fittings: Series 2000PV Fitting Restrainer by EBAA Iron Sales, Inc. (MEGALUG), or approved equal.
 - (2). Bell and Spigot: Series 1600 (C900) or Series 2800 (C905) Restraint Harness by EBAA Iron Sales, Inc., or approved equal.
 - c. Steel Pipe: Welded joints (see Part 3.05C)
- B. Flanged Joints (DIP, Steel):
 1. AWWA C207. 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 centerline. Do not exceed 3/64-inch per foot inclination of flange face from true alignment.
 2. Use full-face gaskets for all flanged joints. Provide 1/8-inch thick cloth inserted rubber gasket material. Cut gaskets at the factory to proper dimensions.
 3. Use galvanized or black nuts and bolts to match flange material. Use cadmium-plated steel nuts and bolts underground. 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.
- C. Welded Joints (Steel):
 1. Joints: AWWA C206. Full-fillet, single lap-welded slip type either inside or outside, or double butt-welded type; use automatic or hand welders; provide

complete penetration of deposited metal with base metal; provide filler metal suitable for use 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 backfilling before welding. For exterior field-welded joints, provide adequate working room under and beside pipe. Use exterior welds for 30-inch diameter lines and smaller.

2. Bell-and-Spigot, Lap-Welded Slip Joints: Deflection may be taken at joint by pulling joint up to 3/4-inch as long as 1-1/2-inch minimum lap is maintained. Spigot end may be miter cut to take deflections up to 5 degrees as long as proper 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.
3. Align piping and equipment so that no part is offset more than 1/8-inch. Set all 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, care shall be taken to avoid damage to linings and coatings.
4. 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.
5. Welding Rods: Compatible with metal to be welded to obtain strongest bond, E-70XX.
6. Deposit metal in successive layers to provide at least 2 passes or beads for automatic welding and 3 passes or beads for manual welding in completed weld.
7. Deposit no more than 1/4 inch of metal on each pass. Thoroughly clean each individual pass with wire brush or hammer to remove dirt, slag or flux.
8. Do not weld under any weather condition that would impair strength of weld, such as wet surface, rain or snow, dust or high winds, unless work is properly protected.
9. Tack weld of same material and make by same procedure as completed weld. Otherwise, remove tack welds during welding operation.
10. Remove dirt, scale and other foreign matter from inside piping before tying in sections, fittings or valves.

D. Joint Grout (Steel):

1. Mix grout by machine except when less than 1/2 cubic yard is required. When less than 1/2 cubic yard is required, grout may be hand mixed. Mix grout only in quantities for immediate use. Use grout within 20 minutes after mixing. Discard grout that has set. Re-tempering of grout by any means is not permitted.
2. Prepare grout in small batches to prevent stiffening before it is used. Any grout which has become so stiff that proper placement cannot be assured without re-tempering by any means shall be wasted. Provide grout for filling grooves of such consistency that it will adhere to ends of pipe.
3. Surface Preparation: Remove all 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 all foreign materials from all metal surfaces in contact with grout.
4. Follow established procedures for hot and cold weather concrete placement.
5. 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 1 hour before compacting backfill.
6. Grouting exterior joint space: Use minimum 9-inch wide Ethafoam "diaper" or wrapper placed around pipe and over joint. Hold wrapper in place on both sides of joint with minimum 5/8-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 the 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 a structurally protective material. Do not remove band from joint.
7. Interior Joints for Pipe Smaller than 24-inch: 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.
8. 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 the joint bands are protected by zinc metallizing or other approved protective coatings.
9. Remove and replace all improperly cured or otherwise defective grout at no additional cost to City.

10. 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 all steel in joint area. Fill interior of joint with grout in normal manner after joint closure.
- E. Joint Testing:
1. In addition to testing individual joints with feeler gage approximately 1/2-inch wide and 0.015-inch thick, use any 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 to City.
 2. On any joint or seam welded after hydrostatic testing or not subjected to hydrostatic testing, test 100 percent of welded joint by methods as described in section on Welded Joints. City reserves right to require Contractor to make additional tests at City's expense except that if tests performed at Contractor's expense or City's expense indicate an unacceptable weld, then cost of test, subsequent repair of rejected weld and test of repaired weld shall be borne by Contractor.
- F. Make curves and bends by deflecting joints or other method as approved by manufacturer and Engineer.
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. Contractor shall replace, repair or reapply coatings and linings as required above.
 5. No additional payment will be made for above described work.
 6. Assessment of deflection may be measured by City at any location along pipe. Arithmetical averages of deflection or similar average measurement methods will not be deemed as meeting intent of standard.

7. Contractor may submit details of other methods of providing curves and bends for consideration by Engineer, and if deemed satisfactory, shall be installed at no additional cost to City.
 8. When rubber gasketed pipe is laid on a curve, joint pipe in a straight alignment and then deflect to curved alignment.
- G. Closures and Field Modifications:
1. Apply welded-wire fabric reinforcement to interior and exterior of all exposed interior and exterior surfaces greater than 6 inches in diameter. Welded-wire fabric: minimum W1; maximum spacing 2 inches by 4 inches; 3/8-inch from surface of steel plate or middle third of lining or coating thickness for mortar thickness less than 3/4-inch.
 2. Fill all exposed interior and exterior surfaces with nonshrink grout.

3.07 SECURING, SUPPORTING AND ANCHORING

- A. Support piping as shown on Drawings and as specified herein, 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 main 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 begin 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. Provide adequate temporary blocking of fittings when making connections to distribution system and during hydrostatic tests. Provide sufficient anchorage and blocking to resist all stresses and forces encountered while tapping existing waterline.

3.08 THRUST RESTRAINT

- A. For new water lines 12 inches in diameter and larger, restrain joints as specified in Part 3.06 A.4 of this section. The new water line shall also be additionally restrained with concrete thrust blocking.
- B. For existing waterlines and waterlines less than 12 inches in diameter, restrain pipe joints with concrete thrust blocks or provide joints as specified in Part 3.06 A.4 of this section.
- C. Prevent any lateral movement of thrust restraints throughout pressure testing and operation. Place 2,500 psi concrete conforming to Section 03305 - Concrete for Utility Construction, for blocking at each change in direction of existing water lines, and water

lines 12 inches in diameter and smaller to brace pipe against undisturbed trench walls. Complete 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.

3.09 POLYETHYLENE WRAP

- A. Double wrap all ductile iron pipe and appurtenances (except fire hydrants) with 8-mil polyethylene film.
- B. Conform to requirements of Section 02630 - Polyethylene Wrap.

3.10 CLEANUP, RESTORATION AND PAYMENT

- A. Provide "cleanup" and "restoration" crews to work closely behind pipe laying crews, and where necessary, during chlorination, testing, service transfers, abandonment of old mains, backfill and surface restoration.
- B. Upon completion of water line installation in a street and prior to moving to another, chlorinate and pressure test. Provide City a sampling point every 1,000 feet of completed water line for testing. Begin transfer of services no later than seven calendar days after successful completion of chlorination and pressure testing.
- C. After completion of transfer of services, but no later than 21 calendar days after successful completion of chlorination and pressure testing, begin abandonment of old mains, backfill, resod, and placement of sidewalks and pavements.
- D. Do not begin construction of additional sections if above conditions are not met.

3.11 CLEANING PIPING SYSTEMS

- A. Remove construction debris or foreign material and thoroughly clean and flush piping systems. Provide temporary connections, equipment and labor for cleaning.

3.12 DISINFECTION OF WATERLINES

- A. Conform to requirements of Section 02675 - Disinfection of Waterlines.

3.13 FIELD HYDROSTATIC TESTS

- A. Conform to requirements of Section 02676 - Hydrostatic Testing of Pipelines.

END OF SECTION

SECTION 02665

RESIDENTIAL WATER SERVICE CONNECTION AND OR RECONNECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tapping existing mains and furnishing and installing new service lines for water. Where applicable, coordinate changeover of water service lines with City.

1.02 UNIT PRICES

- A. Refer to Section 01025 – Measurement and Payment for unit price procedures.

1.03 DEFINITIONS

- A. Short Side Connection: Service line connecting proposed curb stop, located inside water meter box, to water main on same side of street.
- B. Long Side Connection: Service line connecting proposed curb stop, located inside water meter box, to water main on opposite side of street or from center of streets where supply main is located in street center such as boulevards and streets with esplanades.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Copper Tubing: In accordance with Section 02612. Polybutylene tubing is not permitted.
- B. Corporation Stops: AWWA C800 (Mueller H-15082 or approved equal):
 - 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 for use with type-K, soft copper.
- C. Provide taps for various water main types and sizes in accordance with following schedule.

PIPE TAPPING SCHEDULE				
WATER MAIN TYPE AND DIAMETER	SERVICE SIZE			
	3/4"	1"	1-1/2"	2"
4" Cast Iron or Ductile Iron	DDS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS

PIPE TAPPING SCHEDULE				
WATER MAIN TYPE AND DIAMETER	SERVICE SIZE			
	3/4"	1"	1-1/2"	2"
4" Asbestos Cement	WBSS	WBSS	DSS, WBSS	DSS, WBSS
4" PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6" and 8" Cast Iron or Ductile Iron	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6" and 8" Asbestos Cement	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6" and 8" Cast Iron or Ductile Iron	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6" and 8" PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
12" Cast Iron or Ductile Iron	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
12" Asbestos Cement	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
12" PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
16" and Up Cast Iron or Ductile Iron	DWBSS	DWBSS	DWBSS	DWBSS
16" and Up Asbestos Cement	DWBSS	DWBSS	DWBSS	DWBSS
16" and Up PVC (AWWA C900)	DWBSS	DWBSS	DWBSS	DWBSS

DSS – DUAL STRAP SADDLES

WBSS – WIDE BAND STRAP SADDLES

DWBSS – DUAL WIDE BAND STRAP SADDLES

Mueller H-15092 or equal

- D. 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.
- E. Taps for PVC Water Mains: Use 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. Romac Series 101N wide-band, stainless steel tapping saddle with AWWA standard thread (Mueller thread) or equal.
- F. Taps for Steel Pipe: Not allowed, unless specifically approved by Engineer. Use saddle only if tap is approved on steel pipe.
- G. Curb Stops and Brass Fittings: AWWA C800 as modified herein.
 - 1. Inlet End: Compression-type fitting.
 - 2. Valve Body: Straight-through or angled, meter-stop design equipped with the 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: Ford or approved equal; use same size open-end wrenches and tapping machines as used with respective Ford 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 any fitting that shows air leakage. City may confirm tests locally. Entire lot from which samples were taken will be rejected when random sampling discloses unsatisfactory fittings.
- H. Angle Stops: In accordance with AWWA C800; ground-key, stop type with bronze lock-wing head stop cap; inlet and outlet threads conform to application tables of AWWA C800; and inlets compression connection.
 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.
- I. Fittings: In accordance with AWWA C800 and:
 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 have symmetrical hexagonal wrench flats.
 3. Thread fittings, of all types, shall have N.P.T. or AWWA threads, and male threaded ends shall be protected in shipment by plastic coating or other equally satisfactory means.
 4. Compression tube fittings shall have Buna-N beveled gasket.
 5. Stamp of manufacturer's name or trademark and size on body.

PART 3 EXECUTION

3.01 GENERAL

- A. Set service taps at right angles to proposed meter location and locate taps in upper pipe segment within 45 degrees of pipe springline unless otherwise approved by Engineer.

- B. All 2-inch and smaller service taps on pressurized water mains: Use tapping machine manufactured for pressure tapping purposes.
- C. Install service lines in open-cut trench in accordance with Section 02227 except those service lines under all paved roadways, other paved areas and areas indicated on Drawings shall be installed in bored hole in accordance with paragraph 3.01D.
- D. Unless otherwise approved by Engineer, 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 all ditches to service lines, unless otherwise approved by Engineer.
- E. Service lines across existing street (push-unders): Pull service line through prepared hole under paving. Only full lengths of tubing will be used. Take care not to damage copper tubing when pulling it through hole. A compression-type union is only permitted if Contractor cannot span underneath pavement with a full length of tubing. Contractor is allowed one compression-type union for each full length of tubing, provided it is not under the pavement.
- F. Maintain service lines free of dirt and foreign matter at all times.
- G. Install service lines so that top of meter will be 4 to 6 inches below finished grade.
- H. Locate water meters one foot inside street right-of-way, or if this is not applicable, one foot on curb side of sidewalk. Contact Engineer 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.

3.02 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 an "S" curve in the field. No flattening of tube. In all 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.

3.03 SEQUENCE OF OPERATIONS

- A. Open trench for proposed service line in accordance with Section 02227.
- B. Install curb stop on meter end of service line.
- C. Complete all disinfection, bacteriological and hydrostatic testing after installation of service lines and curb stops, and prior to connection of curb stops to meters.
- D. 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.

- E. Check service line for apparent leaks. Repair any leaks before proceeding.
- F. Call to schedule inspection prior to backfilling. After inspection, backfill in accordance with Section 02227.
- G. Install meter box centered over meter with top of lid flush with finished grade. Meter box: Refer to Section 02604.

END OF SECTION

SECTION 02667

WET CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wet connections for new water mains and service lines to existing water mains.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 DEFINITIONS

- A. Wet connections consist of isolating sections of pipe to be connected with installed valves, draining the isolated sections, and completing the connections.
- B. Connection of 2-inch or smaller lines, which may be referred to on Drawings as "2-inch tap connections" will be measured as 2-inch wet connections. This item is not to be used as any part of a 2-inch service line.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Pipe shall conform to requirements of applicable portions of Sections 02610 through 02627.
- B. Corporation stops and saddles shall conform to requirements of Section 02665.
- C. Valves shall conform to requirements of Section 02640.
- D. Brass fittings shall conform to requirements of AWWA C800.

PART 3 EXECUTION

3.01 GENERAL

- A. Plan wet connections in such manner and at such hours as to least inconvenience public. Notify Engineer at least 72 hours in advance of making connections.
- B. Do not operate valves on mains in use by City. City will handle, at no cost to Contractor, all operations involving opening and closing valves for wet connections.

- C. Conduct connection operations when Inspector is at job site. Connection work shall progress without interruption until complete, once existing mains have been cut or plugs has been removed for making connections.

3.02 2-INCH WET CONNECTIONS

- A. Tap water main. Provide and install corporation stops; saddles; polyethylene tubing as required for line and grade adjustment; and brass fittings necessary to adapt to existing main. Provide 2-inch valves when indicated on Drawings for 2-inch connections.

END OF SECTION

SECTION 02669

CUT, PLUG AND ABANDONMENT OF MAINS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cut, plug and abandonment of water mains.

1.02 UNIT PRICES

- A. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Submit product data for proposed plugs and clamps for approval.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete for reaction blocks: Class B conforming to requirements of Section 03305 - Concrete for Utility Construction.
- B. Plugs and clamps shall be suitable for type of pipe to be plugged.

PART 3 EXECUTION

3.01 GENERAL

- A. Do not begin cut, plug and abandonment operations until replacement main has been constructed, disinfected, and tested, and all service lines have been transferred to replacement main.
- 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 main or as shown on Drawings.
- D. After main to be abandoned has been cut and plugged, check for other sources feeding abandoned main. If sources are found, notify Engineer immediately. Cut and plug abandoned main at point of other feed as directed by Engineer.

- E. Plug or cap all ends or openings in abandoned main in an acceptable manner approved by Engineer.
- F. Remove and dispose of all surface identifications such as valve boxes and fire hydrants, unless otherwise indicated on Drawings. Valve boxes in improved streets, other than shell, may be poured full of concrete after removing cap.
- G. Backfill all excavations in accordance with Section 02227 - Excavation and Backfill for Utilities.
- H. Repair all street surfaces in accordance with Section 02571 - Pavement Repair for Utilities and the project details.

END OF SECTION

SECTION 02675

DISINFECTION OF WATER LINES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Disinfection of potable water lines.

1.02 UNIT PRICES

- A. No payment will be made for disinfection of water lines. Include cost in unit price of water lines being disinfected.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL

- A. All water lines constructed shall be promptly disinfected in accordance with AWWA Standard C651 before any tests are conducted on water lines and before water lines are connected to water distribution system.
- B. Water for disinfection and flushing will be furnished without charge to Contractor.

3.02 PREPARATION

- A. Furnish all required temporary blind flanges, cast-iron sleeves, plugs, and other items needed to facilitate disinfection of new mains prior to connecting them to water distribution system. Normally, each valved section of waterline requires two each 3/4-inch taps. A 2-inch minimum blow-off is required for water lines up to and including 6-inch diameter.
- B. Fire hydrants shall be used as blow-offs to flush newly constructed water lines. Where fire hydrants are not available on water lines, locations and designs for blow-offs shall be as indicated on Drawings, or Contractor shall install temporary blow-off valves (no separate payment) and remove promptly upon successful completion of disinfection and testing.
- C. Slowly fill each section of pipe with water in a manner approved by Engineer. Average water velocity when filling pipeline should be less than 1 fps and shall not, under any circumstance, exceed 2 fps. Before beginning disinfection operations, expel all air from pipeline.

- D. All excavations made shall be backfilled immediately after installation of risers or blow-offs.
- E. Install blow-off valves at end of main to facilitate flushing at all dead-end water mains. Install permanent blow-off valves as per drawing.

3.03 DISINFECTION

- A. Use not less than 100 parts of chlorine per million parts of water. Introduce chlorinating material to water lines in accordance with AWWA C651. After contact period of not less than 24 hours, flush system with clean water until residual chlorine is no greater than 1.0 parts per million parts of water. Open and close valves in lines being sterilized several times during contact period.
- B. If a chemical compound is used for a sterilizing agent, it shall be placed in pipes as directed by Engineer.

3.04 BACTERIOLOGICAL TESTING

- A. Standard Specifications: AWWA C651-06 as applicable.
- B. Bacterial Analysis: Following disinfection and flushing, the City will perform bacteriological analysis to check effectiveness of disinfection. Contractor will assist City in the performance of the bacteriological analysis. Methods of bacteriological analysis are as specified in the Standard Methods for Examination of Water and Wastewater by the American Public Health Association, latest edition. No main shall be placed in service or accepted until water samples are approved by the Texas Commission on Environmental Quality (TCEQ).
- C. Test a minimum of one sample for each 1,000 feet of completed main.
- D. Testing laboratories used to analyze samples must be TCEQ Accredited Laboratories.

3.05 COMPLETION

- A. Upon completion of disinfection and testing, remove risers except those approved for use in subsequent hydrostatic testing, and backfill excavation promptly.

END OF SECTION

SECTION 02676

HYDROSTATIC TESTING OF PIPELINES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Field hydrostatic testing of new water pipelines.

1.02 UNIT PRICES

- A. No payment will be made for hydrostatic testing of pipelines under this Section. Include cost in unit price of pipelines being tested.

PART 2 PRODUCTS - NOT USED.

PART 3 EXECUTION

3.01 GENERAL

- A. Hydrostatically test all new water pipelines for liquids after disinfection, if required, and before connecting to water distribution system.
- B. Install all service lines and curb stops prior to testing and connection to meters.
- C. Pipelines shall be tested in lengths between valves, or plugs, of not more than 1,000 feet unless greater length is approved by Engineer.
- D. Conduct hydrostatic tests in presence of Engineer in accordance with requirements of this Section.

3.02 PREPARATION

- A. Disinfect water system pipelines prior to hydrostatic testing.

3.03 TEST PROCEDURES

- A. Furnish, install, and operate connections, pump, meter and gages necessary for hydrostatic testing.
- B. Allow pipeline to sit minimum of 24 hours from time it is initially disinfected until testing begins, to allow pipe wall or lining material to absorb water. Contractor should

be aware that periods of up to 7 days may be required for mortar lining to become saturated.

- C. Expel all air and apply a minimum test pressure of 125 psi or 150 psi as directed by Engineer.
- D. Maintain test pressure for 8 hours. If a large quantity of water is required to maintain pressure during test, testing shall be discontinued until cause of water loss is identified and corrected.

3.04 ALLOWABLE LEAKAGE FOR WATER MAINS

- A. During hydrostatic tests, no leakage will be allowed for sections of water mains consisting of welded joints.
- B. Maximum allowable leakage for water mains with rubber gasketed joints: 3.19 gallons per inch nominal diameter per mile of pipe per 24 hours while testing at the required pressure.

3.05 CORRECTION FOR FAILED TESTS

- A. Repair all joints showing visible leaks on surface regardless of total leakage shown on test. Check all valves and fittings to ensure that no leakage occurs that could affect or invalidate test. Remove any cracked or defective pipes, fittings and valves discovered during pressure test and replace with new items.
- B. Engineer may direct Contractor to disinfect failed lines after repair and prior to retesting. Conduct subsequent disinfection operations in accordance with requirements of Section 02675.
- C. Repeat test until satisfactory results are obtained.

3.06 COMPLETION

- A. Upon satisfactory completion testing, remove risers remaining from disinfection and hydrostatic testing, and backfill excavation promptly.

END OF SECTION

SECTION 02730

GRAVITY SANITARY SEWERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Gravity sanitary sewers and appurtenances, including cleanouts, stacks, and service connections.

1.02 UNIT PRICES

- A Measurement for payment of pipe is on a unit price per linear foot basis. Measurement will be taken along the centerline of the pipe from centerline to centerline of manholes. Payment will be made for each linear foot installed, complete in place including sewer pipe, excavation, bedding, backfill and special backfill, shoring, earthwork, connections to existing manholes and pipe, stacks, cleanouts, accessories, inspection and testing.
- B Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 SUBMITTALS

- A Submittals shall conform to requirements of Section 01300 - Submittals.
- B Submit proposed methods, equipment, materials and sequence of operations for sewer construction. Plan operations to minimize disruption of utilities to occupied facilities or adjacent property.

1.04 QUALITY ASSURANCE

- A Qualifications. Install a sanitary sewer that is watertight both in pipe-to-pipe joints and in pipe-to-manhole connections. Perform testing in accordance with Section 02732 - Acceptance Testing for Sanitary Sewers.
- B Regulatory Requirements.
 - 1 Install sewer lines to meet the minimum separation distance from any potable water line, as scheduled below. The separation distance is defined as the distance between the outside of the water pipe and the outside of the 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 the Engineer if water lines are uncovered during sanitary sewer installation where the minimum separation distance cannot be maintained.
3. Lay gravity sewer lines in straight alignment and grade.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Inspect pipe and fittings upon arrival of materials at the 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 the 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 the outside barrel of pipe and fittings. Do not use hooks, bars, or other devices in contact with the interior surface of the pipe to lift or move lined pipe.

PART 2 PRODUCTS

2.01 PIPE

- A. Provide piping materials for gravity sanitary sewers of the sizes and types indicated on the Drawings or as specified.
- B. Reinforced concrete pipe is not acceptable.

2.02 PIPE MATERIAL SCHEDULE

- A. Unless otherwise shown on the Drawings, use pipe materials that conform to requirements specified in one or more of the following Sections:
 1. Section 02610 - Ductile Iron Pipe and Fittings.
 2. Section 02619 - HDPE Solid and Profile Wall Pipe.
 3. Section 02620 - PVC Pipe.
- B. Where shown on the Drawings, provide pipe meeting the minimum class, dimension ratio, or other criteria indicated.
- C. Pipe materials other than those listed above shall not be used for gravity sanitary sewers.

2.03 APPURTENANCES

- A. Stacks. Conform to the requirements of Section 02762 - Sanitary Sewer Service Stubs or Reconnections.
- B. Service Connections. Conform to requirements of Section 02762 - Sanitary Sewer Service Stubs or Reconnections.
- C. Roof, street or other type of surface water drains shall not be connected or reconnected into the sanitary sewer lines.

2.04 BEDDING, BACKFILL, AND TOPSOIL MATERIAL

- A. Bedding and Backfill: Conform to requirements of Section 02227 - Excavation and Backfill for Utilities, Section 02229 - Utility Backfill Material, and Section 02252 - Cement Stabilized Sand.
- B. Topsoil: Conform to requirements of Section 02920 - Topsoil.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prepare traffic control plans and set up street detours and barricades in preparation for excavation if construction will affect traffic. Conform to requirements of Section 01570 - Traffic Control and Regulation.
- B. Provide barricades, flashing warning lights, and warning signs for excavations. Conform to requirements of Section 01570 - Traffic Control and Regulation. Maintain barricades and warning lights where work is in progress or where traffic is affected by the work.
- C. Perform work in accordance with OSHA standards. Employ a trench safety system as specified in Section 01526 - Trench Safety System for excavations over 5 feet deep.
- D. Immediately notify the agency or company owning any utility line which is damaged, broken or disturbed. Obtain approval from the Engineer and agency or utility company for any repairs or relocations, either temporary or permanent.
- E. Remove old pavements and structures including sidewalks and driveways in accordance with requirements of Section 02076 - Removing Existing Pavements and Structures.
- F. Install and operate dewatering and surface water control measures in accordance with Section 01563 - Control of Ground Water and Surface Water.
- G. Do not allow sand, debris or runoff to enter sewer system.

3.02 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 the Engineer.
- B. Design piping, joints and accessories to withstand twice the maximum system pressure or 50 psi, whichever is greater.
- C. No sewage shall be diverted into any area outside of the sanitary sewer.
- D. In the event of accidental spill or overflow, immediately stop the overflow and take action to clean up and disinfect spillage. Promptly notify the Engineer so that required reporting can be made to the Texas Commission on Environmental Quality and the Environmental Protection Agency by the Engineer.

3.03 EXCAVATION

- A. Earthwork. Conform to requirements of Section 02227 - Excavation and Backfill for Utilities. Use bedding as indicated on Drawings.
- B. Line and Grade. Establish the required uniform line and grade in the trench as shown in the drawings. Maintain this control for a minimum of 100 feet behind and ahead of the pipe-laying operation. Use laser beam equipment to establish and maintain proper line and grade of the work. Use of appropriately sized grade boards which are substantially supported is also acceptable. Protect the boards and location stakes from damage or dislocation.
- C. Trench Excavation. Excavate pipe trenches to depths shown on Drawings and as specified in Section 02227 - Excavation and Backfill for Utilities.

3.04 PIPE INSTALLATION BY OPEN CUT

- A. Install pipe in accordance with the pipe manufacturer's recommendations and as specified in the following paragraphs.
- B. Install pipe only after excavation is completed, the bottom of the trench fine graded, bedding material is installed, and the trench has been approved by the Engineer.
- C. Install pipe to the line and grade indicated. Place pipe so that it has continuous bearing of barrel on bedding material and is laid in the trench so the interior surfaces of the pipe follow the grades and alignment indicated. Provide bell holes where necessary.
- D. Install pipe with the spigot ends toward the direction of flow.

- E. Form a concentric joint with each section of adjoining pipe so as to prevent offsets.
- F. Keep the interior of pipe clean as the installation progresses. Where cleaning after laying the pipe is difficult because of small pipe size, use a suitable swab or drag in the pipe and pull it forward past each joint immediately after the joint has been completed. Remove foreign material and debris from the 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 backhoes or similar powered equipment will not be allowed unless protective measures are provided and approved in advance by the Engineer.
- H. Keep excavations free of water during construction and until final inspection.
- I. When work is not in progress, cover the exposed ends of pipes with an approved plug to prevent foreign material from entering the pipe.
- J. If a water line is encountered closer than nine feet to the proposed sewer and no special provisions are indicated on the Drawings, notify the Engineer before proceeding.
- K. Where the length of stubs is not indicated, install a 12-inch length and seal the free end with an approved plug.

3.05 PIPE INSTALLATION OTHER THAN OPEN CUT

- A. For installation of pipe by augering, or jacking conform to requirements of specification sections on augering or jacking work as appropriate.

3.06 INSTALLATION OF APPURTENANCES

- A. Service Connections. Install service connections to conform to requirements of Section 02762 - Sanitary Sewer Service Stubs or Reconnections.
- B. Stacks. Construct stacks to conform to requirements of 02762 - Sanitary Sewer Service Stubs or Reconnections.
- C. Construct manholes to conform to requirements of Section 02600 - Cast-in-Place Manholes, Section 02601 - Precast Concrete Manholes, and Section 02602 - Fiberglass Manholes, as applicable. Install frames, rings and covers to conform to requirements of Section 02603 - Frames, Grates, Rings and Covers.

3.07 INSPECTION AND TESTING

- A. Visual Inspection. Check pipe alignment in accordance with Section 02732 - Acceptance Testing For Sanitary Sewers.

- B. Mandrel Testing. Use a Mandrel Test to test flexible pipe for deflection. Refer to Section 02732 - Acceptance Testing for Sanitary Sewers.
- C. Leakage Testing. After backfilling a line segment and prior to tie-in of service connections, test for leakage in accordance with Section 02732 - Acceptance Testing for Sanitary Sewers. Maintain piezometers installed to conform with Section 01563 - Control of Ground Water and Surface Water, until acceptance testing is completed.
- D. City may elect to perform television inspection of the completed sewer before acceptance. The Contractor will assist with traffic control.

3.08 BACKFILL AND SITE CLEANUP

- A. Backfill and compact soil in accordance with Section 02227 - Excavation and Backfill for Utilities.
- B. Backfill the trench in specified lifts only after pipe installation is approved by the Engineer.
- C. Repair and replace removed or damaged pavement, curbs, gutters, and sidewalks as specified in Section 02570 - Pavement Repair and Resurfacing.
- D. Provide sodding in areas over the surface of ground disturbed during construction and not paved or not designated to be paved. Grade surface at a uniform slope to natural grade as indicated on the Drawings. Provide a minimum of 4 inches of topsoil per Section 02920 - Topsoil. Sod disturbed areas in accordance with Section 02935 - Sodding.
- E. Conform to requirements of Section 01564 - Waste Material Disposal.

END OF SECTION

SECTION 02732

ACCEPTANCE TESTING FOR SANITARY SEWERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Acceptance testing criteria and procedures for 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. Post Cleaning and Television Inspection of rehabilitated sanitary sewer.
- B. Tests listed in this Section are not necessarily required on this Project. Required test is named in other Sections which refer to this Section for testing criteria and procedures.

1.02 UNIT PRICES

- A. No payment will be made for Acceptance Testing for Sanitary Sewers under this section. Payment for work performed as described under this section shall be included in the unit price bid for applicable work items.

1.03 PERFORMANCE REQUIREMENTS

- A. Gravity flow sanitary sewers are required to have a 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 a line segment but prior to final acceptance using a standard mandrel to verify that installed pipe is within specified deflection tolerances.
- C. Maximum allowable leakage for infiltration or exfiltration.

1. The total exfiltration, as determined by a hydrostatic head test, shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of 2 feet above the crown of the pipe at the upstream manhole or 2 feet above the groundwater elevation, whichever is greater.
 2. When pipes are installed more than 2 feet below the groundwater level, an infiltration test shall be used in lieu of the exfiltration test. The total infiltration shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours. Groundwater elevation must be at least 2 feet above the crown of the pipe at the upstream manhole.
 3. Refer to Table 02732-1, Water Test Allowable Leakage, at the end of this Section, for measuring leakage in sewers. Perform leakage testing to verify that leakage criteria are met.
- D. Perform air testing in accordance with requirements of this Section and the Texas Commission on Environmental Quality requirements. Refer to Table 02732-2, Time Allowed for Pressure Loss from 3.5 psig to 2.5 psig, Table 02732-3, Minimum testing Times for Low Pressure Air Test, and Table 02732-4, Vacuum Test Time Table, at the end of this Section.

1.04 SUBMITTALS

- A. Conform to requirements of Section 01300-Submittals.
- B. Test Plan: Before testing begins and in adequate time to obtain approval through the submittal process, prepare and submit a test plan for approval by Engineer. Include testing procedures, methods, equipment, and tentative schedule. Obtain advance written approval for deviations from the Drawings and Specifications.
- C. Test Reports: Submit test reports for each test on each segment of sanitary sewer.

1.05 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.

1.06 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 any one time.

- B. Coordinate testing schedules with Engineer. Perform testing under observation of Engineer.

PART 2 PRODUCTS

2.01 DEFLECTION MANDREL

- A. Mandrel Sizing. The rigid mandrel shall have an outside diameter (O.D.) equal to 95 percent of the inside diameter (I.D.) of the pipe. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, shall be the average outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and the average inside diameter for I.D. controlled pipe. Dimensions shall be per appropriate standard. Statistical or other "tolerance package" shall not be considered in mandrel sizing.
- B. Mandrel Design. The rigid mandrel shall be constructed of a metal or a rigid plastic material that can withstand 200 psi without being deformed. The mandrel shall have nine or more "runners" or "legs" as long as the total number of legs is an odd number. The barrel section of the mandrel shall have a length of at least 75 percent of the inside diameter of the pipe. The rigid mandrel shall not have adjustable or collapsible legs which would allow reduction in mandrel diameter during testing. A proving ring shall be provided and used for verifying each size mandrel.
- C. Proving Ring. Furnish a "proving ring" with each mandrel. Fabricate the ring of 2-inch-thick, 3-inch-wide bar steel to a diameter of 0.02-inches larger than approved mandrel diameter.
- D. Mandrel Dimensions (5% allowance). Average inside diameter and minimum mandrel diameter are specified in Table 02732-5, Pipe vs. Mandrel Diameter, at the end of this Section. Mandrels for higher strength, thicker wall pipe or other pipe not listed in the table may be used when approved by the Engineer.

2.02 EXFILTRATION TEST

- A. Test Equipment:
 - 1. Pipe plugs.
 - 2. Pipe risers where the manhole cone is less than 2 feet above highest point in pipe or service lead.

2.03 INFILTRATION TEST

- A. Test Equipment:

1. Calibrated 90° V-notch weir.
2. Pipe plugs.

2.04 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:

- B. Testing Pneumatic Plugs: Place a pneumatic plug in each end of a length of pipe on the ground. Pressurize plugs to 25 psig; then pressurize sealed pipe to 5 psig. Plugs are acceptable if they remain in place against the test pressure without external aids.

2.05 GROUND WATER DETERMINATION

- A. Equipment: Pipe probe or small diameter casing for ground water elevation determination.

2.06 SMOKE TESTING

A. Equipment:

1. Pneumatic plugs.
2. Smoke generator as supplied by Superior Signal Company, or an approved equal.
3. Blowers producing 2500 scfm minimum.

PART 3 EXECUTION

3.01 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. The selection of test methods and pressures for gravity sanitary sewers shall be determined based on ground water elevation. Determine ground water elevation using equipment and procedures conforming to Section 01563-Control of Ground Water and Surface Water.

3.02 VISUAL INSPECTION OF GRAVITY SANITARY SEWERS

- A. Check pipe alignment visually by flashing a 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.

3.03 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 the line segment.
- B. Pull the approved mandrel by hand through sewer sections. Replace any section of sewer not passing the mandrel. Mandrel testing is not required for stubs.
- C. Retest repaired or replaced sewer sections.

