

CITY OF AZLE

CONTRACT DOCUMENTS & SPECIFICATIONS for

DUNAWAY LANE RECONSTRUCTION

AUGUST 2026

AZLE RFP NO. 2026-005

CITY COUNCIL MEMBERS

Randa Goode	Mayor
Derrick Nelson	Council Member Place 1
Amy Estes	Council Member Place 2
Stacy Peek	Council Member Place 3
Josh Berry	Council Member Place 4
Rouel Rothenberger	Council Member Place 5
Brian Conner	Council Member Place 6
Amber Beard	City Manager
Rick White	Director of Public Services



Firm #2448
Project #: 21256



3465 Curry Lane
Abilene, TX 79606
325.695.1070

908 S. Main Street, Suite 100
Boerne, TX 78006
325.695.1070

4920 S. Loop 289, Suite 106
Lubbock, TX 79414
806.368.6375

36 E. Twohig, Suite 101
San Angelo, TX 76903
325.695.1070

1925 Fort Worth Highway
Weatherford, TX 76086
817.594.9880

CITY OF AZLE

CONTRACT DOCUMENTS & SPECIFICATIONS for

DUNAWAY LANE RECONSTRUCTION

AUGUST 2026

AZLE RFP NO. 2026-005

CITY COUNCIL MEMBERS

Randa Goode	Mayor
Derrick Nelson	Council Member Place 1
Amy Estes	Council Member Place 2
Stacy Peek	Council Member Place 3
Josh Berry	Council Member Place 4
Rouel Rothenberger	Council Member Place 5
Brian Conner	Council Member Place 6
Amber Beard	City Manager
Rick White	Director of Public Services



Firm #2448
Project #: 21256



9/2/26



3465 Curry Lane
Abilene, TX 79606
325.695.1070

908 S. Main Street, Suite 100
Boerne, TX 78006
325.695.1070

4920 S. Loop 289, Suite 106
Lubbock, TX 79414
806.368.6375

36 E. Twohig, Suite 101
San Angelo, TX 76903
325.695.1070

1925 Fort Worth Highway
Weatherford, TX 76086
817.594.9880

TABLE OF CONTENTS
THE CITY OF AZLE, TEXAS
DUNAWAY LANE RECONSTRUCTION

CONTRACT DOCUMENTS:

1. Invitation to Bid
2. Information for Bidders
3. Statement of Bidder's Qualifications
4. Non-Collusion Affidavit of Prime Bidder
5. Proposer Guarantees
6. Conflict of Interest Questionnaire (Form CIQ)
7. Certificate of Interested Parties (Form 1295)
8. Bid Proposal
9. Bid Bond
10. Notice of Award
11. Contract
12. Performance Bond
13. Payment Bond
14. Maintenance Bond
15. Notice to Proceed
16. General Conditions
17. Technical Specifications

**ADVERTISEMENT FOR BIDS
CITY OF AZLE, TEXAS
DUNAWAY LANE RECONSTRUCTION**

Separate sealed bids for the construction of **Dunaway Lane Reconstruction (Azle bid number 2026-005)** will be received by the **City of Azle, Texas** until **3:00 PM** on **October 28, 2026**, at City Hall, 505 W. Main Street, Azle, Texas, 76020, and then at said location publicly opened and read aloud. This project includes removal of existing pavement and installation of approximately 26,500 SY of concrete roadway, install curb inlets and culvert system, replace 5,600 linear feet of sanitary sewer, and replace 5,800 linear feet of waterline.

A non-mandatory Pre-Bid conference will be held at **10:00 AM** on **October 14, 2026**, located at Azle City Hall, 505 W. Main Street, Azle, Texas, 76020.

The Contract Documents consisting of Advertisement of Bids, Information for Bidders, Bid Proposal, Bid Bond, Contract, Performance and Payment Bonds, Maintenance Bond, General Conditions, Notice of Award, Notice to Proceed, Plans, Specifications, and Addenda (if any) may be examined at the following location:

JACOB & MARTIN, LLC
1925 Fort Worth Highway, Weatherford, Texas 76086

The Owner reserves the right to waive any informalities and to reject any or all bids. Bids may be held by the Owner for a period not to exceed 60 days from the date of bid opening for the purpose of reviewing the bids and investigating the qualifications of Bidders prior to awarding of the contract.

Contractors must obtain a set of CONTRACT DOCUMENTS online at www.jacobmartin.com by digital download or hard copy to be considered a registered plan holder eligible to bid the project. Cost for digital download of CONTRACT DOCUMENTS will be \$0.00. Hard copies of the CONTRACT DOCUMENTS will be \$100.00. All Copies of the CONTRACT DOCUMENTS must be ordered online and are available for pick up, mail out or digital download via www.jacobmartin.com. Upon verification of online payment, hard copies may be picked up at Jacob & Martin, LLC, located at 1925 Fort Worth Highway, Weatherford, Texas 76086.

A certified check or bank draft, payable to the order of CITY OF AZLE, TEXAS, negotiable U.S. Governmental bonds (at par value) or a satisfactory Bid Bond executed by the Bidder and an acceptable surety in an amount equal to five percent (5%) of the total bid shall be submitted with each bid.

City of Azle, Texas

Randa Goode, Mayor

September 9th & 16th, 2026

INFORMATION FOR BIDDERS

Bids will be received by the City of Azle, Texas, herein called the Owner, at the City Hall in Azle, 505 W. Main Street, Azle, Texas 76020, until **3:00 PM** on **October 28, 2026** and then at said location publicly opened and read aloud.

Each bid must be submitted in a sealed envelope addressed to the Purchasing Agent. Each sealed envelope containing a bid must be plainly marked on the outside as "**DUNAWAY LANE RECONSTRUCTION - (Azle bid number 2026-005)**" and the envelope shall bear on the outside the Bidder's name and address. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope and addressed to the Purchasing Agent, City of Azle, 505 W. Main Street, Azle, Texas, 76020.

All bids must be made on the required bid form. All blank spaces for bid prices must be filled in, in ink or typewritten, and the bid must be fully completed and executed when submitted. Only one copy of the bid form is required. **Bids will not be accepted from contractors who have not obtained original plans and specifications from Jacob & Martin, LLC. Bids shall be submitted on the provided documents. No faxed bids will be accepted.**

All bidders must be able to show they have completed, as a general contractor, at least three completed projects within the last five years for a public entity and of similar size and nature as the project being bid.

The Owner may waive any informalities or minor defects or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening or authorized postponement thereof. Any bid received after the time and date specified will not be considered. No Bidder may withdraw a bid within 60 days after the actual date of opening thereof. Should there be reasons that the contract cannot be awarded within the specified period, the time may be extended by mutual Agreement between the Owner and the Bidder.

Bidders must satisfy themselves of the accuracy of the estimated quantities in the Bid Schedule by examination of the site and a review of the drawings and specifications including Addenda. The failure or omission of any Bidder to do any of the foregoing shall in no way relieve any Bidder from any obligation in respect to his Bid. After bids have been submitted, the Bidder shall not assert that there was a misunderstanding concerning the quantities of the work or of the nature of the work to be done. The Contract Documents contain the provisions required for the construction of the project. Information obtained from an officer, agent or employee of the Owner or any other person shall not affect the risks or obligations assumed by the Contractor or relieve him from fulfilling any of the conditions of the Contract.

A certified check or bank draft, payable to the order of CITY OF AZLE, TEXAS, negotiable U.S. Governmental bonds (at par value) or a satisfactory Bid Bond executed by the Bidder and an acceptable surety in an amount equal to five percent (5%) of the total bid shall be submitted with each bid. As soon as bid prices have been compared, the Owner will return the bonds of all except the three lowest responsible bidders. When the Contract is executed, the bonds of the two

remaining unsuccessful bidders will be returned. The Bid Bond of the successful Bidder will be retained until the Performance-Payment Bonds and Maintenance Bond (providing for a two (2) year warranty) have been executed and approved, after which it will be returned. If the Contract is \$50,000 or more, Performance-Maintenance-Payment Bonds in the amount of 100% of the contract price, with a corporate surety approved by the Owner, will be required for the faithful performance of the contract. Attorneys-in-fact who sign Bid Bonds, Payment Bonds, Maintenance Bonds or Performance Bonds must file with each bond a certified and effective dated copy of their power of attorney.

Award of the contract will be made as a whole to one Bidder. The Owner reserves the right to award the contract based upon alternates, and/or reduction in bid quantities as stated in the specifications.

The party to whom the contract is awarded will be required to execute the Contract and obtain the Performance-Maintenance-Payment Bonds within twenty-one (21) calendar days from the date the Notice of Award is delivered to the Bidder. The Notice of Award shall be accompanied by the necessary Contract and Bond forms. In case of failure of the Bidder to execute the Contract, the Owner may, at its option, consider the Bidder in default, in which case the Bid Bond accompanying the Proposal shall become the property of the Owner.

The Owner within twenty-one (21) days of receipt of the fully executed Contract documents, shall return to the Contractor an executed duplicate of the Contract Documents. Should the Owner not return the executed Contract Documents within such period, The Bidder may, by written notice, withdraw his signed Contract. Such notice of withdrawal shall be effective upon receipt of the notice by the Owner.

The Notice to Proceed shall be issued following approval of the executed Contract Documents.

All applicable laws, ordinances and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout.

The Engineer is Derek Turner, P.E. with JACOB & MARTIN, LLC., 1925 Fort Worth Highway, Weatherford, Texas 76086.

Supplemental Instructions to Bidders (Local Funding)

Title	Must be returned with your bid
Addendums (if applicable)	Yes – Signed and Dated
Cover Page	No
Table of Contents	No
Advertisement for Bids	No
Information for Bidders	No
Statement of Bidder's Qualifications	Yes – Completed and attachments added as applicable
Non-Collusion of Prime Bidders	Yes – Completed, signed, and notarized
Proposer Guarantees	Yes – Completed and signed
Conflict of Interest Questionnaire (Form CIQ)	Yes – Completed and signed
Certificate of Interested Parties (Form 1295)	Must file online as indicated (within 7 business days from notification of pending award)
Bid Proposal with Bid Schedule	Yes – Completed, signed, and placed at the front of bid packet
Bid Bond	Yes – Completed and signed by Principal and Surety with additional Bond paperwork as needed
Notice of Award	No – (required after award)
Agreement	No – (required after award)
Performance/Payment/Maintenance Bonds	No – (required after award)
Notice to Proceed	No – (required after award)
General Conditions	No
Specifications and Plans	No

Note: Please do not use staples or bindings on submitted bids.

STATEMENT OF BIDDER'S QUALIFICATIONS

All questions must be answered, and the date given must be clear and comprehensive. **All bidders must be able to show they have completed, as a general contractor, at least three completed projects within the last five years for a public entity and of similar size and nature as the project being bid. *If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information as desired.***

Name of Bidder: _____ Date Organized: _____

Physical Address: _____ Date Incorporated: _____

Number of Years in contracting business under present name: _____

Contracts on hand:

<u>Contract</u>	<u>Amount</u>	<u>Anticipated Completion Date</u>
-----------------	---------------	------------------------------------

Type of work performed by your company: _____

Have you ever failed to complete any work awarded to you? _____

Have you ever defaulted on a contract? _____

List the more important projects recently completed by your firm (be sure to include projects of similar importance):

<u>Project</u>	<u>Amount</u>	<u>Month/Year Completed</u>
----------------	---------------	-----------------------------

Major equipment available for this contract:

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

Credit Available: _____ Bank Reference: _____

The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the CITY OF AZLE in verification of the recitals comprising this Statement of Bidder's Qualifications.

Executed this _____ day of _____, 20_____.

By: _____

Name: _____

Title: _____

NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

State of _____}

County of _____} ss.

_____, being first duly sworn,
(Name of Signer)

- (1) He/She is _____ of _____, the
(Title of Signer) (Company Name)
Bidder that has submitted the attached Bid;
- (2) He/She is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid:
- (3) Such Bid is genuine and is not a collusive or sham Bid;
- (4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with another Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix an overhead, profit or cost element of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the CITY OF AZLE or any person interested in the proposed Contract; and
- (5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

Signed _____

Name _____

Title _____

Subscribed and sworn to me this _____ day of _____, _____.

By: _____

Notary Public

My Commission Expires:

PROPOSER GUARANTEES

State of _____

County of _____

_____, being first duly sworn disposed and says that:

- (1) He/She is the (owner, partner, officer, representative or agent) of _____, the proposer that has submitted the attached proposal;
- (2) He/She is fully informed respecting the preparation and contents of the attached proposal and all the pertinent circumstances respecting such proposal;
- (3) Such proposal is genuine and is not a collusive or sham proposal;
- (4) Neither said proposer nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including the affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other proposer, firm or person to submit a collusive or sham proposal in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement, collusion, communication or conference with any other proposer, firm or person to fix the price or prices in the attached proposal or to fix any overhead, profit or cash element of the proposal price or the proposal price of any other proposer or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Owner of any person interested in the proposed contract; and the price or prices quoted in the attached proposals are fair and proper.
- (5) All responsible parties will comply with Chapter 176 Local Government Code and complete the Conflict of Interest Questionnaire (CIQ).
- (6) Proposer will comply with Government Code 2252.908 and provide the CITY OF AZLE the Certificate of Interested Parties, Form 1295, within seven business days from notification of a pending award.
- (7) In accordance with Chapter 2270 of the Texas Government Code, the proposer verifies that the company does not boycott Israel and will not boycott Israel during the term of any contract executed in response to this proposal.
- (8) In compliance with Chapter 2252 of Texas Government Code, the CITY OF AZLE, Texas will not enter in a contract with a company that does business with Iran, Sudan or any known terrorist organization.
- (9) The proposer verifies that in compliance with Senate Bill 13 of the Texas 87th Legislative Session it does not and will not during the contract term boycott energy companies. And further certifies that in accordance with Senate Bill 19 of the 87th Legislative Session it does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association and will not discriminate against such an entity or association during the contract term.

- (10) The proposer and any subcontractor(s) shall comply with Title VI of the Civil Rights Act of 1964, which prohibits recipients of federal financial assistance from excluding from a program or activity, denying benefits of, or otherwise discriminating against a person on the basis of race, color, or national origin (42 U.S.C. § 2000d et seq.), as implemented by the Department of the Treasury's Title VI regulations, 31 CFR Part 22, which are herein incorporated by reference and made a part of this contract (or agreement). Title VI also includes protection to persons with "Limited English Proficiency" in any program or activity receiving federal financial assistance, 42 U.S.C. § 2000d et seq., as implemented by the Department of the Treasury's Title VI regulations, 31 CFR Part 22, which are herein incorporated by reference and made a part of this contract or agreement.

SIGNATURE

PRINTED NAME

DATE

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor doing business with local governmental entity

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

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

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

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

OFFICE USE ONLY

Date Received

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

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

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

Name of Officer

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

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

☐ Yes ☐ No

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

☐ Yes ☐ No

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

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

7

Name of signatory

Signature

Date

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

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

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

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

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

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

- (2) the vendor:

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

(i) a contract between the local governmental entity and vendor has been executed;
or

(ii) the local governmental entity is considering entering into a contract with the vendor;

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

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

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

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

(1) has an employment or other business relationship with a local government officer of that local governmental entity, or a family member of the officer, described by Section 176.003(a)(2)(A);

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

(3) has a family relationship with a local government officer of that local governmental entity.

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

- (1) the date that the vendor:

(A) begins discussions or negotiations to enter into a contract with the local governmental entity; or

(B) submits to the local governmental entity an application, response to a request for proposals or bids, correspondence, or another writing related to a potential contract with the local governmental entity; or

- (2) the date the vendor becomes aware:

(A) of an employment or other business relationship with a local government officer, or a family member of the officer, described by Subsection (a);

(B) that the vendor has given one or more gifts described by Subsection (a); or

(C) of a family relationship with a local government officer.

CERTIFICATE OF INTERESTED PARTIES**FORM 1295****OFFICE USE ONLY**

Complete Nos. 1 - 4 and 6 if there are interested parties.
Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.

4 Name of Interested Party	City, State, Country (place of business)	Nature of Interest (check applicable)	
		Controlling	Intermediary

5 Check only if there is **NO** Interested Party. ☐

6 UNSWORN DECLARATION

My name is _____, and my date of birth is _____.

My address is _____, _____, _____, _____, _____.
(street) (city) (state) (zip code) (country)

I declare under penalty of perjury that the foregoing is true and correct.

Executed in _____ County, State of _____, on the _____ day of _____, 20____.
(month) (year)

Signature of authorized agent of contracting business entity
(Declarant)

ADD ADDITIONAL PAGES AS NECESSARY

BID PROPOSAL

Date: _____

Proposal of _____ (hereinafter called "BIDDER"), organized and existing under the laws of the State of _____ doing business as a _____* to the CITY OF AZLE, (hereinafter called "OWNER").

*Insert "a corporation", "a partnership", or "an individual" as applicable.

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK for the construction of the DUNAWAY LANE RECONSTRUCTION project in strict accordance with the CONTRACT DOCUMENTS, within the time set forth therein, and at the prices stated below.

By submission of this BID, each BIDDER certifies, and in the case of a joint BID each party thereto certifies as to its own organization, that this BID has been arrived at independently, without consultation, communication, or Agreement as to any matter relating to this BID with any other BIDDER or with any competitor.

BIDDER hereby agrees to commence WORK under this contract on or before a date to be specified in the NOTICE TO PROCEED and to fully complete the PROJECT within **270** consecutive calendar days thereafter, BIDDER further agrees to pay as liquidated damages, the sum of **\$500.00** for each consecutive calendar day thereafter as provided in Section 15 of the General Conditions.

BIDDER acknowledges receipt of the following ADDENDUM:

<u>Addendum No.</u>	<u>Bidder's Initials</u>
_____	_____
_____	_____
_____	_____

BIDDER agrees to perform all the work described in the CONTRACT DOCUMENTS for the following unit prices or lump sum prices.

Bidder certifies that it does not currently and will not employ undocumented workers. The Bidder further agrees, that if convicted of federal immigration violations under 8 U.S. Code Section 1324a(f), it shall repay the amount paid up to that date under this contract, including any interest paid by Owner to funding agency, if applicable. Such payment shall be made no later than the 120th day after receiving notice of violation from the Owner.

CITY OF AZLE, TEXAS
DUNAWAY LANE RECONSTRUCTION
BASE BID SCHEDULE

Show prices in numerals. Round off unit prices to two decimal places only.

These Bid Prices must include all labor, materials, equipment, insurance, overhead, superintendence, transportation, profits & incidentals to cover the finished Work called for in the Contract Documents.

For all Labor, Materials, Equipment and Incidentals to Furnish and Install the Following:

Bid Item	Description	Est. Qty.	Unit	Unit Price	Extended Amount
--	<u>DEMOLITION</u>	--	--	--	--
1	Demolish and Remove Existing Ashpalt	6622	CY	\$	\$
2	Demo and Remove Existing Concrete	280	CY	\$	\$
3	Demo and Remove Existing Gravel	840	CY	\$	\$
4	Remove Earthwork Beyond Existing Pavemen	186	CY	\$	\$
5	Remove Existing Culvert without Headwalls	55	EA	\$	\$
6	Remove Existing Culvert with Headwall	8	EA	\$	\$
7	Relocate Existing Mailbox	40	EA	\$	\$
8	Relocate Existing Sign	1	EA	\$	\$
9	Demolish and Remove Existing Ashpalt for TxDOT Island	15	CY	\$	\$
--	<u>PAVEMENT</u>	--	--	--	--
10	Furnish and Install Concrete Pavement with Curb & Gutter	26,500	SY	\$	\$
11	Furnish and Install Asphalt Pavement	838	SY	\$	\$
12	Furnish and Install Sidewalk	3360	SY	\$	\$
13	Furnish and Install Gravel Roadbase	186	CY	\$	\$
14	Furnish and Install TxDOT Stamped Concrete Island	60	SY	\$	\$
--	<u>STORM DRAIN</u>	--	--	--	--
15	3'x5' RCB	150	LF	\$	\$
16	2'x3' RCB	70	LF	\$	\$
17	4'x6' RCB	1345	LF	\$	\$
18	3'9"x8' RCB	145	LF	\$	\$

19	36" RCP	175	LF	\$	\$
20	24" RCP	1370	LF	\$	\$
21	18" RCP	140	LF	\$	\$
22	12" Slotted Drain	55	LF	\$	\$
23	12" ADS HDPE Storm Drain	50	LF	\$	\$
24	12 RCP	40	LF	\$	\$
25	Headwall	6	EA	\$	\$
26	10' Curb Inlet	13	EA	\$	\$
27	Area Drain (3'x3')	3	EA	\$	\$
28	Area Drain (6'x6')	1	EA	\$	\$
29	Area Drain (5'x6')	1	EA	\$	\$
30	Area Drain (4'x4')	2	EA	\$	\$
31	TxDOT 6:1 SET	2	EA	\$	\$
32	Rip Rap for Slope Protection & Erosion Control	1	LS	\$	\$
--	<u>WATER</u>	--	--	--	--
33	2" HDPE Water Line	40	LF	\$	\$
34	4" HDPE Water Line	15	LF		
35	6" HDPE Water Line	150	LF	\$	\$
36	8" HDPE Water Line	3350	LF	\$	\$
37	12" HDPE Water Line	2375	LF	\$	\$
38	2" Gate Valve	1	EA	\$	\$
39	4" Gate Valve	1	EA	\$	\$
40	6" Gate Valve	4	EA	\$	\$
41	8" Gate Valve	12	EA	\$	\$
42	12" Gate Valve	14	EA	\$	\$
43	Fire Hydrant with 6" Gate Valve	23	EA	\$	\$
44	Relocate & Reconnect Exist Water Meter & Irrigation Control Valve	3	EA	\$	\$
45	Relocate & Reconnect Exist Monitor Well	1	EA	\$	\$
46	Relocate & Reconnect Exist Water Meter	19	EA	\$	\$
47	Reconnect Exist Water Meter	21	EA	\$	\$
48	Reconnect to Exist Water Line	14	EA	\$	\$
49	4" Bore & Encasement	10	LF	\$	\$
50	14" Bore & Encasement	95	LF	\$	\$
51	20" Bore & Encasement	50	LF	\$	\$
52	Metal Tape	5930	LF	\$	\$

	<u>SANITARY SEWER</u>	--	--	--	--
53	8" DR26 PVC Gravity Line (5' - 10')	3740	LF	\$	\$
54	8" DR26 PVC Gravity Line (Over 10')	1,845	LF	\$	\$
55	8" HDPE Force Main	170	LF	\$	\$
56	Replace Exist Manhole (Over 5')	6	EA	\$	\$
57	Manhole (5' - 10')	11	EA	\$	\$
58	Manhole (Over 10')	4	EA	\$	\$
59	Demolish and Remove Existing Manhole	4	EA	\$	\$
60	Reconnect Existing Sewer Service	53	EA	\$	\$
61	Main Line Cleanout	1	EA	\$	\$
62	Connect to Exist SS Line	6	EA	\$	\$
63	14" Bore & Encasement	70	LF	\$	\$
64	Metal Tape	5,755	LF	\$	\$
	<u>ANCILLARY ITEMS</u>	--	--	--	--
65	Hydromulch	15,000	SY	\$	\$
66	Traffic Control	1	LS	\$	\$
67	Erosion Control as Required by TPDES	1	LS	\$	\$
68	Owner's Allowance	1	LS	\$ 850,000.00	\$ 850,000.00
	TOTAL BASE BID (Items 1-68)				\$

BID SCHEDULE CONTRACTOR COMPLIANCE TO TEXAS SALES TAX CODE

The contractor shall make available to the _____ CITY OF AZLE _____ all tax advantages available to the _____ CITY OF AZLE _____ pursuant to Chapter 151, Subchapter E of the Texas Tax Code.