3.04 LEAKAGE TESTING FOR GRAVITY SANITARY SEWERS

- A. Test Options:
 - 1. Test gravity sanitary sewer pipes for leakage by either exfiltration or infiltration methods, as appropriate, or with low pressure air testing.
 - 2. Test new or rehabilitated sanitary sewer manholes with water or low-pressure air. Manholes tested with low-pressure air shall undergo a physical inspection prior to testing.
 - 3. Leakage testing shall be performed after backfilling of a line segment, and prior to tie-in of service connections.
 - 4. If no installed piezometer is within 500 feet of the sewer segment, Contractor shall provide a temporary piezometer for this purpose.
- B. Compensating for Ground Water Pressure:
 - 1. Where ground water exists, install a pipe nipple at the same time sewer line is placed. Use a ½ - inch capped pipe nipple approximately 10 inches long. Make

the installation through manhole wall on top of the sewer line where line enters manhole.

2. Immediately before performing line acceptance test, remove cap, clear pipe nipple with air pressure, and connect a clear plastic tube to nipple. Support tube vertically and allow water to rise in the tube. After water stops rising, measure height in feet of water over invert of the pipe. Divide this height by 2.3 feet/psi to determine the 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 if 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, if used, with water to a 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 a one-hour period, and calculate water loss (1 inch of water in 4 feet diameter manhole equals 8.22 gallons) or measure the quantity of water required to keep water at same level. Loss shall not exceed that calculated from allowable leakage according to Table 02732-1 at the 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° V-notch weir in pipe on downstream manhole.
4. Allow water to rise and flow over weir until it stabilizes.
5. Take five readings of accumulated volume over a period of 2 hours and use average for infiltration. The average must not exceed that calculated for 2

hours from allowable leakage according to the Table 02732-1 at the end of this Section.

- 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 02732-2.
1. Air testing for sections of pipe shall be limited to lines less than 36-inch average inside diameter.
 2. Lines 36-inch average inside diameter and larger shall be "joint" tested at each joint. The minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch during a joint test shall be 10 seconds, regardless of pipe size. "Joint Test" shall be conducted as follows:
 - a. Each joint shall be tested successfully.
 - b. Joint Tester shall be set over joint to be tested so that the two inflation tubes straddle the joint.
 - c. Inflate "inflation tubes" to 25 psig to seal off joint to be tested.
 - d. Apply air pressure into void between inflation tubes until pressure reaches 4 psig.
 - e. After pressure has stabilized, bleed air pressure back to 3.5 psig.
 - f. Record time required for pressure to drop from 3.5 psig to 2.5 psig.
 - g. If the time in seconds for the air pressure to decrease from 3.5 psig to 2.5 psig is greater than 10 seconds, the joint shall be presumed to be free from defect. When the time is less than 10 seconds pipe breakage, joint leakage or leaking tester seals 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 joint test.
 - h. The joint shall be air tested before the pipe has been backfilled. Air testing shall be performed as pipe installation progresses.
 3. For pipe sections less than 36-inch average inside diameter:
 - a. Determine ground water level.
 - b. Plug both ends of pipe. For concrete pipe, flood pipe and allow 2 hours to saturate concrete. Then drain and plug concrete pipe.

- c. After a manhole-to-manhole section of sanitary sewer main has been sliplined and prior to any service lines being connected to new liner, plug liner at each manhole with pneumatic plugs.
- d. Pressurize pipe to 4.0 psig. Increase pressure 1.0 psi for each 2.3 feet of ground water over highest point in the system. Allow pressure to stabilize for 2 to 4 minutes. Adjust pressure to start at 3.5 psig (plus adjustment for ground water table). See Table 02732-2 at the end of this Section.
- e. To determine air loss, measure the time interval for pressure to drop to 2.5 psig. The time must exceed that listed in the Table 02732-2 at the end of this Section for pipe diameter and length. For sliplining, use diameter of carrier pipe.

F. Retest: Any section of pipe which fails to meet requirements shall be repaired and retested.

3.05 TEST CRITERIA TABLES

A. Exfiltration and Infiltration Water Tests: Refer to Table 02732-1, Water Test Allowable Leakage, at the end of this Section.

B. Low Pressure Air Test:

- 1. Times in Table 02732-2, Time Allowed for Pressure Loss From 3.5 psig to 2.5 psig, at the end of this Section, are based on the equation from Texas Commission on Environmental Quality (TCEQ) Design Criteria 317.2(a)(4)(B).

$$T = 0.0850 (D) (K) / (Q)$$

where:

T = time for pressure to drop 1.0 pounds per square inch gauge in seconds

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 ft³/min./sq. ft. internal surface

2. Since a K value of less than 1.0 shall not be used, there are minimum testing times for each pipe diameter as given in Table 02732-3, Minimum Testing Times for Low Pressure Air Test.

3. Notes:

- (a). When two sizes of pipe are involved, the time shall be computed by the ratio of lengths involved.
- (b). Lines with 27-inch average inside diameter and larger may be air tested at each joint.
- (c). Line with an average inside diameter greater than 36 inches must be air tested for leakage at each joint.
- (d). If the joint test is used, a visual inspection of the joint shall be performed immediately after testing.
- (e). For joint test, the pipe is to be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure has stabilized, the minimum times allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be 10 seconds.

3.06 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 a minimum of 6 inches outside of manhole walls. Brace inverts to prevent lines from being dislodged if lines entering manhole have not been backfilled.
- C. Vacuum Testing:
 - 1. Install vacuum tester head assembly at top access point of manhole and adjust proper seal on straight top section of manhole structure. Following manufacturer's instructions and safety precautions, inflate sealing element to the recommended maximum inflation pressure; do not overinflate.
 - 2. Evacuate manhole with vacuum pump to 10 inches mercury (Hg), disconnect pump, and monitor vacuum for the time period specified in Table 02732-4, Vacuum Test Time Table.
 - 3. If the drop in vacuum exceeds 1 inch Hg over the specified time period tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.
- D. Hydrostatic Exfiltration Testing: Hydrostatic exfiltration testing shall be performed as follows:
 - 1. Seal wastewater lines coming into the manhole with an internal pipe plug. Then, fill the manhole with water and maintain it full for at least one hour.
 - 2. The maximum leakage for hydrostatic testing shall be 0.025 gallons per foot of manhole diameter per foot of manhole depth per hour.
 - 3. If water loss exceeds amount tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

3.07 SMOKE TEST PROCEDURE FOR POINT REPAIRS

- A. Application: Perform smoke test to:
 - 1. Locate points of line failure for point repair.

-
2. Determine if point repairs are properly made.
 3. Determine if service connections have been reconnected to the 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 a single manhole section at any one time. Keep the number of open excavations to a minimum.
- C. Preparation: Prior to smoke testing, give written notice to area residents no fewer than 2 days, nor more than 7 days, prior to proposed testing. Also give notice to City's 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 the annular space at manhole for sliplined sections.
- E. Smoke Introduction:
1. Operate equipment according to manufacturer's recommendation and as approved by Engineer.
 2. Conduct test by forcing smoke from smoke generators through sanitary sewer main and service connections. Operate smoke generators for a minimum of 5 minutes.
 3. Introduce smoke into upstream and downstream manholes as appropriate. Monitor the tap/connection for smoke leaks. Note sources of leaks.
- F. Repair and Retest: Repair and replace any taps or connections noted as leaking and then retest. Taps and connections may be left exposed in only one manhole section at a time. If repair or replacement, testing or retesting, and backfilling of the excavation is not completed within one workday, properly barricade and cover each excavation as approved by Engineer.
- G. Service Connections: On houses where smoke does not issue from plumbing vent stacks to confirm reconnection of sewer service to the newly installed liner pipe, perform a dye test to confirm reconnection. Introduce dye into the service line through a plumbing fixture inside the structure or a sewer cleanout immediately outside the structure and flush with water. Observe flow at service reconnection or downstream manhole. Detection of dye confirms a reconnection.

TABLE 02732-1
WATER TEST ALLOWABLE LEAKAGE

DIAMETER OF RISER OR STACK IN INCHES	VOLUME PER INCH OF DEPTH		ALLOWANCE LEAKAGE*	
	Inch	Gallons	Pipe Size in Inches	Gallon/Minute per 100 Ft.
1	0.7854	.0034	6	0.0039
2	3.1416	.0136	8	0.0053
2.5	4.9087	.0212	10	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 shall be reduced to 10 gallons per inch of inside diameter per mile per 24 hours, when sewer is identified as located within the 25-year flood plain

TABLE 02732-2

TIME ALLOWED FOR PRESSURE LOSS FROM 3.5 PSIG TO 2.5 PSIG

Pipe Diameter (in)	Minimum Time (min. sec)	Length for Minimum Time (ft)	Time for Longer Length (sec/ft)	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 02732-3

MINIMUM TESTING TIMES FOR LOW PRESSURE AIR TEST

PIPE DIAMETER (inches)	MINIMUM TIME (seconds)	LENGTH FOR MINIMUM TIME (feet)	TIME FOR LONGER LENGTH (seconds)
6	340	398	0.855 (L)
8	454	298	1.520 (L)
10	567	239	2.374 (L)

12	680	199	3.419 (L)
15	850	159	5.342 (L)
18	1020	133	7.693 (L)
21	1190	114	10.471 (L)
24	1360	100	13.676 (L)
27	1530	88	17.309 (L)
30	1700	80	21.369 (L)
33	1870	72	25.856 (L)

TABLE 02732-4

VACUUM TEST TIMETABLE

DEPTH IN 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 924-85)

TABLE 02732-5

PIPE VS. MANDREL DIAMETER

Material and Wall Construction	Nominal Size(Inches)	Average I.D. (Inches)	Minimum Mandrel Diameter (Inches)
PVC-Solid (SDR 26)	6	5.764	5.476
	8	7.715	7.329
	10	9.646	9.162
PVC-Solid (SDR 35)	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
HDPE-Profile	48	47.500	45.125
	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
Fiberglass-Centrifugally Cast	60	60.000	57.000
	12	12.85	11.822
	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 02733

CLEANING AND TELEVISION INSPECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cleaning the sewer line to remove debris, solids, roots, sand, pieces of broken pipe, bricks, grease, and grit from sewer line and manholes, thus improving flow and facilitating television inspection for sewer evaluation. Cleaning includes the initial manhole wall washing by high-pressure water jet.
- B. Televising the line to obtain quality videotapes and TV inspection reports upon which the Engineer can make a decision regarding needed sewer rehabilitation and repair.

1.02 UNIT PRICES

- A. Cleaning Using Normal Cleaning Equipment. Measurement for cleaning sanitary sewer mains with normal cleaning equipment is on a linear foot basis. The Contract unit price bid for cleaning with normal equipment is full payment for sewer line actually cleaned and accepted. Cleaning using normal cleaning equipment includes:
 - 1. Charges for transient water meter setup and water usage.
 - 2. Collection, removal, transportation, and disposal of sand, debris, and liquid wastes to legal disposal sites.
 - 3. Locating, exposing, and opening the manholes on sewers to be cleaned.
 - 4. The initial manhole wall washing with high-pressure water hose. Payment for additional cleaning and scrubbing of manhole walls which may be required for manhole rehabilitation is included in the unit price for manhole wall sealing as specified in Section 02764 Manhole Rehabilitation.
 - 5. Reconstruction of manholes which are dismantled for access of cleaning equipment, and repair of any damages caused by the dismantling or cleaning equipment.
- B. Cleaning Using Mechanical Cleaning Equipment. Measurement for cleaning sanitary sewer mains with mechanical cleaning equipment is on a linear foot basis for the quantity approved by the Engineer. The Contract unit price for cleaning sanitary sewer mains with mechanical cleaning equipment is paid in addition to the unit price for cleaning using normal cleaning equipment. Cleaning using mechanical cleaning equipment includes:

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1. Collection, removal, transportation and disposal of sand, debris, and liquid wastes to legal disposal sites regardless of quantity of material.
 2. Locating, exposing and opening the manholes on sewers to be cleaned.
 3. Reconstruction of manholes which are dismantled for access of cleaning equipment and repair of any damages caused by the dismantling or cleaning equipment.
- C. Mechanical cleaning is limited to locations approved by the Engineer on a case-by-case basis after normal cleaning methods have failed to produce satisfactory results, as determined by viewing videotapes.
1. Mechanical cleaning prior to normal cleaning does not relieve the Contractor of the responsibility of fully cleaning the pipe with normal cleaning equipment.
- D. Survey TV Inspection. Measurement of survey TV inspection for pipe segments selected by the Engineer is on a linear foot basis from the centerline to centerline of manholes. Payment for survey TV inspection is made for the actual lengths of TV inspection footage, as measured in the field at grade as submitted for evaluation prior to final recommendations of sewer rehabilitation method.
1. No payment will be made for poor or unacceptable quality tapes. Hazy, unclear pictures will not qualify for payment.
 2. No payment will be made for re-televising any segment without prior approval of the Engineer.
 3. No payment will be made for portions of sanitary sewer not televised. No payment will be made for linear feet of sewers through which the camera could not pass.
 4. No payment will be made for reverse setups required to bracket an obstruction.
 5. No separate payment shall be made for sewer flow control.
- E. Survey TV Inspection by Floating Camera. Measurement of survey TV inspection by floating camera for pipe segments selected by the Engineer is on a linear foot basis for actual footage televised from the centerline to centerline of manholes. The inspections may be required in 36-inch through 84-inch-diameter sewer pipes, without any cleaning, for purely investigative studies. Payment for television inspection by floating camera shall be made based on a separate bid item for floating camera.
- F. Pre-Installation TV Inspection. No separate payment will be made for pre-installation TV inspection, including cleaning, except for lines inspected but not rehabilitated. Include cost for pre-installation TV inspection in the cost of line work for which the rehabilitation effort is performed. If a line is inspected and found, in the opinion of the Engineer, to require no rehabilitation work, the Contractor will be paid for pre- installation TV inspection on the basis

of survey TV inspection, and cleaning on the basis of normal mechanical cleaning.

- G. Post-Installation TV Inspection. No separate payment will be made for post-installation TV inspection. Include cost for post-installation TV inspection in the cost of line work for which the rehabilitation is performed. The post-installation TV inspection tape policy allows payment for work based on the field measured lengths indicated on the inspector's daily reports, but still requires the Contractor to submit a post-installation TV tape within one calendar month after the segment was completed. If no tape is received within that period, credit for the previously paid line segment will automatically be deducted from pay estimates in following months until the required tape is submitted. If, after review by the Engineer, the post-installation TV tape is disapproved, the Contractor shall repair the identified defects, reteleviser the entire line segment and submit a post-installation TV tape of the repaired line segment. This work shall be done at no additional cost to the City. If post-installation TV tape is disapproved pay may be deducted.
- H. Footage paid for cleaning, under some circumstances, may exceed the footage paid for televising, as approved by the Engineer.

1.03 DEFINITIONS

- A. Normal Cleaning Equipment. Cleaning devices such as rods, metal pigs, porcupines, root saws, snakes, scooters, sewer balls, kites, and other approved equipment in conjunction with a hand-winch device and gas or electric rod-propelled devices. Variable pressure water nozzles, (3000 psi) are considered normal cleaning equipment.
- B. Mechanical Cleaning Equipment. Buckets, scrapers, scooters, porcupines, kites, heavy-duty brushes, metal pigs, and other debris-removing equipment and accessories used in conjunction with an approved power winching machine. High to very high-pressure water nozzles (10,000 psi) are considered as mechanical cleaning equipment.
- C. Survey TV Inspection. Survey TV is a video inspection of existing sanitary sewers to evaluate lines and determine if conditions exist which will require line rehabilitation.
- D. Pre-Installation TV Inspection. Pre-installation TV is a video inspection by the Contractor of sewer lines specified for rehabilitation to confirm cleaning, location of service connections, and constructability of line rehabilitation according to Drawings and Specifications.
- E. Post-Installation TV Inspection. Post-installation TV is a video inspection to determine that rehabilitation of a sanitary sewer has been completed according to Drawings and Specifications.
- F. TV Inspection Report. A form that is filled out by each TV inspection for any videotape that is submitted to the City. Form provided by the Engineer.

1.04 PERFORMANCE REQUIREMENTS

- A. Clean the designated sanitary sewers and manholes using mechanical, hydraulically

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propelled, or high-velocity sewer cleaning equipment. Select a cleaning process which removes grease, sand, silt, solids, rags, and debris from each sewer segment and associated manholes.

- B. The Engineer may determine that no additional line rehabilitation work is required if the cleaning operation shows the sewer line to be free of damage or deterioration. The Engineer may delete from the project, any or all of the sanitary sewer lines which do not show the need for rehabilitation.
- C. If, after Pre-Installation TV Inspection, the Contractor determines that the existing line condition is such that, in his judgment, the specified rehabilitation method would be ineffective or not constructable, he should notify the Engineer in writing. The Engineer will determine what rehabilitation method should be used and notify the Contractor in writing.

1.05 SUBMITTALS

- A. Make submittals in conformance with Section 01300 - Submittals.
- B. Submit the equipment manufacturer's operational manual and guidelines to the Engineer for review. Strictly follow such instructions unless modified by the Engineer.
- C. Submit a list of legal disposal sites proposed for dumping debris from the cleaning operation.
- D. Submit and maintain a Liquid Waste Manifest conforming to the City's requirements. Send the City's and Regulator's copies of the completed manifest to the Engineer monthly.
- E. Submit videotapes and TV inspection reports to the Engineer for review.
 - 1. Provide tapes of a quality sufficient for the Engineer to evaluate the condition of the sanitary sewer, locate the sewer service connections, and verify cleaning. If quality is not sufficient, Contractor shall re-televiser the sanitary sewer segment and provide a new tape and report at no additional cost to the City. Camera distortions, inadequate lighting, dirty lens, or blurred/hazy picture will be cause for rejection of a tape and rejection of the associated line segment.
 - 2. Videotapes submitted become the property of the City.
 - 3. Contractor shall maintain a master copy of all TV tapes and TV inspection reports submitted, until final acceptance of the work.
 - 4. Transmit each TV Inspection Report to the Engineer with a Transmittal Form. Copies of the TV Inspection Report form and Television Inspection Codes Summary are attached.

1.06 QUALITY ASSURANCE

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- A. Qualifications. Use experienced personnel to operate cleaning equipment and devices.
 - B. Acceptance of sewer cleaning work is contingent upon the successful completion of the television inspection. If television inspection shows debris, solids, sand, grease, or grit remaining in the line, the cleaning is considered unsatisfactory. Repeat cleaning, inspection, and televising of the sewer line until cleaning is acceptable by the Engineer.
 - C. For reporting overflow or spillage of wastewater, refer to Section 01500 - Temporary Facilities and Controls.

PART 2 PRODUCTS

2.01 CLEANING EQUIPMENT

- A. Select the cleaning equipment and method for cleaning, based on the condition of the sanitary sewer mains at the time work begins. More than one type of equipment or attachments may be required on a single project or at a single location.
- B. When requested by the Engineer, demonstrate the performance capabilities of the cleaning equipment and method proposed for use on the project. If results obtained by the demonstration are not satisfactory, provide other equipment or devices that will clean the sewer line.
- C. For cleaning equipment, install a gauge to indicate working pressure on the discharge of high-pressure water pumps. In addition to conventional nozzles, use a nozzle which directs the cleaning force to the bottom of the pipe for sewers 18-inches and larger.
- D. When cleaning equipment is used, install a suitable sand trap, weir, dam, or suction in the downstream manhole so that solids and debris are trapped for removal.

2.02 CLEANING ACCESSORIES

- A. When an additional quantity of water from the public water supply is needed to meet the cleaning requirements of the equipment and the sewer, obtain transient water meters from the local authority for installation on the trucks or at fire hydrants.
- B. All cleaning equipment must be equipped with a backflow preventer to prevent any contamination to the public water supply.

2.03 TELEVISION EQUIPMENT

- A. Closed Circuit TV Equipment. Select and use closed-circuit television equipment that will produce a color videotape.
- B. Pipe Inspection Camera. Produce a videotape using a pan-and-tilt, radial viewing, pipe inspection camera that pans ~~275~~ 275 degrees and rotates 360 degrees. Use a camera with an accurate footage counter which displays on the monitor the exact distance of the camera

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from the centerline of the starting manhole. Use a camera with camera height adjustment so that the camera lens is always centered at one-half the inside diameter, or higher, in the pipe being televised. Provide a lighting system that allows the features and condition of the pipe to be clearly seen. A reflector in front of the camera may be required to enhance lighting in dark or large diameter pipe.

C. Video Tape. Provide videotapes in the VHS format, recorded at Standard Play (SP).

1. Only line segments from the same basin shall be included on a videotape.
2. One or more line segments (a maximum of 5) can be included on the same videotape as long as they are in the same basin.
3. Two labels are required. One label shall be placed on the spine of the videotape and the other on the face of the videotape. Permanently label each tape with the following information:

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Spine of Tape

Engineer File No.: _____ Contractor's Name: _____

Inspection Type: ☐ Survey ☐ Pre-Installation ☐ Post-Installation

Tape No.: _____ Date Televised: _____ Date Submitted: _____

Face of Tape

Manhole No. From	Manhole No. To	Pipe Diameter	Pipe Length	Street
_____	_____	_____	_____	
_____	_____	_____	_____	

3.01 EXAMINATION

- A. Do not begin cleaning until both upstream and downstream manholes have been checked for flow monitors or other mechanical devices. Refer to Section 02764 - Manhole Rehabilitation.

3.02 PREPARATION

- A. Cleaning.
 - 1. Take precautions to protect sanitary sewer mains and manholes from damage that might be inflicted by the improper selection of the cleaning process or improper use of the equipment. When using hydraulically propelled devices, take precautions to ensure that the water pressure created does not cause damage or flooding to public or private property. Do not surcharge the sanitary sewer beyond the elevation that could cause overflow of sewage into area waterways, homes, or buildings or onto the ground.
 - 2. Do not use or obstruct a fire hydrant when there is a fire in the area. Remove water meters, fittings and piping from fire hydrants at the end of each working day.
 - 3. Exercise care to prevent contamination of the potable water system. Use of a backflow preventer of appropriate size is mandatory when drawing water from a public hydrant.
 - 4. Where possible, use the flow of wastewater present in the sanitary sewer main to provide fluid for hydraulic cleaning devices.
- B. Televising. Contractor shall use the Television Inspection Report form following this Section to document results of TV inspections.

3.03 CLEANING

- A. Conserve Water. Do not waste water from the public water supply because of poor connections or from hydrants left opened.
- B. Install Collapsible Dam. Use a collapsible dam for hydraulically propelled devices which require a head of water to operate. Provide a dam which is easily collapsible to prevent damage to the sewer, public property, or private property.
- C. High Velocity Cleaning. Operate high-velocity cleaning equipment so that the pressurized nozzle moves continuously. Turn off or reduce the flow to the nozzle to prevent damage to the line any time the nozzle becomes stationary.
- D. Mechanical Cleaning. In addition to normal cleaning equipment, perform mechanical cleaning when required and approved using equipment and accessories defined in

mechanical cleaning equipment.

- E. Debris Disposal. Remove sludge, dirt, sand, rocks, grease, roots, and other solid or semi-solid material resulting from the cleaning operation at the downstream manhole of the section being cleaned. Passing debris from one sewer section to any other sewer section is not allowed. Load debris from the manholes into an enclosed container for liquid waste hauling. Remove and dispose of solids or semi-solids resulting from cleaning operations at the end of each workday. Do not accumulate debris, liquid waste, or sludge on the site except in totally enclosed containers approved by the Engineer.
- F. Disposal Sites. Dispose of waste at a legally permitted disposal site using a transporter who has a valid TCEQ Liquid Waste Transporter Permit.

3.04 TELEVISION

- A. Immediately after cleaning, televise the sanitary sewer line to document the condition of the line and to locate existing service connections. Notify the Engineer 24 hours in advance of any TV inspection so that the Engineer may observe inspection operations.
 - B. Perform TV inspection of sanitary sewers as follows:
 - 1. Perform a survey TV inspection on any sanitary sewer within the boundary of the project, as directed by the Engineer. After reviewing survey TV tapes, the Engineer will identify which sanitary sewers will be rehabilitated or will need additional work.
 - 2. Perform pre-installation TV inspection immediately after line cleaning and before line rehabilitation work. Pre-installation TV is not required for sewer lines designated as "remove and replace". Verify that the line is clean and ready to accept the line rehabilitation. Prepare Television Inspection Report forms. Maintain copies of tapes and reports for reference by the Engineer for the duration of the project.
 - 3. Perform post-installation TV inspection to confirm completion of rehabilitation work, including removal and replacement. Verify that the rehabilitation work conforms to the requirements of the Drawings and Specifications. Provide a color videotape showing the completed work, including the condition of restored service connections. Prepare and submit Television Inspection Report forms providing location of service connections along with location of any discrepancies. Manhole work, including benches, inverts and pipe penetrations into manhole, should be complete prior to post-installation TVwork.
 - 4. Videos shall pan beginning and ending manholes to demonstrate that all debris has been removed. Camera operator shall slowly pan each service connection, clamped joints, and when pipe material transitions from one material to another. A TV Inspection Report shall be completed for every segment that is submitted to the Engineer.
 - C. TV inspection tapes shall be continuous for pipe segments between manholes. Do not leave
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gaps in the video taping of a segment between manholes and do not show a single segment on more than one videotape, unless specifically allowed by the Engineer.

3.05 FLOW CONTROL

- A. Perform survey TV inspection on one manhole section at a time. Adequately control the flow in the section being televised. Do not exceed the depth of wastewater flow shown below:

Pipe Diameter	Depth of Flow
<u>(Inches)</u>	<u>(Percent of Pipe Diameter)</u>
6 to 10	10
12 to 24	15
Over 24	20

1. If during survey TV inspection of a manhole section, the wastewater flow depth exceeds the maximum allowable, reduce the flow depth to an acceptable level by performing the survey TV inspection during minimum flow hours, by diversion pumping, or by pulling a camera with swab, high-velocity jet nozzle or other acceptable dewatering device. Videotape made while floating the camera is not acceptable unless approved by the Engineer.
- B. Minimize flow in the line while performing pre-installation TV inspection. Divert the normal flow and clean the line to be inspected.
- C. No flow is allowed in the line while performing post-installation TV inspection.

3.06 PASSAGE OF TV CAMERA

- A. Do not pull or propel the television camera through the line at a speed greater than 30 feet per minute.
- B. If during survey TV inspection of a manhole section, the camera is unable to pass an obstruction even though flow is unobstructed, televise the manhole section from the other direction (reverse setup) in order to obtain a complete video of the line. Whenever such a condition arises, notify the Engineer to determine if an obstruction removal or point repair is necessary. If a point repair is authorized, repair the pipe at the designated location and then re-televise the manhole section to verify completion of the point repair, unless waived by the Engineer.
1. When the camera is being pulled from the other direction in order to survey on either side of an obstruction and a second repair location is encountered away from the first obstruction, notify the Engineer and request a review of the TV tape. The Engineer

-
- may direct the Contractor to make one or both point repairs. No downtime shall be allowed.
 - 2. If two point repairs are allowed and completed, re-televiser the manhole section. Generally, up to 20 feet of the sewer pipe from the finished end of the first point repair to the starting end of the second point repair may be lapped or physically inspected to verify the condition of the sewer without further TV inspection.
 - 3. The City makes no guarantee that the sanitary sewer specified or proposed for survey TV after cleaning, is clear for the passage of the camera set-up. Select the appropriate equipment, tools, and methods for securing safe passage of the camera.
 - C. During pre-installation TV inspection, camera passage should show the line is ready to rehabilitate. Report any variations between previous reported (existing data) conditions and the actual conditions encountered to the Engineer.
 - D. For post-installation TV inspection, exercise the full capabilities of the camera equipment to document the completion of the rehabilitation work and the conformance of the work to the Drawings and Specifications. Provide a full 360-degree view of pipe, joints and service connections.

3.07 TV INSPECTION REPORT

- A. For each TV inspection video provide a completed TV Inspection Report, as attached at the end of this section. The Report is a written/narrated log of pipe defects, sags, service connection locations and conditions, indexed to the footage counter. The TV Inspection Report shall be filled out as instructed below.
- B. Direction of Flow
 - 1. MANHOLE NUMBER: The upstream manhole number of the line segment shall be put in this field. This is an alphanumeric field with 9 spaces available (i.e. SB179003).
 - 2. MANHOLE NUMBER: The downstream manhole number of the line segment shall be put in this field. This is an alphanumeric field with 9 spaces available (i.e. SB179002).
- C. Header Section
 - 1. ADDRESS UPS/DWN: The upstream and downstream address of the line segment shall be put in this field. This is an alphanumeric field with 6 spaces available for the street number and 21 spaces available for the street name (i.e., UPS: 2150 Sunnyland DWN: 2110 Sunnyland).

2. W.W. FILE NO.: The Engineer's File number shall be put in this field. This number is found on the contract documents and specifications. This is an alphanumeric field with 10 spaces available (i.e., 4250-49).
3. WORK ORDER NO.: This number will be provided by the City, this field shall be left blank. This is a numeric field with 10 spaces available.
4. TV DATE: The date that the videotape was produced shall be placed in this field. This date shall be the same as the date shown on the display screen. This is a numeric field with 8 spaces available (i.e., 2/21/95).
5. BASIN: The basin that the line segment is located in shall be placed in this field. This is an alphanumeric field with 10 spaces available (i.e., IA010).
6. TV CONTRACTOR: The TV Contractor's name shall be placed in this field. This is an alphanumeric field with 5 spaces available (i.e., Chief, KIN (Kinsel), IGS (Insituform)).
7. WEATHER: The existing weather conditions at the time that the TV tape was made shall be placed in this field. This is an alpha-numeric field with 10 spaces available (i.e., Cloudy)
8. VTR FORMAT: The VTR format shall be placed in this field. This is an alphanumeric field with 4 spaces available (i.e., VHS).
9. TAPE NUMBER: Each TV tape produced must have a tape number for identification. This number must be affixed to the cassette label. This number must not be duplicated in the same project. This is an alphanumeric field with 6 spaces available (i.e., IA0101).
10. VTR INDEX: The numeric location of the line segment on the tape shall be indicated here. This is an alphanumeric field with 6 spaces available for each number (i.e., 1336 to 2185).
11. SUMMARY:
 - a. This line is to be used to put in additional information about the line segment as indicated below:
 - b. Type of TV Tape (i.e., Post, Survey, Pre-Rehabilitation)
 - (1). General Contractor (i.e., Cullum, Kinsel, Texas Sterling) (2).
Rehabilitation Method (i.e., FF, CPP, PB, SL, RR)

- (3). Rehabilitation System Manufacturer or Trade Name when applicable (i.e., Insituform, Inliner II)
 - (4). PIM System, McConnell Pipe Crushing, U Liner)
 - (5). Pipe Trade Name for PVC, PEP or FRP pipe (i.e., Hobas, Drisco 1000, Lamson Vylon, Quail)
- c. This information will be noted in the following manner:
- (1). Post/Cullum/FF/U Liner/Quail (a typical listing for a **Fold and Form** line segment)
 - (2). Post/Insituform/CPP/Insituform (a typical listing for a **Cured-in- Place** line segment)
 - (3). Post/McLat/PB/McConnell PipeCrushing/Drisco1000 (a typical listing for a **Pipeburst** line segment)
 - (4). Post/Kinsel/SL/Hobas (a typical listing for a **Sliplined** line segment)
 - (5). Post/Texas Sterling/RR/Lamson Vylon (a typical listing for a **Removed and Replaced** line segment)
12. LOCATION: The physical location of the line segment shall be placed in this field. The location is for the line segment, not the manholes. If the line segment covers more than one location, then choose location where majority of line segment is. The codes for the location are shown on the attached Television Inspection Codes list. This is an alpha-numeric field with 2 spaces available (i.e., C)
13. SURFACE COVER: The type of surface that covers the line segment shall be placed in this field. Use the designation that reflects what covers the majority of the line segment. The codes for surface cover are shown on the attached Television Inspection Codes list. This is an alpha field with only 1 space available (i.e., F).
14. PIPE SIZE: The inside diameter of the liner or pipe based on new pipe size, material and SDR shall be placed in this field. The unit of measure is inch. This is a numeric field with 6 spaces available, which includes 2 spaces for decimals (i.e., 6.58 IN).

15. PIPE TYPE: The pipe or liner type installed shall be placed in this field. This is an alpha field with 3 spaces available (i.e., PEP, CPP, PVC).
16. LENGTH: The length of the line segment shall be placed in this field. The length shown on the TV report shall be the same as the length shown on the TV tape. Also, the length on the top portion of the TV report shall match that shown on the bottom portion of the TV Report. The unit of measure is feet. This is a numeric field with 4 spaces available, with no decimals (i.e., 305 FT).
17. UPS DEPTH: The depth, measured from the top ring of the upstream manhole to the invert of the upstream manhole, shall be placed in this field. The unit of measure is in feet and tenths of feet. This is a numeric field with 3 spaces available, which includes one space for a decimal (i.e., 6.9 FT).
18. DWN DEPTH: The depth, measured from the top ring of the downstream manhole to the invert of the downstream manhole, shall be placed in this field. The unit of measure is in feet and tenths of feet. This is a numeric field with 3 spaces available, which includes one space for a decimal (i.e., 7.4 FT).
19. JOINT LENGTH: The pipe joint length shall be placed in this field. Show no joint length for CPP, FF and PEP line segments. Put a "0" in the field for these line segments that have no joints. The unit of measure is inch. This is a alpha field with 2 spaces available (i.e., 40 IN).
20. FLOW DEPTH: The pipe or liner flow depth shall be placed in this field. The unit of measure is inch. This is a numeric field with 3 spaces available, which includes one decimal place (i.e., 2.5 IN).
21. MASTER TAPE NO. : The Contractor's master tape number (if one exists) shall be placed in this space. This item is not in the database, therefore there is no field length or type data for this item.
22. REVERSE SET UP: When a reverse set up is done on a line segment check "yes" if not check "no". This item is not in the database, therefore there is no field length or type data for this item.
23. SKETCH: If a sketch of the line segment is included check "yes" if not check "no". This item is not in the database, therefore there is no field length or type data for this item.
24. PRIOR HISTORY: If any prior information exists on this line segment check "yes" if not check "no". This item is not in the database, therefore there is no field length or type data for this item.

25. EVALUATION TV: If the TV Inspection Report is for line segment evaluation or survey purposes check "yes" if not check "no". This item is not in the database, therefore there is no field length or type data for this item.
26. PRE-REHAB TV: If the TV Inspection Report is for pre-installation TV inspection to show that the line is ready for rehabilitation check "yes" if not check "no". This item is not in the database, therefore there is no field length or type data for this item.
27. POST-REHAB TV: If the TV Inspection Report is for post-rehab TV inspection to document the completion of the rehabilitation work check "yes" if not check "no". This item is not in the database, therefore there is no field length or type data for this item.
28. LINE DETERIORATION: The existence of pipe deterioration and how much deterioration exists shall be indicated here. If there is no deterioration check "N" if deterioration is light check "L", if it is medium check "M", if it is heavy check "H". This item is not in the database, therefore there is no field length or type data for this item.
29. DIRECTION OF FLOW: The direction of flow in the line segment shall be placed in this field. Typically, the larger number is the upstream manhole and the smaller number is the downstream manhole. Do not reverse the manhole designation on the TV report if a reverse set up is shown, check the reverse set up box on the report.