I, _____, the undersigned, as authorized representative of _____, do hereby agree to complete the installation of material within **270** consecutive calendar days, which time allows for the normal delays associated with inclement weather, etc. as specified in the Specifications.

Respectfully Submitted,

(Contractor Signature)

By: _____

Title: _____

Physical Address: _____

Email Address: _____

Telephone: _____

Employer Federal ID No. _____

ATTEST:

(Seal) if bid by Corporation

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned, _____
as Principal, and _____ as Surety, are hereby and firmly bound
unto the CITY OF AZLE, TEXAS in the penal sum of 5% for the payment of which, well and truly to be
made, we hereby jointly and severally bind ourselves, successors and assigns.

SIGNED, this _____ day of _____, 20_____.

The condition of the above obligation is such that whereas the Principal has submitted to the CITY OF
AZLE, TEXAS a certain bid, attached hereto, and hereby made a part hereof to enter into a contract in
writing for the DUNAWAY LANE RECONSTRUCTION project.

NOW THEREFORE,

- (a) If said bid shall be rejected, or in the alternate,
- (b) If said bid shall be accepted and the Principal shall execute and deliver a contract in the form
of contract attached hereto (properly completed in accordance with said bid,) and shall furnish
a bond for this faithful performance of said contract, and for the payment of all persons
performing labor or furnishing materials in connection therewith, and shall in all other respects
perform the Agreement created by the acceptance of said bid, then this obligation shall be void,
otherwise the same shall remain in force and effect, it being expressly understood and agreed
that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the
penal amount of this obligation as herein stated.

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

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

Principal

Surety

By: _____

By: _____

IMPORTANT: Surety companies executing bonds must appear on the Treasury Department's most
current list (Circular 570 as amended) and be authorized to transact business in the state where the project
is located.

NOTICE OF AWARD

To: _____ Project Description: Dunaway Lane Reconstruction

City of Azle

The Owner has considered the Bid submitted by you for the above-described work in response to the Advertisement for Bids dated September 9th & 16th, 2026, and the Information for Bidders.

You are hereby notified that your Bid has been accepted for items in the amount of \$_____.

You are required by the Information for Bidders to execute the Contract and furnish the required Contractor's Performance Bond, Payment Bond, Maintenance Bond, and Certificate of Insurance within twenty-one (21) days from the date of this Notice to you.

If you fail to execute said Contract and to furnish said bonds within twenty-one (21) days from the date of this Notice, the Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your Bid as a forfeiture of your Bid Bond. The Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this Notice of Award to the Owner.

Dated this _____ day of _____, 20____.

CITY OF AZLE

By: _____

Name: Amber Beard

Title: City Manager

ACCEPTANCE OF NOTICE

Receipt of the above Notice of Award
is hereby acknowledged by:

(Contractor)

This _____ day of _____, 20____.

By: _____

Name: _____

Title: _____

PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

a _____ hereinafter called **PRINCIPAL** and
(Corporation, Partnership or Individual)

(Name of Surety)

(Mailing Address of Surety)

(Physical Address of Surety)

(Telephone Number, including area code, of Surety)

hereinafter called **SURETY**, as held, and firmly bound unto

CITY OF AZLE
(Name of Owner)

505 W. Main Street, Azle, Texas 76020
(Address of Owner)

hereinafter called **OWNER** in the total aggregate penal sum of: _____
Dollars (\$_____) in lawful money of the United States, for the payment of which sum well and
truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly
and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the **PRINCIPAL** entered into a
certain Contract with the **OWNER**, dated the _____ day of _____, 20____,
a copy of which is hereto attached and made a part hereof for the construction of:

DUNAWAY LANE RECONSTRUCTION

NOW, THEREFORE, if the **PRINCIPAL**, shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term thereof, and any extensions thereof which may be granted by the **OWNER** with or without notice to the **SURETY** and if the **PRINCIPAL** shall satisfy all claims and demands incurred under such Contract, and shall fully indemnify and save harmless the **OWNER**, from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the **OWNER** all outlay and expense which the **OWNER** may incur in making good any default, then this obligation shall be void, otherwise to remain in full force and effect.

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

PROVIDED, FURTHER, that it is expressly agreed that the **BOND** shall be deemed amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the Contract not increasing the contract price more than 25 percent, so as to bind the **PRINCIPAL** and the **SURETY** to the full and faithful performance of the **CONTRACT** as so amended. The term "Amendment", wherever used in this **BOND**, and whether referring to this **BOND**, the Contract or the Loan Documents shall include any alteration, addition, extension, or modification of any character whatsoever.

PROVIDED, FURTHER, that no final settlement between the **OWNER** and the **PRINCIPAL** shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied. The **OWNER** is the only beneficiary hereunder.

IN WITNESS WHEREOF, this instrument is executed in three (3) counterparts, each one of which shall be deemed an original, this _____ day of _____, 20_____.

PRINCIPAL (Contractor):

Name: _____

Address: _____

ATTEST:

By: _____

Name: _____

Title: _____

(SEAL)

Name: _____

Title: _____

SURETY:

Name: _____

Address: _____

ATTEST:

By: _____

Name: _____

Title: _____

(SEAL)

Name: _____

Title: _____

OWNER APPROVAL:

The OWNER approves the form of this Performance Bond.

Date: _____

Name: CITY OF AZLE

Address: 505 W. Main Street

Azle, Texas 76020

ATTEST:

By: _____

Name: Amber Beard

Title: City Manager

(SEAL)

NOTES:

1. The date of the Bond must not be prior to the date of the Contract.
2. The amount of the Bond must not be less than the amount of the Contract.
3. If the contractor is a partnership, all partners should execute the Bond.
4. If the contractor is a corporation, the Bond must be executed by an authorized official of the corporation. Authorization should be evidenced by a corporate resolution.
5. The surety must:
 - (a) be a corporation which is authorized to conduct business in the State of Texas;
 - (b) be a corporation which is licensed by the State of Texas to execute bonds as a surety; and
 - (c) must appear on the Treasury Department's most current list (Circular 570 as amended). See the FMI.
6. The Bond must be executed by an authorized representative of the surety. Ordinarily, Bonds are signed by an attorney-in-fact or agent of the surety. The person signing the Bond for the surety should provide a copy of the power of attorney or other evidence of their authority to act on behalf of the surety.
7. (For Public Bodies Only) the Contractor may not be required to obtain a surety bond from any specific insurance or surety company.

PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

a _____ hereinafter called **PRINCIPAL** and
(Corporation, Partnership or Individual)

(Name of Surety)

(Mailing Address of Surety)

(Physical Address of Surety)

(Telephone Number, including area code, of Surety)

hereinafter called **SURETY**, as held, and firmly bound unto

CITY OF AZLE
(Name of Owner)

505 W. Main Street, Azle, Texas 76020
(Address of Owner)

hereinafter called **OWNER** and unto all persons, firms, and corporations who or which may furnish labor, or who furnish materials to perform as described under the contract and to their successors and assigns in the total aggregate penal sum of: _____

Dollars (\$_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the **PRINCIPAL** entered into a certain contract with the **OWNER**, dated the _____ day of _____, 20_____, a copy of which is hereto attached and made a part hereof for the construction of:

DUNAWAY LANE RECONSTRUCTION

NOW, THEREFORE, if the **PRINCIPAL,** shall promptly make payment to all persons, firms, and corporations furnishing materials for or performing labor in the prosecution of the **WORK** provided for in such contract, and any authorized extensions or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such **WORK,** and for all labor cost incurred in such **WORK** including that by a **SUBCONTRACTOR,** and to any laborer, mechanic or materialman lienholder whether it acquires its lien by operation of State or Federal law; then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, that beneficiaries or claimants hereunder shall be limited to the **SUBCONTRACTORS,** and persons, firms and corporations having a direct contract with the **PRINCIPAL** or its **SUBCONTRACTORS.**

PROVIDED, FURTHER, that the said **SURETY** for value received hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the contract or to the **WORK** to performed thereunder of the **SPECIFICATIONS** accompanying the same shall in any way affect its obligation on this **bond,** and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of this contract or to the **WORK** or to the **SPECIFICATIONS.**

PROVIDED, FURTHER, that no suit or action shall be commenced hereunder by any claimant:

- (a) Unless claimant shall have given the notice or notices required by applicable state law, in the manner required by applicable state law and within the time limits prescribed by applicable state law; or
- (b) After the expiration of the minimum period of limitation permitted by applicable state law.

PROVIDED, FURTHER, that it is expressly agreed that this **BOND** shall be deemed amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the Contract not increasing the contract price more than 25 percent, so as to bind the **PRINCIPAL** and the **SURETY** to the full and faithful performance of the Contract as so amended. The term "Amendment", wherever used in this **BOND** and whether referring to this **BOND,** the contract or the loan Documents shall include any alteration, addition, extension, or modification of any character whatsoever.

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

IN WITNESS WHEREOF, this instrument is executed in three (3) counterparts, each one of which shall be deemed an original, this _____ day of _____, 20_____.

PRINCIPAL (Contractor):

Name: _____

Address: _____

ATTEST:

By: _____

Name: _____

Title: _____

(SEAL)

Name: _____

Title: _____

SURETY:

Name: _____

Address: _____

ATTEST:

By: _____

Name: _____

Title: _____

(SEAL)

Name: _____

Title: _____

OWNER APPROVAL:

The OWNER approves the form of this Payment Bond.

Date: _____

Name: CITY OF AZLE

Address: 505 W. Main Street

Azle, Texas 76020

ATTEST:

By: _____

Name: Amber Beard

Title: City Manager

(SEAL)

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That _____
(NAME OF CONTRACTOR)

as principal and _____
(NAME OF SURETY)

a corporation organized under the laws of _____

as Surety, do hereby expressly acknowledge themselves to be held and bound to pay unto the

_____ CITY OF AZLE _____ as Obligee, a municipal corporation hereinafter called OWNER,
the sum of _____
(100% OF TOTAL AMOUNT BID)

Dollars (\$ _____) for the payment of which sum well and truly to be made unto said OWNER and its successors, said principal and sureties do hereby bind themselves, their assigns, and successors jointly and severally.

This obligation is conditioned, however, that whereas said CONTRACTOR has by written Agreement dated _____, 20____, entered into a contract with said OWNER to build and construct the DUNAWAY LANE RECONSTRUCTION project which contract and the plans and specifications therein mentioned and adopted by the OWNER are hereby expressly made a part thereof as though the same were written and embodied herein.

WHEREAS, under Item(s) 01 02 01 of the specifications and other contract documents, it is provided that the CONTRACTOR shall maintain and keep in good repair the work constructed and/or equipment furnished by him as contemplated by the plan drawings, specifications, and other Contract Documents, and perform for a period of two (2) year(s) (NOTE: Period to be as stated in Information For Bidders) from the date of acceptance as shown on the "Certificate of Completion" issued by the Engineer, or the date of Final Payment by the OWNER if a separate Certificate of Completion is not issued, all necessary repairs, reconstruction and renewal of any part of said construction, and to furnish the labor and materials to make good and to repair any defective condition growing out of or on account of the breakage or failure of any substance or the improper function of any part of the construction work. The CONTRACTOR shall reimburse the OWNER for the costs of all Engineering and special services required to be furnished by the OWNER which are directly attributable to the restoration of the constructed work. Said maintenance contemplates the complete restoration of the constructed work to a functional use during the said period as set forth above. It is the intended purpose of this section to require the correction of all defective conditions resulting from materials furnished or work and labor performed by the CONTRACTOR under the conditions prescribed by the plans and specifications; and in case the CONTRACTOR shall fail or refuse to commence and actively pursue such corrections within ten (10) days after proper written notifications have been furnished to him by the OWNER, it is agreed that the OWNER may do said work and supply such materials and the said CONTRACTOR and SURETY herein shall be liable for the payment of all costs thereby incurred.

NOW THEREFORE, if the said CONTRACTOR shall keep and perform its said agreement to maintain said work and keep the same in good repair for the said maintenance period as provided above, then these presents shall be null and void and have no further effect, but if default shall be made by the CONTRACTOR in the performance of its contract to do so maintain and repair said work, then these presents shall have full force and effect and the OWNER shall have and recover from the said CONTRACTOR and its sureties damages in the premises, as provided, and it is further understood and agreed that this obligation shall be a continuing one against the principal and sureties hereon, and that successive recoveries may be had hereon for successive breaches until the full amount shall have been exhausted; and it is further understood that the obligation herein to maintain said work shall continue throughout said maintenance period, and the same shall not be changed, diminished, or in any manner affected from any cause during said time.

IN WITNESS WHEREOF, this instrument is executed in three (3) counterparts, each one of which shall be deemed an original, this the ____ day of _____, 20____.

PRINCIPAL (Contractor):

Name: _____

Address: _____

ATTEST:

By: _____

Name: _____

Title: _____

(SEAL)

Name: _____

Title: _____

SURETY:

Name: _____

Address: _____

ATTEST:

By: _____

Name: _____

Title: _____

(SEAL)

Name: _____

Title: _____

OWNER APPROVAL:

The OWNER approves the form of this Maintenance Bond.

Date: _____

Name: CITY OF AZLE

Address: 505 W. Main Street

Azle, Texas 76020

ATTEST:

By: _____

Name: Amber Beard

Title: City Manager

(SEAL)

NOTICE TO PROCEED

To: _____ Project Description: Dunaway Lane Reconstruction

_____ City of Azle

You are hereby notified to commence work in accordance with the Agreement dated _____, 20_____, on or before _____, 20_____ and to complete the work within **270** consecutive calendar days thereafter.

The date of completion of all work is therefore _____, 20_____.

CITY OF AZLE
(Owner)

By: _____
Name: Rick White
Title: Director of Public Services

ACCEPTANCE OF NOTICE

Receipt of the above Notice to Proceed
is hereby acknowledged by:

(Contractor)

This ____ day of _____, 20_____.

By: _____
Name: _____
Title: _____

GENERAL CONDITIONS

1. Definitions
2. Additional Instructions and Detail Drawings
3. Schedules, Reports and Records
4. Drawings and Specifications
5. Shop Drawings
6. Materials, Services and Facilities
7. Inspection and Testing
8. Substitutions
9. Patents
10. Surveys, Permits, Regulations
11. Protection of Work, Property, Persons
12. Supervision by Contractor
13. Changes in the Work
14. Changes in Contract Price
15. Time for Completion and Liquidated Damages
16. Correction of Work
17. Subsurface Conditions
18. Suspension of Work, Termination and Delay
19. Payments to Contractor
20. Acceptance of Final Payment as Release
21. Insurance
22. Contract Security
23. Assignments
24. Indemnification
25. Separate Contracts
26. Subcontracting
27. Engineer's Authority
28. Land and Rights-of-Way
29. Guaranty
30. Taxes

1. DEFINITIONS

1.1 Wherever used in the CONTRACT DOCUMENTS, the following terms shall have the meanings indicated which shall be applicable to both the singular and plural thereof:

1.2 ADDENDA--Written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the CONTRACT DOCUMENTS, DRAWINGS and SPECIFICATIONS, by additions, deletions, clarifications or corrections.

1.3 BID--The offer or proposal of a BIDDER submitted on the prescribed form setting forth the prices for the WORK to be performed.

1.4 BIDDER--Any person, firm or corporation submitting a BID for the WORK.

1.5 BONDS--Bid, Performance, Maintenance, and Payment Bonds and other instruments of security, furnished by the CONTRACTOR and his surety in accordance with the CONTRACT DOCUMENTS.

1.6 CHANGE ORDER--A written order to the CONTRACTOR authorizing an addition, deletion or revision in the WORK within the general scope of the CONTRACT DOCUMENTS, or authorizing an adjustment in the CONTRACT PRICE or CONTRACT TIME.

1.7 CONTRACT DOCUMENTS--The contract, including Advertisement for Bids, Information for Bidders, BID, Bid Bond, Agreement, Payment Bond, Performance Bond, Maintenance Bond, NOTICE OF AWARD, NOTICE TO PROCEED, CHANGE ORDER, DRAWINGS, SPECIFICATIONS and ADDENDA.

1.8 CONTRACT PRICE--The total monies payable to the CONTRACTOR under the terms and conditions of the CONTRACT DOCUMENTS.

1.9 CONTRACT TIME--The number of calendar days stated in the CONTRACT DOCUMENTS for the completion of the WORK.

1.10 CONTRACTOR--The person, firm or corporation with whom the OWNER has executed the Contract.

1.11 DRAWINGS--That part of the CONTRACT DOCUMENTS which show the characteristics and scope of the WORK to be performed and which have been prepared or approved by the ENGINEER.

1.12 ENGINEER--The person, firm or corporation named as such in the CONTRACT DOCUMENTS.

1.13 FIELD ORDER--A written order effecting a change in the WORK not involving an adjustment in the CONTRACT PRICE or an extension of the CONTRACT TIME, issued by the ENGINEER to the CONTRACTOR during construction.

1.14 FINAL COMPLETION--The time at which the Work in entirety is complete to the satisfaction of the Engineer and Owner, in accordance with the Contract Documents so that the Work can be utilized for the purposes for which it was intended. The terms finally complete(d), wholly complete(d), and entirely complete(d) as applied to all of the Work refer to final completion thereof.

1.15 NOTICE OF AWARD--The written notice of the acceptance of the BID from the OWNER to the successful BIDDER.

1.16 NOTICE TO PROCEED--A written notice given by the OWNER to the CONTRACTOR authorizing him to proceed with the WORK and establishing the date of commencement of the WORK.

1.17 OWNER--The individual or entity with whom the CONTRACTOR has entered into the Agreement and for whom the WORK is to be performed.

1.18 **PROJECT**--The total construction of Work to be performed under the CONTRACT DOCUMENTS.

1.19 **RESIDENT PROJECT REPRESENTATIVE**--The authorized representative of the OWNER who is assigned to the PROJECT Site or any part thereof.

1.20 **SHOP DRAWINGS**--All drawings, diagrams, illustrations, brochures, schedules, and other data which are prepared by the CONTRACTOR, a SUBCONTRACTOR, manufacturer, SUPPLIER or distributor, which illustrate how specific portions of the WORK shall be fabricated or installed.

1.21 **SPECIFICATIONS**--That part of the CONTRACT DOCUMENTS consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.

1.22 **SUBCONTRACTOR**--An individual, firm or corporation having a direct contract with the CONTRACTOR or with any other SUBCONTRACTOR for the performance of a part of the WORK at the site.

1.23 **SUBSTANTIAL COMPLETION**--That date as certified by the ENGINEER when the construction of the PROJECT or a specified part thereof is sufficiently completed, in accordance with the CONTRACT DOCUMENTS, so that the PROJECT or specified part can be utilized for the purposes for which it is intended.

1.24 **SUPPLEMENTAL GENERAL CONDITIONS**--Modifications to General Conditions required by a Federal agency for participation in the PROJECT and approved by the agency in writing prior to inclusion in the CONTRACT DOCUMENTS, or such requirements that may be imposed by applicable state laws.

1.25 **SUPPLIER**--Any person or organization who supplies materials or equipment for the WORK, including that fabricated to a special design, but who does not perform labor at the site.

1.26 **WORK**--All labor necessary to produce the construction required by the CONTRACT DOCUMENTS, and all materials and equipment incorporated or to be incorporated in the PROJECT.

1.27 **WRITTEN NOTICE**--Any notice to any party of the Contract relative to any part of this Contract in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address, or delivered in person to said party or his authorized representative on the WORK.

2. ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS

2.1 The CONTRACTOR may be furnished additional instructions and detail drawings, by the ENGINEER, as

necessary to carry out the WORK required by the CONTRACT DOCUMENTS.

2.2 The additional drawings and instruction thus supplied will become a part of the CONTRACT DOCUMENTS. The CONTRACTOR shall carry out the WORK in accordance with the additional detail drawings and instructions.

3. SCHEDULES, REPORTS, AND RECORDS

3.1 The CONTRACTOR shall submit to the OWNER such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data where applicable as are required by the CONTRACT DOCUMENTS for the WORK to be performed.

3.2 Prior to the first partial payment estimate the CONTRACTOR shall submit construction progress schedules showing the order in which he proposes to carry on the WORK, including dates at which he will start the various parts of the WORK, estimated date of completion of each part and, as applicable:

3.2.1 The dates at which special detail drawings will be required; and

3.2.2 Respective dates for submission of SHOP DRAWINGS, the beginning of manufacture, the testing and the installation of materials, supplies and equipment

3.3 The CONTRACTOR shall also submit a schedule of payments that he anticipates he will earn during the course of the WORK.