D. CODE INPUT SECTION

1. TV INSPECTION CODES: Codes to be used in this section are shown on the Television Inspection Codes sheet (attached).
2. FOOT READ U/D: The up/down designation shall be shown under the section titled "Footage Reading" in the boxes marked "U." and "D." This will make it clear what direction footage is measured from.
3. CLOCK POSITION: The clock position, with 12 o'clock straight up, of each defect shall be shown in this field (i.e., 12:00, 3:00). Also, show the clock position of each service connection and state the condition of the connection. Include the distance the connection is protruding into the pipe, when appropriate, and the type of connection, such as plumber service.
4. CRACKS: Any cracks in the pipe shall be listed in this field using the codes on the Television Inspection Codes sheet. Report the size length and width of any cracks.

5. JOINTS: Misaligned and broken joints shall be listed in this field using the codes on the Television Inspection Codes sheet.
6. LATERALS: All laterals shall be listed in this field using the codes on the Television Inspection Codes sheet.
7. ROOTS: Any root intrusion into the pipe shall be listed in this field using the codes on the Television Inspection Codes sheet.
8. DEBRIS: Any debris in the pipe shall be listed in this field using the codes on the Television Inspection Codes sheet.
9. INFLOW/INFILTRATION: Report any inflow and infiltration in this field using the codes listed on the Television Inspection Codes sheet.
10. ALIGNMENT: Report the existence of any sags in the field using the codes listed on the Television Inspection Codes sheet. Report the beginning of sags for one- quarter pipe, one-half pipe and underwater as well as where the camera pulls out of the sag.
11. STRUCTURAL: Report structural condition of the pipe using the codes listed on the Television Inspection Codes sheet.
12. PICTURE NO.: Leave this field blank.
13. COMMENTS: Comments shall be placed in this field. Comments must be accompanied by a corresponding footage. Items to report in this field are: collapses in pipe, stabilized material, mineral deposits, changes in pipe material, reverse set up, drop stack, large voids, multiple cracks, when unable to continue video, etc.
14. CLAMP/SPLICE LOCATION: The clamp/splice location shall be shown in the Comments field. Clamp/splice location must be accompanied by a footage.
15. START SURVEY AT M. H. XYZ: The depth of the line segment shall be shown in the Comments field. (i.e., Start Survey at M. H. 021 - Line Depth 10.2 FT). The depth is to be measured from the top ring of the manhole to the invert of the pipe being televised. The unit of measure is feet and tenths of feet. This depth may be different from the manhole depth.
16. END OF SURVEY AT M. H. XYZ: The depth of the line segment shall be shown in the comments field (i.e., End Survey at M. H. 022 - Line Depth 10.8 FT). The depth is to be measured from the top ring of the manhole to the invert of the

pipe being televised. The unit of measure is feet and tenths of feet. This depth may be different from the manhole depth.

3.08 FIELD QUALITY CONTROL

- A. Do not allow, under any circumstances, sewage or solids removed in the cleaning process to be released onto streets or into ditches, catch basins, storm drains, sanitary or storm sewer manholes, or cleanouts.
- B. Acceptance of sewer cleaning work is contingent upon the successful completion of the television inspection. If the television inspection shows debris, solids, sand, grease, or grit remaining in the line, the cleaning will be considered unsatisfactory. Repeat cleaning, inspection, and televising of the sewer line until cleaning is satisfactory.

3.09 ADJUSTING

- A. Repair manholes which are dismantled or damaged during the cleaning process and replace any manhole frame and cover which is damaged during the cleaning process.

END OF SECTION

SECTION 02762

SANITARY SEWER SERVICE STUBS OR RECONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Installation of service stubs on new 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.

1.02 UNIT PRICES

- A. Measurement for sanitary sewer service stubs or service reconnections with stacks located within 5 feet of the sanitary sewer main centerline is on a unit price basis for each stub or reconnection, complete in place. Service stubs and reconnections include service connections, couplings, clean-outs, adapters disconnecting existing services, reconnecting new service, fittings, excavation, backfill, and testing.
- B. Measurement for sanitary sewer service stubs or service reconnections without stacks located within 5 feet of the sanitary sewer main is on a unit price basis for each stub or reconnection, complete in place. Service stubs and reconnections include service connections, couplings, clean-outs, adapters disconnecting existing services, reconnecting new service, fittings, excavation, backfill, and testing.
- C. Measurement for sanitary sewer service lines more than 5 feet laterally from the sewer main is on a linear foot basis, complete in place. Measurement will be taken along the centerline of the pipe from the centerline of the lateral connection or stack to the end of the service for service stubs laid in open cut excavation. Augered pipe for service stubs will be paid as provided in Section 02316 - Pipe and Casing Augering.
- D. Pay estimates for progress payments will be made as measured above according to the following schedule:
 - 1. An estimate for 95 percent payment will be authorized when the reconnection is completely installed and backfilled.
 - 2. An estimate for 100 percent payment will be authorized when the reconnection has been tested as specified in Section 02732 - Acceptance Testing for Sanitary Sewers.

- E. One or more connections discharging into a common point are considered one service connection. The Contractor shall not add service reconnections without approval of the Engineer. The Engineer may require reconnections to be moved or relocated to avoid having more than two houses per reconnection.
- F. Measurement for abandonment of service connection is on a 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 the new or replacement sewer trench.
- G. No separate payment will be made for an abandoned service connection if the service to be abandoned is within 4 feet of an active connection. Payment for only one abandoned service connection will be allowed when a second abandoned connection is within 4 feet of the first.

1.03 PERFORMANCE REQUIREMENTS

- A. Accurately locate in the field all proposed service stubs along the new sanitary sewer main.
- B. Properly disconnect all existing connections from the existing sewer and reconnect to the rehabilitated liner, as described in this Section.
- C. Accurately locate in the field existing service connections and proposed service stubs along the alignment of the new parallel or replacement sewer main.
- D. Reconnect all service connections, including those that go to unoccupied or abandoned buildings or to vacant lots, unless directed otherwise by the Engineer.
- E. Begin reconnection of service lines immediately after cured-in-place liner has cured.
- F. Reconnection by the excavation method shall include the stack and 4-feet of service line, as necessary to the property line for which the connection is intended. The service lines shall be replaced to the right-of-way or easement line (short side and long side) and a cleanout installed at that location.

1.04 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Submit product data for each pipe product, fitting, coupling and adapter.
- C. Show reconnected services on record drawings. Give the exact distance from each service connection to the nearest downstream manhole.

PART 2 PRODUCTS

2.01 PVC SERVICE CONNECTION

- A. As stubouts, use PVC sewer pipe, 4-inch through 10-inch, conforming to ASTM D 1784 or D1785 Schedule 40, with a cell classification of 12454-B.
- B. PVC pipe shall be gasket jointed with gasket conforming to ASTM D3319.
- C. Provide service connection pipe in sizes shown on the Drawings. For reconnection of existing services, select service connection pipe diameter to match existing service diameter.
- D. Provide a 6-inch service connection when more than one service discharges into a single pipe.
- E. Connect service pipes to new parallel or replacement sewer mains with prefabricated, full-bodied tee or wye fittings conforming to specifications for the sewer main pipe material as specified in other Sections for all sewers up to 18 inches in diameter.
- F. Where new sewers are installed using pipe augering or tunneling, or where the new sewer is greater than 18 inches in diameter, use Fowler "Inserta-Tee" to connect the service to the new sewer main.

2.02 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 a complete seal. Use a saddle fabricated to fit the outside diameter of the pipe to which it will be attached. The protruding lip of the saddle must be at least 5/8-inch long with grooves or ridges to retain the stainless steel band clamps.
- C. Use 1/2-inch stainless steel band clamps for securing saddles to liner pipe. The screws, bolts, and associated appurtenances shall be stainless steel.
- D. Inserta Tee fittings (includes PVC Hub, Rubber Sleeve, and Stainless Steel Band) as manufactured by Inserta Tee Fittings, Co. shall be used for stacks, service reconnections (by excavation) and for drop connections.

2.03 COUPLINGS AND ADAPTERS

- A. For connection between new PVC pipe stubout and existing service; 4-, 6-, or 8-inch diameter, use flexible adapter coupling consisting of a neoprene gasket and stainless steel shear ring, with 1/2-inch stainless steel band clamps:
 - 1. Fernco Pipe Connectors, Inc., Series 1055 with shear ring SR-8;
 - 2. Band Seal by Mission Rubber Co., Inc.;
 - 3. Approved equal.
- B. For connection between new PVC pipe stub out and new service, use rubber-gasketed adapter coupling:
 - 1. GPK Products, Inc., IPS & Sewer Adapter.
 - 2. Approved Equal.

2.04 STACKS

- A. Provide stacks for service connections wherever the crown of the sewer is 8 feet or more below finished grade.
- B. Construct stacks of the same material as the sanitary sewer and as shown on the Drawings.
- C. Provide stacks of the same nominal diameter at the sanitary service line.

2.05 CLEAN-OUTS

- A. Tall clean-outs at property line on each service connection as shown in detail on the Drawings.

2.06 PLUGS AND CAPS

- A. Seal the upstream end of unconnected sewer service stubs with rubber gasketed plugs or caps of the same pipe type and size. Provide plugs or caps by GPK Products, Inc., or equal.

PART 3 EXECUTION

3.01 PERFORMANCE REQUIREMENTS

- A. Provide a 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, as pipe laying progresses from downstream to upstream.
- C. Properly disconnect existing connections from the sewer and reconnect to the new sewer, as described in this Section.
- D. Reconnect service connections, including those that go to unoccupied or abandoned buildings, unless directed otherwise by the Engineer. Plug the service connection at the R.O.W. for vacant lots.
- E. Complete reconnection of service lines within 24 hours after disconnection.
- F. Reconnection shall include the stack and fittings and required pipe length to reconnect service line.
- G. Connect services 8 inches in diameter and larger to the sewer by construction of a manhole. Payment for the manhole will be made at the contract unit price for the appropriate manhole diameter and depth.

3.02 PROTECTION

- A. Provide barricades and warning lights and signs for excavations created for service connections. Conform to requirements of Section 01570 - Traffic Control and Regulation.
- B. Do not allow sand, debris or runoff to enter sewer system.

3.03 PREPARATION

- A. Where sewers are existing, field locate existing service connections, whether in service or not. Use existing service locations to reconnect service lines to new liner or new sanitary sewer main.
- B. 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.

3.04 EXCAVATION AND BACKFILL

- A. Excavate in accordance with Section 02227 - Excavation and Backfill for Utilities.
- B. Provide barricades and warning lights and signs, for excavations created for service connections. Conform to requirements of the Texas Manual on Uniform Traffic Control Devices.

- C. Perform work in accordance with OSHA standards. Employ a Trench Safety System as specified in Section 01526 - Trench Safety System for excavations requiring trench safety.
- D. Install and operate necessary ground water and surface water control measures in accordance with requirements of Section 01563 - Control of Ground Water and Surface Water.
- E. Do not allow sand, debris or runoff to enter sewer system.

3.05 SERVICE RECONNECTION BY EXCAVATION METHOD TO SANITARY SEWER PIPE REHABILITATED BY PIPE BURSTING, CURED IN PLACE LINER, AND SLIPLINING

- A. Remove a portion of existing sanitary sewer main to expose the liner pipe. Provide sufficient working space for installing a prefabricated pipe saddle.
- B. Carefully cut the liner pipe making a hole to accept the stubout protruding from the underside of the saddle. In the event the Contractor chooses to cut the liner pipe using a remote device prior to excavation, no additional payment shall be made for such efforts.
- C. Strap on the saddle using a stainless steel band on each side of the saddle. Tighten the bands to produce a watertight seal of the saddle gasket to the liner pipe. Stainless steel bands shall be strapped 360° around line and pipe with the existing pipe removed.
- D. Use a saddle with a stubout that protrudes into the liner a depth equal to the liner pipe wall thickness.
- E. Remove and replace service line to the street right of way line.
- F. Make up the connection between liner and existing service line using PVC sewer pipe and approved couplings and stainless steel bands to construct new stub outs and/or stacks.
- G. Encase the entire service connection in cement stabilized sand. Place a minimum of 6- inches below and 12-inches above and on the sides of the pipe connections.
- H. Test the service connections before backfilling.

3.06 SERVICE RECONNECTION ON POINT REPAIR, REMOVE AND REPLACE PIPE OR NEW PIPE

- A. Install the new service connection 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 the centerline of the new sanitary sewer main.
- C. Make up the connection between the new main and the existing service line using PVC sewer pipe and approved couplings, as shown on the Drawings.
- D. Test service connections before backfilling.
- E. Embed the service connection and service line as specified for the new sanitary sewer main at this location, and as shown on the Drawings. Place and compact trench zone backfill in compliance with Section 02227 - Excavation and Backfill for Utilities.

3.07 RECONNECTION ON CURED-IN-PLACE SEGMENTS (REMOTE METHOD) PRIOR TO RECONNECTION BY EXCAVATION

- A. Service reconnections shall be made using remote operated cutting tools prior to reconnection by excavation on cured-in-place liners.
- B. The method and equipment used shall restore the service connection capacity to not less than 90 percent of original capacity.
- C. The Contractor shall immediately open any missed connections and repair any holes drilled in error, by a method approved by the Engineer.
- D. Complete reconnection by excavation as per Item 3.05.

3.08 PROTRUDING TAPS

- A. Pipebursting and Sliplining
 - 1. Protruding taps or service connections which obstruct the passage of the television inspection camera during cleaning and during television inspection operations or the insertion of the liner while pulling or pushing shall be removed to allow the liner to pass through. Reconnection of this service to new carrier pipe shall be paid for as a service reconnection.
 - 2. No payment shall be made at this location for any obstruction removal.
 - 3. Abandoned taps/ services which are protruding and which must be removed to allow the liner to be inserted into the sewer and the service abandoned, shall not be paid for as an obstruction removal. Payment shall be made for abandonment of service connection.
- B. Cured-in-Place Method of Rehabilitation

1. See Obstruction Removal (by Remote) Section 02769 and Point Repairs to Sanitary Sewers - Section 02763.

3.09 INSTALLATION OF NEW SERVICE STUBS

- A. Install the new service connections on the new sanitary sewer main for each service connection. Provide the length of stub indicated on the Drawings. Install plug or cap on the upstream end of the service stub as needed.
- B. Test service connections before backfilling.
- C. Embed the service connection and service line as specified for the new sanitary sewer main at this location, and as shown on the Drawings. Place and compact trench zone backfill in compliance with Section 02227 - Excavation and Backfill for Utilities.

3.10 TESTING

- A. Test service reconnections and service stubs. Follow applicable procedures given in Section 02732 - Acceptance Testing for Sanitary Sewers.

3.11 CLEANUP

- A. Backfill the excavation as specified in Section 02227 - Excavation and Backfill for Utilities.
- B. Replace pavement or sidewalks removed or damaged by excavation in accordance with Section 02570 - Pavement Repair and Resurfacing. In unpaved areas, bring surface to grade and slope surrounding the excavation. Replace a minimum of 4 inches of topsoil and sod according to requirements of Section 02935 - Sodding.
- C. Conform to Section 01564 - Waste Material Disposal.

END OF SECTION

SECTION 02763

POINT REPAIRS TO SANITARY SEWERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Repairs to existing sewer lines by replacing short lengths of failed pipe.

1.02 UNIT PRICES

- A. Measurement for point repairs is on a unit price basis for each repair performed on each material type and diameter within depth ranges listed in the following table. Depth shall be measured from natural ground level to flow line of sanitary sewer main at point of repair.

Greater Than	Up To and Including
0	5 feet
5 feet	10 feet
10 feet	15 feet
15 feet	20 feet
Greater than 20 feet	

- B. Measurement for extra length repair is on a linear foot basis for each material type and diameter in excess of replacement lengths given in Paragraph 1.05.
- C. Measurement for hand excavation is on a cubic yard basis when authorized by Engineer in locations where excavation by machine is not suitable.
- D. Measurement for abandonment of point repair is on a cubic yard basis for excavation required to expose existing pipe. Separate measurement will be made for machine excavation and hand excavation.
- E. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 PERFORMANCE REQUIREMENTS

- A. Locate and replace small lengths of one or more pipe sections where isolated line failure has occurred due to settlement, corrosion, crushing or separation of joints.
- B. Engineer may identify potential locations for point repair, but Contractor is responsible for verifying locations.
- C. Engineer will authorize each point repair after failed points are located. Do not make point repairs without prior approval of Engineer.
- D. Replace carrier pipe for all point repairs unless otherwise directed by Engineer.
- E. Minimum length of pipe to be replaced shall be determined by the depth of sewer line as given in the following table. Measure depth from natural ground to flow line.

Depth of Sewer Line	Minimum Length of Replacement Pipe
0 to 10 feet	6 feet
10 to 15 feet	9 feet
Greater than 15 feet	12 feet

1.04 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Submit product data for each pipe product, fittings, and jointing material.
- C. Submit certified test results prepared by manufacturer for jointing material integrity.
- D. Submit alternative lining systems for ductile iron pipe for approval.

1.05 SEQUENCING

- A. Complete point repairs before rehabilitating sewer between adjacent manholes.
- B. Clean line and make closed-circuit television inspection for each point repair.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials for point repairs, other than those specified, may be considered for use in

rehabilitation of existing sewers.

- B. For consideration of other materials, submit complete manufacturer's data including material, sizes, flow carrying capacity, installation procedures and history of similar installations to Engineer for evaluation

2.02 PVC PIPE

- A. PVC sewer pipe and joints: 6 inch through 18-inch pipe conforming requirements of Section 02620.

2.03 DUCTILE IRON PIPE

- A. Ductile iron pipe: 4 inch thorough 48 inch, conforming to requirements of Section 02610.
- B. Fittings: Push-on end joint fittings with bell-and-spigot ends, with bell modified for push-on joint, conforming to requirements of Section 02610.
- C. Interior Coating: Conform to requirements of Section 02610 for sanitary sewers.
- D. Exterior coating: 8-mil polyethylene tubular material conforming to requirements of Section 02630.

2.04 REINFORCED CONCRETE PIPE

- A. Reinforced concrete pipe and joints: Conform to requirements of Section 02615. Reinforced concrete pipe may be used for sewers 24-inches in diameter and larger.

2.05 JOINTING MATERIALS

- A. Use Fernco adapters secured with 1/2-inch stainless steel bands, or approved equal.

PART 3 EXECUTION

3.01 PROTECTION

- A. Provide barricades and warning lights and signs, for excavations created by point repairs.
- B. Do not allow sand, debris or runoff to enter sewer system.

3.02 EXCAVATION

- A. Excavate trenches in accordance with Section 02227.

- B. Perform work in accordance with OSHA standards. Employ a Trench Safety System as specified in Section 01526 for excavations over 5 feet deep.
- C. Install and operate necessary dewatering and surface water control measures in accordance with requirements of Section 01563.

3.03 DIVERSION PUMPING

- A. Install and operate diversion pumping equipment to maintain sewage flow and to prevent backup or overflow. Obtain approval for diversion pumping equipment and procedures from Engineer.
- B. Design all piping, joints and accessories to withstand twice the maximum system pressure or 50 psi, whichever is greater.
- C. In the event of accidental spill or overflow, immediately stop the overflow and take action to clean up and disinfect spillage. Promptly notify Engineer so that required reporting can be made to the TCEQ and the Environmental Protection Agency.

3.04 TYPICAL SEQUENCE OF POINT REPAIR

- A. Survey, clean and televise to verify the location of point repair.
- B. Excavate to the minimum length of existing pipe to be replaced.
- C. Prior to replacing pipe, determine condition of the existing line on both sides of point repair by lamping the line a minimum of 10 feet in each direction. Determine whether additional lengths of line beyond "minimum length" criteria, need replacement. Report need for additional replacement to Engineer and obtain approval before proceeding.
- D. Remove and replace failed pipe and connect to existing pipe using Fernco couplings. If joints cannot be made watertight using Fernco adapters, place waterstop gaskets on each joint and encase in a reinforced concrete collar as indicated on the Drawings. Place concrete as specified in Section 03305. Reconnect affected service connections or stacks.
- E. Establish proper grade for the pipe being replaced using methods acceptable to Engineer.
- F. After completion of point repair, but prior to backfill, perform a smoke test in the presence of Engineer. Testing as specified in Section 02732. Repair and retest sections that fail.
- G. Encase exposed pipe in cement stabilized sand conforming to Section 02252 as indicated on Drawings.
- H. Backfill the excavation as specified in Section 02227.

Standard Specifications

POINT REPAIRS TO SANITARY SEWERS

-
- I. Replace pavement or sidewalks removed or damaged by excavation in accordance with Section 02571. In unpaved areas, bring surface to grade and slope surrounding the excavation. Replace a minimum of 4 inches of topsoil and seed area in accordance with Section 02932.
 - J. Perform a post-completion TV inspection as specified in Section 02732. Point repairs that have offset joints, non-uniform grade or alignment, or other unsatisfactory conditions, shall be rejected. Replace pipe and bedding as required when work is rejected.

3.05 ABANDONMENT OF POINT REPAIR

- A. If a pipe is exposed and found in good condition, not requiring a point repair, notify Engineer who will record abandonment of point repair.
- B. Backfill the excavation, replace pavement or sidewalk and repair and seed or sod unpaved areas, as specified in paragraph 3.04.

END OF SECTION

SECTION 02764

MANHOLE REHABILITATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Repair, rehabilitation, or replacement of deteriorated, leaking, or structurally unsound manholes and inlets.

1.02 UNIT PRICES

- A. Measurement for manhole wall sealing and bench repair is on a vertical foot basis to the nearest tenth of a foot, measured from first joint below castings to pipeinvert.
- B. Measurement for the installation of fiberglass manhole liner or concrete liner is on a vertical foot basis of manhole depth. Payment includes removal of corbel section and re-installation of the existing frame and cover for fiberglass systems and preparation and forming of benches and channels for both systems.
- C. Measurement for abandoned manholes and cleanouts is on a cubic yard basis for backfill material.
- D. Measurement for removal of manholes and cleanouts is on lump sum basis for removal when a new manhole is proposed for construction at that location.
- E. Measurement for sealing manhole frames using non-shrink grout or other sealing material is on a lump sum basis for each frame sealed.
- F. Measurement for watertight manhole casting covers and frame covers is on a lump sum basis for each installation.
- G. Measurement for manhole cover adjustment over one foot is on a linear foot basis, measured to the nearest tenth of a foot.
- H. Measurement for elevation adjustment of existing manholes is on a linear foot basis for the height the manhole cover is raised or lowered with a minimum of one foot allowed for each adjustment.
- I. Measurement for cement stabilized sand bedding is on a cubic yard basis.
- J. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 PERFORMANCE REQUIREMENTS

- A. Perform work needed to make manholes structurally sound, improve flow, prevent entrance of inflow or groundwater, prevent entrance of soil or debris, and provide protection against hydrogen sulfide gas attack.
- B. Manufacturer's Product Support.
 - 1. Through the Contractor, manufacturers of wall sealing or lining systems shall submit to Engineer for review and approval a detailed description of the proposed rehabilitation process. Describe surface preparation, independent laboratory test results, mix design procedures and method of controlling uniform thickness.
 - 2. A representative employed by the manufacturer and having technical training in admixture and concrete mix design shall be named and available for consultation by telephone during business hours and on site upon 48 hours notices.
 - 3. Manufacturer's representative on concrete lining systems shall provide technical assistance to concrete batch plant operators to ensure proper usage of dispensing equipment and accurate proportions of admixtures.

1.04 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Product Data: Submit product data, including surface preparation instructions and application instructions, from manufacturer of wall repair materials, hydraulic cements, quickset mortars, specialized sealants, and grouts.
- C. Installer Qualifications. Installers of liners and wall repair systems shall submit qualifications to Engineer at least 14 days prior to start of any material application. Submittal shall consist of:
 - 1. Manufacturer's approved equipment list, by name and model number for application of product and contractor's equipment list showing approved equipment available for use in product application.
 - 2. List of contractor's personnel who have satisfactorily completed manufacturer's training in product application within previous two years. Include date of certification for each person.

D. Progress Photographs:

1. After cleaning and sealing each manhole, submit 3" x 5" color photographs of manhole's interior walls for review by Engineer. Engineer may inspect the manhole before giving approval to begin lining.
2. After liner installation of each manhole, submit a minimum of three additional 3" x 5" color photographs to show final condition of rehabilitated manhole.
3. Provide photographs of sufficient quality and clarity so that interior condition can be readily determined by Engineer.
4. Annotate each photograph. Give date, manhole number, material used, and appropriate remarks on the back using permanent ink.

1.05 PROJECT CONDITIONS**A. Manholes Containing Mechanical or Electrical Equipment:**

1. Drawings may not show locations of flow monitoring equipment. If a manhole contains any mechanical hardware or electrical flow monitoring equipment immediately notify Engineer.
2. Reschedule work in such manholes until equipment has been removed by City and further instructions are given.
3. Do not subject manholes with mechanical hardware or electrical equipment to diversion/bypass pumping.
4. Damage to installed equipment, due to negligence of Contractor, will be repaired by City and cost of repairs charged to Contractor.

B. Field Location of Manholes, Cleanouts and Inlets:

1. Contractor is responsible for locating and uncovering all manholes and cleanouts in lines being rehabilitated. If difficulty is encountered in locating a manhole or cleanout covered by ground or pavement, notify Engineer and await instructions.
2. Manholes may be located within project limits which are not part of the system being rehabilitated. Properly identify manholes before starting cleaning and sealing operations.

1.06 SALVAGE

- A. Manhole covers and frames, inlet grates and frames, and adjusting rings from abandoned manholes and inlets remain the property of the City. Deliver salvaged items to locations designated by Engineer.

PART 2 PRODUCTS

2.01 WALL CLEANING MATERIAL

- A. High Pressure Water: 3500-psi minimum force.
- B. Cleaners: Detergent or muriatic acid capable of removing dirt, grease, oil and other matter which would prevent a good bond of sealing material to wall. Refer to sealing material manufacturer's recommendations.

2.02 WALL REPAIR MATERIALS

- A. Hydraulic Cements: Use a blend of cement powders or hydraulic cement to stop active leaks in the manhole structure.
- B. Quickset Mortar: Use a quickset mortar to repair wide cracks, holes or disintegrated mortar.

2.03 CONCRETE LINER

- A. Provide corrosion resistant concrete containing microsilica admixtures for use as a liner for manholes, as specified in Section 03305.
- B. Polypropylene fibers shall conform to requirements of Section 03240.

2.04 BENCH FORMING/REPAIR MATERIALS

- A. Use corrosion resistant concrete containing microsilica admixtures to repair and reform manhole benches and inverts, as specified in Section 03305.

2.05 FIBERGLASS LINER MATERIAL

- A. Provide a Flowtite Rehabilitation Manhole by Owens/Corning, or an approved equal, conforming to requirements of Section 02602.
- B. Provide manhole liners with corbel sections designed to fit standard City frame and cover.
- C. Supply sections of fiberglass reinforced pipe (FRP) to line adjustment rings. Provide FRP with a minimum diameter of 24-1/2 inches, stiffness of 36 psi, and wall thickness of 0.45 inches.

- D. Seal FRP liner pipe to casting and manhole liner using Baysilone 600 manufactured by Mobay Chemicals, or an approved equal.
- E. Seal fiberglass manhole liner at manhole base using Oakum soaked in sealing gel such as Scotchseal 5600 (Gel), or an approved equal.
- F. Grout: Use either of the following for grouting between manhole wall and fiberglass liner.
 - 1. Portland Cement, Type I; 5 sacks per cubic yard; water cement ratio of 0.5 or less.
 - 2. Halliburton LG-3 grouting system; 28-day compressive strength of 1500 psi.
 - 3. An approved equal.

2.06 MANHOLE COVER, FRAME AND INSERTS

- A. Provide new covers and frames with a minimum of three bolts and a gasket designed to seal cover to frame. Supply watertight manhole covers and frames, Model R-1916 manufactured by Neenah Foundry Company, or approval equal.
- B. Provide manhole inserts including new dish, gasket and relief valves. Select appropriate watertight inserts to fit walls and frames of manholes.
 - 1. Supply inserts as manufactured by Southwestern Packing and Seals, or an approved equal.
 - 2. Inserts shall be stamped with the words, "Property of (City's Name)".
 - 3. Provide a frame-to-manhole seal as manufactured by Cretex, or approved equal.

PART 3 EXECUTION

3.01 PROTECTION

- A. Provide barricades and warning lights and signs for excavations created by manhole or cleanout removal.
- B. Do not allow sand, debris or runoff to enter sewer system.

3.02 EXCAVATION

- A. Excavate in accordance with Section 02227.

- B. Perform work in accordance with OSHA standards. Employ a Trench Safety System as specified in Section 01526 for excavations over 5 feet deep.
- C. Install and operate necessary dewatering and surface water control measures in accordance with requirements of Section 01563.

3.03 DIVERSION PUMPING

- A. Install and operate diversion pumping equipment to maintain sewage flow and to prevent backup or overflow. Obtain approval for diversion pumping equipment and procedures from Engineer.
- B. Design all piping, joints and accessories to withstand twice the maximum system pressure or 50 psi, whichever is greater.
- C. In the event of accidental spill or overflow, immediately stop the overflow and take action to clean up and disinfect spillage. Promptly notify Engineer so that required reporting can be made to the TCEQ and Environmental Protection Agency.

3.04 CLEANOUT REMOVAL AND REPLACEMENT

- A. Replace removed cleanouts with Modified Type 3 manholes if the depth is less than 4 feet. For cleanouts greater than 4 feet, replace with Type 4 or Type 5 manhole, as applicable.

3.05 ABANDONMENT OF CLEANOUTS AND MANHOLES

- A. Abandon cleanouts or manholes designated on Drawing or as directed by the Engineer.
 - B. If a manhole is to be abandoned on a rehabilitated line, install a carrier pipe through the structure and fill manhole with cement stabilized sand, compacted to a level 2 feet above top of carrier pipe.
 - C. Fill remainder of manhole with selected backfill material to 2 feet below ground level.
 - D. Dismantle manhole including frame, to 2 feet below ground level. Fill void to existing ground level with select backfill material compacted to 95% Proctor Density.
 - E. If manhole to be abandoned is in a paved street, backfill manhole as described above with cement stabilized sand in lieu of select backfill material.

3.06 MANHOLE WALL CLEANING

- A. Clean floor and interior walls of manholes by removing all deleterious material, including dirt, grease, and other debris. Use high pressurewater, at a minimum force of

3,500 psi. If required, use detergent or muriatic acid to remove grease, oil, and other matter which would prevent a good bond between existing manhole wall and the approved repair materials.

- A. Preparation of the interior surfaces shall conform to requirements of the wall sealing material manufacturer.

3.07 MANHOLE WALL SEALING

- A. Seal active leaks in the manhole structure by using a blend of cement powder or hydraulic cement.
- B. Remove loose or defective wall material. Wipe or brush surface clean prior to the application of hydraulic cements.
- C. Drill weep holes at bottom of manhole walls to relieve hydrostatic pressure to stop leaks. Plug pressure relief holes after leaks are stopped using hydraulic cement materials. Lead wool may also be used to plug large leaks.
- D. Repair wide cracks, holes, or disintegrated mortar with quickset mortars. Follow manufacturer's application procedures.
- E. Reshape manhole inverts before wall sealing work. Apply concrete to cleaned manhole benches as specified in Section 03305.
- F. After all active leaks have been stopped, clean and prepare walls for application of selected liner material.
- G. Properly apply the sealing compound to provide the minimum required uniform coating to the wall surface.
- H. Prevent any foreign material from entering the adjoining pipes. Remove droppings of foreign and wall sealant materials before they harden on the bottom of the manhole.
- I. Strictly follow product manufacturer's published technical specifications and recommendations for surface preparation, application and proportioning.

3.08 CONCRETE LINER

- A. A manhole may be rehabilitated using a corrosion resistant, trowelled in place concrete liner. Provide concrete containing microsilica admixtures and polypropylene fibers and developing a compressive strength of 5000 psi as specified in Section 03305. Follow fiber manufacturer's recommended batching and mixing instructions, and recommended quantity of fiber to be added to concrete mix.

- B. Apply concrete liner to a thickness of one inch using a steel trowel to provide a smooth, even surface. Finish and cure concrete as specified in Section 03305.
- C. Concrete containing microsilica admixture and polypropylene fibers may be applied using shot-crete or gunite methods. Use steel trowel to provide a smooth, even surface before final set.

3.09 FIBERGLASS LINER

- A. A manhole may be rehabilitated using a fiberglass liner if existing manhole has a minimum 45-inch inside diameter and a depth of at least 4 feet.
- B. Clean manhole and remove corbel section until a 45-inch diameter opening is formed. Engineer may direct Contractor as to amount of corbel or wall to be removed. Do not to allow debris to fall into sewer lines.
- C. When calculating depth of a fiberglass manhole, allow for a minimum of 18-inches of adjustment rings to be placed between casting bottom and the manhole top. Set adjustment rings in approved grout or mortar.
- D. Cut the bottom of rehabilitation manhole to fit evenly on benches or chip benches out to evenly support base.
- E. Determine exact location of incoming and outgoing service lines in existing manhole and cut accurate openings for a close fit into manhole.
- F. Place the fiberglass liner manhole concentrically into the existing manhole with the openings aligned with existing sewers. Use spacer guides in annular space between existing and rehabilitation manhole. Seal openings with Oakum soaked in sealing gel.
- G. Use quickset hydraulic cement around inside base of the fiberglass manhole and inside the annular space for a depth of 6 inches.
- H. Fill the remaining annular space with grout after the hydraulic cement at the bottom has dried. Consolidate grout using a method approved by the Engineer.
- I. After the grout has set, install adjustment rings, FRP liner, frame and cover.
- J. Line rings using a one-piece fiberglass reinforced pipe (FRP). Seal pipe to casting and manhole with sealing compound. Grout annular space between the FRP and adjustment ring.

3.10 MANHOLE BENCHES

- A. Remove obstructions and loose materials from benches prior to shaping the invert. Form a smooth, U-shaped invert having a minimum depth of one-half pipe diameter and channel it across the floor of the manhole using a quickset mortar. Control flow to allow sufficient setting time for material used.
- B. Make finished benches smooth and without defects which would allow for accumulation of debris.

3.11 MANHOLE COVERS AND FRAMES

- A. Adjust manhole frames and covers found above or below grade and reset loose frames as specified in Section 02607. Make adjustments with concrete rings or approved materials. Set frames in a full bed of non-shrink grout as specified in Section 02607 and adjust to surrounding grade. In streets, set covers flush and smooth with pavement grades. Protect bottoms of manhole from debris or soil during adjustment.
- B. Install watertight manhole covers and frames at locations shown on the Drawings or as instructed by Engineer. Use new frames and covers.
- C. Install manhole inserts at locations shown on Drawings or as instructed by Engineer. Replace damaged or missing inserts identified prior to final inspection.
- D. For new sanitary sewer manholes subject to loading or differential movement at manhole frames, and for all rehabilitated manholes, install manhole chimney seals to prevent inflow between manhole frames and masonry chimneys. Refer to Section 02603.

3.12 FIELD QUALITY CONTROL

- A. Inform Engineer immediately if materials being used are not producing required results or need modification. Engineer has the right to stop use of any material at anytime.

3.13 INSPECTION

- A. After manhole wall sealing or manhole rehabilitation has been completed, visually inspect the manhole in the presence of Engineer. Check for cleanliness and for elimination of active leaks.
- B. At completion of manhole rehabilitation assist Engineer in verifying installation of minimum coating thickness of concrete liner. Test several points on the manhole wall. Repair verification points prior to final acceptance for payment.
- C. At completion of manhole rehabilitation, assist Engineer in inspection of installation, sealing and grouting of fiberglass liner.

3.14 TESTING

- A. Refer to Section 02732 for manhole testing requirements.
- B. A vacuum Manhole Tester, in lieu of exfiltration test, may be used if criteria and equipment are approved by Engineer.

3.15 BACKFILL

- A. Backfill and compact soil in area of excavation surrounding manholes in accordance with Section 02227.
- B. In unpaved areas, grade surface at a uniform slop of 1 to 5 from the manhole frame to natural grade. Provide a minimum of 4 inches of topsoil conforming to requirements of Section 02920 and either seed according to Section 02932 or sod according to Section 02935, as required.

END OF SECTION

SECTION 02765

CURED-IN-PLACE-PIPE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Provision and installment of Cured-In-Place Pipe (CIPP) for the rehabilitation of pipelines.

1.02 UNIT PRICES

- A. Measurement for CIPP of each specified thickness is on a linear foot basis, measured along the centerline of the pipe and between the centerline of adjacent manholes.
- B. The CIPP thickness established in these specifications and the depth of the sewer shall be the governing factor in making final payment.
- C. Payment for Pre-Installation Cleaning and Diversion Pumping shall be included under this section.
- D. Payment for Point Repairs shall be included with Section 02763 - Point Repairs to Sanitary Sewers.
- E. Payment for Obstruction Removal shall be included with Section 02763 - Point Repairs to Sanitary Sewers.
- F. Payment for Pre-Installation and Post-Installation Television Inspection shall be included with Section 02733 - Television Inspection.
- G. Payment for Manhole Rehabilitation shall be included with Section 02764 - Manhole Rehabilitation.
- H. Refer to Section 01025 - Measurement and Payment for unit price procedures.

1.03 PERFORMANCE REQUIREMENTS

- A. Rehabilitate deteriorated sewers by forming a tight-fitting CIPP within the existing sewer.
- B. The process generally consists of a flexible tube impregnated with an approved resin which is inserted into an existing sewer and cured with heat. Curing is accomplished by

circulating heated water or steam to effect the desired cure throughout the length of the tube extending full length from manhole-to-manhole.

- C. The CIPP, including flexible tube impregnated with a heat-cured resin, shall cure into a hard, impermeable pipe of the required thickness.
- D. The system shall produce a structurally sound, uniformly smooth interior with hydraulic flow equal to or greater than the existing sewer when in new condition.
- E. ASTM F1216 shall be the general guide for the materials and installation of the CIPP as modified by this specification. The City reserves the right to approve any material or installation practice which may differ from ASTM F1216.

1.04 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01300 - Submittals.
- B. Submit certified copies of test reports on physical and chemical properties of the resin and the flexible tube.
- C. Relevant information from the resin manufacturer shall include specifications, characteristics, properties, and methods of application. A written certification that the resin material complies with the required application, along with curing temperature, and duration of the temperature depending upon the sewer size and CIPP thickness shall be submitted. A blanket letter shall not be sufficient in case of varying CIPP thicknesses and lengths. This information shall be used during field inspection to verify that proper curing procedures are being followed.
- D. Submit certified copies of test reports on CIPP coupons obtained during installation.
- E. Submit results of additional product testing performed for quality control. Provide name, designation, and schedule for in-house testing of resin and liner material.
- F. Submit an analysis of design criteria and calculations for CIPP thickness.
- G. Submit a schedule for verification and inspection of the resin material at the "wet out" of the flexible tube. The inspection shall be at the discretion of the Engineer. Also submit the insertion and heating schedule/plan at least 24 hours in advance of installation.
- H. Submit copies of curing temperature/time log sheets in an approved format immediately after curing is complete.

1.05 QUALITY ASSURANCE

- A. ASTM F-1216 shall be the general guide for acceptable products and processes.
- B. Though the process may be licensed, the Contractor shall not change any material, design values, or procedures during the course of the Contract without the prior written approval of Engineer.
- C. The CIPP supplier shall maintain a filing/retrieval system to store certification statements from producers of resin and flexible tubes.
- D. Resins shall be tested upon arrival from the manufacturer before being placed in stock.

PART 2 PRODUCTS

2.01 SUPPLIERS

- A. Suppliers of the cured-in-place pipe (CIPP) shall be preapproved by the City. Alternative suppliers shall not be considered by prequalification during bidding or substitution during construction.
- B. Preapproved suppliers of CIPP are:
 - 1. Inliner
 - 2. Insituform
 - 3. Paltem
 - 4. Phoenix

2.02 MATERIALS

- A. Flexible Tube
 - 1. The flexible tube shall be manufactured and fabricated under quality-controlled conditions set by the process manufacturer. Tubes shall be sized so that, when installed, a tube will snugly fit the internal circumference of the existing sewer and produce the required thickness when the liquid thermosetting resin is cured.
 - 2. The minimum length of the flexible tube shall be as necessary to effectively and fully span the actual field distance between manholes, with extra allowance as needed for proper stretching or shrinkage due to pressure or expansion. Include a sufficient amount of material to provide for lateral servicecuttings.
- B. Resin

1. The liquid thermosetting resin used to impregnate the tube shall produce a properly cured tube which shall be resistant to abrasion due to solids, grit, and sand. The cured tube shall also be resistant to corrosion due to acids and gases such as sulfuric acid, carbonic acid, hydrogen sulfide, methane, and carbon monoxide. The resin selected shall have proven resistance to municipal wastewater.
2. The resin system to be used shall be manufactured by approved company(ies) selected by the CIPP supplier. Only corrosion-resistant polyester and vinylester resins complying with the following requirements shall be used.
3. Polyester Resin. A resin created by reaction products between isophthalic/terathalic acid, maleic anhydride, and a glycol characterized by reactive unsaturation located along the molecular chain. This resin is compounded with a reactive styrene monomer and reacted together with initiators/promoters to produce crosslinked copolymer matrices.
4. Vinylester Resin. A resin created by reaction products of epoxy resins with methacrylic acid and characterized by reactive unsaturation located in terminal positions of the molecular chain. This resin is compounded with a reactive styrene monomer and reacted together with initiators/promoters to produce crosslinked copolymer matrices.
5. The corrosion resistance of the resin system selected shall be tested by the resin manufacturer in accordance with ASTM C581. Exposure to the chemical solution listed below shall result in a loss of not more than twenty percent of the initial physical properties when tested in accordance with ASTM C581 for a period of not less than one year. For applications other than municipal wastewater, chemical resistance tests shall be conducted with actual samples of the fluid flowing in the pipe and in accordance with procedures approved by the Engineer.

CHEMICAL SOLUTION	CONCENTRATION, %
Tap Water (pH 6-9)	100
Nitric Acid	5
Phosphoric Acid	10
Sulfuric Acid	10

Gasoline	100
Vegetable Oil	100
Detergent	0.1
Soap	0.1

C CIPP Properties

- The installed CIPP after curing shall meet the minimum structural properties listed below:

PROPERTY	REFERENCE	MINIMUM VALUE
Flexural Strength	ASTM D790	4,500 psi
Flexural Modulus of Elasticity	ASTM D790	250,000 psi

D. CIPP Thickness

- The installed CIPP after curing shall meet the minimum thickness specified in the following table. The minimum CIPP thickness has been rounded to the next highest multiple of 1.5 mm after adding an allowance of five percent for resin migration.

MINIMUM CIPP THICKNESS				
NOMINAL SEWER DIAMETER (INCHES)	PIPE INVERT DEPTH			
	Up to 10 feet (mm)	10 – 15 feet (mm)	15 – 20 feet (mm)	20 – 25 feet (mm)
6	4.5	4.5	4.5	-
8	6.0	6.0	6.0	-
10	6.0	6.0	7.5	-
12	6.0	7.5	9.0	-
15	7.5	9.0	10.5	
18	9.0	12.0	13.5	

Standard Specifications

CURED-IN-PLACE-PIPE

21	10.5	13.5	15.0	
24	12.0	15.0	16.5	
30	15.0	18.0	21.0	
36	16.5	21.0	24.0	
42	19.5	24.0	28.5	
48	22.5	28.5	33.0	
54	25.5	30.0	36.0	

2. The minimum thickness for the installed CIPP after curing has been calculated based on the following design conditions:
 - a. The existing sewer is considered fully deteriorated.
 - b. The existing sewer is considered to have an ovality of 2 percent in circumference.
 - c. The CIPP is subjected to a full soil load of 120 pounds per cubic foot.
 - d. The CIPP is subjected to traffic line loads as calculated by AASHTO Standard Specifications for Highway Bridges, HS-20-44 Highway Loading.
 - e. The modulus of soil reaction for pipe zone backfill material is 700 psi.
 - f. The CIPP is subject to a groundwater elevation 5 feet below the ground surface.
 - g. The long-term flexural strength and long-term flexural modulus of elasticity for CIPP is equivalent to 50 percent of the initial flexural strength and initial flexural modulus of elasticity, respectively, as measured in accordance with ASTM D790.
 - h. The maximum deflection is 5 percent in the vertical axis.
 - i. The minimum overall factor of safety is 2.0.
3. Bidders shall review the table of CIPP thickness for correctness and, if disagreeing that the minimum CIPP thickness indicated is adequate to meet the design criteria, shall so advise the Engineer. If any modifications to increase CIPP thickness are required, the Engineer will issue such modifications by an addendum.
4. The thickness of the CIPP shall be within minus 5% and plus 10% of the minimum

thickness. Thickness greater than required shall not be allowed if hydraulic capacity of the pipe is reduced. The required thickness shall be measured accurately using properly calibrated calipers.

PART 3 EXECUTION

3.01 PREPARATION

- A. Inform the Engineer of work schedules for CIPP installation.
- B. Conduct operations in accordance with applicable OSHA standards, including those safety requirements involving work on an elevated platform and entry into a confined space. Make suitable precautions to eliminate hazards to personnel near construction activities when pressurized air is being used.

3.02 PRE-INSTALLATION CLEANING AND INSPECTION

- A. Rewash and reclean existing sewer, as necessary, immediately before pre-installation television inspection.
- B. Perform a television inspection immediately before installation of the resin impregnated flexible tube. Verify that sewer is clean and pipe conditions are as anticipated.

3.03 OBSTRUCTION REMOVAL AND POINT REPAIR

- A. Complete point repairs and remove obstructions such as roots, rocks, or other debris prior to CIPP installation.
- B. Refer to Section 02763 for point repairs.
- C. Obstruction removal may be affected as a point repair or by use of a remote device. For removal by remote device, obtain prior approval of the Engineer.
- D. To remove obstructions by remote device, use a solid steel mandrel or porcupine mandrels winched from one manhole to another. Use mandrels of adequate size to remove obstructions encountered. Use of bucket machines to break obstruction is acceptable if no damage to sewer pipe is caused.

3.04 DIVERSION PUMPING

- A. Install and operate diversion pumping equipment to maintain sewage flow and to prevent backup or overflow. Obtain approval for diversion pumping equipment and procedures from the Engineer.
- B. Design all piping, joints, and accessories to withstand twice the maximum system pressure or 50 psi, whichever is greater.

- C. In the event of accidental spill or overflow, immediately stop the overflow and take action to clean up and disinfect spillage. Promptly notify the Engineer so that required reporting can be made to the Texas Commission on Environmental Quality and Environmental Protection Agency.

3.05 ACCESS PITS

- A. Use excavations at point repair locations as access pits when feasible.
- B. Before excavating check with utility companies and determine the location of utilities in the vicinity of the work area. Arrange for temporary construction easements and rights-of-way. Damage done to utilities and the resulting repair, temporary service cost, etc., shall be borne by the Contractor.
- C. Perform excavation and backfill in accordance with requirements of Section 02161 and Section 02227.
- D. Perform work in accordance with OSHA standards. Employ a Trench Safety System as specified in Section 01526 for excavations over 5 feet deep.
- E. Install and operate necessary dewatering and surface water control measures in accordance with requirements of Section 01563.

3.06 INSTALLATION PROCEDURES

- A. Wet Out: Designate a location where the flexible tube will be impregnated or wet out with resin. Thoroughly saturate flexible tube prior to installation. A catalyst system, or additive compatible with the resin and flexible tube, may be used as recommended by the manufacturer and with approval of the Engineer. Handle the resin impregnated flexible tube to retard or prevent resin setting until it is ready for insertion.
- B. Insertion:
 - 1. Insert flexible tube through an existing manhole by means of an Inversion Procedure or Pulled-In Procedure. Connect tube ends by an attachment so that a leak-proof seal is created.
 - 2. Using the "Inversion Procedure", the flexible tube end shall initially be turned inside out and attached to a platform ring, standpipe, or as approved. The addition of water, air, or steam pressure will be adjusted to sufficient height or pressure to cause the impregnated flexible tube to invert from manhole to manhole and hold the tube tight against the existing sewer.
 - 3. Using the "Pulled-In Procedure", a calibration hose shall initially be turned inside out and attached to a platform ring, standpipe, or as approved. The addition of water, air, or steam pressure will be adjusted to sufficient height or pressure to cause the

calibration hose to invert from manhole-to-manhole, and hold the tube tight against the existing sewer.

C. Curing

1. After insertion is completed, apply a suitable heat source with a water or steam recirculation system capable of delivering hot water or steam uniformly throughout the section to achieve a consistent cure of the resin. Curing temperature shall be as recommended by the resin/catalyst system manufacturer.
2. The heat source shall be fitted with suitable monitors to gauge the temperature of incoming and outgoing water or steam supply. Another such gauge shall be placed between impregnated tube and invert of the original pipe at the manholes to monitor outside liner temperatures during resin curing process.
3. Heating shall continue uninterrupted until the desired temperature is achieved. Temperatures shall be measured at both ends by accurate measuring devices. The initials of the Engineer shall be obtained on curing logs if the Engineer is present at the site. Initial cure may be considered completed when exposed portions of the flexible tube pipe take a hard set and temperatures are adequate, as recommended by the resin/catalyst system manufacturer, and approved by the Engineer.

D. Cool Down: Cool the CIPP to a temperature below 110 degrees F before relieving water column or internal pressure. Cool water may be added to the water column while draining hot water from the opposite end of the CIPP, so that a constant water column height or constant internal pressure is maintained until cool-down is completed. Do not release water column or internal pressure in a way that creates a vacuum and damages the CIPP.

E. Copies of curing temperature/time log sheet in approved format shall be submitted to the Engineer immediately after curing is completed. Attach log sheets to daily construction report.

F. Finished Pipe: The finished CIPP shall be continuous and free as commercially practicable from visual defects such as foreign inclusions, dry spots, pinholes, and delamination. Finished CIPP shall also meet leakage or pressure test requirements.

3.07 MANHOLES

A. The CIPP shall make a tight seal at the manhole opening with no annular gaps. Under all circumstances, a 1/2-inch-diameter activated Oakum band soaked in sealant shall be applied all around for an approved seal. Any annular spaces greater than 1/2-inch shall be sealed and then covered with a cementitious mortar. Complete the sealing procedure before proceeding to the next CIPP segment.

B. Reshape and smooth the manhole invert as specified in Section 02764.

C. Use cementitious grout to form a smooth transition with a reshaped invert and a raised

manhole bench to eliminate sharp edges of CIPP, concrete bench, and channeled invert. Build up and smooth invert of manhole to match flow line of new CIPP.

3.08 SERVICE CONNECTIONS

- A. For making service reconnections, conform to requirements of Section 02762.
- B. Service reconnection may be made by remote-operated cutting tool or by excavation and mechanical connection.

3.09 FIELD QUALITY CONTROL

- A. Exotherm tests shall be performed on the resins prior to wet out of the flexible tube.
- B. A document shall be prepared during wet out of each CIPP segment showing information such as resin lot numbers, volumes of resin, and catalyst used. The document shall be arranged such that each critical step in the wet out process is checked off and initialized.
- C. Charts and/or graphs of the CIPP temperatures at the upstream and downstream manholes shall be made during the curing process to document that proper temperatures and cure times have been achieved.
- D. Low pressure air test before each CIPP segment has been sealed in place at the manholes and before any service reconnections have been made. Check integrity of joints that have been made and verify that the CIPP has not been damaged by inserting it into the sewer.
- E. Service lateral connection test after all service laterals have been completed for a particular sewer section. Verify integrity of connections at points where they join the CIPP and existing service lines. Refer to Section 02732 for applicable test procedures.
- F. Whenever required by the Engineer, a short section of pipe similar to the existing sewer shall be placed in the manhole to install the CIPP under restrained conditions. This pipe section will be used to obtain samples for testing. All samples shall be labeled before shipment for testing. Provide a duplicate sample to the Engineer for inspection and/or testing by an independent laboratory, if requested.

3.10 POST-TELEVISION OF COMPLETED WORK

- A. Provide a quality color VHS videotape at standard play showing completed Work including condition of restored connections prior to requesting payment. Refer to Section 02732.
- B. Correction of failed CIPP or CIPP deemed unacceptable, as a result of post-television inspection or test reports for structural values, thickness, etc., shall be repaired at no extra cost to the City. Method of repair, which may require field or workshop demonstration, shall be approved by the Engineer.

3.11 FINAL CLEANUP

- A. Upon completion of installation work and testing, clean and restore project area affected by the Work, including removal and replacement of fences, damage to yards, lawns, sidewalks, and driveways due to movement of trucks and erection of equipment.
- B. Replace pavement or sidewalks removed or damaged by operations in accordance with Section 02571.
- C. In unpaved areas, bring surface to grade and slope of area surrounding disturbed portion. Replace a minimum of 4 inches of topsoil and seed the area in accordance with Section 02933 or sod the area in accordance with Section 02935, as required.

END OF SECTION

SECTION 02769

OBSTRUCTION REMOVAL

PART 1 GENERAL

1.01 SECTION INCLUDES

This section includes clearing the sewer main from obstructions by one for the following methods:

- A. Obstruction removal by remote device
 - 1. To remove protruding taps (service lines that protrude greater than 1-inch into the sewer)
 - 2. To remove other obstructions
- B. Obstruction removal by excavation

1.02 UNIT PRICES

- A. Obstruction removal by excavation will be paid per bid item. Depth is measured from the ground level to the flow line of the sanitary sewer main at the point of the obstruction removal. The payment for an obstruction removal shall be made when the Contractor has cleared the obstruction from the sewer main to be lined as directed by the Engineer. The unit price for obstruction removal by excavation shall include a minimum length six(6) feet for all pipe sizes and depths. The depth ranges indicated in the bid proposal for the minimum length of pipe removed by obstruction removal by excavation is 0 to 5-feet deep, 6-feet to 10-feet deep, 11-feet to 15-feet deep and over 15-feet deep. In the event the section of pipe removed is greater than the minimum length (6-feet), payment for additional footage of pipe shall be paid for as per the bid item "Extra Length Obstruction Removal" per linear foot for all pipe sizes, and depths.
- B. Obstruction removal by remote device shall be paid per bid item. Obstruction removal by remote device for protruding taps shall be paid per bid item for each protruding tap removed. Obstruction removal by remote for other obstructions shall be paid per bid item for each setup. A setup consists of one or more manhole section up to a continuous length of 800-feet provided that one or more removals are accomplished in each setup.
- C. Any cleaning of sanitary sewer due to broken pipe, roots, dirt, and loose deposits, etc. will be incidental to obstruction removal by both methods. If any TV inspection is involved, it will be incidental.

- D. Removal and legal disposal of hard deposits, concrete, debris, pipes or any other material in the manhole or that is within outside wall of the manhole wall will be incidental to the rehabilitation of sanitary sewer pipes and manholes.
- E. Any bypass pumping associated with obstruction removal shall be considered incidental to the cost of the liner.
- F. When extra length for obstruction removal by excavation occurs under pavement, the pavement removal and replacement and cement stabilized sand backfill shall be incidental.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 OBSTRUCTION REMOVAL BY REMOTE DEVICE

- A. This method of obstruction removal shall be performed prior to rehabilitation. When a T.V. tape of televised sanitary line identifies an obstruction which could cause a non-uniform liner pipe or obstruction during installation of the liner, it shall be removed. The Contractor shall ask the Engineer for approval of obstruction removal with a remote device using one of the following:
 - B. To remove protruding taps prior to the rehabilitating with a liner, a power driven cutting device shall be utilized. The protruding tap shall be cut so that the protrusion is no greater than 1/8-inch. In the event damage to the existing sewer line or service line occurs, a repair shall be done at the Contractor's expense and only a payment for the remote obstruction removal will be made. If the Contractor is unable to remove the protruding tap by this means, then a point repair may be performed at the Engineer's direction.
 - C. To remove other obstructions, such as hanging gaskets, fixed debris, stabilized sand, hardened mineral deposits (includes tuberculation in cast or ductile iron pipes), heavy roots, etc., a remote device shall be utilized. The device(s) shall be pulled or driven from manhole to manhole up to a continuous length of 800-feet using a solid steel mandrel, porcupine, root saw, bucket, etc. to remove the obstruction. The device shall be adequately sized to remove the obstruction to the satisfaction of the Engineer. Damage to the existing sewer line, service line or tap must be repaired by the Contractor and only a payment for remote obstruction removal will be made. The mechanical cleaning method, as described in Section 02791, may be used to remove the obstruction when approved by the Engineer. No separate payment shall be made for utilizing mechanical cleaning method to remove the obstructions. The Contractor shall be paid at the bid unit price for performing obstruction removal (other) irrespective of the method utilized to remove obstruction. Damage to the existing sewer line, service line or tap must be repaired by the Contractor at his expense. The cleaning of the pipe in preparation for rehabilitation is not considered obstruction removal.

3.02 OBSTRUCTION REMOVAL BY EXCAVATION

- A. This method of obstruction removal shall be performed while installing the liner in sanitary sewer. If during the liner insertion operation, a collapsed sewer, off-set joint, or other obstruction is encountered which prevents or blocks the passage or insertion of any liner involved in the rehabilitation process, the Contractor shall notify the Engineer for approval to make an excavation to uncover and remove the obstruction in the following manner:
1. Excavate at the point where there is an obstruction. A trench safety system shall be required for all excavations over 5-feet deep.
 2. Break out the existing sanitary sewer pipe (carrier pipe), etc., as directed by the Engineer. Remove only that amount of material which is causing the obstruction. The amount of "carrier pipe" to be removed shall be minimized. The minimum length of pipe to be removed shall be six(6) feet for all depths.
 3. When the liner is completely in place, it shall be encased with cement stabilized sand as per Class "AA" modified bedding.
 4. When obstruction removal by excavation occurs under a paved area, then backfill shall be cement stabilized sand.
- B. Under such conditions, replacement of the carrier pipe is not required. The existing sewer bedding should not be disturbed by the excavation work. However, if said bedding is disturbed during the obstruction removal procedure, the Contractor shall place cement stabilized sand beneath the liner; the minimum compacted thickness shall be 12-inches.

END OF SECTION

SECTION 02790

DIVERSION PUMPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Use of by-pass pumping to prevent surcharging and maintain un-interrupted flow through sewage collection system while allowing Contractor to provide reliable sewer service to the sanitary sewer users at all times and to isolate sewer line manholes and/or sewer line segments designated for cleaning, rehabilitation, and television inspection operations. Includes installation and operation of bulkheads, plugs, hoses, piping and pumps to maintain sewage flow and prevent backup and overflow.

1.02 UNIT PRICES

- A. No separate payment for work performed under this item, unless stated in the bid proposal. Include cost of same in contract price bid for items of work which it is a component.

PART 2 MATERIALS

2.01 PUMPS

- A. Use electrically powered pumps having a minimum pumping capacity as required.

2.02 PIPING, JOINTS AND ACCESSORIES

- A. All piping, joints and accessories shall be designed to withstand at least twice the maximum system pressure or a minimum of 50 psi which ever is greater and be leak free.

PART 3 EXECUTION

3.01 PROCEDURES AND METHODS

- A. Prior to beginning sewer cleaning, rehabilitation and television inspection operations demonstrate pumping system is in good working order.
- B. Prior to isolating sewer manhole and/or line segment for beginning work have all materials, equipment and labor necessary to complete sewer on job site.
- C. Locate pumping suction and discharge lines so as not to cause undue interference with the use of streets, private driveways entrances or residences.
- D. All piping, joints and accessories shall be designed to withstand at least twice the maximum system pressure or a minimum of 50 psi whichever is greater.

- E. Plug off and pump down sewer manhole or line segment in designated area. Maintain sanitary sewer system so that surcharging does not occur.
- F. Complete sewer cleaning, rehabilitation and television inspection operations as quickly as possible.
- G. An experienced operator shall be on site at all times to monitor the operation, adjust pump speed, valves, etc.
- H. Furnish all labor, materials, supervision and equipment necessary for maintaining the pumping system in continuous proper working order for the duration of cleaning, rehabilitation and television inspection operations. Obtain approval of discharge location for diversion pumping system prior to commencing work. Under no condition will raw sewage be allowed to discharge in open ditches, streets or storm sewer systems nor in any way that would create unsanitary conditions or interfere unduly with the use of streets, private driveways entrances or residences. Whenever flows in a sewer line are blocked, plugged or bypassed, sufficient precautions must be taken to protect the sewer lines from damage. Ensure that sewer line cleaning, rehabilitation and television inspection and/or by-pass operations do not cause flooding or damage to public or private property being served by the sewer lines involved in the repair. The Contractor is responsible for having additional stand by pumps in the event of failure of any pumps.
- I. In the event sewage accidentally drains into the drainage system or street, the Contractor shall immediately stop the overflow, notify the Engineer and cleanup and disinfect the spillage to the satisfaction of the Engineer.
 - 1. In the event the sewage is spilled onto public or private property, the Contractor shall wash down, clean up and disinfect the spillage to the private City's/Engineer's satisfaction.
 - 2. Overflow/spillage shall be reported to the Texas Commission on Environmental Quality (TCEQ) and the Environmental Protection Agency (EPA) by the Contractor within 24 hours.
- J. When diversion pumping operations are complete, piping shall be drained into the sanitary sewer prior to disassembly.

END OF SECTION

SECTION 02920

TOPSOIL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnishing and placing topsoil for finish grading and for seeding, sodding and planting.

1.02 UNIT PRICES

- A. No separate payment will be made for work performed under this section. Include the cost of such work for restoration of the existing vegetation in unit cost for utility and paving items in the Bid Proposal.

PART 2 PRODUCTS

2.01 TOPSOIL

- A. Topsoil shall be fertile, friable, natural sandy loam surface soil obtained from excavation or borrow operations having the following characteristics:
 - 1. pH value of between 5.5 and 6.5.
 - 2. Liquid limit: topsoil not exceed 50
 - 3. Plasticity index: 10 or less.
 - 4. Gradation: maximum of 40 percent with a passing the #280 sieve.
- B. Topsoil shall be reasonably free of subsoil, clay lumps, weeds, non-soil materials and other litter or contamination. Topsoil shall not contain roots, stumps, and stones larger than 2 inches.
- C. Obtain topsoil from naturally well-drained areas where topsoil occurs at a minimum depth of 4 inches and has similar characteristics to that found at the placement site. Do not obtain topsoil from areas infected with a growth of, or reproductive parts of nut grass or other noxious weeds.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavation and embankment operations have been completed to correct lines and grades.

3.02 TOPSOIL EXCAVATION

- A. Conform to excavation and stockpiling requirements of section 02227 – Excavation and Backfill for Utilities.

3.03 PLACEMENT

- A. For areas to be seeded or sodded, scarify or plow existing material to a minimum depth of 4 inches. Remove any vegetation and foreign inorganic material. Place 4 inches of topsoil on the loosened material and roll lightly with an appropriate lawn roller to consolidate the topsoil.
- B. Increase depth of topsoil to 6 inches when placed over sand bedding and backfill materials specified in Section 02229 - Utility Backfill Materials.
- C. For areas to receive bushes or trees, excavate existing material and place topsoil to the depth and dimensions as specified in Section 01535 – Tree and Plant Protection.
- D. Remove spilled topsoil from curbs, gutters, and, paved areas and dispose of excess topsoil in accordance with requirements of Section 01564 - Waste Material Disposal.

3.04 PROTECTION

- A. Protect topsoil from wind and water erosion until planting is completed.

END OF SECTION

SECTION 02935

SODDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Restoration of existing lawn areas disturbed by construction shall be by installation of new sod.
- B. Sod is defined as blocks, squares, strips of turf grass, and adhering soil used for vegetative planting. To be placed edge to edge for complete coverage.
- C. Lawn is defined as ground covered with fine textured grass kept neatly mowed.

1.02 UNIT PRICES

- A. No separate payment will be made for work performed under this section unless included as a bid item on the Bid Form. Include the cost of such work for restoration of the existing sod or lawn areas in unit cost for utility and paving items in the Bid Proposal.

1.03 SUBMITTALS

- A. Submittals shall conform to the requirements of Section 01300 - Submittals.

1.04 QUALITY ASSURANCE

- A. Perform sodding only when weather and soil conditions are deemed by Project Engineer to be suitable for proper placement.
- B. Water and fertilize new sod.
- C. Guarantee sod to be growing 30 days after completion.
- D. Maintenance Period:
 - 1. Begin maintenance immediately after each section of grass sod is installed and continue for a 30-day period from date of substantial completion.
 - 2. Resod unacceptable areas.

-
- 3. Water, fertilize, control disease and insect pests, mow, edge, replace unacceptable materials, and perform other procedures consistent with good horticultural practice to ensure normal, vigorous and healthy growth. All disease control shall be installed within guidelines set forth by the Structural Pest Control Board of the State of Texas.
 - E. Notify Engineer 10 days before end of maintenance period for inspection.
- PART 2 PRODUCTS
- 2.01 SOD
- A. Species: Bermuda (Cynodon Dactylon), Buffalo (Buchloe Dactyloides), or St. Augustine.
 - B. Contents: 95 percent permanent grass suitable to climate in which it is to be placed; not more than 5 percent weeds and undesirable grasses; good texture, free from obnoxious grasses, roots, stones and foreign materials. Block sod is usually a 16" x 16" square.
 - C. Size: 16 inch wide strips, uniformly 2 inches thick with clean-cut edges.
 - D. Sod is to be supplied and maintained in a healthy condition as evidenced by the grass being a normal green color.
- 2.02 FERTILIZER
- A. Available nutrient percentage by weight: 12 percent nitrogen, 4 percent phosphoric acid, and 8 percent potash; or 15 percent nitrogen, 5 percent phosphoric acid, and 10 percent potash.
- 2.03 WEED AND INSECT TREATMENT
- A. Provide acceptable treatment to protect sod from weed and insect infestation. Submit treatment method to the Engineer for approval. All insect and disease control shall be installed within guidelines set forth by the Structural Pest Control Board of the State of Texas.
- 2.04 WATER
- A. Potable, available on-site through Contractor's water trucks. Do not use private resident's water.
- 2.05 BANK SAND
- A. Free of clay lumps, roots, grass, salt or other foreign material.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify that topsoil placement and compaction has been satisfactorily completed. Verify that soil is within allowable range of moisture content.
- B. Topsoil shall be free of weeds and foreign material immediately before sodding.
- C. Do not start work until conditions are satisfactory. Do not start work during inclement or impending inclement weather.
- D. Rake areas to be sodded smooth, free from unsightly variations, bumps, ridges or depressions.
- E. Spread 2-inch layer of bank sand over areas to be sodded prior to planting of sod.
- F. Apply fertilizer at a rate of 25 lbs/1000 SF. Apply after raking soil surface and not more than 48 hours prior to laying sod. Mix thoroughly into upper 2 inches of soil. Lightly water to aid in dissipation of fertilizer.

3.02 APPLICATION

- A. Lay sod with closely fitted joints leaving no voids and with ends of sod strips staggered. Sod shall be laid within 24 hours of harvesting.
- B. After sod is laid, irrigate thoroughly to secure 6-inch minimum penetration into soil below sod.
- C. Tamp and roll sod with approved equipment to eliminate minor irregularities and to form close contact with soil bed immediately after planting and watering. Submit type of tamping and rolling equipment to be used to the Engineer for approval, prior to construction.

3.03 MAINTENANCE

- A. Watering:
 - 1. Water lawn areas once a day with minimum 1/2 inch water for the first 3 weeks after area is sodded.
 - 2. After 3-week period, water twice a week with 3/4 inch of water each time unless comparable amount has been provided by rain.

3. Make weekly inspections to determine moisture content of soil unless soil is in frozen condition.
 4. Water in the morning to enable soil to absorb maximum amount of water with minimum evaporation.
- B. Mowing:
1. Mow sod at intervals which will keep grass height from exceeding 3-1/2 inches.
 2. Set mower blades at 2-1/2 inches.
 3. Not remove more than one-half of grass leaf surface.
 4. Sodded areas requiring mowing within 1 month after installation, shall be mowed with a light-weight rotary type mower. The sod shall be mowed only when dry and not in a saturated or soft condition.
 5. Remove grass clippings during or immediately after mowing.
- C. Fertilizer and Pest Control:
1. Evenly spread fertilizer composite at a rate of 40 pounds per 5,000 square feet or as recommended by manufacturer. Fertilizer shall not be placed until 2 weeks after placement of sod.
 2. Restore bare or thin areas by topdressing with a mix of 50 percent sharp sand and 50 percent sphagnum peat moss.
 3. Apply mixture 1/4 to 1/2 inch thick.
 4. Treat areas of heavy weed and insect infestation as recommended by treatment manufacturer.

3.04 CLEANUP

- A. During course of planting, remove excess and waste materials; keep lawn areas clean and take precautions to avoid damage to existing structures, plants, grass and streets.
- B. Remove barriers, signs and all other Contractor material and equipment from project site at termination of establishment period.

END OF SECTION

SECTION 03305

CONCRETE FOR UTILITY CONSTRUCTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cast-in-place concrete work for utility construction or rehabilitation, such as slabs on grade, small vaults, site-cast bases for precast units, cast-in-place manholes, inlets, headwalls and miscellaneous small structures.

1.02 UNIT PRICES

- A. No payment will be made for concrete for utility construction under this Section unless specifically noted in bid documents. Include payment in applicable utility structure section.
- B. Obtain the services of and pay for a certified testing laboratory to prepare design mixes.