4. DRAWINGS AND SPECIFICATIONS

4.1 The intent of the DRAWINGS and SPECIFICATIONS is that the CONTRACTOR shall furnish all labor, materials, tools, equipment, and transportation necessary for the proper execution of the WORK in accordance with the CONTRACT DOCUMENTS and all incidental WORK necessary to complete the PROJECT in an acceptable manner, ready for use, occupancy or operation by the OWNER.

4.2 In case of conflict between the DRAWINGS and SPECIFICATIONS, the SPECIFICATIONS shall govern. Figure dimensions on DRAWINGS shall govern over scale dimensions, and detailed DRAWINGS shall govern over general DRAWINGS.

4.3 Any discrepancies found between the DRAWINGS and SPECIFICATIONS and site conditions or any inconsistencies or ambiguities in the DRAWINGS or SPECIFICATIONS shall be immediately reported to the ENGINEER, in writing, who shall promptly correct such inconsistencies or ambiguities in writing. WORK done by the CONTRACTOR after his discovery of such discrepancies, inconsistencies or ambiguities shall be done at the CONTRACTOR'S risk.

5. SHOP DRAWINGS

5.1 The CONTRACTOR shall provide SHOP DRAWINGS as may be necessary for the prosecution of the WORK as required by the CONTRACT DOCUMENTS. The ENGINEER shall promptly review all SHOP DRAWINGS. The ENGINEER'S approval of any SHOP DRAWINGS shall not release the CONTRACTOR from responsibility for deviations from the CONTRACT DOCUMENTS. The approval of any SHOP DRAWINGS which substantially deviates from the requirement of the CONTRACT DOCUMENTS shall be evidenced by a CHANGE ORDER.

5.2 When submitted for the ENGINEER'S review, SHOP DRAWINGS shall bear the CONTRACTOR'S certification that he has reviewed, checked and approved the SHOP DRAWINGS and that they are in conformance with the requirements of the CONTRACT DOCUMENTS.

5.3 Portions of the WORK requiring a SHOP DRAWING or sample submission shall not begin until the SHOP DRAWING or submission has been approved by the ENGINEER. A copy of each approved SHOP DRAWING and each approved sample shall be kept in good order by the CONTRACTOR at the site and shall be available to the ENGINEER.

6. MATERIALS, SERVICES, AND FACILITIES

6.1 It is understood that, except as otherwise specifically stated in the CONTRACT DOCUMENTS, the CONTRACTOR shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the WORK within the specified time.

6.2 Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the WORK. Stored materials and equipment to be incorporated in the WORK shall be located so as to facilitate prompt inspection.

6.3 Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.

6.4 Materials, supplies and equipment shall be in accordance with samples submitted by the CONTRACTOR and approved by the ENGINEER.

6.5 Materials, supplies or equipment to be incorporated into the WORK shall not be purchased by the CONTRACTOR or the SUBCONTRACTOR, subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.

7. INSPECTION AND TESTING

7.1 All materials and equipment used in the construction of the PROJECT shall be subject to adequate inspection and

testing in accordance with generally accepted standards, as required and defined in the CONTRACT DOCUMENTS.

7.2 The Owner shall provide all inspection services.

7.3 The Contractor shall provide at his expense the testing services required by the Contract Documents.

7.4 The Owner shall provide all testing services not required by the Contractor in the Contract Documents.

7.5 All retesting due to failure to meet minimum requirements shall be paid for by the Contractor.

7.6 The ENGINEER and his representatives will at all times have access to the WORK. In addition, authorized representatives and agents of any participating Federal or State agency shall be permitted to inspect all WORK, materials, and payrolls, records of personnel, invoices of materials, and other relevant data and records. The CONTRACTOR will provide proper facilities for such access and observation of the WORK and also for any inspection or testing thereof.

7.7 If any WORK is covered contrary to the written instructions of the ENGINEER it must, if requested by the ENGINEER, be uncovered for his observation and replaced at the CONTRACTOR'S expense.

7.8 If the ENGINEER considers it necessary or advisable that covered WORK be inspected or tested by others, the CONTRACTOR, at the ENGINEER'S request, will uncover, expose or otherwise make available for observation, inspection or testing as the ENGINEER may require, that portion of the WORK in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such WORK is defective, the CONTRACTOR will bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, however, such WORK is not found to be defective, the CONTRACTOR will be allowed an increase in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction and an appropriate CHANGE ORDER shall be issued.

8. SUBSTITUTIONS

8.1 Whenever a material, article or piece of equipment is identified on the DRAWINGS or SPECIFICATIONS by reference to brand name or catalogue number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function shall be considered. The CONTRACTOR may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the CONTRACT DOCUMENTS by reference to brand name or catalogue number, and if, in the opinion of the ENGINEER, such material, article, or piece of equipment is of equal

substance and function to that specified, the ENGINEER may approve its substitution and use by the CONTRACTOR. Any cost differential shall be deductible from the CONTRACT PRICE and the CONTRACT DOCUMENTS shall be appropriately modified by CHANGE ORDER. The CONTRACTOR warrants that if substitutes are approved, no major changes in the function or general design of the PROJECT will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the CONTRACTOR without a change in the CONTRACT PRICE or CONTRACT TIME.

9. PATENTS

9.1 The CONTRACTOR shall pay all applicable royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and save the OWNER harmless from loss on account thereof, except that the OWNER shall be responsible for any such loss when a particular process, design, or the product of a particular manufacturer or manufacturers is specified, however if the CONTRACTOR has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the ENGINEER.

10. SURVEYS, PERMITS, REGULATIONS

10.1 The OWNER shall furnish all boundary surveys and establish all base lines for locating the principal component parts of the WORK together with a suitable number of bench marks adjacent to the WORK as shown in the CONTRACT DOCUMENTS. From the information provided by the OWNER, unless otherwise specified in the CONTRACT DOCUMENTS, the CONTRACTOR shall develop and make all detail surveys needed for construction such as slope stakes, batter boards, stakes for pile locations and other working points, lines, elevations and cut sheets.

10.2 The CONTRACTOR shall carefully preserve bench marks, reference points and stakes and, in case of willful or careless destruction, he shall be charged with the resulting expense and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

10.3 Permits and licenses of a temporary nature necessary for the prosecution of the WORK shall be secured and paid for by the CONTRACTOR unless otherwise stated in the SPECIFICATIONS. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the OWNER, unless otherwise specified. The CONTRACTOR shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the WORK as drawn and specified. If the CONTRACTOR observes that the CONTRACT DOCUMENTS are at variance therewith, he shall promptly notify the ENGINEER in writing, and any necessary changes shall be adjusted as provided in Section 13, CHANGES IN THE WORK.

11. PROTECTION OF WORK, PROPERTY, AND PERSONS

11.1 The CONTRACTOR will be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the WORK. He will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the WORK and other persons who may be affected thereby, all the WORK and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction.

11.2 The CONTRACTOR will comply with all applicable laws, ordinances, rules, regulations, and orders of any public body having jurisdiction. He will erect and maintain, as required by the conditions and progress of the WORK, all necessary safeguards for safety and protection. He will notify OWNERS of adjacent utilities when prosecution of the WORK may affect them. The CONTRACTOR will remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the CONTRACTOR, any SUBCONTRACTOR or anyone directly or indirectly employed by any of them or anyone for whose acts any of them be liable, except damage or loss attributable to the fault of the CONTRACT DOCUMENTS or to the acts or omissions of the OWNER or the ENGINEER or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the CONTRACTOR.

11.3 In emergencies affecting the safety of persons or the WORK or property at the site or adjacent thereto, the CONTRACTOR, without special instruction or authorization from the ENGINEER or OWNER, shall act to prevent threatened damage, injury or loss. He will give the ENGINEER prompt WRITTEN NOTICE of any significant changes in the WORK or deviations from the CONTRACT DOCUMENTS caused thereby. If OWNER agrees that an emergency affecting the safety of persons or the WORK or property at the site or adjacent thereto, and a CHANGE ORDER shall thereupon be issued covering the changes and deviations involved.

12. SUPERVISION BY CONTRACTOR

12.1 The CONTRACTOR will supervise and direct the WORK. He will be solely responsible for the means, methods, techniques, sequences, and procedures of construction. The CONTRACTOR will employ and maintain on the WORK a qualified supervisor or superintendent who shall have been designated in writing by the CONTRACTOR as the CONTRACTOR'S representative at the site. The supervisor shall have full authority to act on behalf of the CONTRACTOR and all communications given to the supervisor shall be as binding as if given to the CONTRACTOR. The supervisor shall be present on the site

at all times as required to perform adequate supervision and coordination of the WORK.

12.2 Labor; Working Hours

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
 - B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.
1. Regular working hours will be 8:00 AM to 5:00 PM. Owner, Engineer and Contractor may agree to alternative regular working hours at the time of the pre-construction meeting but at no time will work be allowed prior to sunrise or after sunset.
 2. Legal holidays are:
 - a. January 1st, New Year's Day
 - b. Last Monday in May, Memorial Day
 - c. July 4th, Independence Day
 - d. First Monday in September, Labor Day
 - e. Fourth Thursday and Friday of November, Thanksgiving
 - f. December 25th, Christmas

13. CHANGES IN THE WORK

13.1 The OWNER may at any time, as the need arises, order changes within the scope of the WORK without invalidating the Contract. If such changes increase or decrease the amount due under the CONTRACT DOCUMENTS, or in the time required for performance of the WORK, an equitable adjustment shall be authorized by CHANGE ORDER.

13.2 The ENGINEER, also, may at any time, by issuing a FIELD ORDER, make changes in the details of the WORK. The CONTRACTOR shall proceed with the performance of any changes in the WORK so ordered by the ENGINEER unless the CONTRACTOR believes that such FIELD ORDER entitles him to a change in CONTRACT PRICE or TIME, or both, in which event he shall give the ENGINEER WRITTEN NOTICE thereof within seven (7) days after the receipt of the ordered change. Thereafter, the CONTRACTOR shall document the basis for the change in

CONTRACT PRICE or TIME within thirty (30) days. The CONTRACTOR shall not execute such changes pending the receipt of an executed CHANGE ORDER or further instruction from the OWNER.

14. CHANGES IN CONTRACT PRICE

14.1 The CONTRACT PRICE may be changed only by a CHANGE ORDER. The value of any WORK covered by a CHANGE ORDER or of any claim for increase or decrease in the CONTRACT PRICE shall be determined by one or more of the following methods in the order of precedence listed below:

- (a) Unit prices previously approved.
- (b) An agreed lump sum.
- (c) The actual cost for labor, direct overhead, materials, supplies, equipment, and other services necessary to complete the Work. In addition, there shall be added an amount to be agreed upon but not to exceed fifteen (15) percent of the actual cost of the WORK to cover the cost of general overhead and profit.

15. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

15.1 The date of beginning and the time for completion of the WORK are essential conditions of the CONTRACT DOCUMENTS and the WORK embraced shall be commenced on a date specified in the NOTICE TO PROCEED.

15.2 The CONTRACTOR will proceed with the WORK at such rate of progress to insure full completion within the CONTRACT TIME. It is expressly understood and agreed, by and between the CONTRACTOR and the OWNER, that the CONTRACT TIME for completion of the WORK described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the WORK.

15.3 If the CONTRACTOR shall fail to complete the WORK within the CONTRACT TIME, or extension of time granted by the OWNER, then the CONTRACTOR will pay to the OWNER the amount for liquidated damages as specified in the BID for each calendar day that the CONTRACTOR shall be in default after the time stipulated in the CONTRACT DOCUMENTS.

15.4 The CONTRACTOR shall not be charged with liquidated damages or any excess cost when the delay in completion of the WORK is due to the following, and the CONTRACTOR has promptly given WRITTEN NOTICE of such delay to the OWNER or ENGINEER.

15.4.1 To any preference, priority or allocation order duly issued by the OWNER.

15.4.2 To unforeseeable causes beyond the control and without the fault or negligence of the CONTRACTOR, including but not restricted to, acts of God, or of the public enemy, acts of the OWNER, acts of another CONTRACTOR in the performance of a

contract with the OWNER, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and

15.4.3 To any delays of SUBCONTRACTORS occasioned by any of the causes specified in paragraphs 15.4.1 and 15.4.2 of this article.

16. CORRECTION OF WORK

16.1 The CONTRACTOR shall promptly remove from the premises all WORK rejected by the ENGINEER for failure to comply with the CONTRACT DOCUMENTS, whether incorporated in the construction or not, and the CONTRACTOR shall promptly replace and re-execute the WORK in accordance with the CONTRACT DOCUMENTS and without expense to the OWNER and shall bear the expense of making good all WORK of other CONTRACTORS destroyed or damaged by such removal or replacement.

16.2 All removal and replacement WORK shall be done at the CONTRACTOR'S expense. If the CONTRACTOR does not take action to remove such rejected WORK within ten (10) days after receipt of WRITTEN NOTICE, the OWNER may remove such WORK and store the materials at the expense of the CONTRACTOR.

17. SUBSURFACE CONDITIONS

17.1 The CONTRACTOR shall promptly, and before such conditions are disturbed, except in the event of an emergency, notify the OWNER by WRITTEN NOTICE of:

17.1.1 Subsurface or latent physical conditions at the site differing materially from those indicated in the CONTRACT DOCUMENTS; or

17.1.2 Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in WORK of the character provided for in the CONTRACT DOCUMENTS.

17.2 The OWNER shall promptly investigate the conditions, and if he finds that such conditions do so materially differ and cause an increase or decrease in the cost of, or in the time required for, performance of the WORK, an equitable adjustment shall be made and the CONTRACT DOCUMENTS shall be modified by a CHANGE ORDER. Any claim of the CONTRACTOR for adjustment hereunder shall not be allowed unless he has given the required WRITTEN NOTICE; provided that the OWNER may, if he determines the facts so justify, consider and adjust any such claims asserted before the date of final payment.

18. SUSPENSION OF WORK, TERMINATION, AND DELAY

18.1 The OWNER may suspend the WORK or any portion thereof for a period of not more than ninety days or such further time as agreed upon by the CONTRACTOR, by WRITTEN NOTICE to the CONTRACTOR and the

ENGINEER which notice shall fix the date on which WORK shall be resumed. The CONTRACTOR will resume that WORK on the date so fixed. The CONTRACTOR will be allowed an increase in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, directly attributable to any suspension.

18.2 If the CONTRACTOR is adjudged a bankrupt or insolvent, or if he makes a general assignment for the benefit of his creditors, or if a trustee or receiver is appointed for the CONTRACTOR or for any of his property, or if he files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or applicable laws, or if he repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment, or if he repeatedly fails to make prompt payments to SUBCONTRACTORS or for labor, materials or equipment or if he disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction of the WORK or if he disregards the authority of the ENGINEER, or if he otherwise violates any provision of the CONTRACT DOCUMENTS, then the OWNER may, without prejudice to any other right or remedy and after giving the CONTRACTOR and his surety a minimum of ten (10) days from delivery of a WRITTEN NOTICE, terminate the services of the CONTRACTOR and take possession of the PROJECT and of all materials, equipment, tools, construction equipment and machinery thereon owned by the CONTRACTOR and finish the WORK by whatever method he may deem expedient. In such case the CONTRACTOR shall not be entitled to receive any further payment. If the direct and indirect costs of completing the PROJECT, including compensation for additional professional services, exceed the unpaid balance of the CONTRACT PRICE, the CONTRACTOR will pay the difference to the OWNER. Such costs incurred by the OWNER will be determined by the ENGINEER and incorporated in a CHANGE ORDER.

18.3 Where the CONTRACTOR'S services have been so terminated by the OWNER, said termination shall not affect any right of the OWNER against the CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of monies by the OWNER due the CONTRACTOR will not release the CONTRACTOR from compliance with the CONTRACT DOCUMENTS.

18.4 After ten (10) days from delivery of a WRITTEN NOTICE to the CONTRACTOR and the ENGINEER, the OWNER may, without cause and without prejudice to any other right or remedy, elect to abandon the PROJECT and terminate the CONTRACT. In such case, the CONTRACTOR shall be paid for all WORK executed and any expense sustained.

18.5 If, through no act or fault of the CONTRACTOR, the WORK is suspended for a period of more than ninety (90) days by the OWNER or under an order of court or other public authority, or the ENGINEER fails to act on any request for payment within thirty (30) days after it is submitted, or the OWNER fails to pay the CONTRACTOR substantially the sum approved by the ENGINEER within thirty (30) days of its approval and presentation, then the

CONTRACTOR may, after ten (10) days from delivery of a WRITTEN NOTICE to the OWNER and the ENGINEER, terminate the CONTRACT and recover from the OWNER payment for all WORK executed and all expenses sustained. In addition, and in lieu of terminating the CONTRACT, if the ENGINEER has failed to act on a request for payment or if the OWNER has failed to make any payment as aforesaid, the CONTRACTOR may upon ten (10) days WRITTEN NOTICE to the OWNER and the ENGINEER stop the WORK until he has been paid all amounts then due, in which event and upon resumption of the WORK, CHANGE ORDERS shall be issued for adjusting the CONTRACT PRICE or extending the CONTRACT TIME, or both, to compensate for the costs and delays attributable to the stoppage of the WORK.

18.6 If the performance of all or any portion of the WORK is suspended, delayed, or interrupted as a result of a failure of the OWNER or ENGINEER to act within the time specified in the CONTRACT DOCUMENTS, or if no time is specified, within a reasonable time, an adjustment in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, shall be made by CHANGE ORDER to compensate the CONTRACTOR for the costs and delays necessarily caused by the failure of the OWNER or ENGINEER.

19. PAYMENTS TO CONTRACTOR

19.1 At least ten (10) days before each progress payment falls due (but not more often than once a month), the CONTRACTOR will submit to the ENGINEER a partial payment estimate filled out and signed by the CONTRACTOR covering the WORK performed during the period covered by the partial payment estimate and supported by such data as the ENGINEER may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the WORK but delivered and suitably stored at or near the site, the partial payment estimate shall also be accompanied by such supporting data, satisfactory to the OWNER, as will establish the OWNER'S title to the material and equipment and protect his interest therein, including applicable insurance. The ENGINEER will, within ten (10) days after receipt of each partial payment estimate, either indicate in writing his approval of payment and present the partial payment estimate to the OWNER, or return the partial payment estimate to the CONTRACTOR, indicating in writing his reasons for refusing to approve payment. In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the partial payment estimate. The OWNER will, within ten (10) days of presentation to him of an approved partial payment estimate, pay the CONTRACTOR a progress payment on the basis of the approved partial payment estimate. The OWNER shall retain ten (10) percent of the amount of each payment until final completion and acceptance of all WORK covered by the CONTRACT DOCUMENTS. The OWNER at any time however, after fifty (50) percent of the WORK has been completed, if he finds that satisfactory progress is being made, shall reduce retainage to five (5) percent on the current and remaining estimates. When the WORK is substantially complete (operational or beneficial occupancy), the retained

amount may be further reduced below five (5) percent to only that amount necessary to assure completion. On completion and acceptance of a part of the WORK on which the price is stated separately in the CONTRACT DOCUMENTS, payment may be made in full, including retained percentages, less authorized deductions.

19.2 The request for payment may also include an allowance for the cost of such major materials and equipment which are suitably stored either at or near the site.

19.3 Prior to SUBSTANTIAL COMPLETION, the OWNER, with the approval of the ENGINEER and with the concurrence of the CONTRACTOR, may use any completed or substantially completed portions of the WORK. Such use shall not constitute an acceptance of such portions of the WORK.

19.4 The OWNER shall have the right to enter the premises for the purpose of doing work not covered by the CONTRACT DOCUMENTS. This provision shall not be construed as relieving the CONTRACTOR of the sole responsibility for the care and protection of the WORK, or the restoration of any damaged WORK except such as may be caused by agents or employees of the OWNER.

19.5 Upon completion and acceptance of the WORK, the ENGINEER shall issue a certificate attached to the final payment request that the WORK has been accepted by him under the conditions of the CONTRACT DOCUMENTS. The entire balance found to be due the CONTRACTOR, including the retained percentages, but except such sums as may be lawfully retained by the OWNER, shall be paid to the CONTRACTOR within thirty (30) days of completion and acceptance of the Work.

19.6 The CONTRACTOR will indemnify and save the OWNER or the OWNER'S agents harmless from all claims growing out of the lawful demands of SUBCONTRACTORS, laborers, workmen, mechanics, material men, and furnishers of machinery and parts thereof equipment, tools, and all supplies, incurred in the furtherance of the performance of the WORK. The CONTRACTOR shall, at the OWNER'S request, furnish satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. If the CONTRACTOR fails to do so, the OWNER may, after having notified the CONTRACTOR, either pay unpaid bills or withhold from the CONTRACTOR'S unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the CONTRACTOR shall be resumed, in accordance with the terms of the CONTRACT DOCUMENTS, but in no event shall the provisions of this sentence be construed to impose any obligations upon the OWNER to either the CONTRACTOR, his Surety, or any third party. In paying any unpaid bills of the CONTRACTOR, any payment so made by the OWNER shall be considered as a payment made under the CONTRACT DOCUMENTS by the OWNER to the CONTRACTOR and the OWNER shall not be liable to the CONTRACTOR for any such payments made in good faith.

19.7 If the OWNER fails to make payment thirty (30) days after approval by the ENGINEER, in addition to other remedies available to the CONTRACTOR, there shall be added to each such payment interest at the maximum legal rate commencing on the first day after said payment is due and continuing until the payment is received by the CONTRACTOR.

20. ACCEPTANCE OF FINAL PAYMENT AS RELEASED

20.1 The acceptance by the CONTRACTOR of final payment shall be and shall operate as a release to the OWNER of all claims and all liability to the CONTRACTOR other than claims in stated amounts as may be specifically excepted by the CONTRACTOR for all things done or furnished in connection with this WORK and for every act and neglect of the OWNER and others relating to or arising out of this WORK. Any payment, however, final or otherwise, shall not release the CONTRACTOR or his sureties from any obligations under the CONTRACT DOCUMENTS or the Performance BOND, Maintenance BOND and Payment BOND.