1.03 SUBMITTALS

- A. Conform to Section 01300 - Submittals.
- B. Submit proposed mix design and test data for each type and strength of concrete in the Work.
- C. Submit laboratory reports prepared by an independent testing laboratory stating that materials used comply with the requirements of this Section.
- D. Submit manufacturer's mill certificates for reinforcing steel. Provide specimens for testing when required by the Engineer.
- E. Submit certification from concrete supplier that materials and equipment used to produce and deliver concrete comply with this Specification.
- F. When required on Drawings, submit shop drawings showing reinforcement type, quantity, size, length, location, spacing, bending, splicing, support, fabrication details and other pertinent information.
- G. For waterstops, submit product information sufficient to indicate compliance with specifications, including manufacturer's descriptive literature and specifications, when required on Drawings.

1.04 HANDLING AND STORAGE

- A. Cement: Store cement off of the ground in a well-ventilated weatherproof building.
- B. Aggregate: Prevent mixture of foreign materials with aggregate and preserve gradation of aggregate.
- C. Reinforcing Steel: Store reinforcing steel to protect it from mechanical injury and formation of rust. Protect epoxy-coated steel from damage to the coating.

PART 2 PRODUCTS**2.01 CONCRETE MATERIALS**

- A. Cementitious Material:
 - 1. Portland Cement: ASTM C150, Type II, unless the use of Type III is authorized by the Engineer; or ASTM C595, 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 the form of $\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$.
- B. Water: Clean, free from harmful amounts of oils, acids, alkalis or other deleterious substances, and meeting requirements of ASTM C94.
- C. Aggregate:
 - 1. Coarse Aggregate: ASTM C33. Unless otherwise indicated, use the following ASTM standard sizes: No. 357 or No. 467; No. 57 or No. 67, No. 7. Maximum size: Not larger than 1/5 of the narrowest dimension between sides of forms, nor larger than 3/4 of minimum clear spacing between reinforcing bars.
 - 2. Fine Aggregate: ASTM C33.
 - 3. Determine the potential reactivity of fine and coarse aggregate in accordance with the Appendix to ASTM C33.
- D. Air Entraining Admixtures: ASTM C260.
- E. Chemical Admixtures:
 - 1. Water Reducers: ASTM C494, Type A.
 - 2. Water Reducing Retarders: ASTM 494, Type D.
 - 3. High Range Water Reducers (Superplasticizers): ASTM C494, 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 A615, ASTM A767, or ASTM A775, 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 A185 or ASTM A884. Supply the gage 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 A82. Use 16-1/2 gage minimum for tie wire, unless otherwise indicated.
- H. Fiber:
 - 1. Polypropylene Fiber:
 - a. Ratio: 1.5 pounds of fiber per cubic yard of concrete.
 - b. Physical Properties:
 - (1). Material: Polypropylene.
 - (2). Length: 3/4 inch
 - (3). Specific Gravity: 0.9l.
 - (4). Absorption: None.
 - (5). Tensile Strength: 70-110 ksi.
 - (6). Modulus of Elasticity: 500 ksi.
 - (7). Melt Point: 140 degrees F (60 degrees C).
 - (8). Flash Point: 932 degrees F (500 degrees C).
 - (9). Density: 3 pounds/cubic yard.
 - c. Acceptable Manufacturer: W. R. Grace Company, Fibermesh, or approved equal.

1. Steel Fiber: Comply with applicable provisions of ACI 544 and ASTM A820.
 - d. Ratio: 50 to 200 pounds of fiber per cubic yard of concrete.
 - e. Physical Properties
 - (1). Material: Steel.
 - (2). Aspect Ratio (for fiber lengths of 0.5 to 2.5 inch, length divided by diameter or equivalent diameter): 30:1 to 100:1.
 - (3). Specific Gravity: 7.8.
 - (4). Tensile Strength: 40-400 ksi.
 - (5). Young's Modulus: 29,000 ksi.
 - (6). Minimum Average Tensile Strength: 50,000 psi.
 - (7). Bending Requirements: Withstand bending around 0.125-inch diameter mandrel to an angle of 90 degrees, at temperatures not less than 60 degrees F, without breaking.
- I. Curing Compounds: Type 2 white-pigmented liquid membrane-forming compounds conforming to ASTM C309.

2.02 FORMWORK MATERIALS

- A. Lumber and Plywood: Seasoned and of good quality, free from loose or unsound knots, knot holes, twists, shakes, decay and other imperfections which would affect strength or impair the finished surface of concrete. Use S4S lumber for facing or sheathing. Forms for bottoms of caps: At least 2-inch (nominal) lumber, or 3/4-inch form plywood backed adequately to prevent misalignment. General use: Provide lumber of 1-inch nominal thickness or form plywood of approved thickness.
- B. Formwork for Exposed Concrete Indicated to Receive Rubbed Finish: Form or form-lining surfaces free of irregularities; plywood of 1/4-inch minimum thickness, preferably oiled at the mill.
- C. Chamfer Strips and Similar Moldings: Redwood, cypress or pine that will not split when nailed and which can be maintained to true line. Use mill-cut molding dressed on all faces.
- D. Form Ties: Metal or fiberglass of approved type with tie holes not larger than 7/8 inch in diameter. Do not use wire ties or snap ties.

- E. Metal Forms: Clean and in good condition, free from dents and rust, grease or other foreign material that tend to disfigure or discolor concrete in a gage and condition capable of supporting concrete and construction loads without significant distortion. Countersink bolt and rivet heads on facing sides. Use only metal forms which present a smooth surface and which line up properly.

2.03 PRODUCTION METHODS

- A. Use either ready-mixed concrete conforming to requirements of ASTM C94, or concrete produced by volumetric batching and continuous mixing in accordance with ASTM C685.

2.04 MEASUREMENT OF MATERIALS

- A. Measure dry materials by weight, except volumetric proportioning may be used when concrete is batched and mixed in accordance with ASTM C685.
- B. Measure water and liquid admixtures by volume.

2.05 DESIGN MIX

- A. Use design mixes prepared by a certified testing laboratory in accordance with ASTM C1077 and conforming to requirements of this section.
- B. Proportion concrete materials based on ACI 211.1 to comply with durability and strength requirements of ACI 318, Chapters 4 and 5, and this specification. Prepare mix design of Class A concrete so minimum cementitious content is 564 pounds per cubic yard. Submit concrete mix designs to the Engineer for review.
- C. Proportioning on the basis of field experience or trial mixtures in accordance with the requirements at Section 5.3 of ACI 318 may be used, if approved by the Engineer.
- D. Classification:

<u>Class</u>	<u>Type</u>	Minimum Compressive Strength (Lbs/sq. in.)		Maximum W/C	Air Content (Percent)	Range in Slump (Inches)
		<u>7-Day</u>	<u>28-Day</u>			
A	Structural	3200	4000	0.45	4 1/2	2 to 4*
B	Pipe Block Fill, Thrust Block	----	2500	----	4 1/2	5 to 7

- * When ASTM C494, Type F or type G admixture is used to increase workability, this range may be 6 to 9.

- E. Add steel or polypropylene fibers only when called for on the Drawings or in another section of these Specifications.
- F. Determine air content in accordance with ASTM C138, ASTM C173 or ASTM C231.
- G. Use of Concrete Classes: Use classes of concrete as indicated on the drawings and other specifications. Use Class B for un-reinforced concrete used for plugging pipes, seal slabs, thrust blocks, trench dams, and concrete fill unless indicated otherwise. Use Class A for all other applications.

2.06 PVC WATERSTOPS

- A. Extrude from virgin polyvinyl chloride elastomer. Use no reclaimed or scrap material. Submit waterstop manufacturer's current test reports and manufacturer's written certification that the material furnished meets or exceeds Corps of Engineers Specification CRD-C572 and other specified requirements.
- B. Flat Strip and Center-Bulb Waterstops: As detailed, and as manufactured by: Kirkhill Rubber Co., Brea, California; Water Seals, Inc., Chicago, Illinois; Progress Unlimited, Inc., New York, New York; Greenstreak Plastic Products Co., St. Louis, Missouri; or equal acceptable to the Engineer, provided that at no place shall waterstop thickness be less than 3/8 inch.

2.07 RESILIENT WATERSTOP

- A. Resilient waterstop, where called for on the Drawings, shall be either a bentonite or adhesive type material.
- B. Bentonite Waterstop:
 - 1. Material: 75 percent bentonite, mixed with butyl rubber-hydrocarbon containing less than 1.0 percent volatile matter, and free of asbestos fibers or 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. Adhesive waterstop shall be at least 2 inches in diameter and shall be Synko- Flex preformed plastic adhesive waterstop by Synko-Flex Products, Inc., or equal. The waterstop shall meet or exceed requirements of Federal Specification SS-S-210A.
2. The adhesive waterstop shall be supplied wrapped completely by a two part protective paper.
3. The adhesive waterstop material shall have independent laboratory tests verifying that the material seals joints in concrete against leakage when subjected to a minimum of 30 psi water pressure for at least 72 hours.
4. Primer, to be used on hardened concrete surfaces, shall be provided by the same manufacturer as the waterstop material.

PART 3 EXECUTION**3.01 FORMS AND SHORING**

- A. Provide mortar-tight forms sufficient in strength to prevent bulging between supports. Set and maintain forms to lines designated such that finished dimensions of structures are within the tolerances specified in ACI 117. Construct forms to permit removal without damage to concrete. Forms may be given slight draft to permit ease of removal. Provide adequate cleanout openings. Before placing concrete, remove extraneous matter from within forms.
- B. Install rigid shoring having no excessive settlement or deformation. Use sound timber in shoring centering. Shim to adjust and tighten shoring with hardwood timber wedges.
- C. Design Loads for Horizontal Surfaces of Forms and Shoring: Minimum fluid pressure, 175 pounds per cubic foot; live load, 50 pounds per square foot. Maximum unit stresses: 125 percent of allowable stresses used for form materials and for design of support structures.
- D. Back formwork with a sufficient number of studs and wales to prevent deflection.
- E. Re-oil or lacquer the liner on the job before using. Facing may be constructed of 3/4-inch plywood made with waterproof adhesive backed by adequate studs and wales. In such cases, form lining will not be required.
- F. Unless otherwise indicated, form outside corners and edges with triangular 3/4-inch chamfer strips (measured on sides).
- G. Remove metal form ties to depth of at least 3/4 inch from surface of concrete. Do not burn off ties. Do not use pipe spreaders. Remove spreaders which are separate from forms as concrete is being placed.

- H. Treat facing of forms with approved form coating before concrete is placed. When directed by the Engineer, treat both sides of face forms with coating. Apply coating before reinforcement is placed. Immediately before the concrete is placed, wet surface of forms which will come in contact with concrete.

3.02 PLACING REINFORCEMENT

- A. Place reinforcing steel accurately in accordance with approved Drawings. Secure steel adequately in position in forms to prevent misalignment. Maintain reinforcing steel in place using approved concrete and hot-dip galvanized metal chairs and spacers. Place reinforcing steel in accordance with CRSI Publication "Placing Reinforcing Bars." Request inspection of reinforcing steel by the Engineer and obtain acceptance before concrete is placed.
- B. Minimum spacing center-to-center of parallel bars: 2-1/2 times nominal bar diameter. Minimum cover measured from surface of concrete to face of reinforcing bar unless shown otherwise on the Drawings: 3 inches for surfaces cast against soil or subgrade, 2 inches for other surfaces.
- C. Detail bars in accordance with ACI 315. Fabricate reinforcing steel in accordance with CRSI Publication MSP-1, "Manual of Standard Practice." Bend reinforcing steel to required shape while steel is cold. Excessive irregularities in bending will be cause for rejection.
- D. Do not splice bars without written approval of the Engineer. Approved bar bending schedules or placing drawings constitute written approval. Splice and development length of bars shall conform to ACI 318, Chapters 7 and 12, and as shown on Drawings. Stagger splices or locate at points of low tensile stress.

3.03 EMBEDDED ITEMS

- A. Install conduit and piping as shown on Drawings. Accurately locate and securely fasten conduit, piping and other embedded items in forms.
- B. Install waterstops as specified in other sections and according to manufacturer's instructions. Securely position waterstops at joints unless otherwise indicated on Drawings. Protect waterstops from damage or displacement during concrete placing operations.

3.04 BATCHING, MIXING AND DELIVERY OF CONCRETE

- A. Measure, batch, mix, and deliver ready-mixed concrete in accordance with ASTM C94, Sections 8 through 11. Produce ready-mixed concrete using an automatic batching system as described in NRMCA Concrete Plant Standards, Part 2 - Plant Control Systems.
- B. Measure, mix and deliver concrete produced by volumetric batching and continuous mixing in accordance with ASTM C685, Sections 6 through 8.

- C. Maintain concrete workability without segregation of material and excessive bleeding. Obtain approval of the Engineer before adjustment and change of mixproportions.
- D. Ready-mixed concrete delivered to the site shall be accompanied by batch tickets providing the information required by ASTM C94, Section 16. Concrete produced by continuous mixing shall be accompanied by batch tickets providing the information required by ASTM C685, Section 14.
- E. When adverse weather conditions affect quality of concrete, postpone concrete placement. Do not mix concrete when the air temperature is at or below 40 degrees F and falling. Concrete may be mixed when temperature is 35 degrees F and rising. Take temperature readings in the shade, away from artificial heat. Protect concrete from temperatures below 32 degrees F until the concrete has cured for a minimum of 3 days at 70 degrees F or 5 days at 50 degrees F.

When concrete temperature is 85 degrees F or above, do not exceed 60 minutes between introduction of cement to the aggregates and discharge. When the weather is such that the concrete temperature would exceed 90 degrees F, employ effective means, such as pre-cooling of aggregates and mixing water, using ice or placing at night, as necessary to maintain concrete temperature, as placed, below 90 degrees F.

- F. Clean, maintain and operate equipment so that it thoroughly mixes material as required.
- G. Hand-mix only when approved by the Engineer.

3.05 PLACING CONCRETE

- A. Give sufficient advance notice to the Engineer (at least 24 hours prior to commencement of Operations) to permit inspection of forms, reinforcing steel, embedded items and other preparations for placing concrete. Place no concrete prior to the Engineer's approval.
- B. Schedule concrete placing to permit completion of finishing operations in daylight hours. However, if necessary to continue after daylight hours, light the site as required. If rainfall occurs after placing operations are started, provide covering to protect the Work.
- C. Use troughs, pipes and chutes lined with approved metal or synthetic material in placing concrete so that concrete ingredients are not separated. Keep chutes, troughs and pipes clean and free from coatings of hardened concrete. Allow no aluminum material to be in contact with concrete.
- D. Limit free fall of concrete to 4 feet. Do not deposit large quantities of concrete at one location so that running or working concrete along forms is required. Do not jar forms

after concrete has taken on initial set; do not place any strain on projecting reinforcement or anchor bolts.

- E. Use tremies for placing concrete in walls and similar narrower 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 the size of placement. When immersion vibrators cannot be used, use form vibrators. Apply vibrators to concrete immediately after depositing. Move the vibrator vertically through the layer of concrete just placed and several inches into plastic layer below. Do not penetrate or disturb layers previously placed which have partially set. Do not use vibrators to aid lateral flow concrete. Closely supervise consolidation to ensure uniform insertion and duration of immersion.
- H. Handling and Placing Concrete: Conform to ACI 302.1R, ACI 304R and ACI 309R.

3.06 WATERSTOPS

- A. Embed waterstops in concrete across joints as shown. Waterstops shall be continuous for the extent of the joint; make splices necessary to provide such 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 the next pour. When a waterstop will remain exposed for 2 days or more, shade and protect the exposed waterstop from direct rays of the sun during the entire exposure and until the exposed portion of the waterstop is embedded in concrete.
- C. Splicing PVC Waterstops:
 - 1. Splice waterstops by heat-sealing adjacent waterstop sections in accordance with the manufacturer's printed instructions.
 - 2. Butt end-to-end joints of 2 identical waterstop sections may be made in the forms during placement of waterstop material.
 - 3. Prior to placement in formwork, prefabricate all waterstop joints involving more than two ends to be joined together, an angle cut, an alignment change, or the joining of two dissimilar waterstop sections, allowing not less than 24-inch long strips of waterstop material beyond the joint. Upon inspection and approval by the Engineer, install prefabricated waterstop joint assemblies in formwork, and

butt-weld ends of the 24-inch strips to the straight-run portions of waterstop in the forms.

D. Setting PVC Waterstops:

1. Correctly position waterstops during installation. Support and anchor waterstops during progress of the work to ensure proper embedment in concrete and to prevent folding over of the 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 a waterstop in a vertical wall joint does not connect with any other waterstop, and is not intended to be connected to a waterstop in a future concrete placement, terminate the waterstop 6 inches below the top of the 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 the Contract Documents.

F. Resilient Waterstop:

1. Install resilient waterstop in accordance with manufacturer's instructions and recommendations except as otherwise indicated and specified.
2. When requested by the Engineer, provide technical assistance by manufacturer's representative in the field at no additional cost to the City.
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 a minimum of 6 inches and place in contact with the PVC waterstop. Where crossing PVC at right angles, melt PVC ribs to form a smooth joining surface.
5. At the free top of walls without connecting slabs, stop the resilient waterstop and grooves (where used) 6 inches from the top in vertical wall joints.
6. Bentonite Waterstop:
 - a. Locate bentonite waterstop as near as possible to the center of the joint and extend continuous around the entire joint. Minimum distance from edge of waterstop to face of member: 5 inches.

- b. Where thickness of the concrete member to be placed on the 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 the 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 the 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 if necessary to produce satisfactory substrate, or bond waterstop to irregular surfaces using an epoxy grout which completely fills voids and irregularities beneath the waterstop material. Prior to installation, wire brush the concrete surface to remove laitance and other substances that may interfere with bonding of epoxy.
 - e. In addition to the adhesive backing provided with the waterstop, secure bentonite waterstop in place with concrete nails and washers at 12-inch maximum spacing.
1. Adhesive Waterstop:
- f. Thoroughly clean the concrete surface on which the waterstop is to be placed with a wire brush and coat with primer.
 - g. If the surface is too rough to allow the waterstop to form a complete contact, grind to form an adequately smooth surface.
 - h. Install the waterstop with the top protective paper left in place. Overlap joints between strips a minimum of 1 inch and cover back over with the protective paper.
 - i. Do not remove protective paper until just before final formwork completion. Concrete shall be placed immediately. The time that the waterstop material is uncovered prior to concrete placement shall be minimized and shall not exceed 24 hours.

3.07 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 the Engineer. Where so approved, make additional construction joints with details equivalent to those indicated for joints in similar locations.

- B. 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.

3.08 CURING

- A. Comply with ACI 308. Cure by preventing loss of moisture, rapid temperature change and mechanical injury for a period of 7 curing days when Type II or IP cement has been used and for 3 curing days when Type III cement has been used. Start curing as soon as free water has disappeared from the concrete surface after placing and finishing. A curing day is any calendar day in which the temperature is above 50 degrees F for at least 19 hours. Colder days may be counted if air temperature adjacent to concrete is maintained above 50 degrees F. In continued cold weather, when artificial heat is not provided, removal of forms and shoring may be permitted at the end of calendar days equal to twice the required number of curing days. However, leave soffit forms and shores in place until concrete has reached the specified 28-day strength, unless directed otherwise by the Engineer.

- B. Cure formed surfaces not requiring rub-finished surface by leaving forms in place for the full curing period. Keep wood forms wet during the curing period. Add water as needed for other types of forms. Or, at Contractor's option, forms may be removed after 2 days and curing compound applied.

- C. Rubbed Finish:

1. At formed surfaces requiring rubbed finish, remove forms as soon as practicable without damaging the surface.
2. After rub-finish operations are complete, continue curing formed surfaces by using either approved curing/sealing compounds or moist cotton mats until normal curing period is complete.

- D. Unformed Surfaces: Cure by membrane curing compound method.

1. After concrete has received a final finish and surplus water sheen has disappeared, immediately seal surface with a uniform coating of approved curing compound, applied at the rate of coverage recommended by manufacturer or as directed by the Engineer. Do not apply less than 1 gallon

per 180 square feet of area. Provide satisfactory means to properly control and check rate of application of the compound.

2. Thoroughly agitate the compound during use and apply by means of approved mechanical power pressure sprayers equipped with atomizing nozzles. For application on small miscellaneous items, hand-powered spray equipment may be used. Prevent loss of compound between nozzle and concrete surface during spraying operations.
3. Do not apply compound to a dry surface. If concrete surface has become dry, thoroughly moisten surface immediately prior to application. At locations where coating shows discontinuities, pinholes or other defects, or if rain falls on a newly coated surface before film has dried sufficiently to resist damage, apply an additional coat of compound at the specified rate of coverage.

3.09 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 rub-finish when concrete has aged for the required number of curing days. When curing compound is used, do not remove forms before 2 days after concrete placement,
- B. Leave soffit forms and shores in place until concrete has reached the specified 28-day strength, unless directed otherwise by the Engineer.

3.10 DEFECTIVE WORK

- A. Immediately repair any defective work discovered after forms have been removed. If concrete surface is bulged, uneven, or shows excess honeycombing or form marks which cannot be repaired satisfactorily through patching, remove and replace the entire section.

3.11 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 a stiff mixture and thoroughly tamp into place. After each patch has stiffened sufficiently to allow for greatest portion of shrinkage, strike off mortar flush with the surface.
- B. Apply a rubbed finish to exposed surfaces of formed concrete structures as noted on Drawings. After pointing has set sufficiently, wet the surface with a brush and perform first surface rubbing with No. 16 carborundum stone or equal. Rub sufficiently to bring surface to paste, to remove form marks and projections, and to produce a smooth,

dense surface. Add cement to form surface paste as necessary. Spread or brush material, which has been ground to paste, uniformly over surface and allow to reset. In preparation for final acceptance, clean surfaces and perform final finish rubbing with No. 30 carborundum stone or equal. After rubbing, allow paste on the surface to reset; then wash surface with clean water. Leave structure with a clean, neat and uniform-appearing finish.

- C. Apply a wood float finish to concrete slabs.

3.12 FIELD QUALITY CONTROL

- A. Testing shall be performed under provisions of Section 01410 - Testing Laboratory Services.
- B. Unless otherwise directed by the Engineer, the following minimum testing of concrete is required. Testing shall be performed by qualified individuals employed by an approved independent testing agency, and conform to the requirements of ASTM C1077.
 - 1. Take concrete samples in accordance with ASTM C172.
 - 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 the specimens in accordance with ASTM C31 and ASTM C39.
 - 3. When taking compression test specimens, test each sample for slump according to ASTM C143, for temperature according to ASTM C1064, for air content according to ASTM C231, and for unit weight according to ASTM C138.
 - 4. Inspect, sample and test concrete in accordance with ASTM C94, Section 13, 14 and 15, and ACI 311-5R.
- C. Test Cores: Conform to ASTM C42.
- D. Testing High Early Strength Concrete: When Type III cement is used in concrete, the specified 7-day and 28-day compressive strengths shall be applicable at 3 and 7 days, respectively.
- E. If 7-day or 3-day test strengths (as applicable for type of cement being used) fail to meet established strength requirements, extended curing or resumed curing on those portions of structure represented by test specimens may be required. If additional curing fails to produce the required strength, strengthening or replacement of portions of structure which fail to develop required strength may be required by the Engineer, at no additional cost to the City.

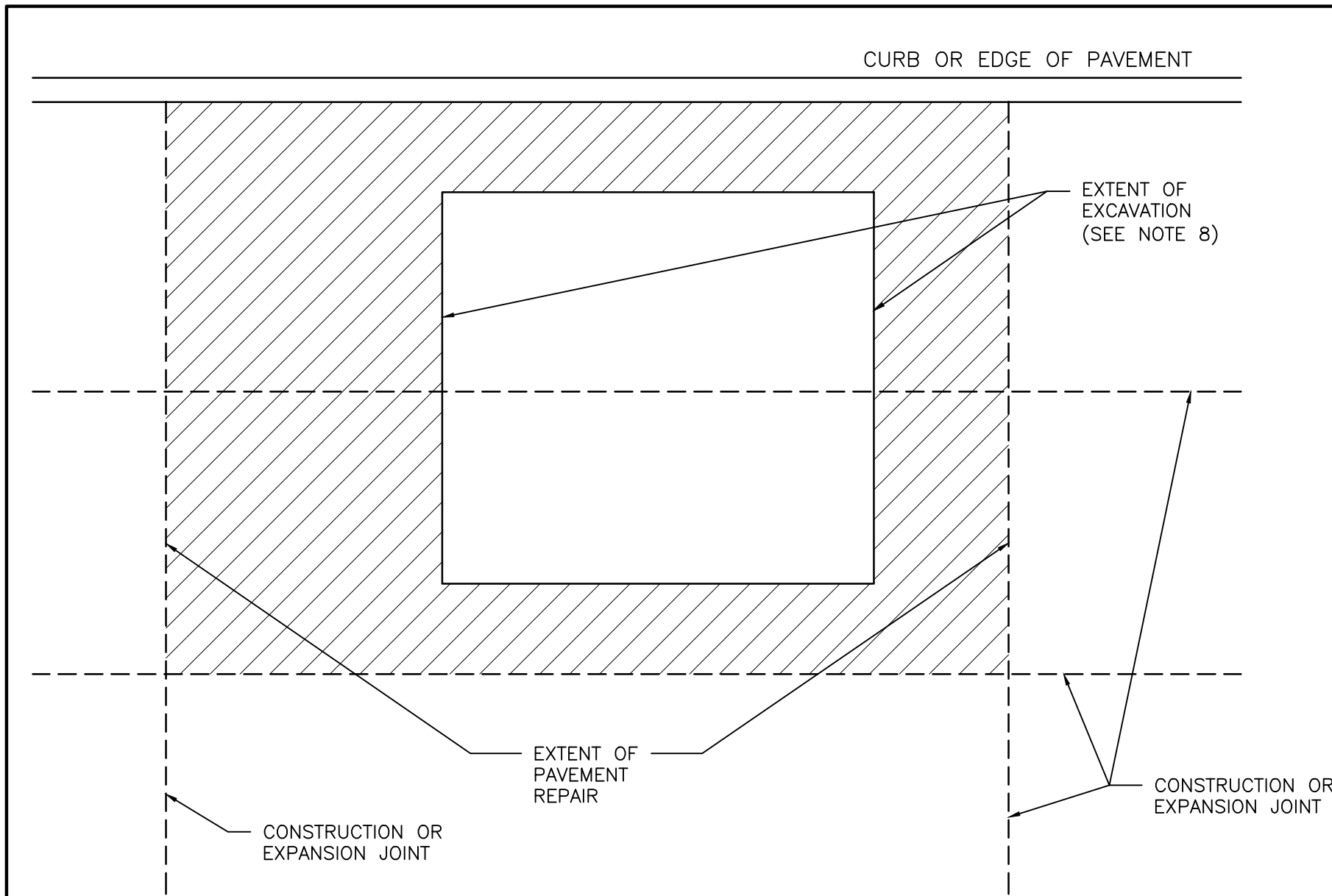
3.13 PROTECTION

- A. Protect concrete against damage until final acceptance by the City.

- B. Protect fresh concrete from damage due to rain, hail, sleet, or snow. Provide such protection while the concrete is still plastic, and whenever such precipitation is imminent or occurring.
- C. Do not backfill around concrete structures or subject them to design loadings until all components of the structure needed to resist the loading are complete and have reached the specified 28-day compressive strength, except as authorized otherwise by the Engineer.

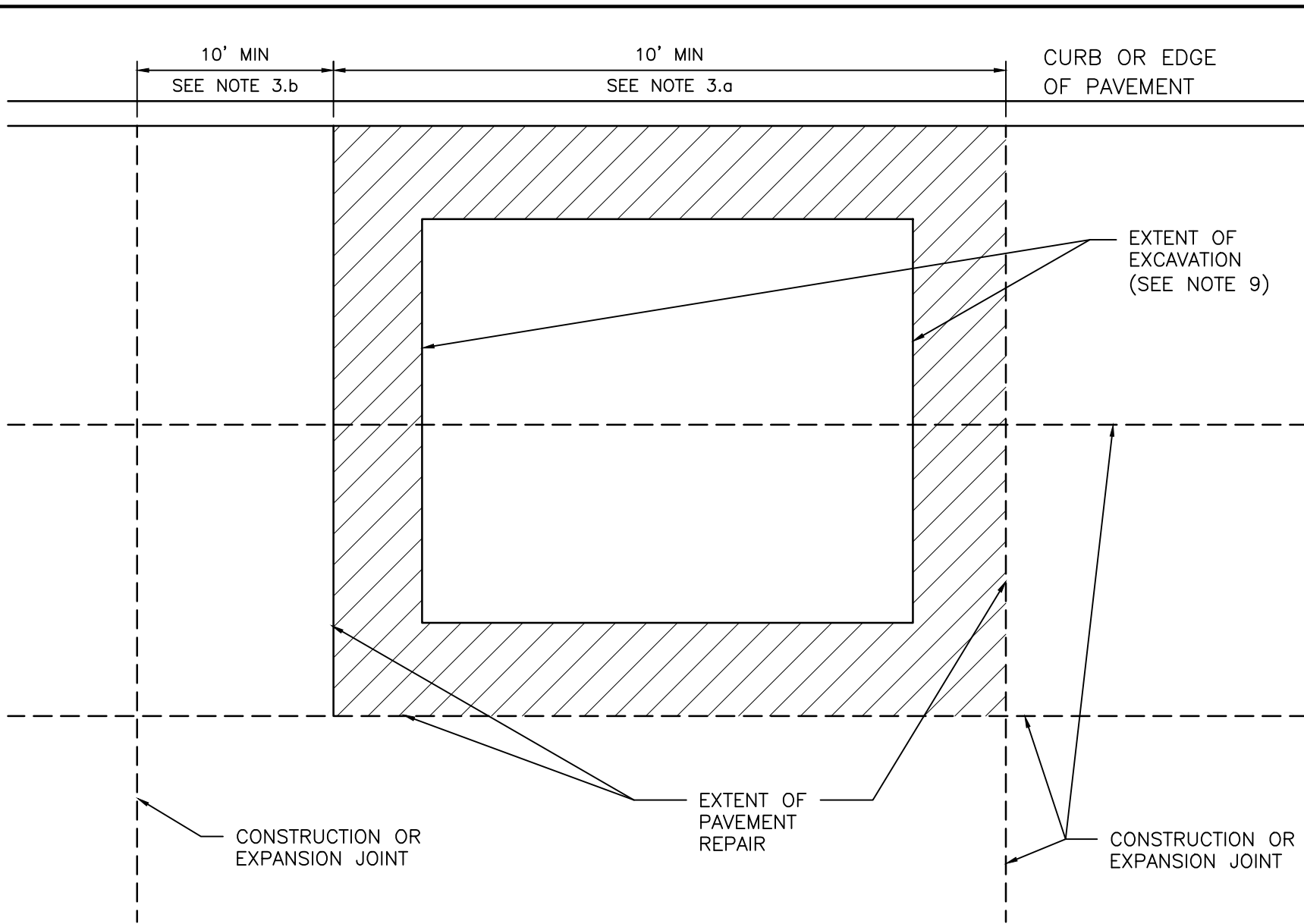
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NOTES:

1. EXTENT OF PAVEMENT REPAIR SHALL BE PERPENDICULAR AND PARALLEL TO TRAVEL WAY.
2. REPLACE ENTIRE PANEL WIDTH AND LENGTH TO NEAREST CONSTRUCTION OR EXPANSION JOINT BEYOND EDGE OF EXCAVATION.
3. SAW CUT AND EXPOSE 15" OF REINFORCING STEEL WITHIN EXISTING PAVEMENT. PROVIDE HORIZONTAL DOWELS IF EXISTING REINFORCING IS BROKEN OFF.
4. REPLACE CURB WHEN ADJACENT LANE IS REPLACED.
5. MAINTAIN EXPANSION JOINTS AT EXISTING LOCATIONS UNLESS OTHERWISE DIRECTED BY CITY ENGINEER.
6. SPECIALTY PAVEMENTS (IE: BRICK PAVERS) TO BE REPLACED WITH MATCHING PAVEMENT IN ALL CASES.
7. REPLACE PAVEMENT MARKINGS IN ACCORDANCE WITH STANDARD SPECIFICATIONS.
8. EXTENT OF EXCAVATION INCLUDES 18" OVERCUT AS SHOWN ON PAVEMENT REPAIR DETAILS FOR STREET CUTS (FLEX-BASE PAVEMENT & CONCRETE PAVEMENT).