21. INSURANCE

21.1. The CONTRACTOR shall not commence work under the CONTRACT until he has obtained all insurance required under this paragraph and the insurance has been approved by the OWNER, nor shall the CONTRACTOR allow any SUBCONTRACTOR to commence WORK under this CONTRACT unless CONTRACTOR'S insurance covers the acts of the SUBCONTRACTOR or all similar insurance of the SUBCONTRACTORS has been obtained and approved.

21.2 The CONTRACTOR shall procure and maintain during the term of this CONTRACT such Liability Insurance as shall protect him, the OWNER, and any SUBCONTRACTOR performing work covered by the CONTRACT, from claims of damage which may arise from operations under the CONTRACT, including blasting, when blasting is done on, or in connection with the Work, whether the operations by the CONTRACTOR or by a SUBCONTRACTOR or by anyone directly or indirectly employed by either of them, and the limits of the insurance shall be not less than the following:

21.2.1 Automobile Liability: \$1,000,000.00 each accident or reasonably equivalent split limits for bodily injury and property damage. Cover shall be on "any auto" including leased, hired, owned, non-owned and borrowed vehicles used in connection with the CONTRACT.

21.2.2 Comprehensive General Liability: \$1,000,000.00 each occurrence, coverage under the policy shall be as comprehensive as that provided in a current Insurance Services Office (ISO) policy form approved for use in Texas and the policy shall have no exclusions by endorsement unless they are approved by the OWNER. Consequential damage due to faulty workmanship shall be covered.

Liability insurance shall include all major division of coverage, including:

Premises - Operations (including XCU)
Independent contractor's protective (OCP)
Products and completed operation
Contractual
Owner, non-owned and hired motor vehicles
Broad form coverage for property damage, including operations

21.2.3 Umbrella Liability Insurance: \$1,000,000 Limit: Coverage under this policy shall provide Excess Liability Protection over the "underlying" Liability Insurance IE: General Liability, Employer's Liability and Commercial Automobile Liability.

21.3 The CONTRACTOR shall procure and maintain at all times during the term of this CONTRACT, Builder's Risk Insurance against the perils of fire, lightning, windstorm, hurricane, hail, riot, explosion, civic commotion, smoke, aircraft, land vehicles, vandalism, and malicious mischief, at a limit of \$2,000,000.00. The policy shall include coverage for flood and earthquake and for materials and supplies while in transit and while being stored on or off site. Different sublimits for these coverages shall be approved by the OWNER. Upon completion of the WORK, the CONTRACTOR shall notify the OWNER in writing before terminating this insurance.

21.4 Worker's Compensation Insurance Coverage

21.4.1 Definitions:

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

Duration of the project - includes the time from the beginning of the work on the project until the CONTRACTOR'S/person's work on the project has been completed and accepted by the OWNER.

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

hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

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

21.4.3 The CONTRACTOR must provide a certificate of coverage to the OWNER prior to beginning work on the project.

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

21.4.5 The CONTRACTOR shall obtain from each person providing services on a project, and provide to the OWNER:

21.4.5.1 A certificate of coverage, prior to that person beginning work on the project, so the OWNER will have on file certificates of coverage showing coverage for all persons providing services on the project; and

21.4.5.2 No later than seven days after receipt by the CONTRACTOR, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

21.4.6 The CONTRACTOR shall retain all required certificates of coverage for the duration of the project and for one year thereafter.

21.4.7 The CONTRACTOR shall notify the OWNER in writing by certified mail or personal delivery, within 10 days after the CONTRACTOR knew or should have known, of any change that materially affects the provision of coverage of any person providing services on this project.

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

21.4.9 The CONTRACTOR shall contractually require each person with whom it contracts to provide services on a project, to:

21.4.9.1 Provide to the CONTRACTOR, prior to that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project;

21.4.9.2 Provide the CONTRACTOR, prior to the end of the coverage period a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project;

21.4.9.3 Obtain from each other person with whom it contracts, and provide to the CONTRACTOR:

a) A certificate of coverage, prior to the other person beginning work on the project; and

b) A new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the project;

21.4.9.4 Retain all required certificates of coverage on file for the duration of the project and for one year thereafter;

21.4.9.5 Notify the OWNER in writing by certified mail or personal delivery, within 10 days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and

21.4.10 By signing this CONTRACT or providing or causing to be provided a certificate of coverage, the CONTRACTOR is representing to the OWNER that all employees of the CONTRACTOR who will provide services on the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the CONTRACTOR for administrative penalties, criminal penalties, civil penalties, or other civil actions.

21.4.11 The CONTRACTOR'S failure to comply with any of these provisions is a breach of contract by the CONTRACTOR which entitles the OWNER to declare the CONTRACT void if the CONTRACTOR does not remedy the breach within ten days after receipt of notice of breach from the OWNER.

21.5 Miscellaneous Insurance Requirements

21.5.1 The CONTRACTOR shall provide a certificate of insurance documenting the OWNER as a "Certificate Holder," and noting the specific project(s) covered by the CONTRACTOR'S insurance as documented on the certificate of insurance. More than one certificate may be required of the CONTRACTOR depending upon the agents

or insurers for the CONTRACTOR'S insurance coverages specified for the project(s).

21.5.2 The CONTRACTOR must comply with the following requirements regarding insurance:

21.5.2.1 The OWNER shall be an additional insurance, by endorsement, on all applicable insurance policies.

21.5.2.2 Applicable insurance policies shall each be endorsed with a waiver of subrogation in favor of the OWNER.

21.5.2.3 Insurers of policies maintained by CONTRACTOR and its SUBCONTRACTORS shall be authorized to do business in the State of Texas, or otherwise approved by the OWNER and they shall be acceptable to the OWNER as to their financial strength and solvency.

21.5.2.4 Deductible limits on insurance policies and self-insured retentions exceeding \$25,000.00 require approval of the OWNER.

21.5.2.5 The OWNER shall be notified in writing a minimum of 30 days prior to an insurer's action in the event of cancellation, non-renewal or material change in coverage regarding any policy providing insurance coverage required in this CONTRACT.

21.5.2.6 Full limits of insurance required in this Section 21 shall be available for claims arising out of this CONTRACT.

21.5.2.7 Certificates of Insurance shall be provided by the CONTRACTOR to the OWNER prior to commencement of work on the project. Any failure on part of the OWNER to request this documentation shall not be construed as a waiver of insurance requirements.

21.5.2.8 The OWNER shall be entitled, upon request and without incurring expense, to review the insurance policies including endorsement and, at its discretion to require proof of payment for policy premiums.

21.5.2.9 Except as otherwise provided in this Section 21, the OWNER shall not be responsible for paying the costs of required insurance coverage.

21.5.2.10 Notice of any actual or potential claim or litigation that would affect required insurance coverages shall be provided to the OWNER in a timely manner.

21.5.2.11 "Other insurance" as referenced in any policy of insurance providing required coverages shall not apply to any insurance policy or program maintained by the OWNER.

21.5.2.12 CONTRACTOR agrees to either require its SUBCONTRACTORS to maintain the same insurance coverages and limits as specified for the CONTRACTOR or coverage of Subcontractors shall be provided by the CONTRACTOR.

21.6 Any failure of CONTRACTOR to comply with the reporting provisions of the policies shall not affect the coverage provided to the OWNER, its officers, employees, or volunteers

22. CONTRACT SECURITY

22.1 The CONTRACTOR shall within ten (10) days after the receipt of the NOTICE OF AWARD furnish the OWNER with a Performance BOND, Maintenance BOND and a Payment BOND in penal sums equal to the amount of the CONTRACT PRICE, conditioned upon the performance by the CONTRACTOR of all undertakings, covenants, terms, conditions and agreements of the CONTRACT DOCUMENTS, and upon the prompt payment by the CONTRACTOR to all persons supplying labor and materials in the prosecution of the WORK provided by the CONTRACT DOCUMENTS. Such BONDS shall be executed by the CONTRACTOR and a corporate bonding company licensed to transact such business in the state in which the WORK is to be performed and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these BONDS shall be borne by the CONTRACTOR. If at any time a surety on any such BOND is declared a bankrupt or loses its right to do business in the state in which the WORK is to be performed or is removed from the list of Surety Companies accepted on Federal BONDS, CONTRACTOR shall within ten (10) days after notice from the OWNER to do so, substitute an acceptable BOND (or BONDS) in such form and sum and signed by such other surety or sureties as may be satisfactory to the OWNER. The premiums on such Bond shall be paid by the CONTRACTOR. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable BOND to the OWNER.

23. ASSIGNMENTS

23.1 Neither the CONTRACTOR nor the OWNER shall sell, transfer, assign or otherwise dispose of the CONTRACT or any portion thereof, or of his right, title or interest therein, or his obligations thereunder, without written consent of the other party.

24. INDEMNIFICATION

24.1 The CONTRACTOR will indemnify and hold harmless the OWNER and the ENGINEER and their agents and employees from and against all claims, damages, losses, and expenses including attorney's fees arising out of or resulting from the performance of the WORK, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury or destruction of tangible property including the loss of use resulting therefrom; and is caused in whole or in part by any negligent or willful act or omission of the CONTRACTOR, and SUBCONTRACTOR, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

24.2 In any and all claims against the OWNER or the ENGINEER, or any of their agents or employees, by any employee of the CONTRACTOR, any SUBCONTRACTOR, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the CONTRACTOR or any SUBCONTRACTOR under workmen's compensation acts, disability benefit acts or other employees benefits acts.

24.3 The obligation of the CONTRACTOR under this paragraph shall not extend to the liability of the ENGINEER, his agents or employees arising out of the preparation or approval of maps, DRAWINGS, opinions, reports, surveys, CHANGE ORDERS, designs or SPECIFICATIONS.

25. SEPARATE CONTRACTS

25.1 The OWNER reserves the right to let other contracts in connection with this PROJECT. The CONTRACTOR shall afford other CONTRACTORS reasonable opportunity for the introduction and storage of their materials and the execution of their WORK, and shall properly connect and coordinate his WORK with theirs. If the proper execution or results of any part of the CONTRACTOR'S WORK depends upon the WORK of any other CONTRACTOR, the CONTRACTOR shall inspect and promptly report to the ENGINEER any defects in such WORK that render it unsuitable for such proper execution and results.

25.2 The OWNER may perform additional WORK related to the PROJECT by himself, or he may let other contracts containing provisions similar to these. The CONTRACTOR will afford the other CONTRACTOR'S who are parties to such CONTRACTS (or the OWNER, if he is performing the additional WORK himself), reasonable opportunity for the introduction and storage of materials and equipment and the execution of WORK, and shall properly connect and coordinate his WORK with theirs.

25.3 If the performance of additional WORK by other CONTRACTORS or the OWNER is not noted in the CONTRACT DOCUMENTS prior to the execution of the CONTRACT, WRITTEN NOTICE thereof shall be given to the CONTRACTOR prior to starting any such additional WORK. If the CONTRACTOR believes that the performance of such additional WORK by the OWNER or others involves him in additional expense or entitles him to an extension of the CONTRACT TIME, he may make a claim thereof as provided in Sections 14 and 15.

26. SUBCONTRACTING

26.1 The CONTRACTOR may utilize the services of specialty SUBCONTRACTORS on those parts of the WORK which, under normal contracting practices, are performed by specialty SUBCONTRACTORS.

26.2 The CONTRACTOR shall not award WORK to SUBCONTRACTOR (s), in excess of fifty (50) percent of

the CONTRACT PRICE, without prior written approval of the OWNER.

26.3 The CONTRACTOR shall be fully responsible to the OWNER for the acts and omissions of his SUBCONTRACTORS, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

26.4 The CONTRACTOR shall cause appropriate provisions to be inserted in all subcontracts relative to the WORK to bind SUBCONTRACTORS to the CONTRACTOR by the terms of the CONTRACT DOCUMENTS insofar as applicable to the WORK of SUBCONTRACTORS and to give the CONTRACTOR the same power as regards terminating any subcontract that the OWNER may exercise over the CONTRACTOR under any provision of the CONTRACT DOCUMENTS.

26.5 Nothing contained in this CONTRACT shall create any contractual relation between any SUBCONTRACTOR and the OWNER.

26.6 The OWNER may require copies of executed subcontracts.

27. ENGINEER'S AUTHORITY

27.1 The ENGINEER shall act as the OWNER'S representative during the construction period. He shall decide questions which may arise as to quality and acceptability of materials furnished and WORK performed. He shall interpret the intent of the CONTRACT DOCUMENTS in a fair and unbiased manner. The ENGINEER will make visits to the site and determine if the WORK is proceeding in accordance with the CONTRACT DOCUMENTS.

27.2 The CONTRACTOR will be held strictly to the intent of the CONTRACT DOCUMENTS in regard to the quality of materials, workmanship, and execution of the WORK. Inspections may be made at the factory or fabrication plant of the source of material supply.

27.3 The ENGINEER will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.

27.4 The ENGINEER shall promptly make decisions relative to interpretation of the CONTRACT DOCUMENTS.

28. LAND AND RIGHTS-OF-WAY

28.1 Prior to issuance of NOTICE TO PROCEED, the OWNER shall obtain all land and rights-of-way necessary for carrying out and for the completion of the WORK to be performed pursuant to the CONTRACT DOCUMENTS, unless otherwise mutually agreed.

28.2 The OWNER shall provide to the CONTRACTOR information which delineates and describes the lands owned and rights-of-way acquired.

28.3 The CONTRACTOR shall provide at his own expense and without liability to the OWNER any additional land and access thereto that the CONTRACTOR may desire for temporary construction facilities, or for storage of materials.

29. GUARANTY

29.1 The CONTRACTOR shall guarantee all materials and equipment furnished and WORK performed for a period of two (2) years from the date of FINAL COMPLETION. The CONTRACTOR warrants and guarantees for a period of two (2) years from the date of FINAL COMPLETION of the system that the complete system is free from all defects due to faulty materials or workmanship and the CONTRACTOR shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects. The OWNER will give notice of observed defects with reasonable promptness. In the event that the CONTRACTOR should fail to make such repairs, adjustments, or other WORK that may be made necessary by such defects, the OWNER may do so and charge the CONTRACTOR the cost thereby incurred. The Maintenance BOND shall remain in full force and effect through the guarantee period.

30. TAXES

30.1 The CONTRACTOR will pay all sales, consumer, use and other similar taxes required by the law of the place where the WORK is performed.

TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

01 00 01	DEFINITIONS AND TERMINOLOGY
01 01 01	SUMMARY OF WORK
01 02 01	SPECIAL TECHNICAL SPECIFICATIONS AND CONDITIONS
01 03 01	MEASUREMENT AND PAYMENT
01 04 01	SUBMITTALS
01 08 01	GENERAL DEMOLITION
01 09 01	DISINFECTION OF POTABLE WATER PIPING AND TANKS

DIVISION 02 - EXISTING CONDITIONS

02 01 01	SITE CLEARING
-----------------	----------------------

DIVISION 03 - CONCRETE

03 01 01	CONCRETE FORMWORK
03 02 01	CONCRETE REINFORCEMENT
03 04 01	MANHOLES
03 09 01	GENERAL CONCRETE

DIVISION 31 - EARTHWORK

31 02 01	STRUCTURAL EXCAVATING, BACKFILLING AND COMPACTING
31 03 01	TRENCHING, BACKFILLING AND COMPACTING
31 04 01	TRENCH EXCAVATION SAFETY PROTECTION SYSTEM
31 06 01	SITE GRADING AND EARTHWORK
31 08 01	LIME TREATED SUBGRADE
31 09 01	ROCK RIPRAP
31 11 01	CRUSHED AGGREGATE BASE COURSE

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 01 01	ASPHALTIC CONCRETE SURFACE
32 02 01	SEEDING
32 92 13	HYDROMULCH SEEDING

DIVISION 33 - UTILITIES

33 01 01	GENERAL REQUIREMENTS FOR PIPING SYSTEMS
33 01 02	FIELD TESTING OF PIPING SYSTEMS
33 01 03	DUCTILE IRON PIPE
33 01 06	POLYVINYL CHLORIDE (PVC) PRESSURE PIPE
33 01 07	POLYVINYL CHLORIDE (PVC) SANITARY SEWER PIPE
33 01 08	PIPE COUPLINGS AND EXPANSION JOINTS
33 01 11	HIGH-DENSITY POLYETHYLENE (HDPE) PIPE
33 02 04	GATE VALVES

33 06 01	MISCELLANEOUS WATER LINE MATERIALS
33 07 01	SERVICE METERS, BOXES, REGULATORS AND SERVICE LINES
33 08 01	INLET / OUTLET STRUCTURES
33 10 01	CULVERTS

SECTION 01 00 01 - DEFINITIONS AND TERMINOLOGY

PART 1 GENERAL

1.1 ABBREVIATIONS

- A. Whenever any of the following abbreviations appear in these Specifications and Contract Documents, their meanings shall be as follows:
- | | |
|-------------|--|
| 1. OWNER | City of Azle |
| 2. ENGINEER | Jacob & Martin, LLC |
| 3. ASTM | American Society for Testing Materials |
| 4. AWWA | American Water Works Association |
| 5. AASHTO | American Association of State Highway and Transportation Officials |
| 6. A.C. | Asbestos Cement |
| 7. C.I. | Cast Iron |
| 8. C.S. | Commercial Standards |
| 9. D.I. | Ductile Iron |
| 10. EPA | Environmental Protection Agency |
| 11. GPM | Gallons Per Minute |
| 12. NSF | National Sanitation Foundation |
| 13. TDA | Texas Department of Agriculture |
| 14. OSHA | Occupational Safety and Health Administration |
| 15. PVC | Polyvinyl Chloride |
| 16. TCDP | Texas Community Development Program |
| 17. TCF | Texas Capital Fund |
| 18. TXDOT | Texas Department of Transportation |
| 19. TCEQ | Texas Commission on Environmental Quality |
| 20. TWDB | Texas Water Development Board |
| 21. USDA/RD | United States Department of Agriculture - Rural Development |
- *Latest Revision

1.2 DOCUMENT ORGANIZATION

- A. Section GENERAL REQUIREMENTS govern the execution of all sections of the Specifications.
- B. Organization of Contract Documents is not intended to control or to lessen the responsibility of the Contractor in dividing work among his subcontractors, or in establishing extent of work to be performed by any trade.

1.3 SPECIFICATION SENTENCE STRUCTURE

- A. Specifications are written in modified brief style. Requirements indicated and specified apply to all work of same kind, class, and type even though word "all" is not stated.
- B. Simple imperative mood of sentence structure is used in Specification sections which places verb as first word sentence. Where such words as "perform", "provide", "install", "erect", "furnish", "connect", "test", or words similar import are used, it shall be understood that such words include meanings of phrase "The CONTRACTOR shall..." before each word.
- C. Standard paragraph titles and other identifications of subject matter in Specifications are intended as aid in locating and recognizing various requirements in the Specifications. Titles do not define, limit, or otherwise restrict Specification text. Capitalizing of words in text does not signify or mean that such words convey special or unique meanings that have precedence over other parts of the Contract Documents. Specification text shall govern over titling and shall be understood to be interpreted as a whole.

1.4 SPECIFICATION TERMINOLOGY

- A. Terms such as "directed", "designated", "requested", "authorized", "approved", "selected", or words of similar value shall mean by the Engineer unless otherwise stated. Use of these terms does not extend the ENGINEER's responsibility for construction supervision or responsibilities defined in the General conditions.
- B. "Required" and words of similar value mean as required to complete the work, unless otherwise stated.
- C. "Perform" shall mean CONTRACTOR, at his own expense, shall perform operations necessary to complete work.
- D. "Provide" shall mean CONTRACTOR, at his own expense, shall furnish and install work complete in place and ready to use.
- E. "Other acceptable manufacturer", "Approved equal", or words of similar meaning shall be understood to be followed by expression "in sole opinion of the ENGINEER" even though such words may not appear in print, unless otherwise stated.
- F. "Acceptance", "acceptable", or words of similar meaning shall mean acceptable to ENGINEER or OWNER. OWNER shall have jurisdiction and may override decisions of others.
- G. "At no extra cost to Owner", "With no extra compensation to CONTRACTOR", "At CONTRACTOR's own expense", or words of similar meaning shall be understood to mean the CONTRACTOR shall perform or provide specified operation of work at no increase to CONTRACTOR Sum in the executed Contract.
- H. "Indicated" refers to graphic representations, notes, or schedules on drawings, or other paragraphs or schedules in specifications, and similar requirements in Contract Documents. Where terms such as "shown", "noted", "scheduled" and "specified" are used, it is to help locate the reference; no limitation on location is intended except as specifically noted.
- I. "Accepted" where used in conjunction with ENGINEER's action on CONTRACTORS submittals, and requests, is limited to responsibilities and duties of ENGINEER. Such approval does not release CONTRACTOR from responsibility to fulfill Contract Document requirements.
- J. "Regulation" includes Federal, State and Local Laws, statutes, ordinances, and lawful orders issued by authorities have jurisdiction, as well as, rules, conventions, and agreements within construction industry that control performance of work, whether they are lawfully imposed by authorities having jurisdiction or not.
- K. "Furnish" is used to mean to supply and deliver to project site, ready for unloading, unpacking, assembly, installation, and similar operation.
- L. "Install" is used to describe operations at project site including actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- M. "Installer" is an entity engaged by CONTRACTOR, either as an employee, subcontractor, or sub-subcontractor for performance of particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
- N. The term "experienced", when used with the term "installer", means having minimum five (5) previous projects similar in size and scope to this project, and familiar with precautions required, and has complied with requirements of authority having jurisdiction.
- O. "Project site" is the space available to the CONTRACTOR for performance of work, either exclusively or in conjunction with others performing construction as part of the project.
- P. "Testing Laboratory" is an independent entity engaged to perform specific inspections or test, either at the project site or elsewhere, and to report on, or to interpret results of those

inspections or tests as required. Unless otherwise indicated, testing laboratories shall be hired by the CONTRACTOR at no additional cost to the OWNER.

- Q. Equipment is "Listed" if of a kind mentioned in a list which:
 - 1. Is published by a nationally recognized laboratory which makes periodic inspection of production of such equipment.
 - 2. States that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.
- R. Equipment is "Labeled" if:
 - 1. It embodies a valid label, symbol, or other identifying mark of a nationally recognized testing laboratory such as Underwriters Laboratories, Inc.
 - 2. Production is periodically inspected in accordance with nationally recognized standards or tests to determine safe use in a specified manner.
- S. Equipment is "Certified" if:
 - 1. Equipment has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner.
 - 2. Production is periodically inspected by a nationally recognized testing laboratory.
 - 3. It bears a label, tag, or other record of certification.