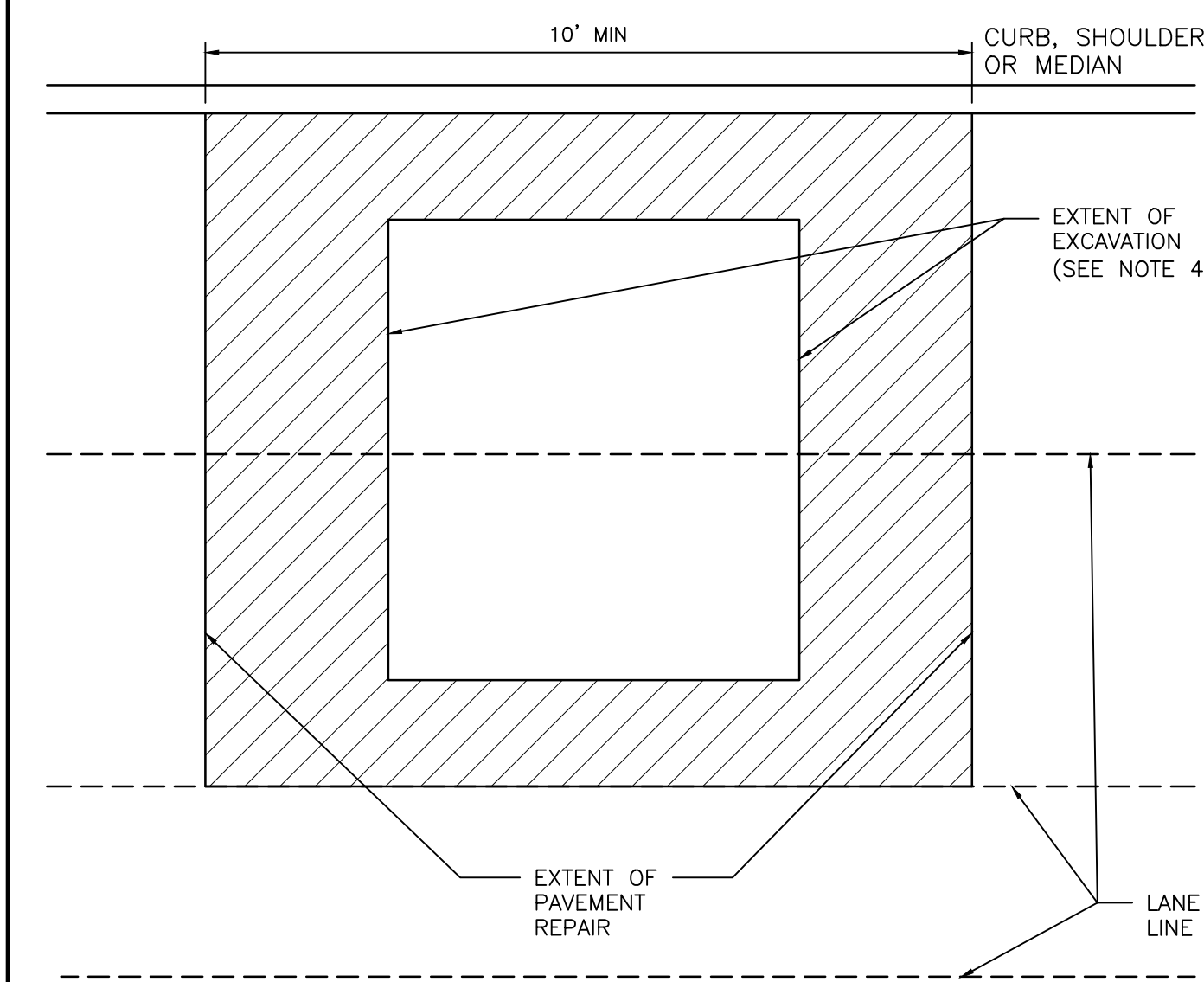


NOTES:

1. EXTENT OF PAVEMENT REPAIR SHALL BE PERPENDICULAR AND PARALLEL TO TRAVEL WAY.
2. WIDTH: REPLACE PANEL WIDTH TO NEAREST CONSTRUCTION OR EXPANSION JOINT BEYOND EDGE OF EXCAVATION.
3. LENGTH:
 - a. MINIMUM LENGTH OF PAVEMENT REPAIR ALONG TRAVEL WAY IS 10' FROM THE NEAREST JOINT.
 - b. IF EXTENT OF PAVEMENT REPAIR IS LESS THAN 10' FROM EXISTING CONSTRUCTION OR EXPANSION JOINT, EXTEND PAVEMENT REPAIR TO EXISTING JOINT.
4. SAW CUT AND EXPOSE 15" OF REINFORCING STEEL AROUND EDGE OF PANEL REPLACEMENT. PROVIDE HORIZONTAL DOWELS IF REINFORCING IS BROKEN OFF OR DOES NOT EXIST.
5. REPLACE CURB WHEN ADJACENT LANE IS REPLACED.
6. MAINTAIN EXPANSION JOINTS AT EXISTING LOCATIONS UNLESS OTHERWISE DIRECTED BY CITY ENGINEER.
7. SPECIALTY PAVEMENTS (IE: BRICK PAVERS) TO BE REPLACED WITH MATCHING PAVEMENT IN ALL CASES.
8. REPLACE PAVEMENT MARKINGS IN ACCORDANCE WITH STANDARD SPECIFICATIONS.
9. EXTENT OF EXCAVATION INCLUDES 18" OVERCUT AS SHOWN ON PAVEMENT REPAIR DETAILS FOR STREET CUTS (FLEX-BASE PAVEMENT & CONCRETE PAVEMENT).

1 STREET CUT FOR CONCRETE PAVEMENT REPLACEMENT/RESTORATION AGE OF PAVEMENT < 5YRS

2 STREET CUT FOR CONCRETE PAVEMENT REPLACEMENT/RESTORATION AGE OF PAVEMENT > 5YRS



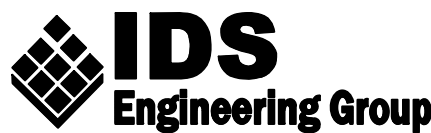
NOTES:

1. EXTENT OF PAVEMENT REPAIR SHALL BE PERPENDICULAR AND PARALLEL TO TRAVEL WAY.
2. FLEXIBLE BASE: REPLACE BASE TO SAME THICKNESS PLUS TWO INCHES (2") FOR EXTENT OF EXCAVATION. USE APPROVED BASE MATERIAL TYPE.*
3. SURFACE COURSE:
 - 3.1. WIDTH: SURFACE MILL AND OVERLAY FULL WIDTH OF LANE(S) TO NEAREST LANE DIVIDER BEYOND EDGE OF EXCAVATION.
 - 3.2. LENGTH: MINIMUM LENGTH OF SURFACE MILL ALONG TRAVEL WAY IS 10'.
 - 3.3. REPLACE PAVEMENT MARKINGS IN ACCORDANCE STANDARD SPECIFICATIONS.
4. EXTENT OF EXCAVATION INCLUDES 18" OVER CUT AS SHOWN ON PAVEMENT REPAIR DETAILS FOR STREET CUTS (FLEX-BASE PAVEMENT AND CONCRETE PAVEMENT).
5. ADDITIONAL REQUIREMENTS FOR ASPHALT OVERLAY ON CONCRETE PAVEMENT:
 - 5.1. REPLACE CONCRETE FOR EXTENT OF EXCAVATION. REPLACE TO SAME THICKNESS PLUS TWO INCHES (2").
 - 5.2. WIDTH:
 - 5.2.1. IF EXCAVATION EXTENDS MORE THAN HALF OF A LANE, REPLACE ENTIRE LANE OF CONCRETE.
 - 5.3. SAW CUT AND EXPOSE 15" OF REINFORCING STEEL AROUND EDGE OF CONCRETE REPLACEMENT. IF NO REINFORCING STEEL EXISTS, USE HORIZONTAL DOWELS.
 - 5.4. REPLACE CURB WHEN ADJACENT LANE IS REPLACED.
 - 5.5. MAINTAIN CONCRETE EXPANSION JOINTS AT EXISTING LOCATIONS UNLESS OTHERWISE APPROVED BY CITY ENGINEER.

3 STREET CUT FOR ASPHALT PAVEMENT REPLACEMENT/RESTORATION FOR PAVEMENT OF ALL AGES

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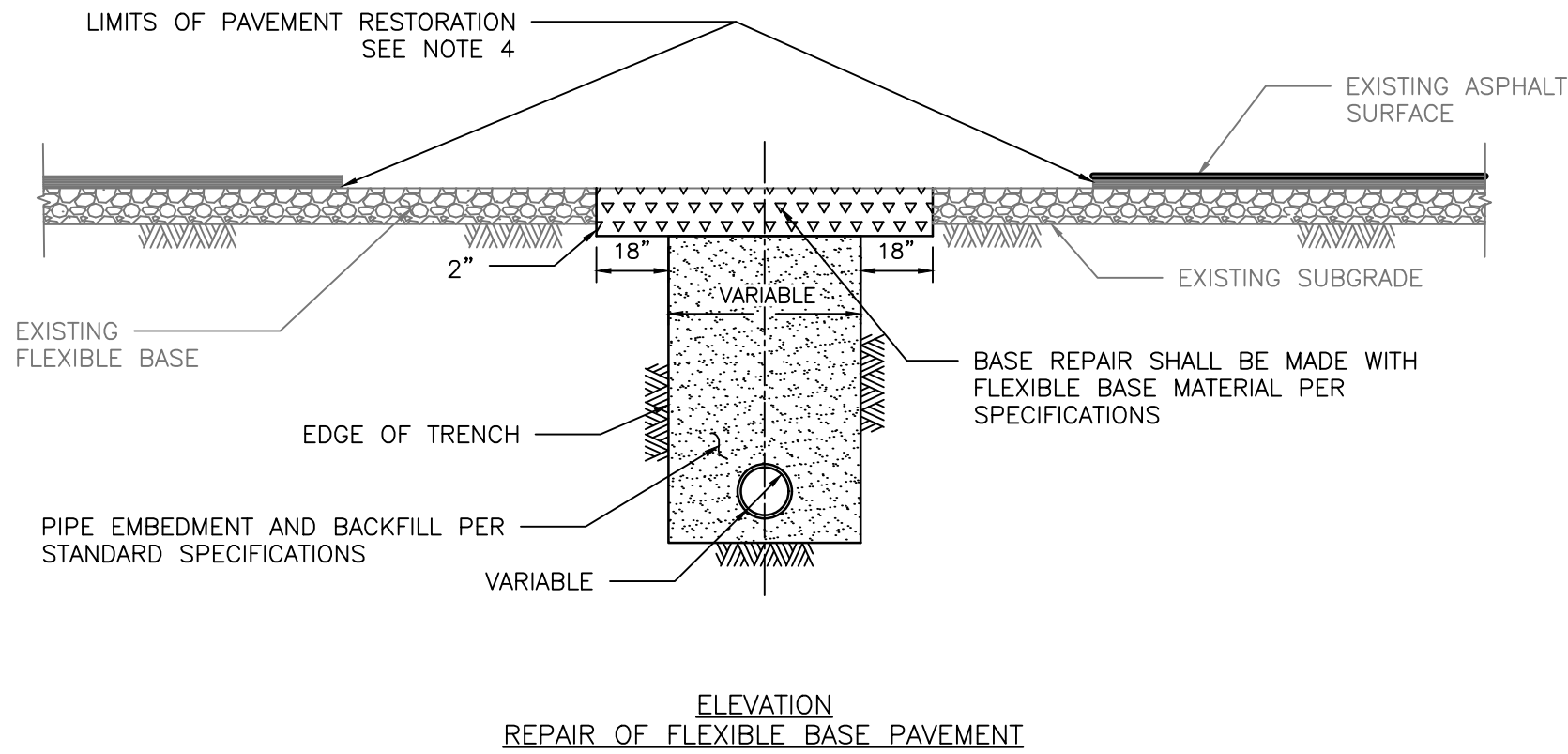


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SCALE: N.T.S.	APPROVED BY:	
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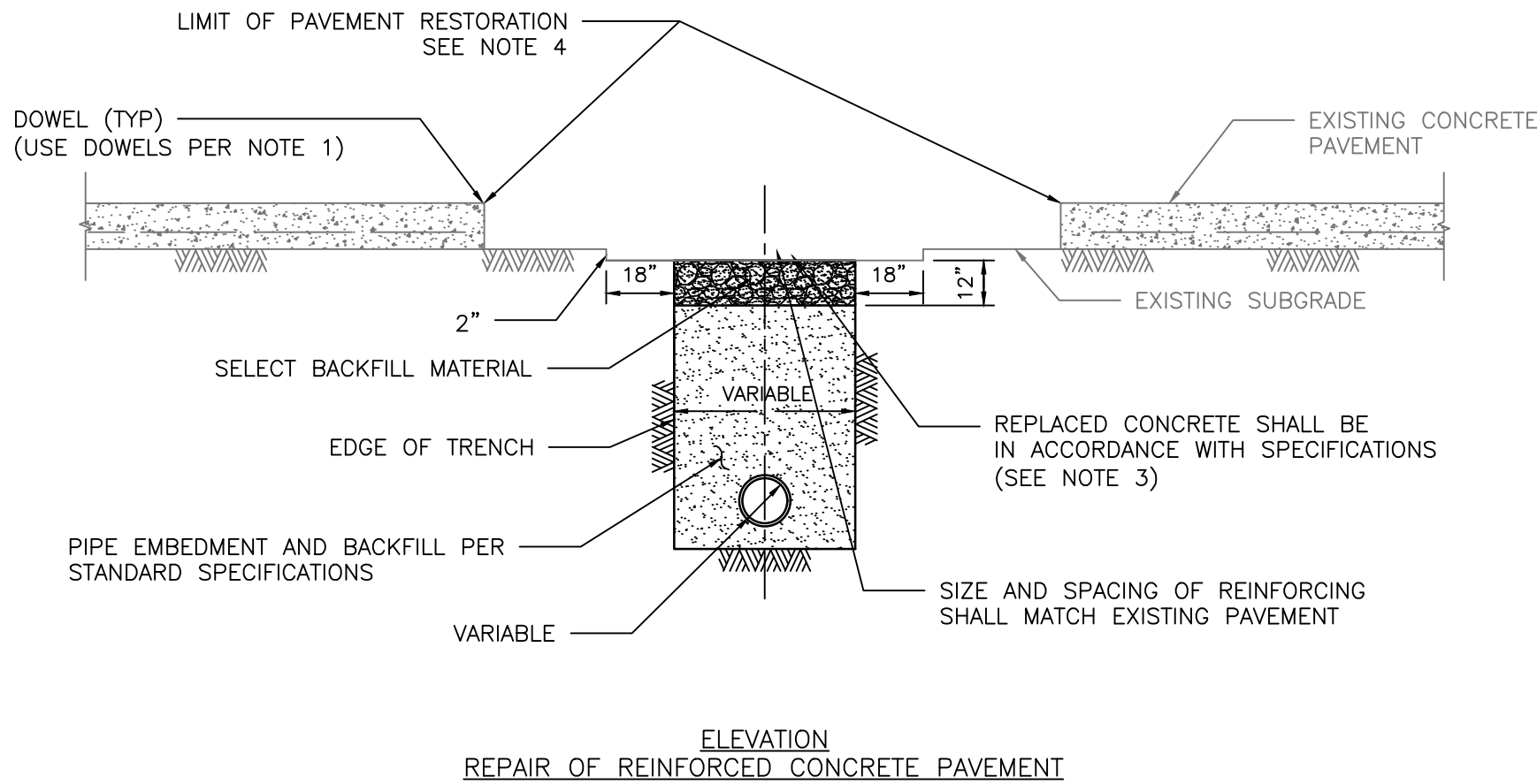
\\sds\com\Projects\2260\227\03900 Co Waller General Consultation\REF for Utility Services\CAD\DWG\CDL-PAV2.dwg [PAV 2] Plotted Jun 19, 2024 at 3:25pm by tbradshaw (last saved by tbradshaw)



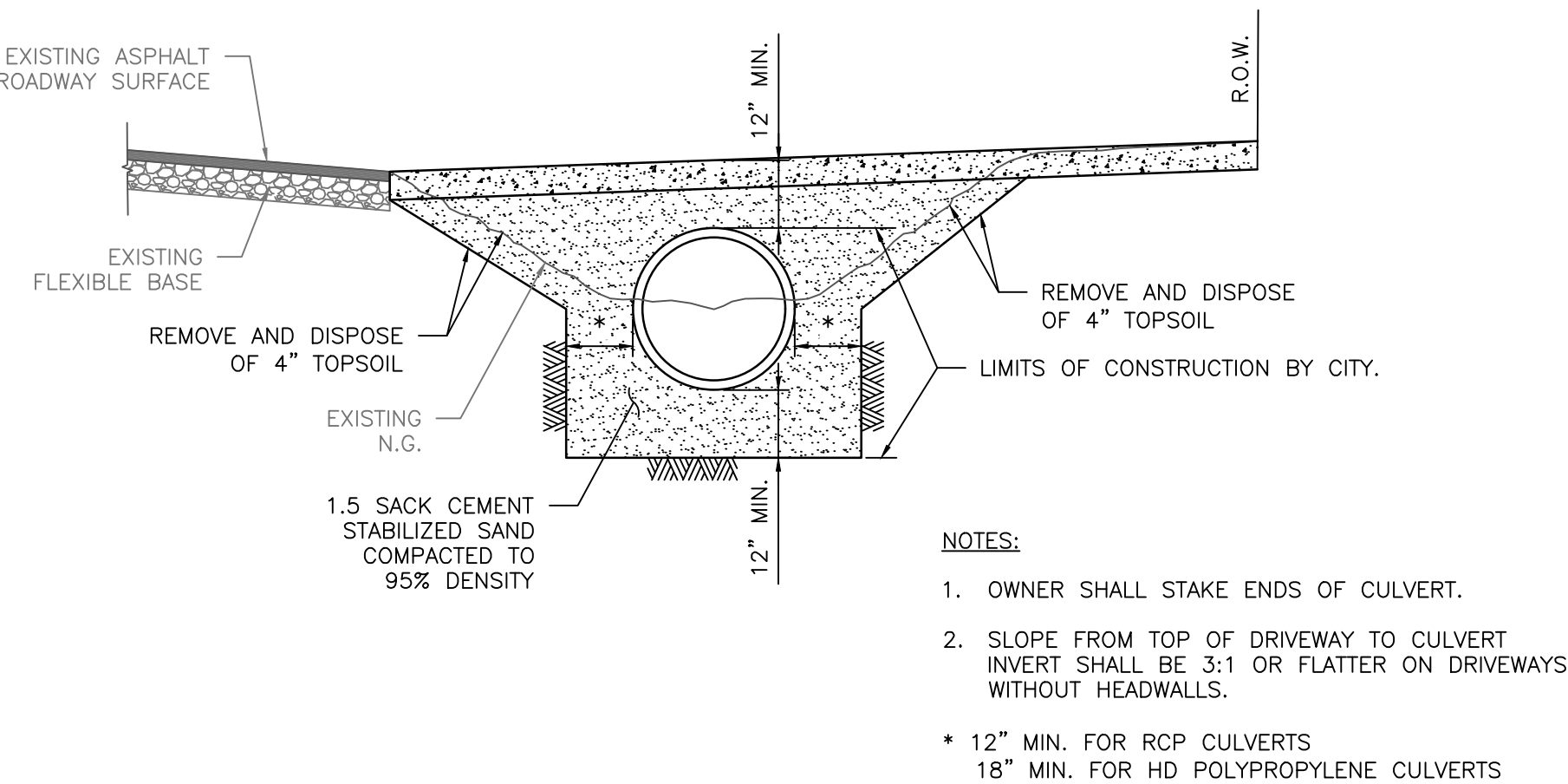
PAVEMENT REPAIR NOTES:

1. EXPOSE 15" OF REINFORCING STEEL AT PROPOSED SAWED JOINT. IF NO REINFORCING STEEL EXISTS, USE HORIZONTAL DOWELS. HORIZONTAL DOWELS SHALL BE #6 BAR, 24" LONG, 24" C-C, DRILLED AND EMBEDDED 8" INTO THE CENTER OF THE EXISTING SLAB. WITH "PO ROC" OR EQUAL.
2. IF REINFORCED CONCRETE IS OVERLAID WITH ASPHALT, REPLACE WITH 2" MIN HMAC SURFACING.
3. REFER TO SPECIFICATIONS FOR REINFORCING STEEL REQUIREMENTS.
4. REFER TO STANDARD STREET CUT DETAILS FOR PAVEMENT RESTORATION LIMITS.

1 PAVEMENT REPAIR DETAIL FOR STREET CUTS - FLEXIBLE BASE PAVEMENT



2 PAVEMENT REPAIR DETAIL FOR STREET CUTS - REINFORCED CONCRETE PAVEMENT

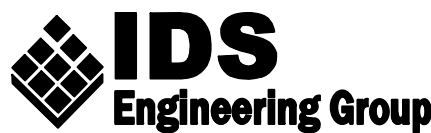


NOTES:

1. OWNER SHALL STAKE ENDS OF CULVERT.
 2. SLOPE FROM TOP OF DRIVEWAY TO CULVERT INVERT SHALL BE 3:1 OR FLATTER ON DRIVEWAYS WITHOUT HEADWALLS.
- * 12" MIN. FOR RCP CULVERTS
18" MIN. FOR HD POLYPROPYLENE CULVERTS

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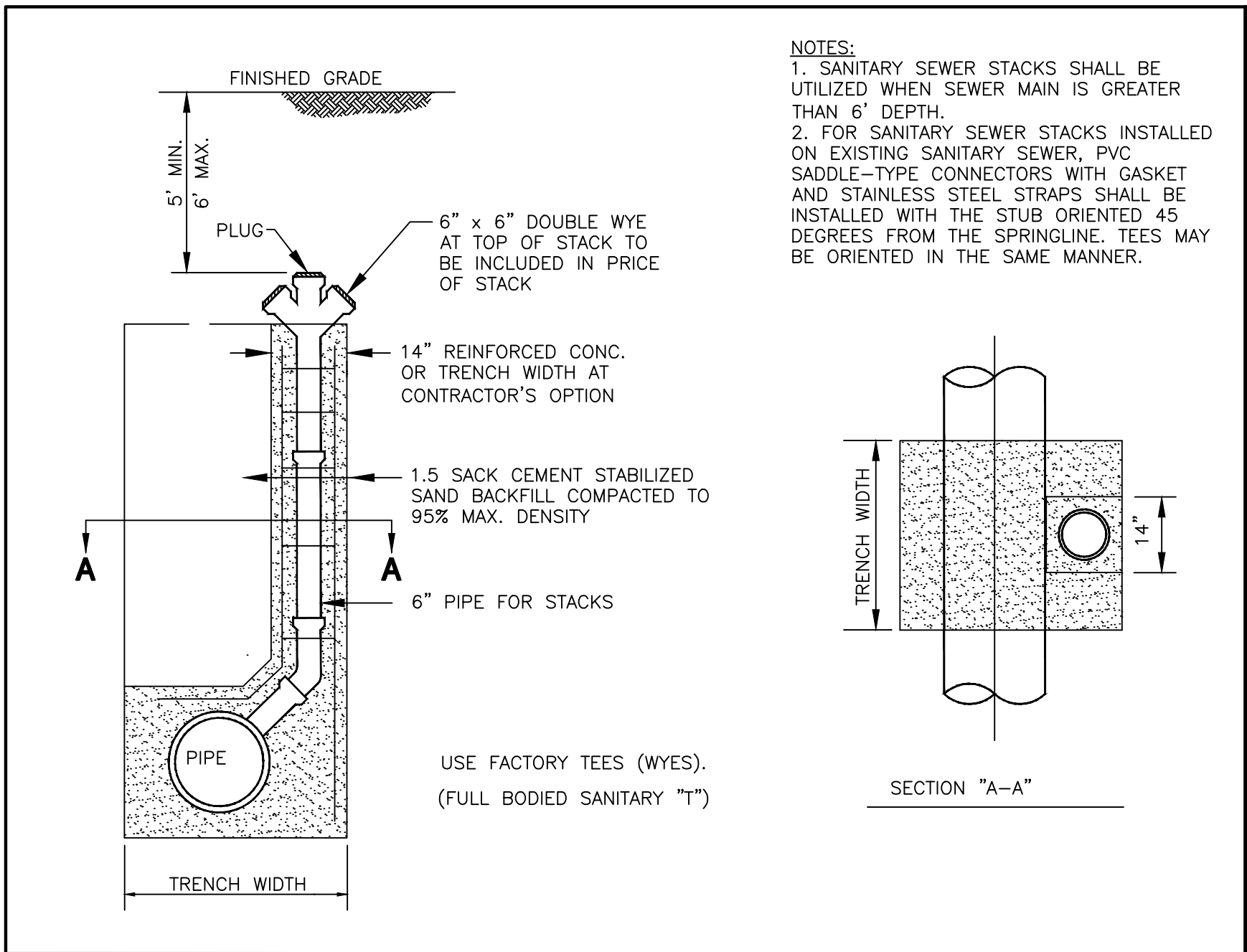


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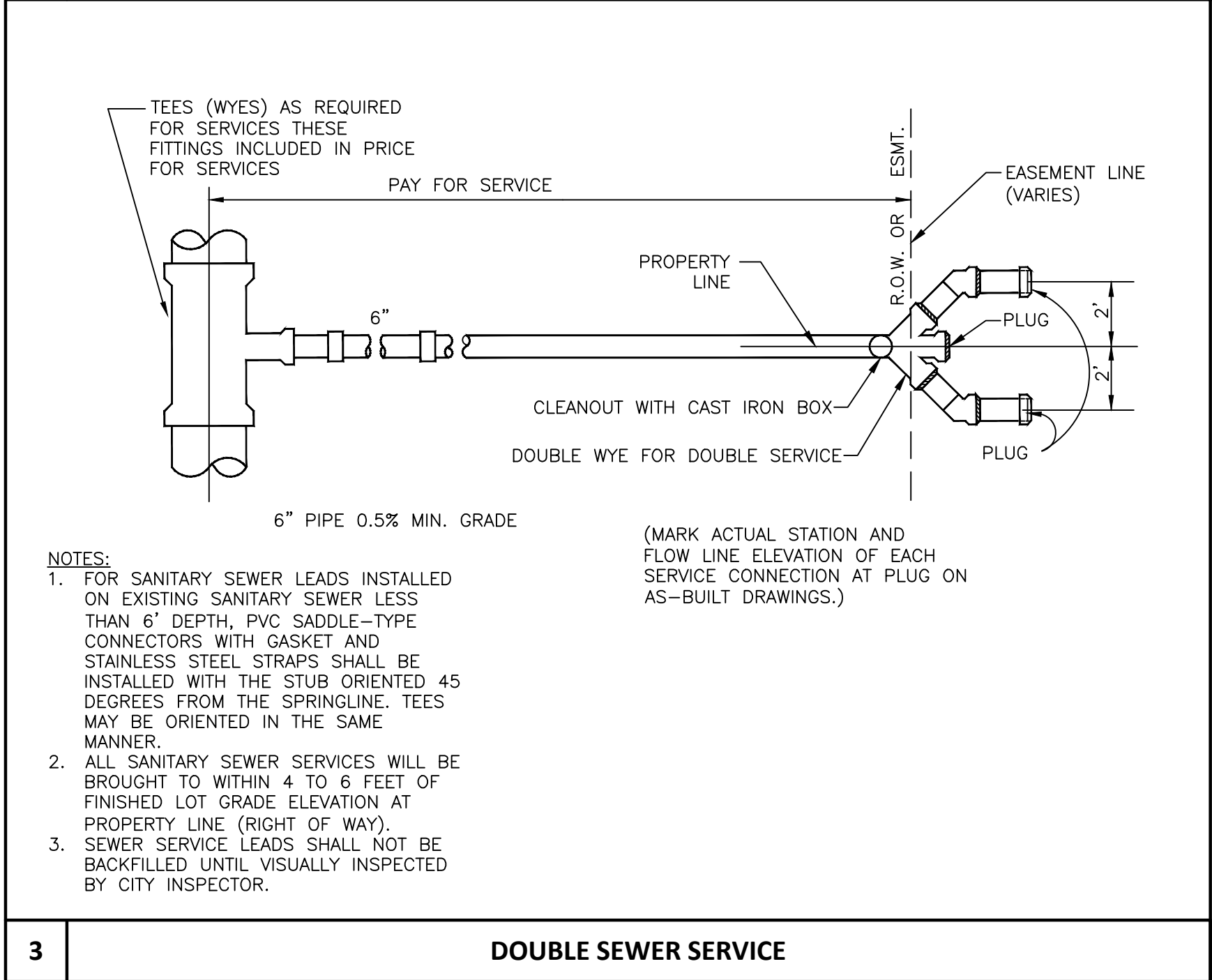
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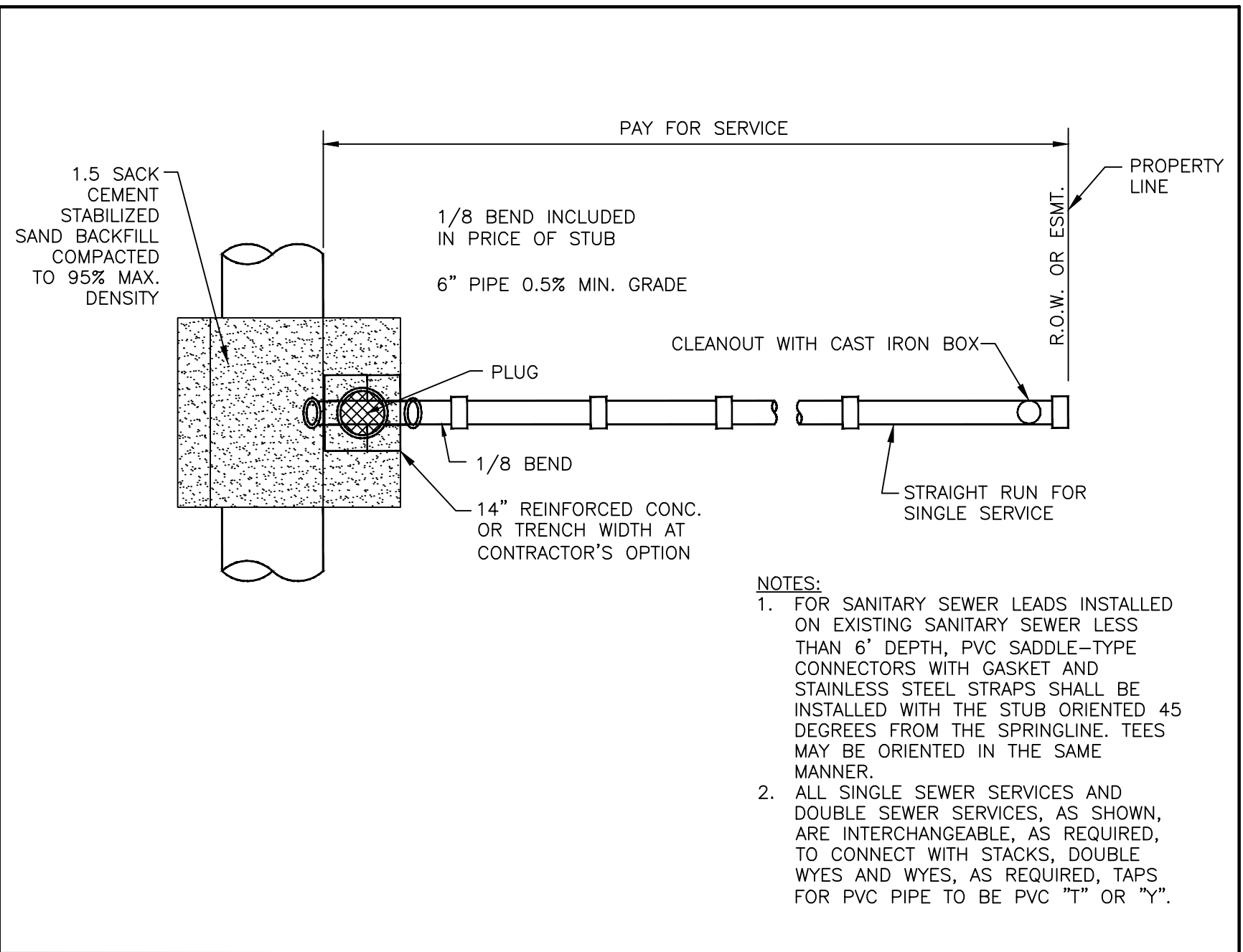
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1 SANITARY SEWER STACK



3 DOUBLE SEWER SERVICE



2 SINGLE SEWER SERVICE

SANITARY SEWER SYSTEM CONSTRUCTION NOTES

- FINISHED ELEVATION ON SANITARY SEWER MANHOLE RIMS SHALL BE THREE INCHES ABOVE FINISHED GRADE WITHIN UTILITY EASEMENTS OR STREET RIGHT-OF-WAY. CLEAN FILL SHALL BE ADDED AND SLOPED FROM MANHOLE RIM.
- CONTRACTOR SHALL MARK LOCATION OF AND MAINTAIN RECORDS OF STUB, STACKS, AND END OF SERVICE LEAD LOCATIONS, WITH WIRE LOOPS AND 2" P.V.C. PIPE.
- WATER LINES AND SANITARY SEWER LINES SHALL BE INSTALLED IN SEPARATE TRENCHES.
- ALL PVC PIPE (POLYVINYL CHLORIDE) SHALL BE IN ACCORDANCE WITH ASTM D3034, SDR 26.
- ALL PVC PIPE (ALL TYPES AND SDR/DR WALL THICKNESS TO BE USED) SHALL HAVE RUBBER GASKET EQUIPPED BELL AND SPIGOT JOINTS CONFORMING TO ASTM D-3212. THE GASKET MATERIAL SHALL CONFORM TO ASTM F-477. SOLVENT WELDED JOINTS WILL NOT BE APPROVED FOR CITY SEWER LINES.
- SANITARY SEWER MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF WALLER RESOLUTION NO. 12-08 "MINIMUM CONSTRUCTION STANDARDS FOR COMMUNITY IMPROVEMENTS". CONTRACTOR TO FURNISH TEST PLUGS AND RISERS (NO SEPARATE PAY). ALL SEWER LINES TO BE AIR TESTED IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS.
- MAINTAIN 12-INCH MINIMUM CLEARANCE BETWEEN ALL STORM SEWERS AND CULVERTS UNLESS OTHERWISE NOTED.
- SEWER TRENCHES UNDER OR WITHIN ONE (1) FOOT OF PROPOSED OR FUTURE PAVEMENT TO BE BACKFILLED WITH CEMENT STABILIZED SAND BACKFILL, AS SPECIFIED, TO WITHIN ONE (1) FOOT OF SUBGRADE.
- WATER LINE/SANITARY MANHOLE AND SANITARY SEWER SEPARATION. UNLESS SANITARY SEWER MANHOLES AND THE CONNECTING SEWER CAN BE MADE WATERTIGHT AND TESTED FOR NO LEAKAGE, MUST BE INSTALLED SO AS TO PROVIDE A MINIMUM OF NINE FEET OF HORIZONTAL CLEARANCE FROM AN EXISTING OR PROPOSED WATERLINE. WHERE THE NINE FOOT SEPARATION DISTANCE CANNOT BE ACHIEVED, FOLLOW THESE SPECIAL PROCEDURES:
 - WHERE A SEWER CROSSES A WATERLINE ALL PORTIONS OF THE SEWER WITHIN NINE FEET OF THE WATERLINE SHALL BE CONSTRUCTED OF PVC PIPE WITH A PRESSURE RATING OF AT LEAST 150 PSI USING APPROPRIATE ADAPTERS. VERTICAL CLEARANCE BETWEEN PIPES SHALL BE AT LEAST 2 FEET IF SEWER IS ABOVE THE WATERLINE AND ONE FOOT IF THE SEWER IS BELOW THE WATERLINE.
 - SANITARY SEWER LINES CROSSING UNDER PROPOSED OR FUTURE WATER LINES WITH GREATER THAN 12-INCHES VERTICAL WALL-TO-WALL CLEARANCE BUT LESS THAN TWO FEET OF VERTICAL WALL-TO-WALL CLEARANCE SHALL HAVE ONE EIGHTEEN-FOOT JOINT OF A SPECIFIED DUCTILE IRON PIPE (AWWA C151, 150 PSI. THK. CL. 50) CENTERED ON THE WATER LINE CROSSING.
 - SANITARY SEWER LINES CROSSING UNDER PROPOSED OR FUTURE WATER LINES WITH GREATER THAN TWO FEET OF VERTICAL BUT LESS THAN NINE FEET OF VERTICAL WALL-TO-WALL CLEARANCE SHALL BE BACKFILLED FOR NINE HORIZONTAL FEET OF WATER LINE ON EACH SIDE OF SEWER LINE WITH CEMENT SAND (MINIMUM 2 SACKS CEMENT PER CUBIC YARD OF SAND) TO A DEPTH OF ONE PIPE DIAMETER OR TWELVE INCHES (WHICHEVER IS GREATER) ABOVE THE SEWER LINE.
 - WHERE A SANITARY SEWER PARALLELS A WATERLINE, THE SEWER MUST BE INSTALLED IN A SEPARATE TRENCH, AND SHALL BE CONSTRUCTED OF PVC PIPE MEETING ASTM SPECIFICATIONS WITH A PRESSURE RATING FOR BOTH THE PIPE AND JOINTS OF 150 PSI. THE VERTICAL SEPARATION SHALL BE A MINIMUM OF TWO FEET BETWEEN OUTSIDE DIAMETERS AND THE HORIZONTAL SEPARATION SHALL BE A MINIMUM OF FOUR FEET BETWEEN OUTSIDE DIAMETERS. THE SEWER SHALL BE LOCATED BELOW THE WATERLINE.
- ALL PROPOSED GRAVITY SANITARY SEWER MAINS SHALL BE SDR 26 PVC PIPE.
- BEDDING FOR ALL TYPES OF SANITARY SEWER PIPE SHALL BE PER DETAILS AT ALL DEPTHS (NO SEPARATE PAY).
- FOR ALL PVC PIPE, RESILIENT CONNECTORS MEETING REQUIREMENTS OF ASTM C-923 AT MANHOLE CONNECTIONS (NO SEPARATE PAY).
- SANITARY SEWER MANHOLES SHALL BE STANDARD TYPE, UNLESS OTHERWISE NOTED, AND BACKFILLED WITH CEMENT STABILIZED SAND AS SPECIFIED (NO SEPARATE PAY). ALL SANITARY MANHOLES SHALL BE AT LEAST 1 FOOT ABOVE THE 100 YEAR BASE FLOOD ELEVATION. SECTIONS FOR PRECAST MANHOLES SHALL BE JOINED WITH RUBBER GASKET JOINTS. "RAM NEK" OR SIMILAR WILL NOT BE APPROVED.
- ALL FAR-SIDE LEADS SHALL BE SIX (6) INCHES DIAMETER AT 0.70% MIN. SLOPE AND SHALL BE PVC, SDR 26.
- LEADS SERVING TWO LOTS SHALL HAVE A SERVICE "WYE" WITH PLUGS (NO SEPARATE PAY). THE "WYE" SHALL BE LOCATED WITHIN THE STREET RIGHT-OF-WAY OR ADJOINING UTILITY EASEMENT.
- ALL PRECAST CONCRETE MANHOLES SHALL HAVE THE TOP 18 INCHES CONSTRUCTED OF STEEL OR PRECAST PCC RINGS, SEALED INSIDE AND OUTSIDE.
- SANITARY SEWER LINE IN PIPE ZONE IN SIDE LOT EASEMENT SHALL BE BACKFILLED WITH CEMENT STABILIZED SAND. (NO SEPARATE PAY).
- IF WET SAND IS ENCOUNTERED IN THE FIELD, USE SPECIAL BEDDING.
- PROVIDE "UNI-FLANGE", "CERTA-LOK", OR APPROVED EQUAL PIPE RESTRAINT AND CASING SYSTEM ON UNDERGROUND PRESSURE PIPE SYSTEMS.