1.5 REFERENCE STANDARDS

- A. Applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents regardless of lack of reference within the Contract Documents. Where Contract Documents include more stringent requirements than the reference standards, the Contract Documents shall apply.
 - 1. Standards referenced directly in the Contract documents take precedence over standards that are not referenced but recognized in the construction industry as applicable.
 - 2. Except as otherwise limited by the Contract Documents, enforce standards not referenced but recognized in industry as applicable for performance of the work. The ENGINEER shall decide whether code or standard is applicable, or which of several are applicable.
- B. Consider a reference standard to be the latest edition with supplements or amendments when standard is referred to in an individual Specification Section but is not listed by the title and date.
- C. Maintain copies of reference standards at project site throughout construction period. Make copies of reference standards available as requested by ENGINEER or OWNER.
- D. Enforce the most stringent requirements where compliance with two (2) or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, unless Contract Documents indicate otherwise.
 - 1. Quantity or quality level shown or indicated shall be minimum to be provided or performed in every instance.
 - 2. Actual installation may comply exactly with minimum quality indicated, or it may exceed that minimum within reasonable limits.
 - 3. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for context of requirements.
 - 4. Refer instances of uncertainty to the Engineer for decision before proceeding.
- E. Trade association names and titles of general standards are frequently abbreviated. Where acronyms or abbreviations are used in specifications or other Contract Documents they mean recognized name of trade association, standards generating organization, authority having jurisdiction, or other entity applicable to context of text provision. Refer to "Encyclopedia of Associations", published by Gale Research Company.

JACOB|MARTIN
City of Azle - Dunaway Lane
Reconstruction

01 00 01
DEFINITIONS AND
TERMINOLOGY

PART 2 NOT USED

PART 3 NOT USED

-- END OF SECTION --

SECTION 01 01 01 - SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Construct work as described in the Contract Documents.
 - 1. Provide materials, equipment, and incidentals required to make the project completely operable.
 - 2. Provide the labor, equipment, tools, and consumable supplies required for a complete project.
 - 3. Provide the civil, architectural, structural, mechanical, electrical, instrumentation and all other work required for a complete and operable project.
 - 4. Test and place the completed project in operation.
 - 5. Provide the special tools, spare parts, lubricants, supplies, or other materials as required for the operation and maintenance of the Project.
 - 6. Drawings and Specifications may not indicate or describe all of the work required to complete the project. Additional details required for the completion of the project are to be provide by the CONTRACTOR and coordinated with the ENGINEER.

1.2 REFERENCE STANDARDS

1.3 JOB CONDITIONS

- A. The General Conditions, the Special Conditions, and Division One Specifications apply to each Specification section.
- B. Comply with all applicable federal, state and local codes and regulations pertaining to the nature and character of the work being performed.

1.4 DESCRIPTION OF WORK

- A. Remove existing pavement and install approximately 26,500 SY of concrete roadway, install curb inlets and culvert system, replace 5,600 linear feet of sanitary sewer, and replace 5,800 linear feet of waterline.

1.5 TIME OF COMPLETION

- A. The time to be allowed under this Contract to complete all work is 270 days. Work time established allows for the normal delays associated with bad weather, etc. and shall begin ten (10) days after the issuance of the Notice to Proceed by the OWNER. Requests for extension to time of completion shall be made by the CONTRACTOR to the ENGINEER, in writing, on a monthly basis corresponding with the submission of a partial payment requests. Requests for time extensions received more than 60 days following a requested date will not be considered.

1.6 SCHEDULE AND SEQUENCE OF CONSTRUCTION

- A. Within 10 days prior to submission of the first partial payment request, the CONTRACTOR shall submit to the ENGINEER for approval six copies of the schedule under which the CONTRACTOR proposes to complete the project.
- B. If, in the opinion of the ENGINEER, construction progress falls behind the schedule, the CONTRACTOR shall take such action as necessary to improve his progress, and the CONTRACTOR shall submit to the ENGINEER a revised schedule demonstrating his proposed plan to make up the lag in scheduled progress and complete the project within the contract time.

1.7 WORK BY OWNER

- A. The OWNER may perform items of work which are not included in this Contract, but may impact construction scheduling. CONTRACTOR to coordinate construction activities through the ENGINEER.

1.8 CONSTRUCTION OF UTILITIES

- A. Coordinate with Utility Companies or their contractors to provide all required utilities for this project. Construction of permanent utilities will be paid for by the OWNER.
- B. Power and Electrical Services
 - 1. Pay for temporary construction power, including but not limited to construction cost, meter connection, fees and permits.

1.9 OCCUPANCY

- A. As soon as any portion of the Project is ready to use, the OWNER shall have the right to operate the portion upon written notice to the CONTRACTOR.
- B. Testing of Controls, including specified test periods, training, and start-up does not constitute acceptance for operation.
- C. OWNER may accept the facility for continued use after start-up and testing at the option of the OWNER. If acceptance is delayed at option of the OWNER, shut down facilities per approved Operation and Maintenance procedures.
- D. The execution of bonds is understood to indicate the consent of surety.
- E. Conduct operations to insure the least inconvenience to the OWNER and general public.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Provide materials and products per the individual sections of the Specifications.

PART 3 EXECUTION

3.1 NOT USED

-- END OF SECTION --

SECTION 01 02 01 - SPECIAL TECHNICAL SPECIFICATIONS AND CONDITIONS**PART 1 GENERAL****1.1 PRIORITY OF INTERPRETATION**

- A. The Contract Documents are complementary, and what is called for by one document shall be binding as if called for by all. In case of conflict between any of the Contract Documents, priority of interpretation shall be in the following order:
1. General Conditions
 2. Agreement
 3. Performance and Payment Bonds
 4. Special Bonds, if any
 5. Bid
 6. Special Technical Specifications and Conditions
 7. Plans
 8. Technical Specifications

1.2 REFERENCE STANDARDS**1.3 SALES TAX EXEMPTION**

- A. The OWNER qualifies as an exempt agency pursuant to the provisions of the Texas Limited Sales, Excise and Use Tax Act, and is not subject to any State or City sales tax on materials and labor used in the performance for this project. The CONTRACTOR shall issue a resale exemption certificate when purchasing said materials. Said exemption certificate complying with Section 151.155 (Exemption Certificate) and 151.309 (Government Entities) of Texas Limited Sales, Excise and Use Tax Act, as amended. Any sales taxes applicable to equipment purchases, rentals, leases, or consumable supplies or other taxable services not incorporated into the project shall be the responsibility of the CONTRACTOR.

1.4 MINIMUM WAGE SCALE

- A. The minimum wage scale shall be according to local prevailing wage rates, if not already listed in the Contract Section.

1.5 METHODS OF OPERATION

- A. The CONTRACTOR shall inform the ENGINEER in advance concerning his plans for carrying on each part of the work, but the CONTRACTOR alone shall be responsible for safety, adequacy, and efficiency of his plant, equipment, and methods.
- B. The OWNER and ENGINEER will not be responsible for any act or omission of the CONTRACTOR, or any subcontractor, or any of the agents or employees, or any other persons performing any of the work. The OWNER and ENGINEER will not be responsible for any failure of the CONTRACTOR or his subcontractors or any other persons to perform the work in accordance with the requirements of the contract documents.
- C. Review by the OWNER or ENGINEER of any plan or method of work proposed by the CONTRACTOR shall not relieve the CONTRACTOR of any responsibility therefore, and such review shall not be considered as an assumption of any risk or liability by the OWNER or ENGINEER, or any officer, agent, or employee thereof.

1.6 SUBCONTRACTORS

- A. Subcontractors who may be used by the CONTRACTOR will not be approved by the ENGINEER prior to award of the contract. After award, if approval is given for a subcontractor to perform certain items of the work, the CONTRACTOR will remain completely and totally responsible for all work under this contract. If directed by the ENGINEER, the CONTRACTOR

will also be responsible for correcting any defects and/or removing any defective work completely from the site and satisfactorily replacing the work.

1.7 EVALUATION OF BIDS

- A. The bid schedule lists the various divisions of construction contemplated in the Plans and Specifications, together with an estimate of the units of each. With these units as the basis, the Bidder will extend each item using the cost he sets in the unit price column. Any total cost found to be inconsistent with the net cost when the bids are evaluated will be deemed in error and corrected to agree with the unit cost, which shall be considered correct. The written unit price shall be used in case of conflict with the numerical unit price.

1.8 AWARD OF THE CONTRACT

- A. The OWNER reserves the right to hold all bids for 60 days before making an award of the Contract.

1.9 WORKMANSHIP

- A. These specifications contain detailed instructions and descriptions covering the major items of construction and workmanship necessary to construct the above mentioned project. The specifications are intended to be so written that only first class workmanship and finish of the best grade and quality will result. The fact that these specifications may fail to be so complete as to cover all details will not relieve the CONTRACTOR of full responsibility for providing a completed project of high quality, first class finish and appearance and satisfactory for operation, all within the apparent intent of the plans and specifications.

1.10 ESTIMATED QUANTITIES

- A. The Contract Documents are intended to show clearly all work to be done and materials to be furnished. Where the estimated quantities are shown for the various classes of work to be done and material to be furnished under this contract, they are approximate and are to be used only as a basis for estimating the probable cost of the work and for comparing the proposals offered for the work. It shall be understood that the actual amount of work to be done and material to be furnished under this contract may differ from these estimates, and where the basis for payment under this contract is the unit price method, payment shall be for the actual amount of such work and material furnished.
- B. Where payment is based on the unit price method, the CONTRACTOR agrees that he will make no claim for damages, anticipated profits or otherwise on account of any differences which may be found between the quantities of work actually done, the material actually furnished under this contract and the estimated quantities contemplated and contained in the proposal. However, in case the actual quantity of any major item becomes as much as 15% more than or 15% less than the estimated or contemplated quantity for such item, then either party to this Agreement, upon demand, shall be entitled to a revised consideration upon the portion of the work above or below 15% of the estimated quantity. The OWNER will not pay for increased material prices for any quantity increase within the 15% allowable. Therefore, the CONTRACTOR should endeavor to have his material quote cover up to 15% more than the bid quantity.
- C. A "Major Item" shall be construed to be any individual bid item included in the proposal that has a total cost equal to or greater than 30% of the total contract cost, computed on the basis of the proposal quantities and contract unit prices. Any revised consideration is to be determined by Agreement between the parties, otherwise by terms of the Agreement, as provided under Changes in Contract Price in the General Conditions.

1.11 FINAL QUANTITIES INSTALLED

- A. Should there be a discrepancy between the CONTRACTOR'S claim for quantity of materials installed and the quantity measured by the ENGINEER, the discrepancy may be resolved as follows:
1. The plans shall be thoroughly checked by the ENGINEER and CONTRACTOR to assure that all changes in work have been recorded and no errors exist in the material take-off.
 2. Should the quantity discrepancy not be resolved by means of plan sheet examination, then at the CONTRACTOR'S request, segments of lines may be re-measured: however, if the CONTRACTOR'S figures are not proven to be accurate by re-measurement, then the CONTRACTOR shall pay for cost of re-measurement.
 3. Any deviations in straight-line routing of pipeline not approved by the ENGINEER and/or OWNER shall be paid only for the footage of pipe which would have been required for a straight line installation.

1.12 PROTECTION OF LIVES AND PROPERTY

- A. In order to protect the lives and health of his employees, the CONTRACTOR shall comply with all pertinent provisions of the "Manual of Accident Prevention in Construction" issued by the Associated General CONTRACTOR of America, Inc. The CONTRACTOR shall maintain an accurate record of all cases of death, occupational disease and injuries requiring medical attention or causing loss of time from work arising out of and in the course of work under this contract. The CONTRACTOR alone shall be responsible for the safety, efficiency and adequacy of his plant, appliances and methods and for any damage which may result from their failure, improper construction, maintenance or operation.

1.13 SANITARY FACILITIES

- A. The CONTRACTOR shall provide adequate toilet facilities for use by workmen in accordance with O.S.H.A. provisions, and shall maintain such facilities throughout the construction period.

1.14 EXISTING UTILITIES

- A. It shall be the entire responsibility of the CONTRACTOR to locate all existing underground utilities ahead of the work, whether or not shown on the Plans, and to protect and preserve such utilities from any damage from the proposed construction operations. In the event an underground water, oil, gas, telephone line, or other utility is damaged, the respective OWNER of said utility shall be notified immediately by the CONTRACTOR. It shall be the CONTRACTOR'S entire responsibility to see that said utilities are repaired to the satisfaction of the ENGINEER and utility OWNER. If the CONTRACTOR shows a complete disregard for existing utilities, the CONTRACTOR will pay the OWNER, \$1,000.00 per occurrence in addition to paying all costs for repairing damage to existing utilities. Continued disregard for existing utilities may result in suspension or termination of the Construction Contract. Where overhead poles or anchors are encountered, or are necessary to be disturbed or moved, the CONTRACTOR shall contact the OWNER of the utility and arrange to have the necessary adjustments made, at no additional cost to the OWNER. When signs are disturbed or damaged, the CONTRACTOR shall restore them to the same or better condition that existed prior to construction.

1.15 SATURDAY AND SUNDAY WORK

- A. Construction work on Saturdays or Sundays will not be permitted on the project except to maintain barricades, warning signs and flares. In the event the CONTRACTOR is prevented from working on the project for two or more days in any one calendar week, he may work the following Saturday if approval is given by the ENGINEER and OWNER.

1.16 TPDES GENERAL PERMIT

- A. The CONTRACTOR shall fully comply with the Texas Pollutant Discharge Elimination System Permit TXR 150000. All construction activities shall fully comply with all aspects of this permit, and the CONTRACTOR shall certify to the OWNER said compliance before the certificate of construction completion is issued. The CONTRACTOR shall apply for and obtain the permit before construction. The CONTRACTOR shall be responsible for the permit fee and all other costs associated with the referenced permit.
- B. At least three (3) days before commencement of construction, the CONTRACTOR shall file a Notice of Intent (NOI) with the TCEQ. The notice shall be sent to the TCEQ, Storm Water & Processing Center: MC-228, P.O. Box 13087, Austin, Texas 78711-3087. One copy of the NOI shall be sent to the ENGINEER and one copy shall be posted at the site. The NOI form and permit requirement may be obtained from the TCEQ or on their website www.tceq.state.tx.us. The CONTRACTOR shall prepare a Stormwater Pollution Prevention Plan (SWPPP), obtain, and fully comply with the Texas Pollutant Discharge Elimination System Permit TXR 150000. Questions concerning this permit may be addressed to TCEQ at 512-239-3700.

1.17 CONSTRUCTION SURVEYING

- A. The construction surveying described in Paragraph 1 below shall be provided by the OWNER. The surveying work contained in Paragraphs 2, 3, and 4 shall be considered subsidiary to the overall project and no separate payment shall be made for this work. Work contained in Paragraphs 2, 3, and 4 shall be accomplished by the CONTRACTOR.
 - 1. The surveyor shall obtain copies of all private property easements, and public right of way permits. From these easements and permits, the surveyor shall set alignment lathes, stakes, and hubs as needed and benchmarks as needed, plus alignment stakes at every horizontal PI. Also, alignment lathes, stakes, and hubs shall be set at every property line or ROW line crossing. The CONTRACTOR shall notify the ENGINEER at least 24 hours before each segment is to be staked. Each segment to be staked shall be a minimum of 1000 feet in length. Staking will be provided one time only. Stakes that are lost or damaged shall be replaced by the CONTRACTOR at his own cost.
 - 2. Locate and protect control points prior to starting the site work and preserve permanent reference points during construction. The CONTRACTOR shall not change or relocate points without prior approval of the ENGINEER. Notify ENGINEER when the reference point is lost, destroyed, or requires relocation. Replace project control points on the basis of the original survey.
 - 3. Provide complete engineering layout of the work needed for construction.
 - a. Provide competent personnel. Provide equipment including accurate surveying instruments, stakes, platforms, tools, and materials.
 - b. Record data and measurements per standards.
 - 4. Construction lines and grades, as well as base lines and bench marks provided by the CONTRACTOR, shall be subject to such checks and reviews as the ENGINEER may, from time to time, desire to make.

1.18 WATER USED DURING CONSTRUCTION PERIOD

- A. The CONTRACTOR shall pay to the City of Azle, \$10.00 per thousand gallons for all water used for filling the lines, flushing, testing, leaks, etc.
- B. The OWNER shall furnish water (at the nearest fire hydrant or flush valve) at no cost to the CONTRACTOR for testing, disinfection and flushing as required by these Specifications.

1.19 UTILITIES DURING CONSTRUCTION

- A. The CONTRACTOR will be required to make arrangements for and pay for the electrical power and any other utilities required during construction.

1.20 STATE HISTORIC PRESERVATION

- A. If cultural materials are encountered during construction, work must cease in the immediate area. Work can continue in the project area where no cultural materials are present. The Secretary of Interior (202-343-4101) must be contacted in accordance with 36 CFR 8007. Also, the State Historic Preservation Officer (512-463-6100) must be notified.

1.21 UNCLASSIFIED EXCAVATION

- A. All excavation on this project will be considered to be unclassified, and no extra payment will be made for the removal of any rock, shale, roots and any other material or substance that may be encountered in the construction work as set out on the Drawings and in the Technical Specifications.

1.22 ROCK EXCAVATION

- A. In all areas requiring rock excavation, the Contractor shall install the pipe and complete the "rock free" bedding so that the installation may be inspected prior to backfilling. The Owner's inspector shall be notified by the Contractor when the bedding is complete for each particular segment. Any rock excavation areas backfilled without the Owner's prior inspection will require uncovering and checking at the Contractor's expense.

1.23 LOCATION OF PIPELINES

- A. In the event pipeline locations required by the Plans should intersect a septic tank drain field or animal pens where extreme pollution might occur, the CONTRACTOR shall notify the ENGINEER and OWNER, and proposed water pipeline shall be re-routed in order to avoid such areas of possible pollution. In the event additional lengths of pipeline are required, the additional lengths will be paid for at the unit price bid per linear foot as set out in the proposal. No unauthorized straight line deviations will be paid for. The CONTRACTOR shall fully comply with TCEQ chapter 290.44(3) and Chapter 317.13 Appendix E for location of water/sewer lines and separation distances. No extra payment will be made to the CONTRACTOR for compliance with TCEQ requirements.

1.24 LOCATION OF VALVES AND METERS

- A. Valves, meters, meter boxes and vaults shall be installed at the locations shown on the Plans.
 - 1. Whenever possible, valves shall be located adjacent to existing fences or edge of the right-of-way especially in cultivated fields. Unless absolutely necessary, valves shall not be located in borrow ditches or wash-out areas. The CONTRACTOR shall install two 4" diameter steel pipes (7'), buried 3 feet with concrete and painted for all valves located in cultivated fields at no additional cost to the OWNER.
 - 2. The meters shall be centered in the boxes, vaults to allow for reading and ease of removal or maintenance. No boring or taps shall be made for meter installation unless the OWNER has previously designated the exact location for the meter.

1.25 CONSTRUCTION ON COUNTY OR CITY RIGHT-OF-WAY

- A. The OWNER has received authorization from the County authorizing pipeline construction in County road right-of-way in the locations indicated on the Plans. It shall be the CONTRACTOR'S entire responsibility to notify the appropriate Precinct Commissioner 48 hours prior to any construction work on County right-of-way, and conduct construction operations in full cooperation with Precinct Commissioner.
- B. Where necessary to cross a county road or install pipeline within the County road riding surface, all ditch backfilling shall be as noted or required per County Precinct Commissioner, base material replaced as directed by the Precinct Commissioner, and the road left in a

condition equal to that prior to crossing. In areas where pavements exists or where new construction is being proposed, and the County Commissioner requires the crossing to be bored, the CONTRACTOR shall bore and encase the pipeline in the same manner required by the Texas Highway Department for highway crossings and payment will be made at the unit price bid for Bore and Encasement as set out in the Bid Schedule. All paved county roads shall be bored. No paved county road shall be open cut unless written approval is obtained from the appropriate Precinct Commissioner.

- C. All County road crossings or paralleling in County right-of-way shall have right-of-way markers installed at the entrance and exit points and a detectable metal tape shall be installed in the pipeline ditch while in the County right-of-way.
- D. **No extra payment shall be made for special backfill in county roads and no extra payment shall be made for any gravel or asphalt repair. All paved driveways and approaches shall be slick bored for no extra pay as noted on the Plans.**

1.26 WATER LINE PARALLELING OR CROSSING SEWER LINES

- A. The Contractor shall fully comply with all Texas Commission on Environmental Quality regulations pertaining to separation distances as described in Table I of this section. No additional payment shall be made for separation distance compliance, but this work shall be considered subsidiary to the overall project.
- B. Location of waterlines. The following rules apply to installations of waterlines, wastewater mains or laterals, and other conveyances/appurtenances identified as potential sources of contamination. Furthermore, all ratings specified shall be defined by ASTM or AWWA standards unless stated otherwise. New mains, service lines, or laterals are those that are installed where no main, service line, or lateral previously existed, or where existing mains, service lines, or laterals are replaced with pipes of different size or material.
 - 1. When new potable water distribution lines are constructed, they shall be installed no closer than nine feet in all directions to wastewater collection facilities. All separation distances shall be measured from the outside surface of each of the respective pieces.
 - 2. Potable water distribution lines and wastewater mains or laterals that form parallel utility lines shall be installed in separate trenches.
 - 3. No physical connection shall be made between a drinking water supply and a sewer line. Any appurtenance shall be designed and constructed so as to prevent any possibility of sewage entering the drinking water system.
 - 4. Where the nine-foot separation distance cannot be achieved, the following criteria shall apply.
- C. New waterline installation - parallel lines.
 - 1. Where a new potable waterline parallels an existing, non-pressure or pressure rated wastewater main or lateral and the licensed professional engineer licensed in the State of Texas is able to determine that the existing wastewater main or lateral is not leaking, the new potable waterline shall be located at least two feet above the existing wastewater main or lateral, measured vertically, and at least four feet away, measured horizontally, from the existing wastewater main or lateral. Every effort shall be exerted not to disturb the bedding and backfill of the existing wastewater main or lateral.
 - 2. Where a new potable waterline parallels an existing pressure rated wastewater main or lateral and it cannot be determined by the licensed professional engineer if the existing line is leaking, the existing wastewater main or lateral shall be replaced with at least 150 psi pressure rated pipe. The new potable waterline shall be located at least two feet above the new wastewater line, measured vertically, and at least four feet away, measured horizontally, from the replaced wastewater main or lateral.

3. Where a new potable waterline parallels a new wastewater main, the wastewater main or lateral shall be constructed of at least 150 psi pressure rated pipe. The new potable waterline shall be located at least two feet above the wastewater main or lateral, measured vertically, and at least four feet away, measured horizontally, from the wastewater main or lateral.
- D. New waterline installation - crossing lines.
 1. Where a new potable waterline crosses above a wastewater main or lateral, the segment of the waterline pipe shall be centered over and must be perpendicular to the wastewater main or lateral such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater main or lateral. When crossing an existing wastewater main or lateral and it is disturbed or shows signs of leaking, the wastewater main or lateral shall be replaced for at least nine feet in both directions (18 feet total) with at least 150 psi pressure-rated pipe embedded in cement stabilized sand (see clause (v) of this subparagraph) for the total length of one pipe segment plus 12 inches beyond the joint on each end.
 - a. The potable waterline shall be at least two feet above an existing, non-pressure rated wastewater main or lateral.
 - b. The potable waterline shall be at least six inches above an existing, pressure-rated wastewater main or lateral.
 2. Where a new potable waterline crosses a new, non-pressure rated wastewater main or lateral, the segment of the waterline pipe shall be centered over and shall be perpendicular to the wastewater main or lateral such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater main or lateral. The potable waterline shall be at least two feet above the wastewater main or lateral. Whenever possible, the crossing shall be centered between the joints of the wastewater main or lateral. The wastewater pipe shall have a minimum pipe stiffness of 115 psi at 5.0% deflection. The wastewater main or lateral shall be embedded in cement stabilized sand (see clause (v) of this subparagraph) for the total length of one pipe segment plus 12 inches beyond the joint on each end. The materials and method of installation shall conform to one of the following options:
 - a. Within nine feet horizontally of either side of the waterline, the wastewater pipe and joints shall be constructed with pipe material having a minimum pressure rating of at least 150 psi. An absolute minimum vertical separation distance of two feet shall be provided. The wastewater main or lateral shall be located below the waterline.
 - b. All sections of wastewater main or lateral within nine feet horizontally of the waterline shall be encased in an 18-foot (or longer) section of pipe. Flexible encasing pipe shall have a minimum pipe stiffness of 115 psi at 5.0% deflection. The encasing pipe shall be centered on the waterline and shall be at least two nominal pipe diameters larger than the wastewater main or lateral. The space around the carrier pipe shall be supported at five-foot (or less) intervals with spacers or be filled to the discrepancies with washed sand. Each end of the casing shall be sealed with watertight non-shrink cement grout or a manufactured watertight seal. An absolute minimum separation distance of six inches between the encasement pipe and the waterline shall be provided. The wastewater line shall be located below the waterline.
 3. When a new waterline crosses under a wastewater main or lateral, the waterline shall be encased as described for wastewater mains or laterals in clause (ii) of this subparagraph or constructed of ductile iron or steel pipe with mechanical or welded joints as appropriate. An absolute minimum separation distance of one foot between the waterline and the wastewater main or lateral shall be provided. When a new waterline crosses under a wastewater main, the procedures in §217.53(d) of this title (relating to Pipe Design) must be followed.
 4. Where a new potable waterline crosses a new, pressure rated wastewater main or lateral, one segment of the waterline pipe shall be centered over and shall be perpendicular to the

wastewater line such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the center line of the wastewater main or lateral. The potable waterline shall be at least six inches above the wastewater main or lateral. Whenever possible, the crossing shall be centered between the joints of the wastewater main or lateral. The wastewater pipe shall have a minimum pressure rating of at least 150 psi. The wastewater main or lateral shall be embedded in cement stabilized sand (see clause (v) of this subparagraph) for the total length of one pipe segment plus 12 inches beyond the joint on each end.

5. Where cement stabilized sand bedding is required, the cement stabilized sand shall have a minimum of 10% cement per cubic yard of cement stabilized sand mixture, based on loose dry weight volume (at least 2.5 bags of cement per cubic yard of mixture). The cement stabilized sand bedding shall be a minimum of six inches above and four inches below the wastewater main or lateral. The use of brown coloring in cement stabilized sand for wastewater main or lateral bedding is recommended for the identification of pressure rated wastewater mains during future construction.
- E. Waterline and wastewater main or lateral manhole or cleanout separation. The separation distance from a potable waterline to a wastewater main or lateral manhole or cleanout shall be a minimum of nine feet. Where the nine-foot separation distance cannot be achieved, the potable waterline shall be encased in a joint of at least 150 psi pressure class pipe at least 18 feet long and two nominal sizes larger than the new conveyance. The space around the carrier pipe shall be supported at five-foot intervals with spacers or be filled to the springline with washed sand. The encasement pipe shall be centered on the crossing and both ends sealed with cement grout or manufactured sealant.
- F. Location of fire hydrants. Fire hydrants shall not be installed within nine feet vertically or horizontally of any wastewater main, wastewater lateral, or wastewater service line regardless of construction.
- G. Location of potable or raw water supply or suction lines. Suction mains to pumping equipment shall not cross wastewater mains, wastewater laterals, or wastewater service lines. Raw water supply lines shall not be installed within five feet of any tile or concrete wastewater main, wastewater lateral, or wastewater service line.
- H. Proximity of septic tank drainfields. Waterlines shall not be installed closer than ten feet to septic tank drainfields.

1.27 TRENCH SETTLEMENT

- A. The CONTRACTOR shall be responsible for all settlement of backfill, fills, and embankments which may occur within one (1) year after final completion of the contract under which the work was performed.
- B. The CONTRACTOR shall make, or cause to be made, all repairs or replacements made necessary by settlement, within thirty (30) days after notice from the ENGINEER or OWNER.

1.28 RESTORATION OF SURFACES

- A. The CONTRACTOR shall replace all surface material (including topsoil in original thickness), and shall restore gravel drives and roadways, fencing, sod and other surfaces disturbed, to a condition equal to that before the work began, furnishing all labor and material incidental thereto.

1.29 SURPLUS EARTH

- A. Surplus excavated materials from all trenching, manholes, and structures shall be disposed of by the CONTRACTOR as approved by the OWNER and ENGINEER.

1.30 CONCRETE BLOCKING

- A. All bends, tees, etc., 2" and larger shall be blocked with concrete per the Plans and Specifications with a minimum soil bearing surface of 1.0 square foot per inch diameter of pipe. The use of rocks, masonry blocks, etc. is not acceptable. Only "Sacrete" which has been thoroughly mixed or Class B concrete shall be used for blocking. No blocking shall be covered up until it has been inspected and approved by the OWNER and/or ENGINEER. If covered prior to inspection, the CONTRACTOR shall uncover the blocking for inspection at his expense.

1.31 FENCES AND SIGNS

- A. When necessary for the CONTRACTOR to take down signs, fences or other obstructions, this shall be done at his own expense and replaced in the original condition after construction operations. Fences which are taken loose by the Contractor shall be done in a manner to prevent slacking of the remainder of the wire. The CONTRACTOR, prior to taking down any fence shall have complete approval of the Project Representative as to the width of the fence gap to be made and the manner in which existing posts are to be placed. **No fences shall be cut without authorization in writing from OWNER or ENGINEER.**

1.32 BARRICADES, WARNING SIGNS AND PUBLIC CONVENIENCE

- A. The convenience of access of the adjoining property OWNERS on the streets herein scheduled for improvements is of prime importance in the construction operations. In certain locations it may be necessary that property OWNERS use a portion of the roadway being improved to access their property. In such cases, the CONTRACTOR shall schedule his operations to provide such access to the property OWNERS in a safe and convenient manner. The CONTRACTOR shall provide courteous, English speaking and well informed flagmen for directing traffic. Flagmen shall wear a bright red coat and shall use a bright red flag to signal traffic.
- B. At each section of street and each cross street intersecting the section of street under construction, the CONTRACTOR shall provide barricades and other warning signs as necessary. Detour signs shall be placed at all intersections where traffic is diverted from the section under construction and at other intersections of the detour to provide complete directions for detouring traffic around the section under construction. CONTRACTOR shall also provide any necessary special signs to signify any hazards or conditions. All barricades, detour and warning signs that remain in place at night shall be fully lighted by approved methods from sunset to sunrise. All signs shall be kept in a good state of repair and be plainly legible at all times. Upon completion of the project, all signs and evidence thereof shall be completely removed from the site of the work by the CONTRACTOR.

1.33 CLEARING AND CLEAN UP

- A. All necessary clearing shall be done by the CONTRACTOR. All tree branches, limbs and roots shall be removed and disposed of by the CONTRACTOR in order that the right-of-way may be left in a neat and presentable condition. Any damage resulting to trees, grass and shrubbery must be paid for, by the CONTRACTOR, and damage claims, if any, settled by the CONTRACTOR.
- B. Prior to final acceptance of the project, the CONTRACTOR shall clean and smooth up the site of the work and remove all rock, debris, material, etc., leaving the project site with a neat appearance to the satisfaction of the OWNER. Disposed of debris, rubbish, etc. shall be made in an area which shall meet the approval of the OWNER and ENGINEER. The CONTRACTOR shall comply fully with all applicable EPA and TCEQ regulations.

1.34 START UP AND OPERATION

- A. Prior to presentation for final acceptance of the work under this contract, the CONTRACTOR shall have started and operated all units at each site for a sufficient duration of time, thirty (30) days to permit the OWNER and ENGINEER to observe overall performance of the respective units and equipment.
- B. Such operation shall be properly coordinated with the OWNER'S operating personnel.

1.35 FEDERAL AND/OR STATE AGENCY'S APPROVAL AND INSPECTION

- A. The written approval of the appropriate state agency having jurisdiction over the facility must be secured prior to payment of the final percentage retained under this contract.
- B. The project site and premises as well as any records required shall be available at all reasonable times for inspection by authorized representatives of the State or Federal Agencies having jurisdiction over the project. The CONTRACTOR shall provide all necessary facilities for these inspections.

1.36 "RECORD DRAWING" INFORMATION

- A. The CONTRACTOR shall be responsible for recording and providing all information concerning changes from the original plans as to valve, meter, and/or pipeline location for transfer to the "As-Built" or "Record Drawings" Plans. Final payment will not be released until "Record Drawings" are approved by the ENGINEER.

1.37 AFFIDAVIT OF BILLS PAID

- A. Prior to final acceptance of the project by the OWNER, the CONTRACTOR shall execute a Release by Claimants and an affidavit which states all bills for labor, materials and incidentals incurred in the construction of the project have been paid in full and that there are no claims pending of which he has been notified.

1.38 LIQUIDATED DAMAGES

- A. It is understood and agreed between the parties hereto that time is of the essence under this Contract, and that for each calendar day of delay beyond the stipulated number of calendar days awarded under this Contract, the CONTRACTOR shall pay the OWNER as liquidated damages the sum of \$500.00 (five hundred dollars) per day. It is also understood between the parties hereto that such sum shall be treated as liquidated damages and not as a penalty, and the OWNER may withhold from the CONTRACTOR'S final payment such sum as liquidated damages.

1.39 WARRANTY

- A. The CONTRACTOR shall guarantee the work performed under this contract against defective materials and workmanship of a period of one (1) year from the date of final acceptance of the work by the OWNER. The CONTRACTOR shall arrange to have his Performance Bond remain in effect for a period of one (1) year after the date of completion of construction work to cover his guarantee as stipulated under this item and in the General Conditions.
- B. If defective materials and/or workmanship are discovered which require repairs made under this guarantee, all such repairs shall be done by the CONTRACTOR at his own expense within ten days after written notice of such defect. Should the CONTRACTOR fail to repair or correct such deficiency within ten days after notification, the OWNER may make the necessary repairs and charge the CONTRACTOR with the applicable costs of all labor and materials required to correct the deficiency.

JACOB|MARTIN

City of Azle - Dunaway Lane
Reconstruction

01 02 01
SPECIAL TECHNICAL
SPECIFICATIONS AND
CONDITIONS

PART 2 NOT USED

PART 3 NOT USED

-- END OF SECTION --

This page intentionally left blank

SECTION 01 03 01 - MEASUREMENT AND PAYMENT

PART 1 PAYMENT ITEMS

1.1 LUMP SUM PAYMENT ITEMS

- A. Payment items for the work of this contract for which contract lump sum payments will be made are listed in the BIDDING SCHEDULE and described below. All costs for items of work, which are not specifically mentioned to be included in a particular lump sum or unit price payment item, shall be included in the listed lump sum item most closely associated with the work involved. The lump sum price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.2 UNIT PRICE PAYMENT ITEMS

- A. Payment items for the work of this contract on which the contract unit price payments will be made are listed in the BIDDING SCHEDULE and described below. The unit price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for each of the unit price items.

PART 2 NOT USED

PART 3 NOT USED

-- END OF SECTION --

This page intentionally left blank

SECTION 01 04 01 - SUBMITTALS

PART 1 GENERAL

1.1 SUMMARY

The CONTRACTOR shall submit descriptive information to:

1. Allow the ENGINEER to advise the OWNER whether the materials and equipment proposed for the project are in general conformance with the design concepts and in conformance with the drawings and specifications.
2. Provide a record for the OWNER of the materials and equipment which have been incorporated into the project.
3. Provide a guide for operations and maintenance of equipment.
4. Provide information required for the administration of the Contract for construction of the project.
5. All submittals, shop drawing and other related documents include under this specification section shall be submitted electronically to the Engineer unless directed otherwise by the Engineer. The only exception being the Operation and Maintenance Manuals, which shall be submitted as directed under that item.

1.2 REFERENCE STANDARDS

PART 2 PROCEDURES

2.1 CONTRACTOR'S RESPONSIBILITIES

- A. The CONTRACTOR shall be responsible for the accuracy and completeness of the information contained in each submittal and shall insure that the values, material, equipment, or method of work shall be as described in the submittal. All submittals must be stamped by the CONTRACTOR, indicating that they have been checked by the CONTRACTOR for compliance with the Contract Documents and approved by the CONTRACTOR, or contain certifications as required by the Contract Documents. Submittals that do not have the stamp applied or include the required certifications will be returned without processing to the CONTRACTOR.
- B. The CONTRACTOR shall ensure that there is no conflict with other submittals and notify the ENGINEER of each case where the proposed change may affect the work of another CONTRACTOR or OWNER. The CONTRACTOR shall ensure coordination of submittals among the related crafts and Subcontractors. Submittals shall not be accepted from Subcontractors or suppliers.

2.2 MARKING OF SUBMITTALS

- A. The CONTRACTOR shall assign a number to each submittal provided to the ENGINEER to allow each submittal to be tracked while processing through the review procedures.
- B. Assignment of numbers shall be by means of a letter prefix, a sequence number, and letter suffix to indicate resubmittal's.
- C. The sequence number shall be issued in chronological order for each submittal in a division. Resubmittal's shall be followed by a letter of the alphabet to indicate the number of times a submittal has been sent to the ENGINEER for processing. As an example, a submittal with the number SD-03-01 indicates that the submittal is the first in Division 3 submitted. Submittal number SD-11-04-AA indicates the submittal is the fourth shop drawing submitted in Division 11 and is being submitted for the second time. Operation and maintenance manuals submitted shall be identified with the same number as its corresponding equipment submittal. For example, OM-11-04 indicates that this is the operation and maintenance manual for the equipment submitted as SD-11-04.
- D. Correct assignment of numbers is essential as different submittal types are processed in different ways. Some submittals received do not require that any response be given for the

material. CONTRACTOR and ENGINEER shall both maintain a log of submissions to allow the processing of CONTRACTOR's submittals to be monitored. Logs will be reviewed periodically to determine that all submittals are received and processed.

- E. Submittals shall be marked to show clearly the applicable sections of the specification and sheet number of drawings.
- F. Submittals shall be accompanied by a Submittal Transmittal Form to be provided by the CONTRACTOR. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate discrete sections, etc. for which a submittal is required. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that they should be checked as a unit.

2.3 CONTRACTOR MODIFICATION REQUEST/PROPOSED CONTRACT MODIFICATION

- A. Any change in the contract documents that is requested will be initiated by the CONTRACTOR issuing a Contractor's Modification Request or by ENGINEER issuing a Proposed Contract Modification. Proposals will be considered and if found acceptable will be incorporated in a Field Order in accordance with the General Conditions or Change Order in accordance with the General Conditions.

2.4 SHOP DRAWINGS

A. DEFINITION

- 1. As defined in the General Conditions, shop drawings consist of all drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the CONTRACTOR to illustrate some portion of the work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams, and other information prepared by a supplier and submitted by CONTRACTOR to illustrate material or equipment for some portion of the Work.
- 2. Shop drawings shall indicate the kind, exact model, size, arrangement, and operation of component materials and devices; materials of construction, external connections, anchorages and supports required; performance characteristics; dimensions, weights, and other information required for installation and correlation with other materials and equipment.

B. SCHEDULE OF SUBMITTAL OF SHOP DRAWINGS

- 1. The CONTRACTOR shall submit, in accordance with the General Conditions, a schedule indicating the time and sequence in which Shop Drawings are to be submitted. This schedule shall consider the dates for incorporation of the materials or equipment into the project and take into consideration time for delivery and a reasonable time for review of shop drawings. Proposed order and delivery dates shall be incorporated in the Progress Schedule.
- 2. Shop drawings will generally be reviewed in the order in which they are received. Drawings marked "Priority" will be reviewed ahead of other shop drawing submittals not so marked which have already been received but are not yet being reviewed. CONTRACTOR shall be aware that checking of "Priority" shop drawings may delay the review of other drawings which have already been submitted by the CONTRACTOR and the use of this designation is to be used with discretion.

C. CONTRACTOR'S REVIEW AND CERTIFICATION

The CONTRACTOR shall verify that the material and equipment in each shop drawing conforms to the requirements of the Contract Documents. Shop drawings shall be in strict compliance with the Contract Documents and shall bear an executed statement to that effect by the CONTRACTOR. Shop Drawings without this stamp applied will be returned without review.

D. DEVIATIONS FROM CONTRACT DOCUMENTS

Requests for deviation from the Contract Documents shall be by Contractor's Modification Request as outlined in Paragraph 2.03 of this section of the specifications. The CONTRACTOR'S Modification Request shall fully identify and describe the deviations and state the reason the change is requested. Any savings in cost related to the substitution is to be stated in the request for consideration.

E. REQUIREMENT FOR COMPLETE SHOP DRAWINGS

1. Material in shop drawings shall be in sufficient detail to demonstrate compliance with all requirements of the Contract Documents. Shop drawings shall address material and/or methods of construction, design criteria, performance characteristics, and special provisions of the Specifications.
2. Shop drawings for systems and related equipment shall include information for all components required for a complete and operational system, including electrical, mechanical, and any other information required to indicate how the various components of the system function, and shall be included in the same submittal.
3. Where statements of certification, written guarantees, extended service agreements or extended warranties as defined in Paragraph J are required, they will be provided with the shop drawing. The effective date of the guarantee and service agreements, however, shall not be until the date of acceptance for the project.
4. Shop drawings shall be clearly marked to show the applicable sections of the specifications and sheet in the drawings. Other identification may also be required on drawings such as layout drawings or schedules to allow the reviewer to determine where a particular item is to be used in the project.
5. One (1) electronic copy of each shop drawing shall be submitted to the ENGINEER and OWNER.
6. Shop drawings which do not have all of the information required for evaluation will be returned without benefit of review and comment.

F. CHECKING AND REVIEW OF SHOP DRAWINGS

1. The ENGINEER will review the data for general conformity to the Contract Documents. Comments will be made on items called to the attention of the ENGINEER for review and verification. Markings will be based on this examination and do not constitute a blanket review of the shop drawing. The ENGINEER's review does not relieve the CONTRACTOR from any responsibility for errors or deviations from the Contract requirements. Shop drawings which contain substantial error or omissions, or which are not clearly legible, will be returned without benefit of review.
2. Shop drawings will be marked in one of the three following ways:
 - a. Approved: Shop drawings are acceptable without correction and may be distributed for construction and/or manufacture.
 - b. Approved as Noted: Shop drawings are acceptable with minor corrections as marked and may be used with the corrections noted.
 - c. Rejected: Material or equipment described is not acceptable.

G. APPROVAL OF EQUAL SUBSTITUTIONS

Where Contract Documents allow substitution of material or equipment as an approved equal to the specified product, shop drawings shall be provided. Shop drawings shall include supporting data to indicate specifically, on a point-by-point basis for each feature of the design, how the proposed product is equal to or better than the specified product. Deviations from the Contract Documents must be requested and approved as described in Paragraph D.

H. SHOP DRAWINGS REQUIRED

Shop drawings are required for only those items of equipment or materials where submittals are listed in the individual specification section and for the determination of substitutions for approval as described in Paragraph G of this section. Only these shop drawings will be reviewed. Shop drawings which are not required may be returned with the notation "NOT REQUIRED BY THIS CONTRACT."

I. OWNER SELECTED OPTIONS

Where selections are to be made by the OWNER for color, texture or finish and shop drawings are required for that product, shop drawings will be submitted for approval of the materials of construction, composition, etc., prior to the selection of finishes by the OWNER. Items requiring selection of finish for which shop drawings are not required shall be furnished as record data. Selection of finish for materials shall be determined as described in Paragraph 2.13.

J. CERTIFICATIONS, WARRANTIES AND OTHER REQUIREMENTS

Where indicated in the Contract Documents the following items as defined below are to be provided as part of the shop drawing:

1. Certified Test Report - A report prepared by an approved testing agency on the results of tests performed on materials to indicate their compliance with the specifications. Reports are to be numbered consecutively for reference. Retest required to verify compliance with Contract Documents shall be identified with the same number as the original test with a letter to indicate retest, similar to the numbering system used for Shop Drawings.
2. Certification of Local Field Service - A certified letter stating that field service is available from a factory or supplier approved service organization located within a 300-mile radius of the project site.
3. Extended Warranty - A guarantee of performance for the product or system beyond the one-year warranty described in the General Conditions. The Warranty Certificate is to be issued in the name of the OWNER.
4. Extended Service Agreement - A contract to provide operations and maintenance for equipment as specified beyond that required to fulfill requirements for warranty repairs; or to perform routine maintenance at some period beyond the warranty period. The Service Agreement is to be issued in the name of the OWNER.
5. Certification of Adequacy of Design - A certified letter from the manufacturer of the equipment stating that they have designed the equipment offered to account for structural stability to withstand all imposed loads without deformation, failure or adversely affecting the operational requirements of the unit; and operational capability, including mechanical and electrical equipment sizing to be fully operational in accordance with the conditions specified.
6. Certification of Applicator/Subcontractor Qualifications - A certified letter stating that the applicator/subcontractor proposed to perform a specified item of work is duly designated as factory-authorized and trained for the application or installation of the specified product.

2.5 RECORD DATA

- A. Record data shall be submitted to provide information as to the general character, style and manufacturer of the equipment to allow the OWNER to adequately identify the materials or equipment incorporated into the project. Record data shall be provided for all equipment and materials of construction. Record data are not required for items for which Shop Drawings and/or operations and maintenance manuals are required.
- B. Record data shall be complete to indicate where the material was incorporated into the project, provide schedules of materials and their use, colors, model numbers and other information which would allow this material to be replaced at some future date. Record data will be received by the ENGINEER and logged for transmittal to the OWNER. Record data will not be reviewed for comment and no response will be made to the CONTRACTOR.

2.6 OPERATIONS AND MAINTENANCE MANUALS

- A. For each type of equipment to be furnished and installed under this contract, the CONTRACTOR shall prepare an operation and maintenance manual covering:
 1. Name, address, and telephone number of nearest competent service organization who can supply parts and service.

2. Equipment function, normal operating characteristics, and limiting conditions, which reflect "as-built" conditions for the equipment furnished.
 3. Assembly, installation, alignment, adjustment, and checking instructions, including field modifications made during installation, startup and testing.
 4. Operating instructions for startup, routine and normal operation, regulation and control, shutdown, and emergency conditions.
 5. Lubrication and maintenance instructions, with lists of acceptable lubricants.
 6. Guide to "Troubleshooting".
 7. Parts lists, predicted life of parts subject to wear, list of recommended spare parts, and list of maintenance tools furnished with equipment.
 8. Outline, cross-section, and assembly drawings; engineering data; control schematics and point-to-point wiring diagrams, and reproductions of all equipment nameplates.
 9. A copy of the shop drawing submittal information, description of the equipment, specifications, test data, and performance curves, where applicable.
 10. Specified warranties and service agreements.
 11. A listing of the manufacturer's identification, including order number, model, and serial number and reproduction of equipment nameplate.
- B. The above information, as applicable, shall be provided for the equipment as indicated in individual specification sections.
- C. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.
- D. Manuals shall be furnished in Adobe PDF Format and printed on heavy, first quality paper, 8-1/2x 11-inch size with standard 3-hole punching. Drawings and diagrams shall be reduced to 8-1/2x 11 inches. Where reduction is not practicable, larger drawings shall be folded separately, and placed in envelopes which are bound into the manual. Each envelope shall bear suitable identification on the outside. Indicate applicable specification number and location within plant that equipment will be installed on cover of each manual. Provide "Table of Contents" and "Index Tabs" for each manual.
- E. Two preliminary copies of each manual, temporarily bound in heavy paper covers bearing suitable identification, shall be submitted to the ENGINEER at the time of submittal of the shop drawings. CONTRACTOR shall organize all equipment O&Ms, and submit draft covers of all manuals required, in order of process treatment. All volumes shall be numbered sequentially. After review by the ENGINEER, CONTRACTOR shall prepare three (3) hard copies and two (2) electronic copies (on CD) of each operation and maintenance manual and deliver to the ENGINEER not later than 90 days prior to placing the equipment into operation.

2.7 PROJECT INFORMATION REQUEST

- A. When it is necessary for the CONTRACTOR to request additional information, interpretation of the Contract Documents, or when the CONTRACTOR believes there is a conflict between the drawings and specifications, he shall identify the conflict and request clarification using the Project Information Request form. Use of this form will allow requests for information to be routed to OWNER, design engineers, design consultants or others through the ENGINEER and allow these requests to be monitored to determine that clarification is provided when needed. Sufficient information shall be attached to permit a written response without further information.
- B. The ENGINEER will log each request and will review the request to determine that the information provided is adequate. If information is not adequate, the request will be returned for additional information. When adequate information is provided, the request will be reviewed and a response made. If a change is required, the ENGINEER will initiate a Proposed Contract Modification. If no change is required, the ENGINEER will provide additional information required to help the CONTRACTOR comply with the Contract Documents.

2.8 SCHEDULE OF VALUES AND PAYMENT ESTIMATES

- A. For contracts based on lump sum amounts, the CONTRACTOR is to submit to the ENGINEER for approval, a breakdown of cost for the Project. The breakdown is to provide adequate detail to allow easy determination of the percentage of completion for periodic payment review by the ENGINEER. Specification sections and add or deduct items in the proposal are to be used as a guide for preparing the breakdown. This breakdown is to be incorporated onto a form for the submission of payment request provided by the ENGINEER or in a form approved by the ENGINEER.
- B. The CONTRACTOR is to submit a schedule showing the anticipated schedule of payments for the CONTRACTOR to assist the OWNER in determining when funds are to be made available for payment of periodic payment requests.

2.9 PROGRESS SCHEDULES

- A. As required in the General Conditions, within 10 days prior to the submission of the first periodical estimate for partial payment, the CONTRACTOR shall prepare and submit to the ENGINEER an electronic copy of the schedule in which the CONTRACTOR proposes to carry on the work. The schedule is to include the date on which work will be started on each major activity, including procurement of materials and equipment, and the anticipated date for the completion of each activity. The CONTRACTOR shall be responsible for developing the construction schedule and monitoring progress. The CONTRACTOR shall consider and include the schedules of all subcontractors, material and equipment suppliers to ensure that all necessary information is incorporated into the construction schedule.
 - 1. Give early warning of delays in time for correction.
 - 2. Require that detailed plans for the execution of the work be prepared in the form of future activities and events in sequential relationships.
 - 3. Establish interrelationships of significant planned work activities and provide a logical sequence of interdependence of planned work activities.
 - 4. Provide continuous current status information.
 - 5. Allow analysis of the CONTRACTOR's program for the completion of the Project.
 - 6. Permit preparation of new schedules when an existing schedule is not achievable.
 - 7. Log the progress of the work as it actually occurs.

2.10 SUPPLIERS AND SUBCONTRACTORS

The Contractor is to provide a written list of subcontractors and suppliers prior to the preconstruction conference described in the General Conditions.

2.11 EQUIPMENT INSTALLATION REPORT

- A. A written report shall be submitted by the equipment supplier performing the installation check for all major equipment. This report shall certify that 1) The equipment has been properly installed and lubricated, 2) is in accurate alignment, 3) is free from any undue stress imposed by connecting piping, equipment, or anchor bolts, and 4) has been operated under full load conditions and that it is operating satisfactorily.

2.12 NOTIFICATION BY CONTRACTOR

Written notification of the need for testing, observation work by ENGINEER, intent to work outside of regular working hours, or the request to shut down the facilities or make utility connections shall be given to the ENGINEER by issuance of a Notification By Contract or on a form provided by the ENGINEER.

2.13 SELECTION OF FINISH BY OWNER

Items that require that the OWNER select the finish, color, texture, fabric or make other choices related to the appearance of some material or equipment to be provided are to be determined

as soon as possible to allow OWNER adequate time to consider available options for selection. Color chips, samples, etc., for all items are to be assembled and submitted to the OWNER through the ENGINEER for selection of finishes at the same time to allow all options to be considered and allow selections to be coordinated with other items of finish. The ENGINEER will meet with the OWNER who will determine the finish to be used within 2 weeks, unless additional samples are required for selection. Materials for which shop drawings are required are to be submitted for approval of material quality prior to selection of finish. CONTRACTOR's bid shall include costs to match existing colors and furnish non-standard colors at OWNER's selection.

PART 3 NOT USED

-- END OF SECTION --

This page intentionally left blank

SECTION 01 08 01 - GENERAL DEMOLITION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

29 CFR 1910 - Occupational Safety and Health Standards; current edition.

1.2 DEFINITIONS

- A. Abandoned: Refers to items that are no longer in use and are to be taken out of service and left in place.
- B. Removed: Refers to items that are to be disconnected and removed from project site.
- C. Salvaged: Refers to items which are disconnected, taken out of service and turned over to OWNER.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Provide all materials necessary for work.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify field measurements and layouts as shown on drawings, or as existing.
- B. Verify that abandoned piping, wiring, equipment, etc. serve only abandoned facilities.
- C. Demolition drawings are based on field observations and existing record documents. Report discrepancies to OWNER's Representative before disturbing existing installation. Drawings are for CONTRACTOR's convenience, and accuracy or exactness is not guaranteed.
- D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

- A. Coordinate utility service outages with utility company, OWNER's representative, and OWNER's Representative ten (10) days prior to outage.
- B. Provide temporary piping, wiring, equipment, etc. as required to maintain existing system in service during construction. When CONTRACTOR elects to perform work on energized equipment or circuits, use personnel experienced in such operations.

3.3 DEMOLITION AND EXTENSION OF EXISTING ITEMS

- A. All equipment shown on the Plans to be demolished shall be completely removed along with all associated devices.
- B. The CONTRACTOR shall relocate all existing piping, circuitry (conduit and wiring), etc., which impedes the installation of new materials and equipment, unless otherwise specified and/or shown on the Plans.
- C. Repair adjacent construction and finishes damaged during demolition and extension work.
- D. Maintain access to existing installations which remain active. Modify installation or provide access as appropriate.
- E. Remove with care all equipment to be relocated. Repair or replace damaged equipment as required.
- F. Provide temporary barricades and other forms of protection as required for safety and security.
- G. Provide barriers and appropriate signs meeting requirements of 29 CFR 1910 for size and color where necessary to restrict pedestrians from wandering into construction areas.
- H. Completely backfill below-grade areas and voids resulting from demolition work, all backfill must be compacted and stabilized to earthwork specifications. Unless otherwise specified and /or shown on the Plans.

- I. Use water as necessary to lay dust when chipping, coring, or sawing concrete, masonry, or similar materials.
 - J. Demolish and remove existing construction only to extent required, as indicated on the Plans.
 - K. CONTRACTOR is responsible for disposal of all materials generated as a result of demolition.
- END OF SECTION --**

SECTION 01 09 01 - DISINFECTION OF POTABLE WATER PIPING AND TANKS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- AWWA C651 - Disinfecting Water Mains; 2014.
- AWWA C652 - Disinfection of Water-Storage Facilities; 2019.
- AWWA C653 - Disinfection of Water Treatment Plants; Current Edition.

1.2 WORK INCLUDED

- A. Disinfection of water piping, filters, clean clearwells, wetwells, and tanks for filtered, finished, and potable water.
- B. Test and report results.

1.3 QUALITY ASSURANCE

- A. Testing Laboratory: State Health Department certified approved for examination of drinking water in compliance with applicable legislation of the State of Texas.
- B. Piping, tanks, and equipment to be cleaned and disinfected shall be isolated from the finished water (potable water) at all times and shall be placed into service by the OWNER following receipt of acceptable test reports.

1.4 REGULATORY REQUIREMENTS

Conform to applicable Texas Department of Health Rules and TCEQ Regulations for Public Water Systems for work of this section.

1.5 SUBMITTALS

- A. Submit a schedule of the proposed sequence for cleaning and method of sterilization to be used or list of the equipment to be used, and the sterilizing agent and quantities to be used, location and/or sizes of fill, blowdown connections, sources of test water, and proposed plan to dispose of test water.
- B. Submit electronic copies.
- C. Submit reports under provisions of Section 01 04 01.
- D. Disinfection report should accurately record:
 - 1. Type and form of disinfection used.
 - 2. Date and time of disinfectant injection start and time of completion.
 - 3. Test locations.
 - 4. Initial and 24-hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
 - 5. Date and time of flushing in ppm for each outlet tested.
- E. Bacteriological report should accurately record:
 - 1. Data issued, project name, and testing laboratory name, address, and telephone number.
 - 2. Time and date of water sample collection.
 - 3. Name of person collecting samples.
 - 4. Test locations.
 - 5. Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
 - 6. Coliform bacteria test results for each outlet tested.
 - 7. Certification that water conforms, or fails to conform, to bacterial standards of Texas Department of Health.
 - 8. Bacteriologist's signature.

PART 2 PRODUCTS

2.1 PRODUCTS - GENERAL

- A. Furnish necessary temporary connections, taps, valves, piping, pumps, hoses, chemicals, and test equipment to accomplish the work.
- B. Disinfection agents shall be chlorine solution prepared from chlorine gas, sodium hypochlorite, or calcium hypochlorite.

PART 3 EXECUTION

3.1 GENERAL

- A. CONTRACTOR shall exercise care at all times during construction to prevent contaminated material from entering the structures and pipelines in the filtered, finished, and potable water system.
- B. All facilities and piping designed to hold or transport process water shall be cleaned, including piping, basins, and channels, prior to disinfection.
- C. Filters, finished water storage tanks, pump station wet wells, pump cans, finished water piping, together with valves and meters, all potable water, service water, and chemical piping shall be disinfected with chlorine solution as specified herein following cleaning and testing. Vertical pumps may be disinfected immediately prior to installation. All surfaces shall be cleaned or washed and disinfected, even though there is no visible evidence of necessity thereof.
- D. Disinfection shall be in accordance with the disinfection procedure described in AWWA C651, AWWA C652, and AWWA C653, and in accordance with the Rules and Regulations for Public Water Systems of the Texas Commission on Environmental Quality and the requirements of this section. Where conflicts exist, the ENGINEER shall determine the appropriate procedures.

3.2 PIPELINE DISINFECTION

- A. Verify that piping system has been cleaned, inspected, and pressure tested. Flush out line, completely replacing its entire volume with potable water.
- B. Purging may be accomplished by passing an appropriate sized "polly-pig(s)" through the pipe, or by flushing.
 - 1. Polly-Pig Method
 - a. In-general, this shall consist of furnishing all equipment, material, and labor to satisfactorily expose cleaning wye, remove cleaning wye covers, etc., as directed by the OWNER's representative or resident inspector.
 - b. Where expulsion of the "polly-pig" is required through a dead-ended main, the CONTRACTOR shall make every effort to prevent backflow of purged water into the main after passage of the pig. One small pipe, such as cast iron pipe through 12 inches (30 cm), backwater re-entry into the pipe can be prevented by the temporary installation of mechanical joint shallow bends and pipe joints to provide a riser out of the trench. On larger pipe, additional excavation of the trench may serve the same purpose.
 - c. Short dead-end pipe sections not swabbed by the pig shall be flushed.
 - d. Backflow water which has inadvertently entered the pipe under conditions similar to those described in the preceding Paragraph b, shall be flushed from the system.
 - e. After passage of the "polly-pig," flushing of all backwater from the pipe, satisfactory test results are received, at the direction of the OWNER, the CONTRACTOR shall proceed with sterilization.
 - 2. Flushing Method: If the "flushing" method of purging is used, the CONTRACTOR shall be required to prepare the main by installing blow-offs at locations and sized as directed by the ENGINEER.
 - a. In general, this shall consist of furnishing all equipment, material and labor to satisfactorily install blow-offs of sizes shown in the following table:

SIZE MAIN	SIZE BLOW-OFF
2-8 Inches	2 Inch
10-12 Inches	4 Inch
16-24 Inches	6 Inch
30 Inches and greater	10 Inch

- b. Before disinfection, flush all foreign matter from the pipeline. Provide hoses, temporary pipes, ditches, etc., as required to dispose of flushing water without damage to adjacent properties. Flushing velocities shall be at least 2.5 fps. For large diameter pipe where it is impractical or impossible to flush the pipe at 2.5 fps velocity, clean the pipeline in-place from the inside by brushing and sweeping, then flush the line at a lower velocity.
 - c. After flushing is complete and satisfactory test results are received at the direction of the OWNER's representative or resident inspector, the CONTRACTOR shall proceed with sterilization.
- C. Perform scheduling and disinfection activity with startup, testing, adjusting, and balancing, and demonstration procedures, including coordination with related systems.
- D. Provide and attach equipment required to execute work of this section. Do not place concentrated quantities of commercial disinfectants in the line before it is filled with water.

Inject treatment disinfectant into piping system being sterilized so that its entire capacity will be filled with potable water containing a free chlorine residual at a level of 50 ppm or other quantity as determined by the ENGINEER. The disinfectant shall be added at one end of the sections being treated through a corporation stop or other approved connection inserted in the horizontal axis of the newly laid pipe. The water being used to fill the line shall be controlled to flow into the section to be sterilized very slowly, and the rate of application of the chlorinating agent shall be in such proportion of the rate of water entering the line that the chlorine dose applied to the water entering the line and released at the opposite end shall have a chlorine concentration of 50 ppm or a level determined by the ENGINEER. Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. If required by the OWNER and ENGINEER the CONTRACTOR shall use RPZ device to prevent water from flowing back into the supply line. All valves shall then be closed and the chlorine solution shall remain in the line for a minimum of 24 hours. A minimum residual of 10 ppm shall be present in the main following the 24-hour holding period. Operate all valves, hydrants, and other appurtenances during disinfection to assure that the disinfecting mixture is dispersed into all parts of the line, including dead ends, and similar areas that otherwise may not receive the disinfecting solution.
- E. Remove the chlorine solution and flush the line with potable water. Comply with regulations and obtain necessary approvals for disposal or discharge of chlorine solution and flushing water.
- F. The OWNER will take samples from the sterilized line through a suitable point in accordance with AWWA C651 (not a fire hydrant) and submit to the testing laboratory. A minimum of one sample shall be taken for each 1000 feet of line tested. A second set of samples shall be taken and submitted to the testing laboratory 2 days after the first samples were taken. The sterilized portion of the line shall be placed in service, if the results of two consecutive tests conform to the bacterial standards. If the samples show unsatisfactory quality, the sterilization process shall be repeated until satisfactory results are obtained.

3.3 STORAGE TANK DISINFECTION

- A. The CONTRACTOR shall, at the completion of the tank and before filling for the leakage test, thoroughly clean and flush the interior of the tank to remove any foreign material from tanks. Fire hoses and/or pressure washers and other tools required for adequate scrubbing and cleaning shall be used. The cleaning water shall be pumped or drained from the tank before disinfection.
- B. The CONTRACTOR shall notify the OWNER's representative or resident inspector prior to chlorinating the tank. Disinfection shall meet with the approval of the OWNER or resident inspector, AWWA C652, and the appropriate state agency.
- C. The following tank disinfection methods are acceptable for this project. The CONTRACTOR shall select one method for use in the disinfection of the tanks.
 - 1. The CONTRACTOR shall add water and chlorine to the storage facility in amounts such that the solution will initially contain 50-mg/L available chlorine and will fill approximately 5 percent of the total storage volume. This solution shall be held in the storage facility for not less than 6 hours. The CONTRACTOR shall then fill the storage facility to the overflow level by flowing potable water into the highly chlorinated water. This mixture of water shall be held at the overflow level for a period of not less than 24 hours. The actual volume of the 50-mg/L chlorine solution shall be such that, after the solution is mixed with filling potable water and the storage facility is held full for 24 hours, there will be a free-chlorine residual of not less than 2 mg/L. This method shall comply with AWWA C652 Chlorination Method 3.
 - 2. The CONTRACTOR shall apply a solution of 200-mg/L available chlorine directly to the surfaces of all parts of the storage facility that would be in contact with water when the storage facility is full to the overflow elevation. The chlorine solution may be applied with brushes or spray equipment. The solution shall thoroughly coat all surfaces to be treated, including the inlet and outlet piping, and shall be applied to any separate drain piping such that it will have available chlorine of not less than 10-mg/L when filled with water. The disinfected surfaces shall remain in contact with the chlorine solution for not less than 30 minutes, after which potable water shall be admitted. The CONTRACTOR shall then purge the drain piping of the 10-mg/L chlorinated water and the storage facility and fill the facility to the overflow level. This method shall comply with AWWA C652 Chlorination Method 2.
- D. Street reservoirs shall be disinfected using an alternate method of disinfection. Other structures (excluding the filter media and underdrains) may be disinfected using the alternate method, when approved by the ENGINEER. This alternate method consists of scrubbing or spraying with solution containing at least 200 parts per million of chlorine, rinsing the walls and floor with water, and wasting the rinse water. The structures shall then be filled with water containing at least 2 parts per million of chlorine. After 24 hours contact time, 1 part per million of chlorine must remain.
- E. Prior to placing the tank in service, a bacteriological test shall be taken by an independent testing laboratory coordinated by the CONTRACTOR and approved by the OWNER.

3.4 FILTER DISINFECTION

- A. The CONTRACTOR shall, at the completion of installation of the filtration equipment and prior to the placement of the sand, thoroughly clean and flush the interior of the filters to remove any foreign material from the filters. Fire hoses and/or pressure washers and other tools required for adequate scrubbing and cleaning shall be used. The cleaning water shall be pumped or drained from the filters before disinfection. Upon completion of the cleaning of the filters, the CONTRACTOR may place the filter sand. The CONTRACTOR shall coordinate and perform this disinfection prior to filter media being installed.