SPECIAL NOTES: LOCATION OF SANITARY SEWER FACILITIES

IF STAKES ARE LEFT IN THE GROUND AT THE STACK AND LEADS AFTER CONSTRUCTION OF UTILITIES, THEN AN EFFORT WILL BE MADE TO PRESERVE THEM DURING PAVING CONSTRUCTION. UTILITY CONTRACTOR REMAINS RESPONSIBLE FOR LOCATING AND MARKING THE FACILITIES AS DESCRIBED BELOW.

THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING AS-BUILT RED LINES AND FLOW LINE ELEVATIONS OF ALL SERVICE CONNECTIONS AND SHALL BE PLACED ON AS-BUILT PLANS AT THE COMPLETION OF THIS JOB.

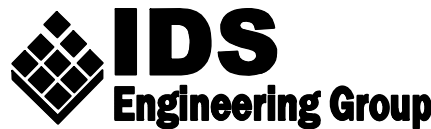
THE UTILITY CONTRACTOR IS RESPONSIBLE FOR LOCATING AND MARKING ALL STACKS AND FAR SIDE LEADS AFTER THE PAVING IN THIS SECTION IS COMPLETE. A 1/4-INCH DEEP NOTCH SHALL BE CUT IN THE CURB AND PAINTED WITH A RED LINE ADJACENT TO THE STACK OR LEAD.

GENERAL NOTES

- ALL SANITARY SEWER TAPS SHOULD BE PLACED IN LINE WITH PROPERTY CORNER OR PLACED HALFWAY BETWEEN THE FRONT LOT CORNERS, OR AT PC OF CURB RETURN IN MULTI LOT SUBDIVISIONS.
- NECESSITY FOR USE OF THIS SECTION TO BE DETERMINED BY THE ENGINEER AS CONSTRUCTION PROGRESSES AND MAY BE MODIFIED TO SUIT CONDITIONS ENCOUNTERED.
- WELL POINTS TO BE INSTALLED AND TRENCH KEPT DRY DURING CONSTRUCTION UNTIL BACKFILL IS COMPLETELY PLACED AND ENOUGH TIME AS APPROVED BY ENGINEER HAS ELAPSED.

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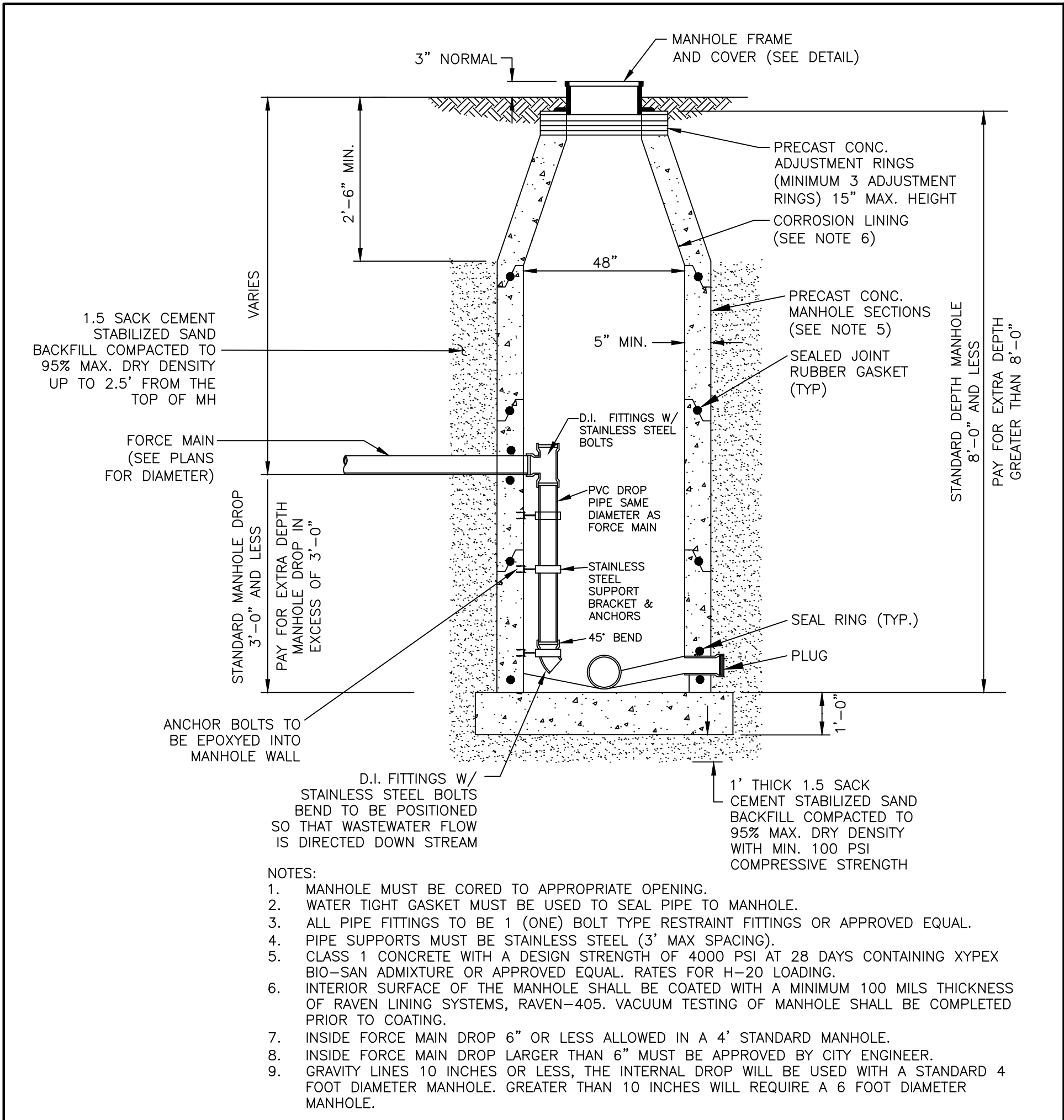


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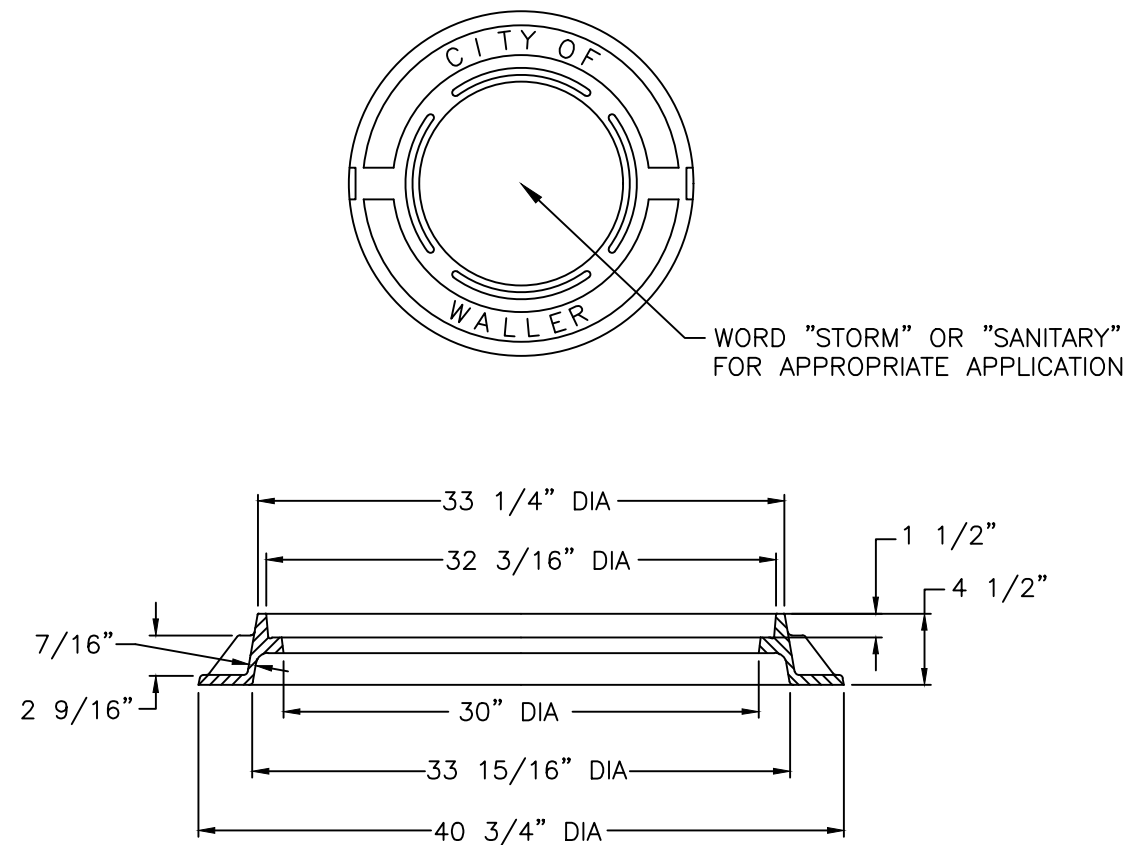
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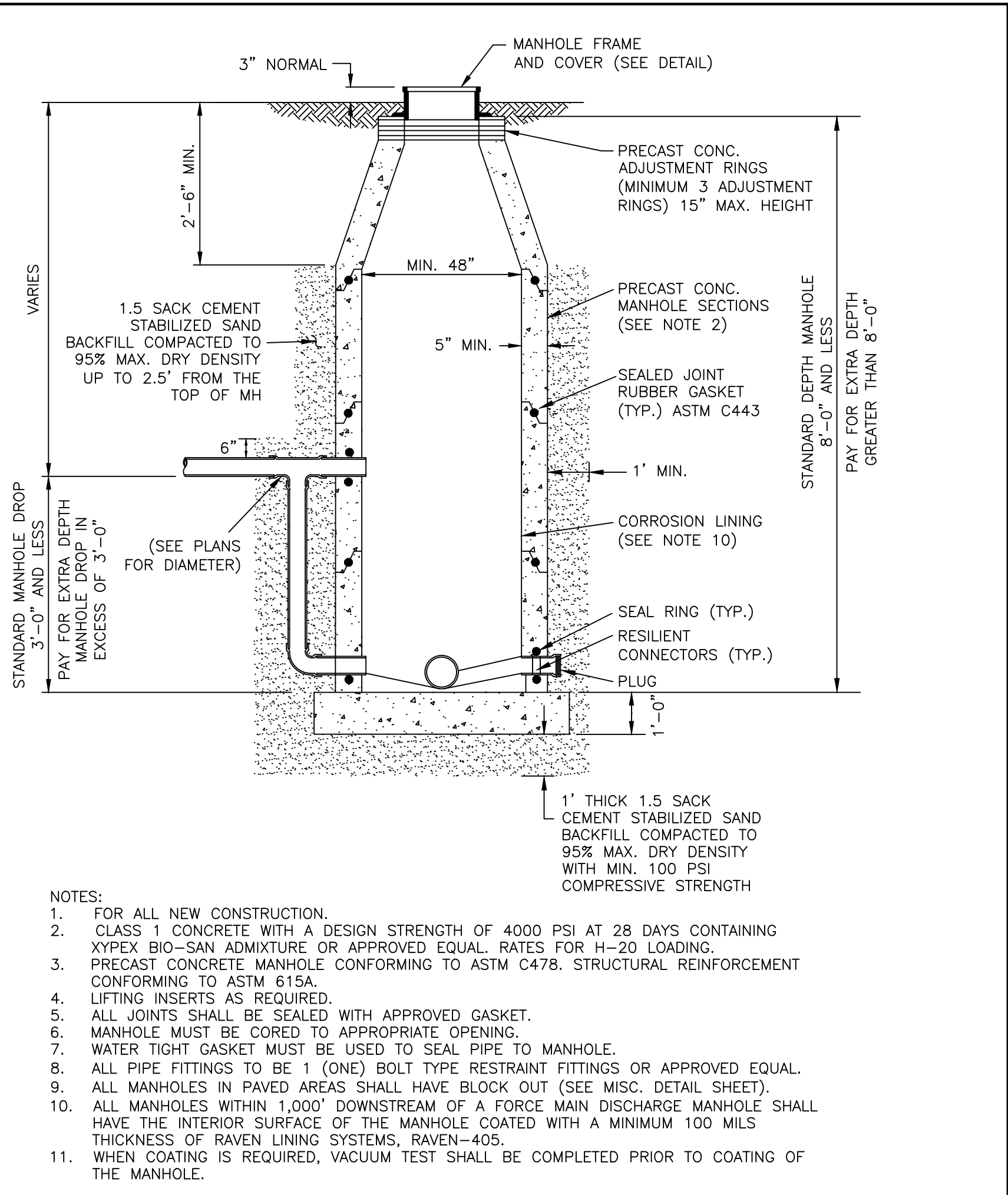
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1 STANDARD PRECAST CONCRETE SEWER MANHOLE
INTERNAL DROP FOR FORCE MAIN



3 31-7/8" MANHOLE COVER AND FRAME



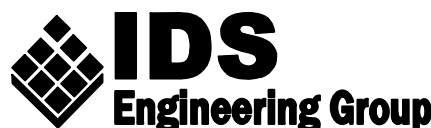
2 STANDARD PRECAST CONCRETE SEWER MANHOLE

GENERAL NOTES

- PRE-CAST MANHOLES ONLY SHALL BE USED.
- NO BRICKS OF ANY KIND WILL BE ALLOWED IN CONSTRUCTION OF MANHOLES.
- ALL MANHOLES SHALL BE VACUUM TESTED IN ACCORDANCE WITH TCEQ REQUIREMENTS.

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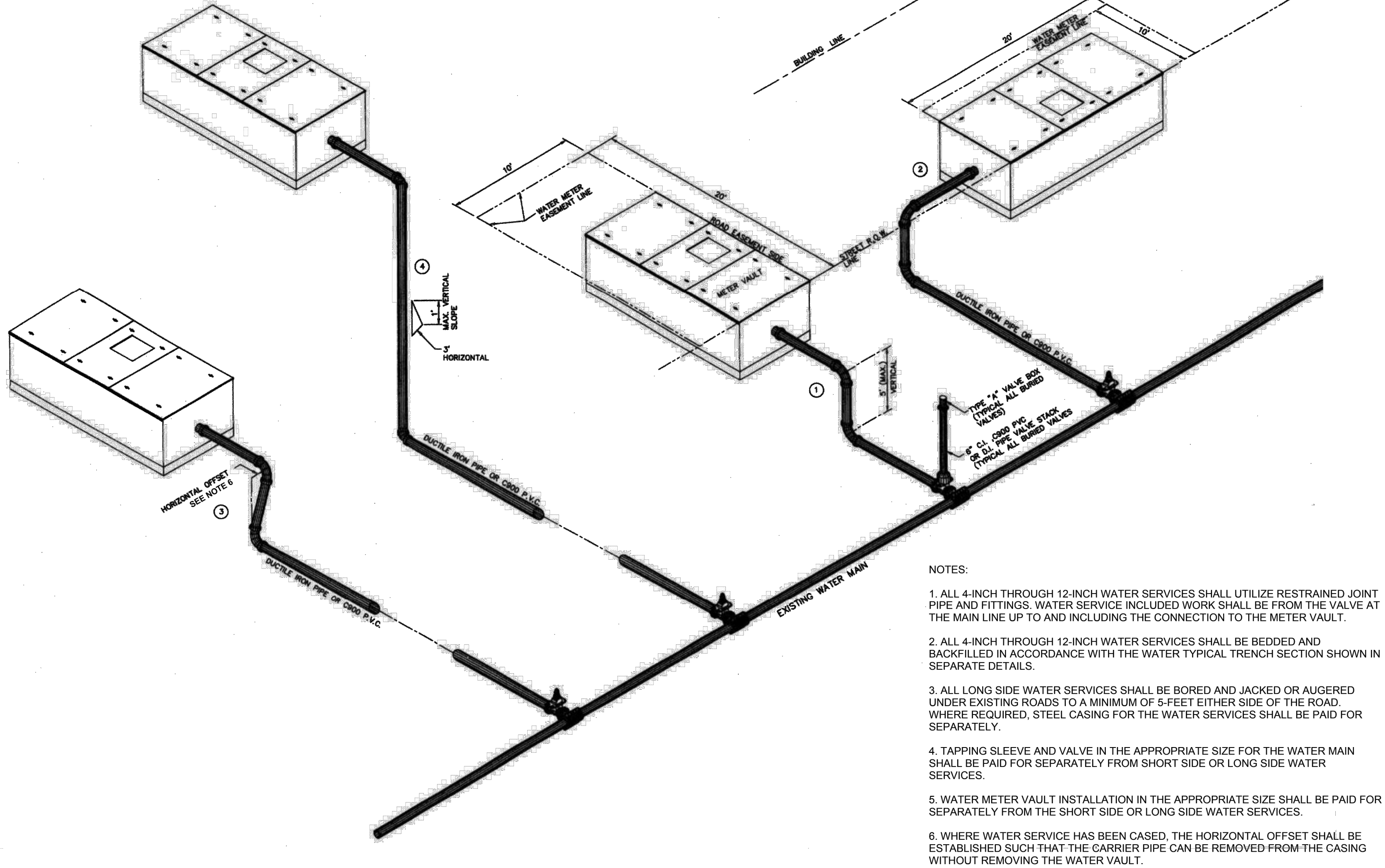
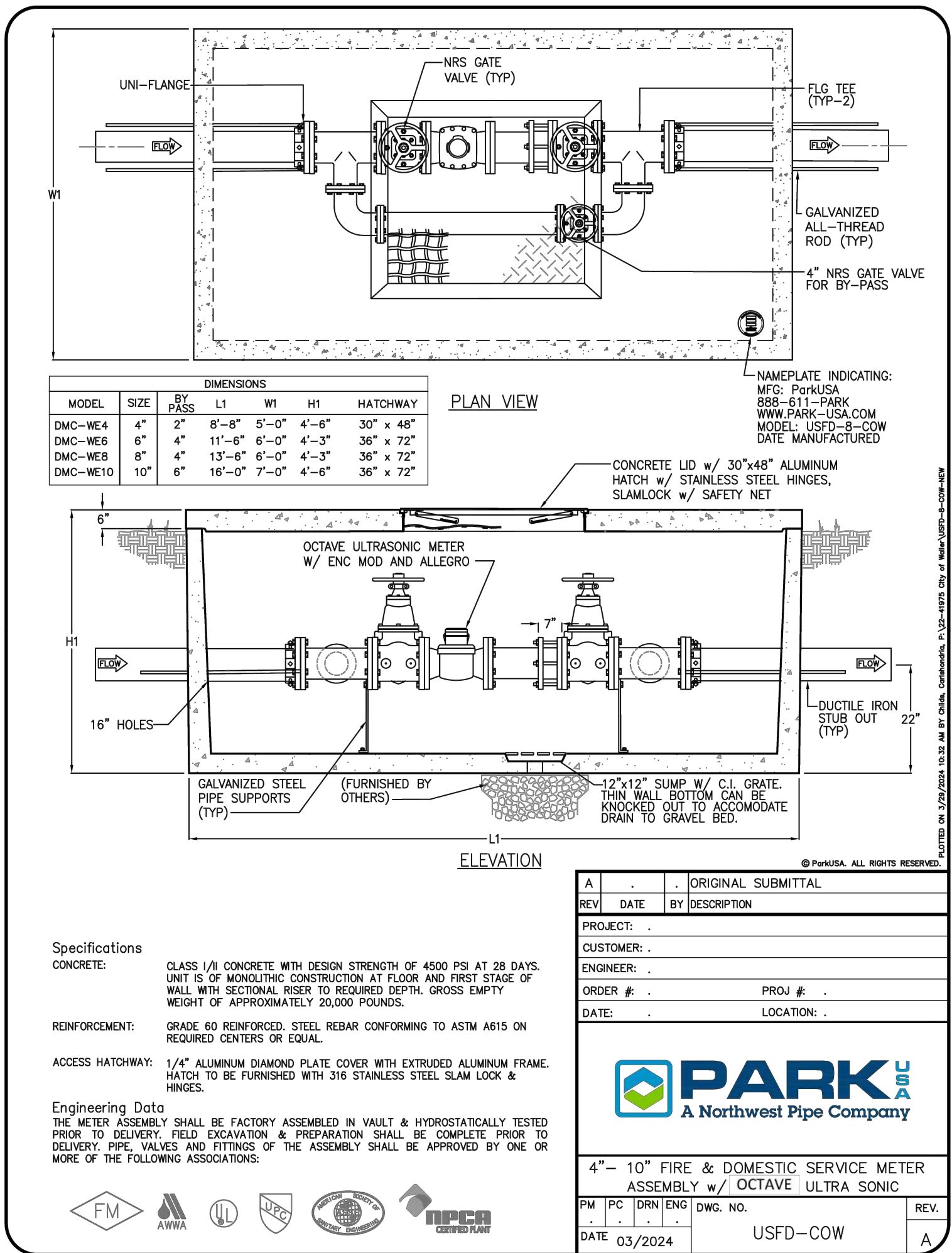
13430 NW Freeway
Suite 700
Houston, Tx. 77040
713.462.3178
TxDwg Firm 3726
TxDwg Firm 10110700

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UNDER THE AUTHORITY OF
BRIAN D. GEROULD, P.E. 108604
ON 06/19/24, IT IS NOT TO BE
USED FOR CONSTRUCTION
PURPOSES.

PROJECT TITLE:		
DRAWN BY:		
CK'D BY:	SHEET DESCRIPTION: SANITARY SEWER DETAILS - 2	
SCALE: N.T.S.		SHEET NO:
DATE:	APPROVED BY:	



\\esg.com\projects\2260\22703930 Co Waller General Consultation\REF for Utility Services\CAD\DWG\CDL-WTR.dwg [Plotted Jun 19, 2024 at 2:11pm by bradshaw (last saved by: tradshaw)]

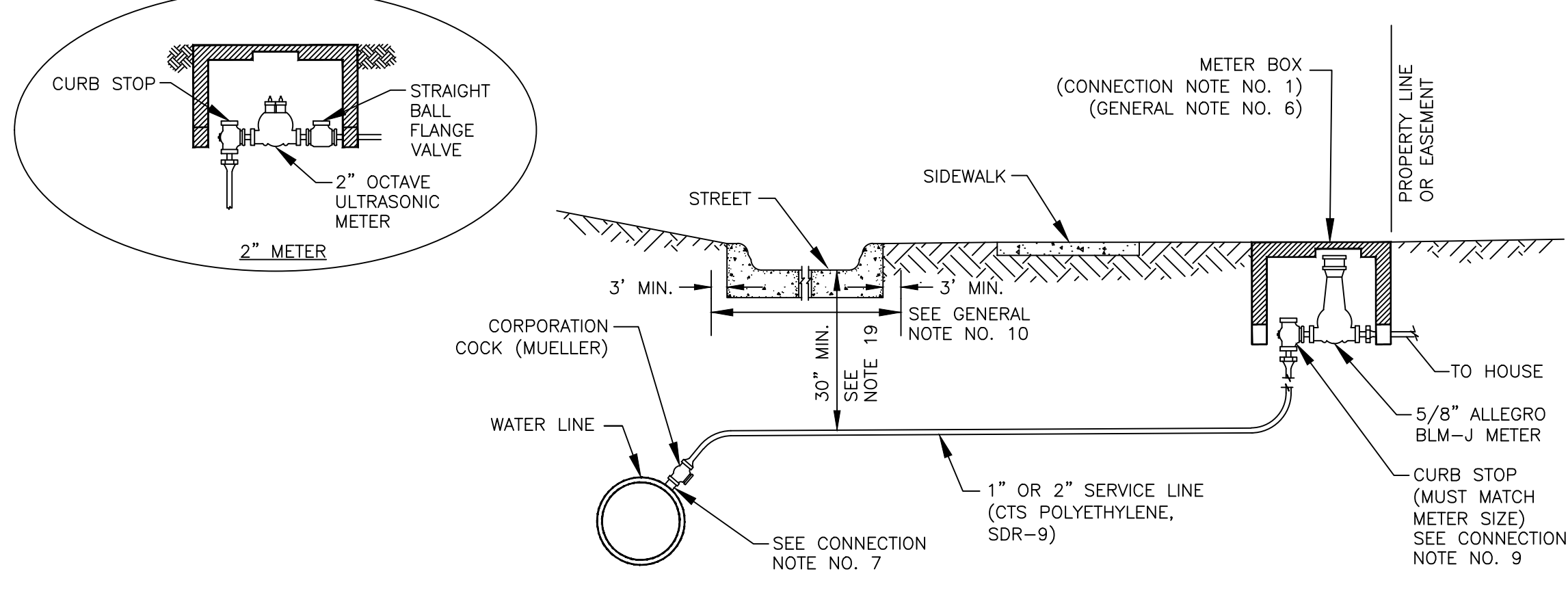
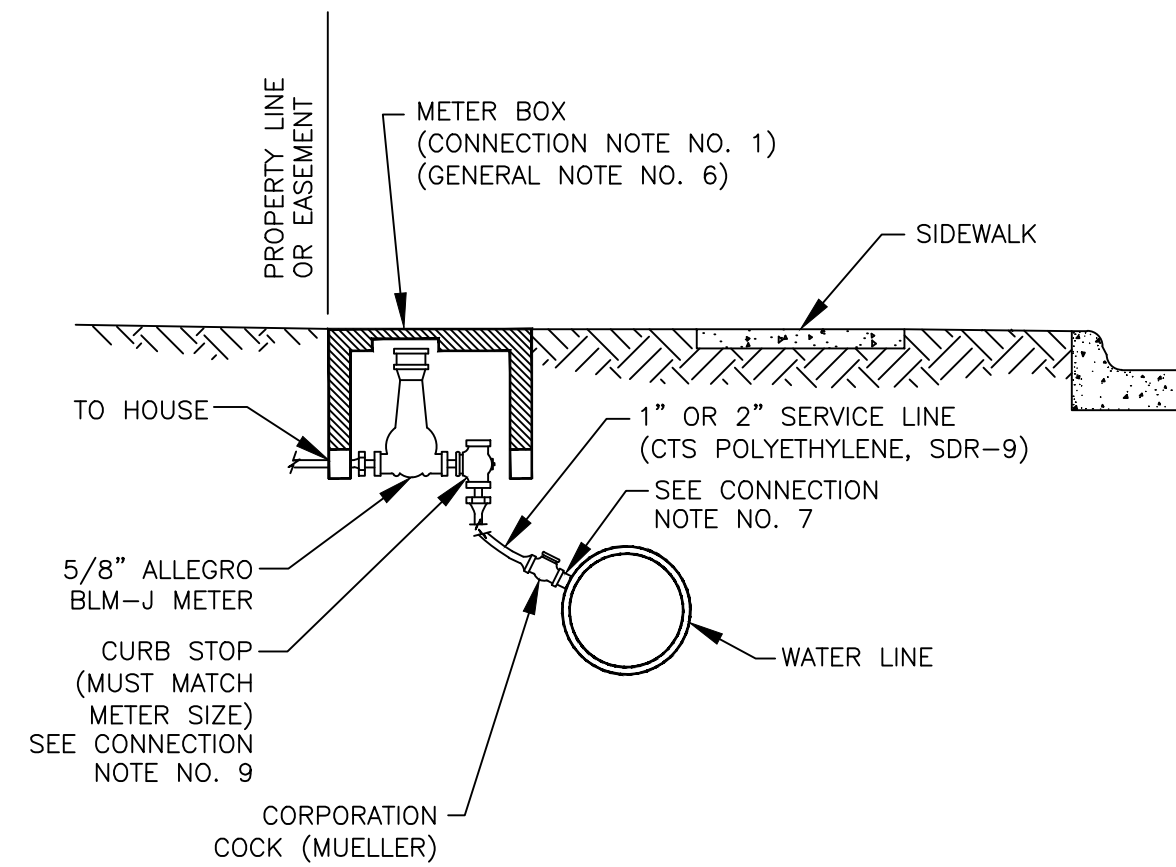


GENERAL NOTES

- THE WATER MAIN SHALL HAVE A MINIMUM COVER OF 48" BELOW TOP OF CURB GRADE.
- ABSOLUTE MINIMUM COVER OF WATER MAINS SHALL BE 36". WATER MAINS WITH LESS THAN 48" COVER AND GREATER THAN 96" COVER SHALL HAVE RESTRAINED JOINTS.
- WATER LINES 4 INCH THOUGH 12 INCH I.D. SHALL COMPLY WITH THE REQUIREMENTS OF AWWA STANDARD C-900 CLASS 235, SDR-18.
- GRAY IRON AND DUCTILE IRON FITTINGS SHALL CONFORM TO AWWA C-153 AND END JOINTS OF FITTINGS AND MAIN LINE VALVES SHALL CONFORM TO AWWA C-111 FOR RUBBER GASKETED JOINTS. GRAY IRON AND DUCTILE IRON FITTINGS SHALL BE CEMENT LINED OR EPOXY COATED.
- PRESSURE TEST OF ALL WATER LINES SHALL BE AT 150 P.S.I. FOR 4 HOURS OR 125 P.S.I. FOR 8 HOURS WITH NO LEAKAGE.
- ALL WATER METER BOXES SHALL BE PLASTIC WITH METAL FLAPS ON THE LIDS.
- PROVIDE "UNI-FLANGE", "CERTA-LOK", OR APPROVED EQUAL PIPE RESTRAINT AND CASING SYSTEM ON UNDERGROUND PRESSURE PIPE SYSTEMS
- ALL WATER TAPS SHOULD BE PLACED IN LINE WITH PROPERTY CORNER OR PLACED HALFWAY BETWEEN THE FRONT LOT CORNERS, OR AT PC OF CURB RETURN IN MULTI LOT SUBDIVISIONS.
- FIRE HYDRANT THREAD SIZE: PUMPER CONNECTION 4-492 SIZE=4.492".
- FIRE HYDRANT ASSEMBLIES SHALL NORMALLY BE LOCATED THREE FEET BEHIND BACK OF CURB, DEFLECT WATERLINES AS NECESSARY TO MAINTAIN THREE FOOT CLEARANCE. REQUIRED ASSEMBLY SHALL INCLUDE ONE LINE SIZE BY SIX INCH TEE, ONE SIX INCH GATE VALVE AND BOX, ONE FIRE HYDRANT AND SIX INCH LEAD PIPING AND TIE BACKS.
- ALL CONCRETE THRUST BLOCKING SHALL BE PLACED TO FORM A SOLID CONNECTION BETWEEN FITTINGS, VALVES, AND FIRE HYDRANTS AND UNDISTURBED EARTH. CONCRETE FOR THRUST BLOCKING SHALL HAVE A MINIMUM OF 2500 P.S.I. COMPRESSIVE STRENGTH AT 28 DAYS.
- INSTALL CONCRETE BLOCK BENEATH FIRE HYDRANTS BEFORE PLACING CONCRETE THRUST BLOCKING TO INSURE THAT FIRE HYDRANTS ARE INSTALLED LEVEL.
- ALL FIRE HYDRANTS AND VALVE BOXES ARE TO BE ADJUSTED TO FINISH GRADE AFTER PAVING IS COMPLETE.
- ALL FIRE HYDRANTS ARE TO BE PAINTED RED.
- CONTRACTOR SHALL NOTIFY CITY ENGINEER 48 HOURS BEFORE START OF CONSTRUCTION.