- B. The CONTRACTOR shall notify the OWNER's representative or resident inspector prior to chlorinating the filters. Disinfection shall meet with the approval of the OWNER or ENGINEER, AWWA C653, and the appropriate state agency.
- C. The following filter disinfection method is acceptable for this project:
 - 1. The filter basin, up to the maximum water level shall be disinfected by chlorination. This shall be accomplished by injecting sufficient chlorine into the backwash water to produce a free chlorine residual of at least 25 mg/L throughout the filter.
 - 2. After the filters have been filled, the chlorinated water shall be allowed to stand in the filter for at least 12 hours. At the end of the 12-hour contact time, the chlorinated water shall be tested to determine the amount of free chlorine residual. In the event the free residual is less than 15 mg/L, the chlorination process shall be repeated.
 - 3. In the event that free residual is acceptable, a bacteriological test shall be taken by an independent testing laboratory coordinated by the CONTRACTOR and approved by the OWNER.
 - 4. At the completion of the disinfection, the filter shall be run to waste or backwashed thoroughly to remove the highly chlorinated water, prior to the placement of the filter media.

3.5 DISPOSAL OF DISINFECTION WATER

The disinfecting water shall be dechlorinated before being released to natural drainage ways. See AWWA C652 for acceptable neutralization methods. Release neutralized disinfecting water at a controlled rate which shall not damage downstream facilities.

-- END OF SECTION --

This page intentionally left blank

SECTION 02 01 01 - SITE CLEARING

PART 1 GENERAL

1.1 WORK INCLUDED

All paving and surface debris shall be removed, and the work area shall be cleared of plant life and grass. Trees and shrubs not in conflict with the proposed structure shall not be removed, except as designated by the OWNER.

1.2 REGULATORY REQUIREMENTS

CONTRACTOR shall conform to all applicable codes for the disposal of debris. Clearing work shall be coordinated with the appropriate utility companies.

1.3 REFERENCE STANDARDS

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 PREPARATION

Verify that existing trees, plant life, and features designated to remain are tagged or identified.

Provide written notification of intent to begin clearing operation. Document trees that are to be protected.

3.2 PROTECTION

CONTRACTOR shall protect existing trees, plant growth, fences and other features designated to remain during clearing procedures. All benchmarks and structures shall be protected from damage or displacement.

3.3 CLEARING

All areas required for access to the site and execution of the Work, except as indicated in paragraph 3.2, shall be cleared.

Trees and shrubs shall be removed within the limits of excavation required. Stumps, main root balls and the root system to a depth of twelve (12) inches below finished grade shall be removed. CONTRACTOR shall clear undergrowth and deadwood without disturbing the subsoil and shall apply herbicide to any remaining stumps to inhibit growth.

All debris, rocks larger than three inches, and extracted plant life shall be promptly removed from the site.

-- END OF SECTION --

This page intentionally left blank

SECTION 03 01 01 - CONCRETE FORMWORK

PART 1 GENERAL

1.1 REFERENCES STANDARDS

ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2016).
ACI 347R - Guide to Formwork for Concrete; 2014.
COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.
NIST PS 1 (2007) DOC Voluntary Product Standard PS 1-07, Structural Plywood

1.2 WORK INCLUDED

The work performed under this section of the Specifications shall consist of furnishing and installing formwork for cast-in-place concrete, with shoring, bracing, anchorage and all necessary accessories. Openings in the formwork for other work shall be provided. All stripping activities shall be included under this section.

1.3 RELATED WORK AND SPECIFICATIONS

- A. Section 03 02 01 - Concrete Reinforcement.
- B. Section 03 09 01 - General Concrete.

1.4 DESIGN REQUIREMENTS

CONTRACTOR shall be responsible for the design, engineering and construction of formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension. Design and construction of formwork shall take into account live loads, dead loads, weight of moving equipment operating on formwork, concrete mix, height of concrete drop, vibrator frequency, temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to the safety of personnel and structures. CONTRACTOR shall provide shores, struts, and trussed supports as necessary.

1.5 QUALITY ASSURANCE

Work shall be performed in accordance with the standards referenced in Part 1.01 of this specification.

1.6 REGULATORY REQUIREMENTS

Conform to applicable codes for design, fabrication, erection and removal of formwork.

1.7 COORDINATION

Coordinate this section with other sections of the Work which require attachment of components to formwork. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, replace formwork or reset reinforcing to provide minimum specified concrete cover.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

Form Materials: At the discretion of the CONTRACTOR.

2.2 PREFABRICATED FORMS

- A. Preformed Steel Forms: Minimum 16-gage (1.5 mm) matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

CONCRETE FORMWORK

- B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.
- C. Pan Type: Steel glass fiber of sizes and profile required.
- D. Tubular Column Type: Round, spirally wound laminated fiber, wood or glass fiber material, surface treated with release agent, non-reusable, of sizes and profile required.
- E. Void Forms: Voids formed under beams and slabs where indicated on the Plans or general notes may be formed through the use of 8-inch thick corrugated fiberboard boxes as manufactured by Voidco, Savway Carton Forms, Jay Void Carton or approved equivalent. Void forms shall be moisture resistant, biodegradable and structurally sufficient to support the weight of wet concrete mix until initial set. For slab, form boxes shall be covered with sheathing of the same material and shall be taped at the joints.

2.3 FORMWORK ACCESSORIES

- A. Form Ties:
 - 1. Metal form ties of the removable or snap-off type, steel, fixed or adjustable length cone type with waterproof washer (for water bearing structures or basements) shall be used to hold forms in place. Such ties shall have provision to permit ease of removal of the metal as hereinafter specified. The use of wire form ties will not be permitted. All metal appliances used inside of the forms to hold them in correct alignment shall be removed to a depth of at least 1/2-inch from the surface of the concrete and shall be so constructed that metal may be removed without undue injury to the surface from chipping or spalling. Such devices, when removed, shall leave a smooth opening in the concrete surface not larger than 7/8-inch in diameter. Burning off of rods, bolts, or ties will not be permitted. Metal ties shall be held in place by devices attached to walls. Each device shall be capable of developing the strength of the tie. Metal and wooden spreaders which are separate from the forms shall be wired to the top of form and shall be entirely removed as the concrete is being placed. The use of metal form ties of a type that are encased in paper or other material to allow the removal of complete tie, leaving a hole through the concrete structure, will not be permitted in the construction of basement or water bearing walls.
After the tie rods are broken back or removed, the holes shall be thoroughly cleaned to remove all grease and loose particles; then the mortar (non-shrink cement-sand mortar, as dry as practicable) shall be carefully placed into the holes in small quantities. After the holes are completely filled, all excess mortar shall be struck off flush and the surface finished in such a manner as to render the filled hole as inconspicuous as possible. If these patches appear to be darker than the other surface of the concrete, white cement shall be used in the mortar as required.
 - 2. "Supertie" fiberglass form tie system as manufactured by RJD Industries, Inc., 26945 Cabot Road, Suite 107, Leguna Hill, California, 800/344-4753. Provide spreader rod, ties, gripper and all necessary accessories and installation devices. Provide gray color rod. Install Supertie in accordance with supplier's instructions. After removal of forms, grind Supertie flush to wall.
- B. Form Release Agent: Colorless mineral oil which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.
- C. Corners: Chamfered, rigid plastic or wood strip type; 3/4" x 3/4" size; maximum possible lengths. Accurately formed to produce uniformly straight lines and tight edge joints.
- D. Nails, Spikes, Lag bolts, Through bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- E. Waterstops:
 - 1. Plastic water stop

CONCRETE FORMWORK

- a. Extruded from elastomeric plastic compound of which basic resin shall be prime virgin polyvinyl chloride (PVC). Compound shall not contain scrapped material, reclaimed material, or pigment.
 - b. Specific Gravity: Approximately 1.37.
 - c. Shore Durometer Type A Hardness: Approximately 80.
 - d. Performance Requirements: COE CRD-C 572 .
 - e. Type: Center bulb with parallel ribs or protrusions on each side of strip center.
 - f. Corrugated or tapered type water stops are not acceptable.
 - g. Thickness: Constant from bulb edge to outside stop edge.
 - h. Minimum Weight per Foot of Water Stop:
 - 1) 1.60 pounds for 3/8 inch by 6-inch.
 - 2) 2.30 pounds for 3/8-inch by 9-inch.
 - i. Factory Fabrications: Use only factory fabrications for intersections, transitions, and changes of direction.
 - j. Manufacturers and Products:
 - 1) Vinylex Corp., Knoxville, TN; Catalog No.032504/VIN: No. RB6-38H (6 inches by 3/8 inch) and No. RB9-38H (9 inches by 3/8-inch).
 - 2) Greenstreak Plastic Products, St. Louis, MO; Catalog No.03150/GRD: Style 732 (6 inches by 3/8-inch) and Style 735 (9 inches by 3/8 inch).
2. Hydrophilic water stop
- a. For use at construction joints only, where new concrete is placed against existing concrete and as shown on Drawings.
 - b. Material shall be a nonbentonite hydrophilic rubber compound.
 - c. Manufacturers and Products:
 - 1) Greenstreak Plastic Products, St. Louis, MO; Hydrotite CJ-1020-2K with Leakmaster LV-1 adhesive and sealant.
 - 2) Adeka Ultra Seal, JLM Associates, Spearfish, SD; MC-2010M with 3M-2141 adhesive and P-201 sealant.

PART 3 EXECUTION

3.1 EXAMINATION

Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with Plans.

3.2 EARTH FORMS

Earth forms shall not be used without specific, written approval from ENGINEER. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.3 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with the requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Obtain approval from ENGINEER before framing openings in structural members which are not indicated on Plans.
- F. Provide chamfer strips on external corners of beams, joists, columns, elevated slabs and walls.
- G. Void forms shall be installed in accordance with the manufacturer's recommendations and in such a manner so as to provide tight joints. Void forms shall be anchored to prevent displacement or flotation during concrete placement. Forms shall be protected from moisture or crushing prior to placement. Damaged forms shall be replaced prior to concrete placement.

3.4 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 INSERTS AND EMBEDDED PARTS

Provide form openings where required for items to be embedded in or passing through concrete work. Locate and set in place items which will be cast directly into concrete.

3.6 FORM CLEANING

- A. Clean and remove foreign matter within forms as erection proceeds.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts to clean out forms. Use compressed air or other means to remove foreign matter.

3.7 FORMWORK TOLERANCES

Construct formwork so as to maintain tolerances required by ACI 347R, Chapter 3.3, except as otherwise noted.

3.8 FIELD QUALITY CONTROL

Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure. Do not reuse split, frayed, delaminated or otherwise damaged formwork.

3.9 FORM REMOVAL

- A. The time for removal of forms shall comply with ACI 318. If curing temperatures are below 50 Degrees F (15 Degrees C), the time for removal shall be increased by fifty percent (50%). In no case shall forms or bracing be removed until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

-- END OF SECTION --

SECTION 03 02 01 - CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 REFERENCES STANDARDS

- ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
- ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2016).
- ACI SP-66 - ACI Detailing Manual; 2004.
- ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.
- ASTM A722/A722M - Standard Specification for High-Strength Steel Bars for Prestressed Concrete; 2015.
- ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
- CRSI 10MSP - Manual of Standard Practice; (2009; 28TH Ed)
- CRSI 63 - Recommended Practice for Placing Reinforcing Bars
- CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature

1.2 WORK INCLUDED

The work included in this Section of the Specifications shall consist of furnishing and installing reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

1.3 RELATED WORK AND SPECIFICATIONS

- A. Section 03 09 01 - General Concrete.
- B. Section 03 01 01 - Concrete Formwork.

1.4 SUBMITTALS

- A. Submittals shall meet the requirements of Section 01 04 01, CONTRACTOR's Submittals.
- B. Record Data: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel, bending and cutting schedules, supporting and spacing devices, and joint and splice locations.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Comply with ACI SP-66.
- E. Manufacturer's specifications and installation instructions for all proprietary products, including sleeves for welded splices.
- F. Shop Drawings are required. Provide to scale drawing showing the fabrication and placement requirements for all reinforcing. Include all details required to clearly show placement of bars. Shop Drawings to be sealed by a Texas Licensed P.E.

1.5 QUALITY ASSURANCE

Perform work in accordance with referenced standards. Submit certified copies of mill test report of reinforcement materials analysis.

1.6 COORDINATION

Coordinate work with other trades, placement of formwork, formed openings and other work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Bars: New, deformed billet steel conforming to ASTM A615/A615M, Grade 60 for nonweldable bars and ASTM A706/A706M, Grade 60 for weldable bars.
- B. Welded Wire Fabric: ASTM A1064/A1064M for smooth wire and ASTM A722/A722M for deformed wire.
- C. High Strength Reinforcing Bar (DYWIDAG Thread Bar) Meeting ASTM A722/A722M for Anchoring in Rocks.

2.2 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16-gage annealed type.
- B. Supports for Reinforcement: Conform to CRSI STANDARDS.
- C. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent settling or vapor barrier puncture.
- D. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel or stainless steel type, size and shape as required.
- E. Splices
 - 1. Mechanical Connections:
 - a. Compression: Gateway Building Products "G-Loc" or approved equivalent.
 - b. Tension: Lenton Anchor or approved equivalent. Connection device shall develop 125 percent of yield strength of bar.
 - 2. Welded Splices: "Cadweld," "Thermoweld" or approved equivalent. Size device to develop 125 percent of yield strength of bar.

2.3 FABRICATION

Fabricate concrete reinforcing in accordance with CRSI Manual of Practice. Locate reinforcing splices not indicated on Plans at point of minimum stress. Review location of splices with ENGINEER.

PART 3 EXECUTION

3.1 PLACEMENT

- A. Place, support and secure reinforcement against displacement by means of accepted spacers, chairs or hangers. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings.
- D. Conform to ACI 318 code for concrete cover over reinforcement. Concrete surfaces in contact with liquids shall have 2-inch cover.
- E. Clean reinforcement to remove loose rust, mill scale, oil, earth, ice, and other materials which might reduce or destroy bond with concrete.

3.2 FIELD QUALITY CONTROL

Concrete shall not be placed until reinforcing steel is inspected by OWNER'S Representative. All concrete placed in violation of this provision will be rejected. The CONTRACTOR shall give OWNER'S Representative a minimum of 24 hours notice after completion of reinforcement placement prior to placement of concrete.

-- END OF SECTION --

SECTION 03 04 01 - MANHOLES

PART 1 GENERAL

1.1 REFERENCES STANDARDS

ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.

ASTM C478 - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections; 2015a.

ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015.

ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2016.

ASTM D3753 - Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells; 2012.

1.2 WORK INCLUDED

Provide precast manholes, rims, and covers where indicated on Plans.

1.3 SUBMITTALS

Submittals Required:

- A. Manufacturers detail design for O-ring joints and gaskets.
- B. Catalog cuts of riser sections, covers, frames, grade rings, and pipe sleeves.

PART 2 PRODUCTS

2.1 MORTAR AND GROUT

- A. Comply with Mortar for unit Masonry, ASTM C270, for Type M mortar.
- B. The cement material used in the preparation of the mortar shall be Portland cement, type II.
- C. Mortar and grout shall be composed of one part Portland cement and three parts clean, washed sand, thoroughly mixed with sufficient water for desired consistency.
 - 1. Mortar shall be of a consistency which spreads evenly with a steel trowel.
 - 2. Grout shall be of the consistency required for the particular application.

2.2 REINFORCING STEEL

Steel for bar reinforcement shall be new billet steel of intermediate or hard grade per ASTM A615/A615M. All reinforcing steel shall be deformed in accordance with ASTM A615/A615M, of the sizes specified, and bent cold in the shop accordance with the details shown on the Plans. Reinforcing steel when placed in the work shall be completely free of loose mill scale, rust, dirt, paint, oil or other foreign material. When specified, wire fabric reinforcement shall conform with the provisions of ASTM A1064/A1064M.

2.3 CAST IRON FRAMES AND COVERS

- A. Furnished and installed in accordance with the details on the Plans.
- B. Manhole frames and covers shall be standard ASTM C478 frames and cover, weighing a minimum of 275 pounds and having a cover with a minimum diameter of 30". In several areas, waterproof manhole frames and covers may be required and these shall be in accordance with the applicable AWWA standards and specifications.

2.4 CAST IN PLACE CONCRETE MANHOLE SECTIONS

Manholes shall be standard 4 foot diameter with entrance cone. Manhole steps will not be required. Grade rings shall be furnished with concrete manholes to satisfactorily adjust the manhole cover to a point approximately 2 inches above the existing grade at the location of the manhole. Monolithically placed concrete manholes will be non-reinforced and shall have a minimum wall thickness of 5 inches. Cement for use with monolithically placed manholes shall be Type II concrete.

2.5 PRECAST REINFORCED CONCRETE MANHOLE SECTIONS

- A. Conform to Precast Reinforced Concrete Manhole Sections, ASTM C478. Cement shall be Type II.
- B. Provide and install concrete grade rings, bring the cast iron frames to grade. Grade rings shall be 2 inches by 8 inches with an inside diameter 48 inches.
- C. The concrete manhole riser sections, with the exception of the grade rings, shall be formed with male and female ends and installed with bell ends turned down.
- D. The joints and gaskets in the riser sections shall comply with the requirements of ASTM C443, as modified to incorporate an O-ring type gasket.
- E. Manhole riser sections shall be of sufficient diameter to allow personnel to work inside them and to allow proper joining of all pipes to the manhole wall while maintaining the structural integrity of the riser sections. All manholes shall have a minimum diameter of four feet unless a larger diameter is noted in the plans or required by the piping configuration shown. Provide larger diameter manholes where necessary to maintain at least a 12-inch clearance between any holes cut in the riser section.
- F. Provide eccentric cone immediately below the grade rings sections for each manhole. For manholes larger than 48-inches in yard areas, precast concrete covers with integrally-cast frames and covers may be used when approved by ENGINEER.
- G. Where PVC piping is connected to manholes, provide and install PVC sleeves with rubber gaskets and an abrasive silica outer coating or a flexible boot with clamps. Sleeve shall be as manufactured by GPK Products, Inc., of Fargo, North Dakota, or approved equal. Sleeve shall be firmly grouted into manhole opening in accordance with manufacturer's instructions. Flexible boot type seals shall have a rubber gasket, internal expansion sleeve of 304 stainless steel and stainless steel take-up clamps as manufactured by Press-Seal Gasket Corporation - PSX:Positive Seal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Manhole Base.
 - 1. Manholes shall be constructed at locations indicated on the Plans or as otherwise directed by the ENGINEER. Development of areas through which the sewer main passes may dictate changes in location or increase the number of manholes required. Manholes shall be constructed to the details shown on the Plans. Where there is a drop in the difference of the invert grade shown on the Plans, the elevation drop shall occur through the manhole section.
 - 2. Sewer pipe that is within the limits of excavation of manholes shall be bedded with bedding material as specified.
 - 3. Excavation for manholes shall be large enough to safely perform the work, and if necessary, the excavation shall be sloped to provide a stable wall. Backfill around manholes shall be made in such a manner to prevent movement of the manhole vertically or laterally and shall be backfilled as specified. Manhole construction in the Texas Department of Transportation right-of-way shall be backfilled as specified.

4. Inverts: Inverts shall be built of concrete or half-sections of pipe and shall be true and troweled to a smooth, hard finish. The invert depth shall be equal to one-half of the diameter of the largest pipe connected to the manhole, and shall be sloped at 3:1 between the inlet and outlet pipe flowlines. The top of the poured manhole invert outside of the flow channel shall be steeply-sloped to prevent solids deposition.
5. Concrete and reinforcing steel for the manhole base shall be placed in accordance with the details on the plans and the applicable provisions of these specifications.
- B. Frames and covers shall be furnished and installed as required and indicated on the Plans.
- C. Use no more than 4 grade rings per manhole. Ring hold down bolts shall pass through the rings into the top of the cone.

3.2 MANHOLE TESTING

- A. Manholes shall be tested separately and independently of the wastewater or drain lines. All lines coming into the manhole shall be sealed with an internal pipe plug before testing. All new manholes shall be hydrostatically tested with a maximum loss allowance of 0.025 gallons per foot diameter per foot of head per hour. The testing period shall not be less than one hour. The manhole shall be filled to the top. For concrete manholes, a wetting period of 24 hours should be used prior to testing in order to allow saturation of the concrete.
- B. Vacuum testing of manholes may be allowed per OWNER'S requirements.

-- END OF SECTION --

This page intentionally left blank

SECTION 03 09 01 - GENERAL CONCRETE

PART 1 GENERAL

1.1 REFERENCE STANDARDS

AASHTO M85 - Standard Specification for Portland Cement; Current Edition.

ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.

ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

TxDot Item 423, (2004) Hydraulic Cement Concrete

THD Bulletin C-11, Construction Bulletin Procedures for the Design and Control of Portland Cement Concrete Mixtures

1.2 WORK INCLUDED

Concrete shall consist of Portland cement, aggregates, and water which shall conform to the requirements as hereinafter specified. All concrete placed under this contract shall be in conformity with this specification.

1.3 SUBMITTALS

- A. Submit complete information for each concrete mix proposed. Include location for mix and proposed finishes.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Cement shall be a standard brand of Portland cement, Type I, in conformity with AASHTO M85. Only one brand of cement may be used in any one structure.
- B. Coarse Aggregate shall comply fully with the minimum requirements of ASTM C33/C33M, for 1 ½ inch maximum size aggregate.
- C. Fine Aggregate shall comply fully with the minimum requirements of ASTM C33/C33M.
- D. Reinforcing Steel shall be new deformed reinforcing bars, ASTM A1064/A1064M, of sizes and shapes noted on the Plans.
- E. Premolded Expansion Joint Material shall conform with the requirements of ASTM D1751.

2.2 CLASSIFICATIONS & PROPORTIONS

- A. Concrete shall be proportioned using methods outlined in the THD Bulletin C-11 for design of a concrete batch to meet the requirements hereinafter set forth. It shall be the entire responsibility of the CONTRACTOR to procure the strength as set out below for the respective class of concrete. All concrete shall be Class C unless otherwise shown on Plans. The concrete shall be uniform and workable. The minimum cement content, maximum allowable water content, and maximum slump shall conform to the following:

Class of Concrete	Minimum Cement (Bags / Cu. Yd.)	Maximum Water (Net Gal / Bag)	Maximum Slump for Hand Tamping	Maximum Slump for Machine Vibration
A	5.00	7.0	4"	3-1/2"
B	4.50	7.5	4"	3-1/2"
C	5.25	6.5	4"	3-1/2"

GENERAL CONCRETE

- B. The concrete mix will be designed with the intent of producing concrete which, when cured and tested as outlined in THD Bulletin C-