1 4" - 10" FIRE & DOMESTIC SERVICE METER w/ OCTAVE ULTRA SONIC

2 TYPICAL WATER SERVICE LINE TO METER VAULTS



SERVICE CONNECTION NOTES

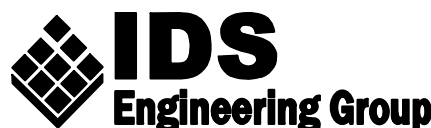
- 4" THROUGH 12" WATER SERVICES SHALL HAVE RESTRAINED JOINTS FROM THE WATER MAIN UP TO AND INCLUDING THE CONNECTION TO THE METER VAULT.
- THE WATER SERVICE LINES THAT ARE INSTALLED BEFORE THE COMPLETION OF STREET CONSTRUCTION SHALL BE LAID IN THE SERVICE DITCH AT THE SAME ELEVATION AS THE WATER MAIN OR A MINIMUM COVER OF 36" BELOW TOP OF CURB GRADE. AT THE PROPER LOCATION FOR THE METER BOX, THE METER (CURB) STOP SHALL BE RAISED TO 18" BELOW TOP OF CURB GRADE WITH ENOUGH EXCESS TUBING TO RAISE THE STOP AT A FUTURE DATE TO 6" BELOW TOP OF CURB GRADE.
- LOCATOR WIRE TO PLACED ON ALL MAINS AND SERVICES. (MIN. 12 GA. COPPER)
- SINGLE METER SERVICE LINES SHALL BE 1" C.T.S. POLYETHYLENE, SDR-9. COLOR SHALL BE BLUE.
- DOUBLE SERVICES ARE NOT ALLOWED.
- WATER VALVES ON MAIN LINES SHALL BE LOCATED AS CLOSE AS POSSIBLE TO EXTENDED PROPERTY LINE AND SHALL CONFORM TO AWWA C-500, OPEN COUNTER CLOCKWISE, EQUIPPED WITH 2" SQUARE OPERATING NUT.
- STAINLESS STEEL DUAL STRAP OR SINGLE WIDE-BAND STRAP SADDLE.
- CONTRACTOR SHALL NOTIFY CITY ENGINEER 48 HOURS BEFORE START OF CONSTRUCTION.
- CURB STOPS SHALL BE MUELLER H-15275 (FLARE). CORPORATION STOPS SHALL BE MUELLER H-15000 (FLARE).
- WATER TAPS SHALL HAVE A MINIMUM OF 24 INCH SEPARATION BETWEEN TAPS ON THE MAIN WATER LINE.
- WATER SERVICES SHALL BE INSTALLED A MINIMUM OF 30 INCHES BELOW THE FLOWLINE OF ROADSIDE DITCH.
- WATER METER VAULTS SHALL BE SET ON COMPACTED 9" THICK BED OF 3/4" CRUSHED GRAVEL. METER VAULTS SHALL BE BACKFILLED WITH ON-SITE MATERIAL PLACED IN 8" LIFTS AND COMPACTED TO 90% MAX DRY DENSITY.
- ALL EXCESS EXCAVATION, NOT WANTED BY THE PROPERTY OWNER, SHALL BECOME PROPERTY OF THE CONTRACTOR TO BE DISPOSED OFF-SITE LEGALLY.
- UNLESS OTHERWISE NOTED, ALL WORK AND PRODUCTS SHALL BE IN ACCORDANCE WITH CITY OF WALLER RESOLUTION NO. 12-08 "MINIMUM CONSTRUCTION STANDARDS FOR COMMUNITY IMPROVEMENTS".

3 SERVICE CONNECTION DETAIL WHEN SERVICE METER IS NEAR WATER MAIN

4 SERVICE CONNECTION DETAIL WHEN SERVICE CROSSES PAVED STREET

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			

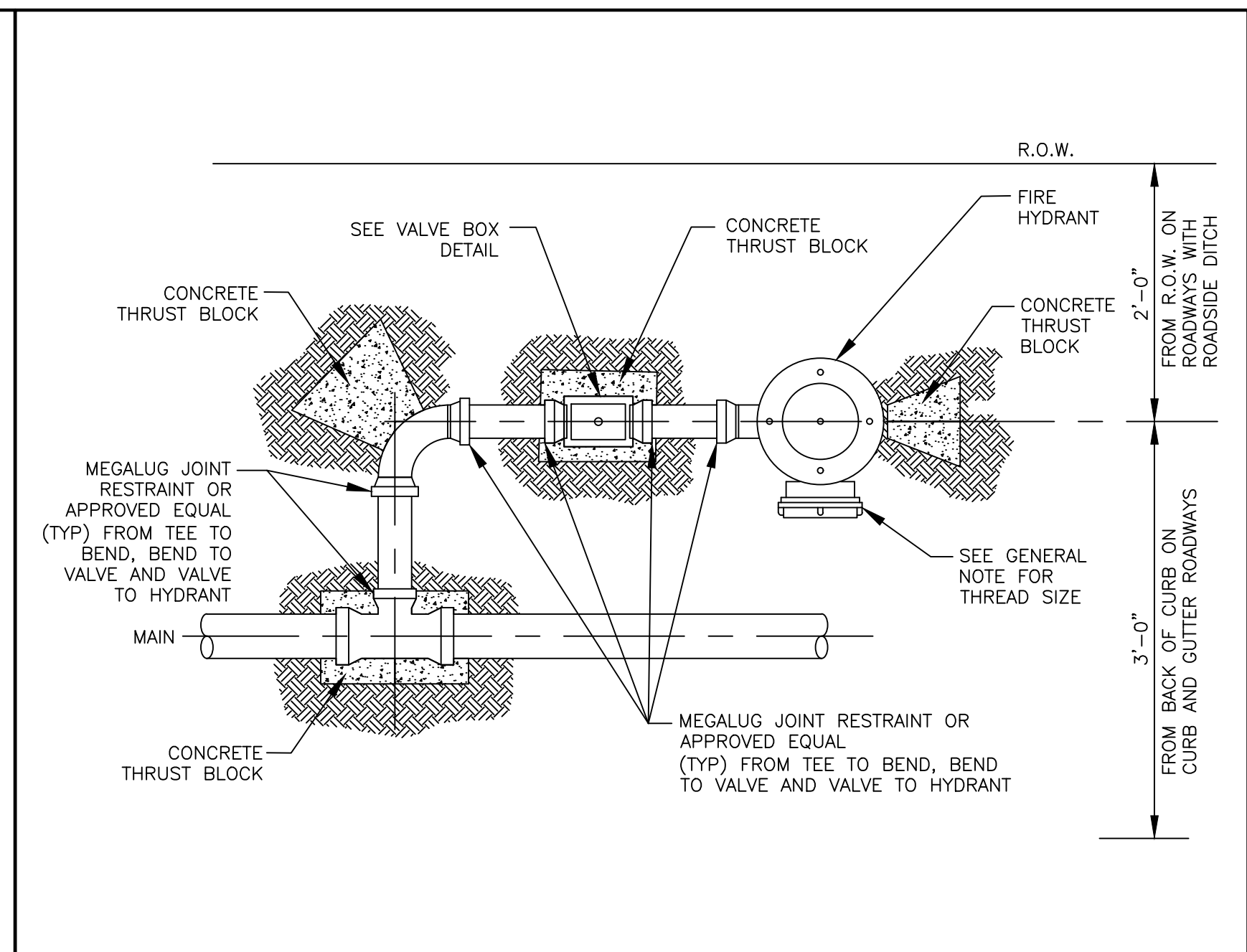
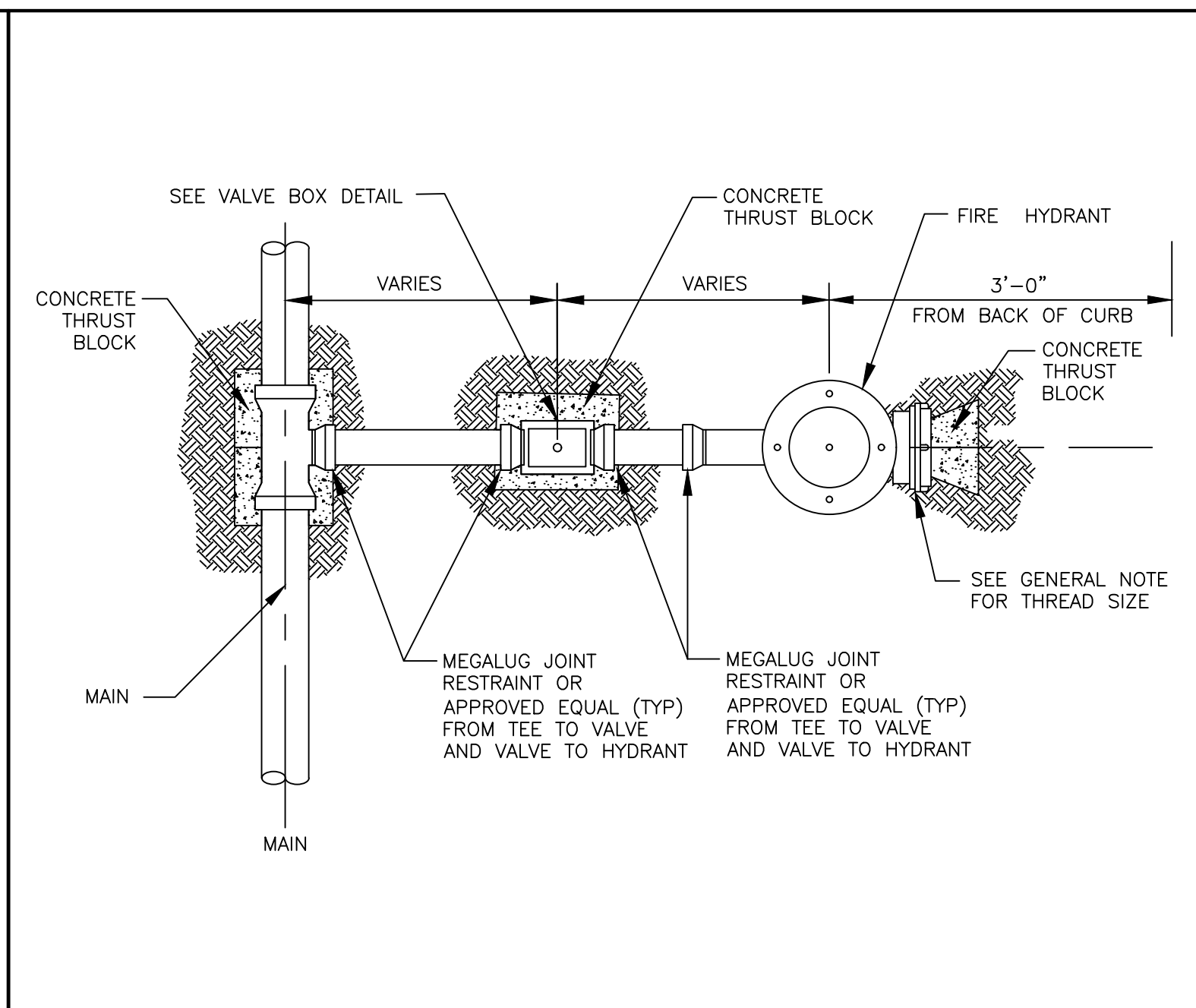
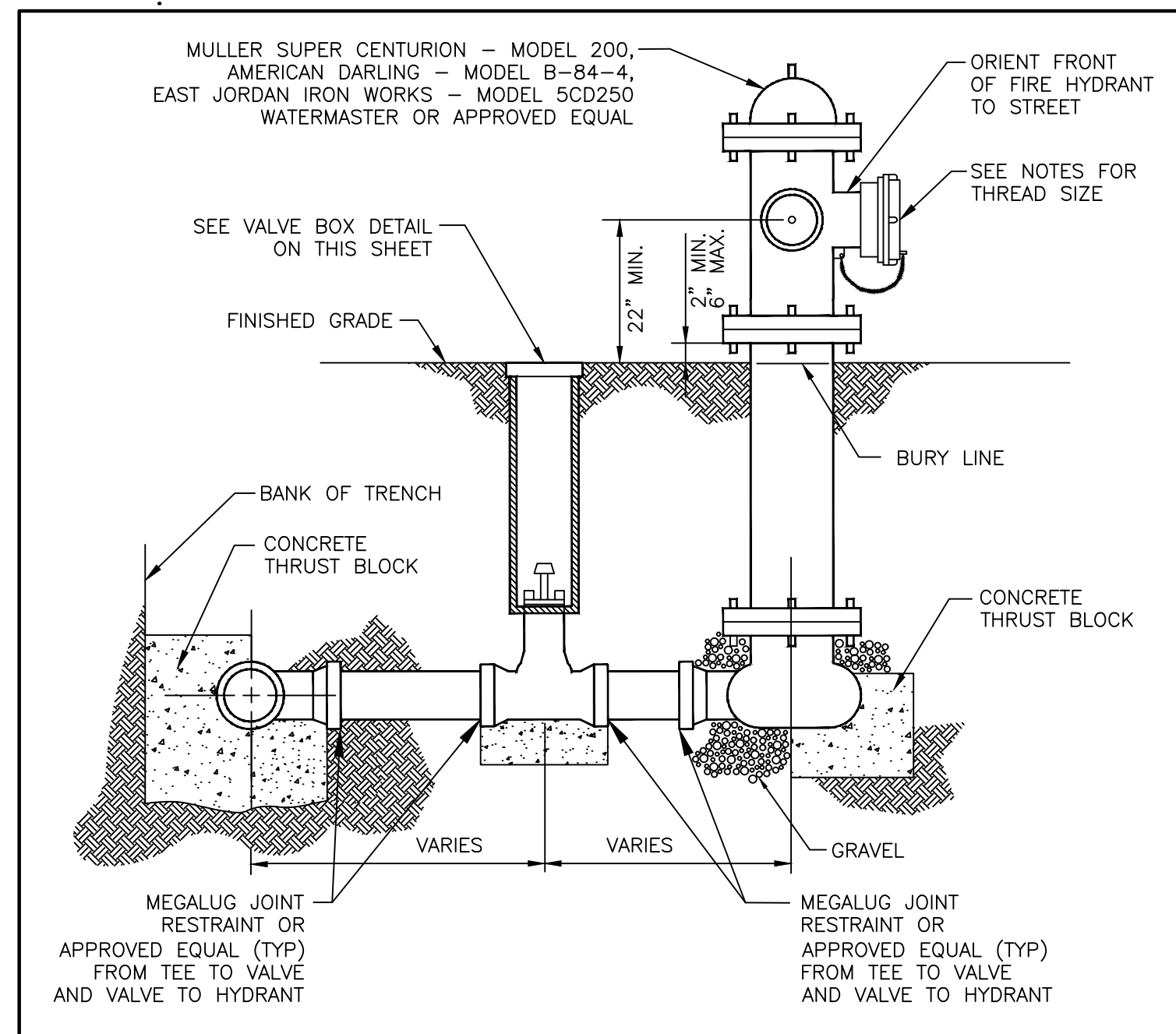
CITY OF WALLER, TEXAS STANDARD DETAILS



13430 NW. Freeway
Suite 700
Houston, Tx. 77040
713.462.3178
Toll-free 800.272.6726
TxDot Firm 10110700

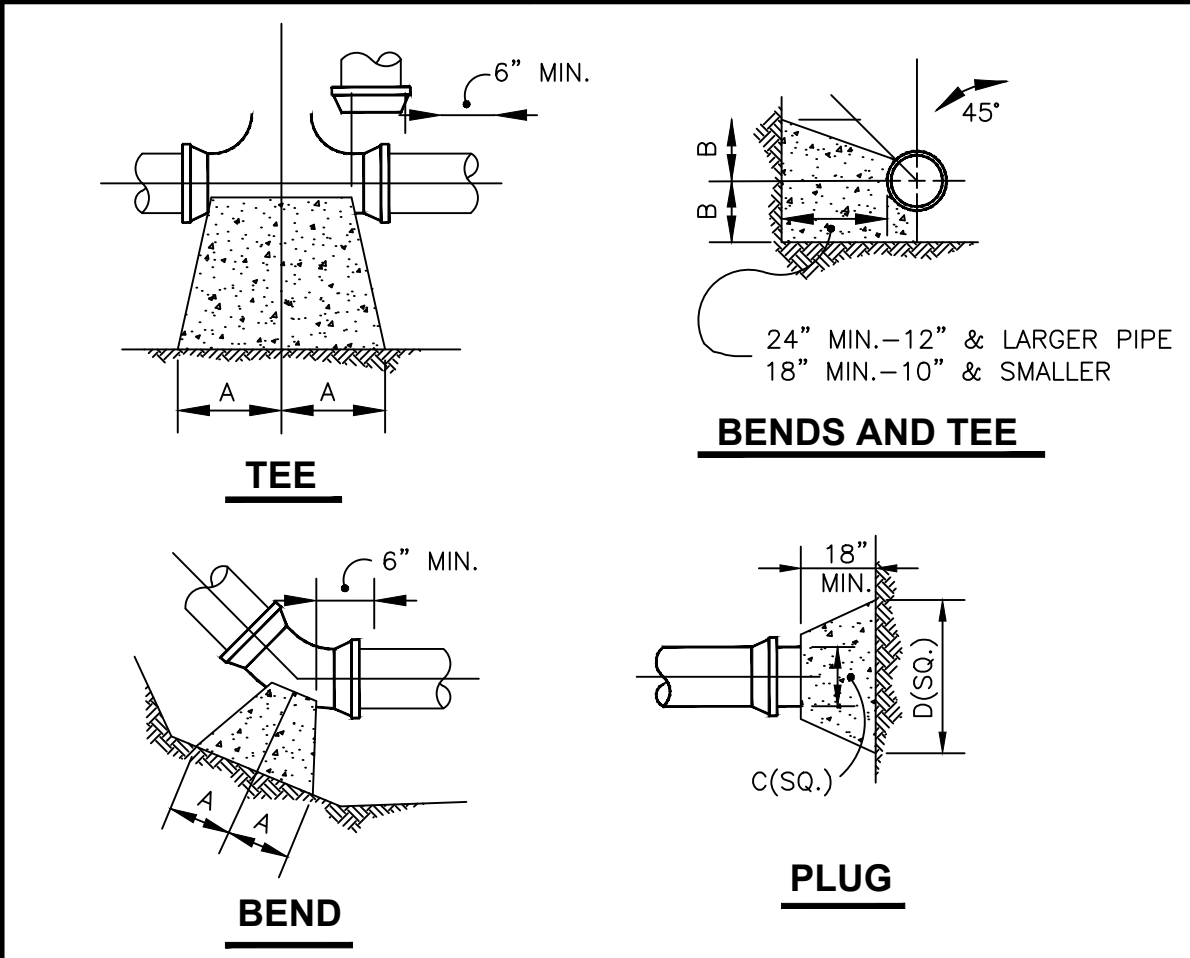
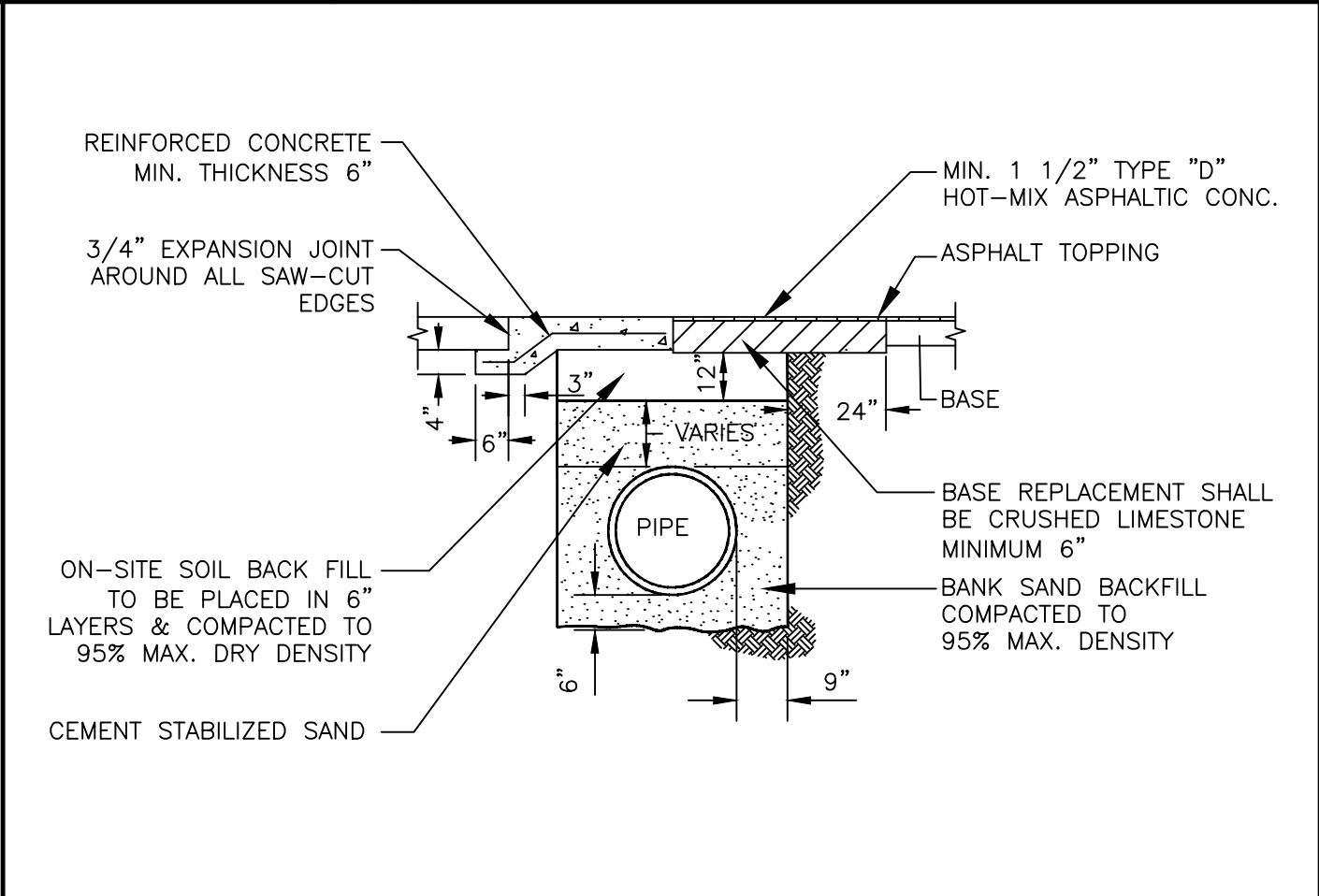
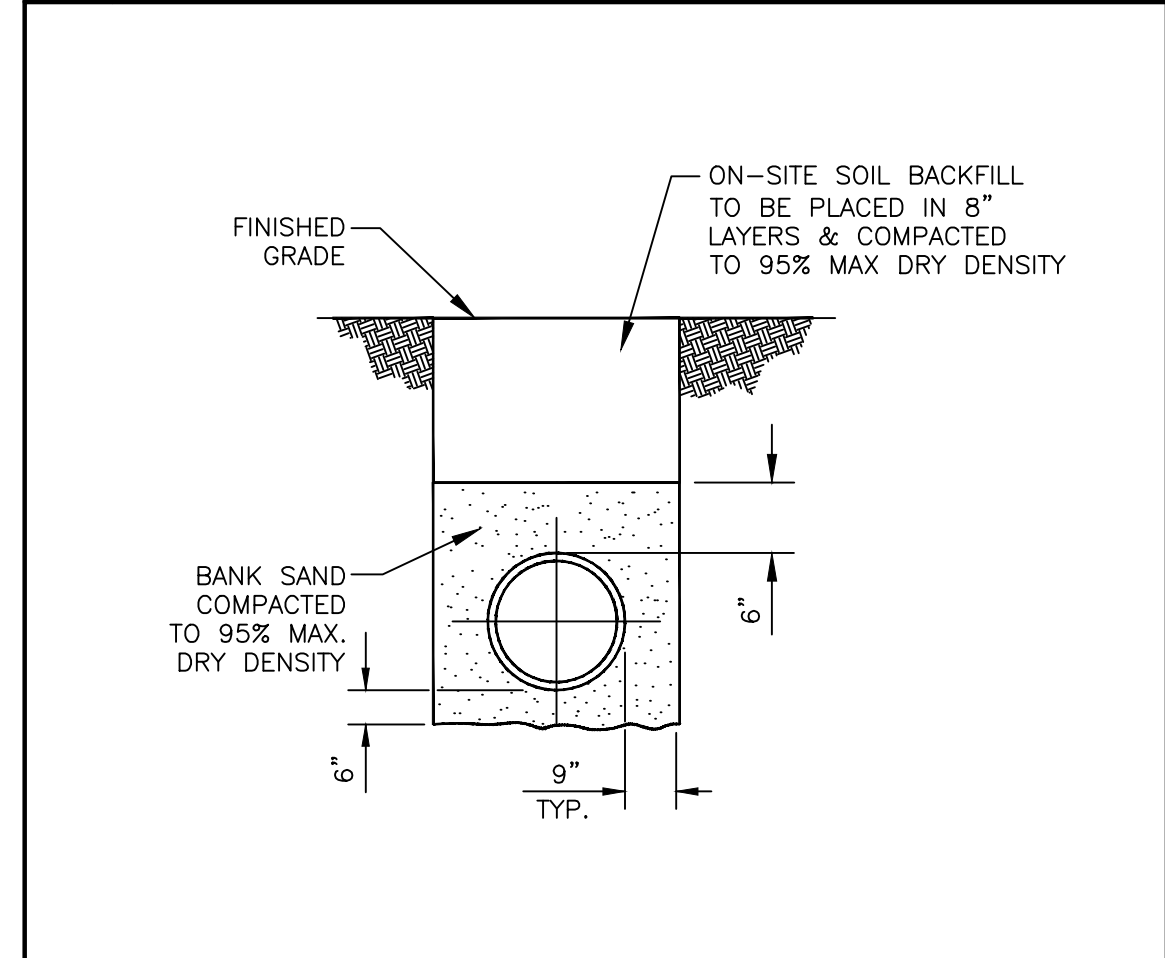
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PROJECT TITLE:		
DRAWN BY:	SHEET DESCRIPTION: WATER DETAILS - 1	
CK'D BY:		
SCALE: N.T.S.	APPROVED BY:	SHEET NO:
DATE:		



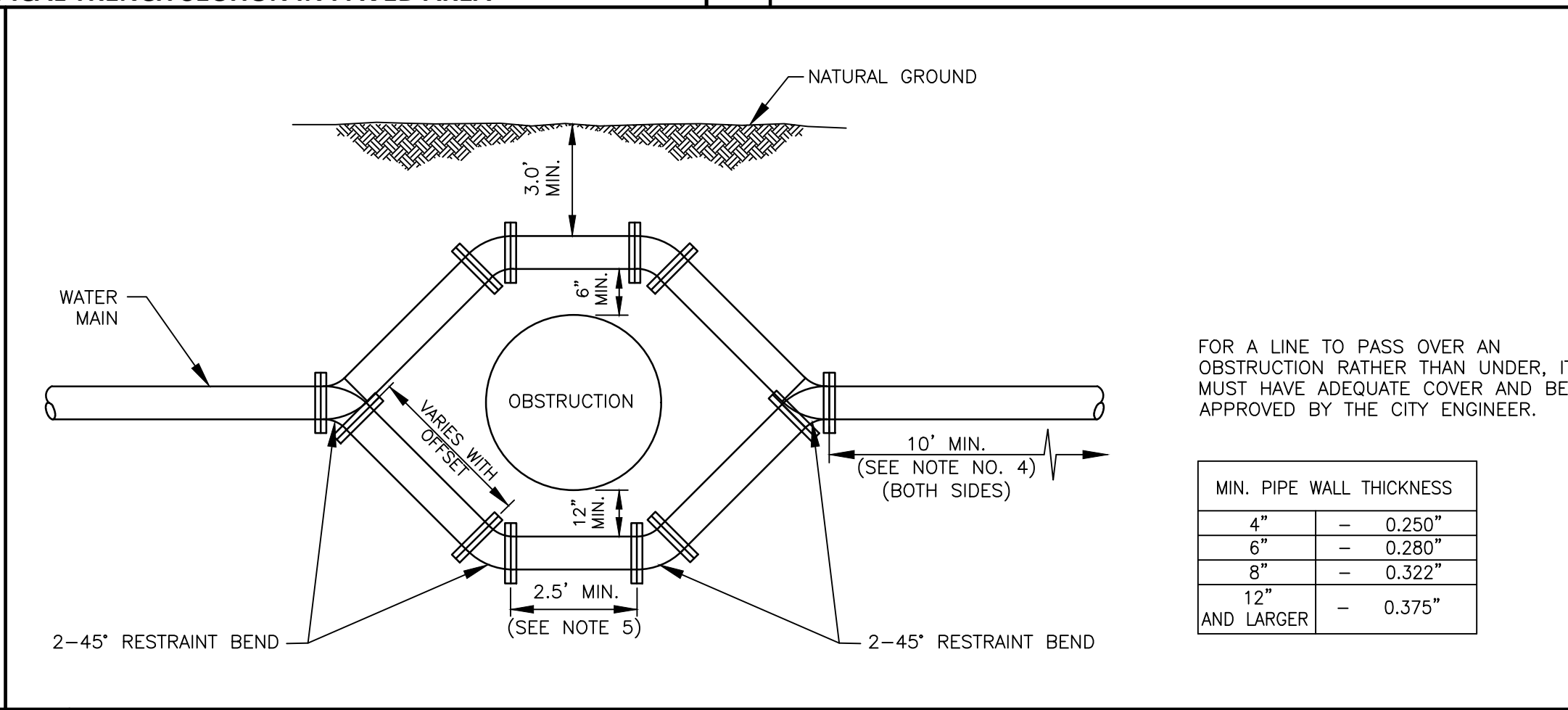
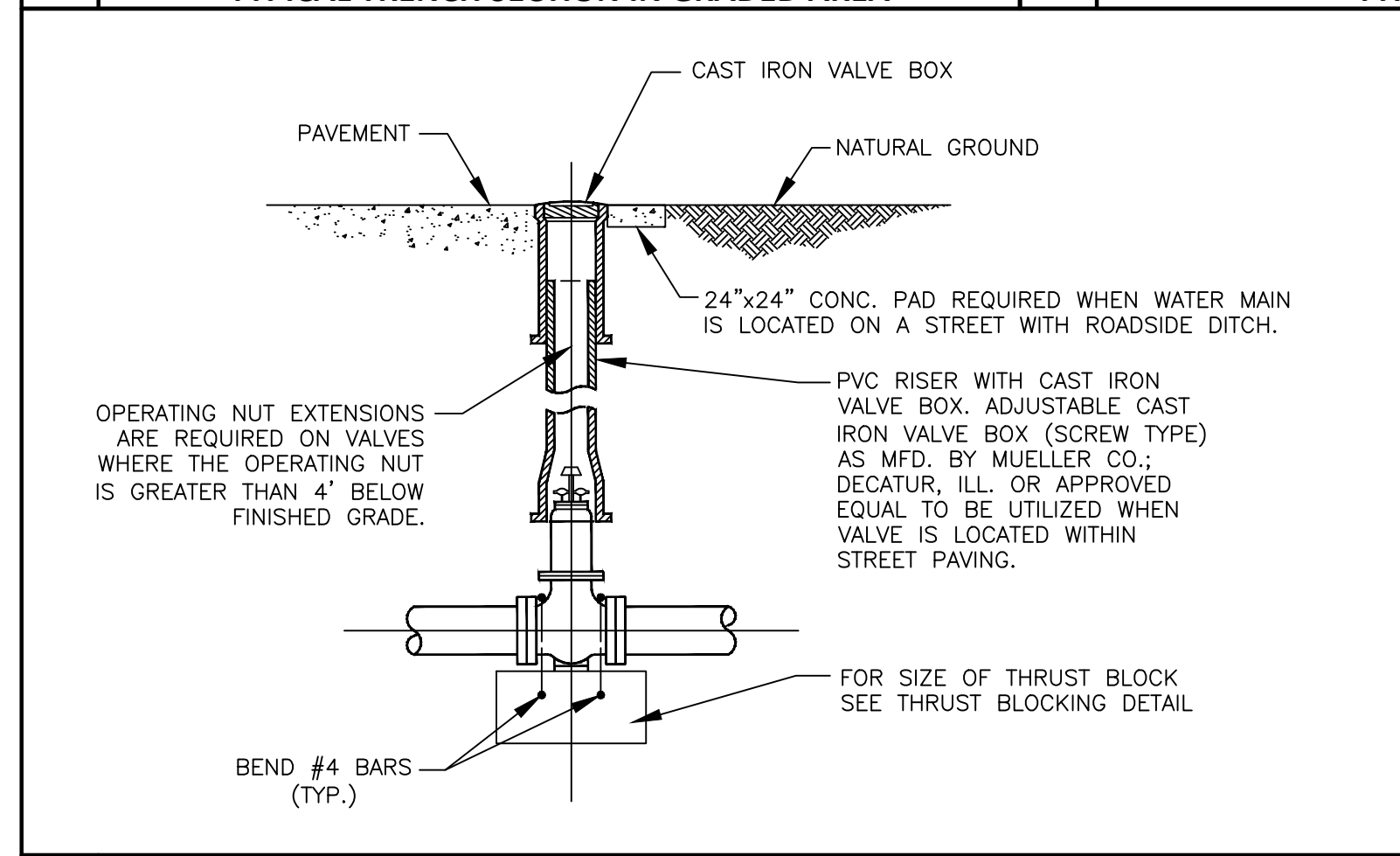
- ## GENERAL NOTES

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15. CONTRACTOR SHALL NOTIFY CITY ENGINEER 48 HOURS BEFORE START OF CONSTRUCTION.



S I Z E	90° BEND		45° BEND		22 1/2° BEND		TEES		PLUGS	
	A	B	A	B	A	B	A	B	C	D
4" 6"	16"	10"	9"	10"	6"	8"	10"	12"	10"	21"
8"	22"	13"	12"	13"	8"	10"	13"	16"	12"	29"
10"	26"	17"	14"	17"	10"	13"	16"	20"	14"	36"
12"	29"	21"	16"	21"	11"	16"	18"	24"	16"	41"
14"	35"	24"	19"	24"	12"	20"	22"	27"	18"	48"
16"	38"	27"	21"	27"	12"	24"	24"	30"	20"	54"
18"	42"	30"	24"	30"	12"	24"	24"	30"	24"	60"
24"	50"	40"	30"	40"	18"	30"	30"	40"	30"	*78"
30"	60"	48"	36"	48"	20"	36"	36"	48"	36"	*96"

NOTE : DIMENSION WITH ASTERISK (*) REQUIRES STRUCTURAL DESIGN



MIN. PIPE WALL THICKNESS	
4"	— 0.250"
6"	— 0.280"
8"	— 0.322"
12" AND LARGER	— 0.375"

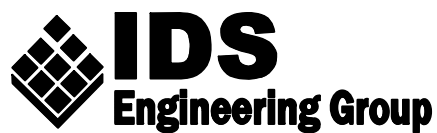
- NOTES:
1. PIPE MATERIAL SHALL BE AWWA C900 PVC, DR-18, WITH MEGALON RESTRAINED JOINTS.
 2. OFFSET ASSEMBLY MUST PASS OVER THE OBSTRUCTION AS LONG AS THE MINIMUM CLEARANCE AND THE MINIMUM COVER ARE MAINTAINED. SPECIFIC APPROVAL FROM THE CITY ENGINEER MUST BE GRANTED FOR THE OFFSET TO PASS UNDER THE OBSTRUCTION.
 3. MATERIAL AND COATINGS SHALL BE IN ACCORDANCE WITH WATER MAIN STANDARD SPECIFICATIONS.
 4. RESTRAIN EXISTING PIPING BEYOND OFFSET SECTION AS REQUIRED TO PREVENT MOVEMENT.
 5. MINIMUM LENGTH SHALL BE OBSTRUCTION O.D. PLUS 2' WITH AN ABSOLUTE MINIMUM LENGTH OF 2.5'.



NO.	REVISIONS	DATE	NAME
△			
△			
△			
△			
△			

CITY OF WALLER, TEXAS

STANDARD DETAILS



13430 NW. Freeway
Suite 700
Houston, Tx. 77040
713.462.3178
TxEng Firm 2726
TxSurv Firm 10110700

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		SHEET NO: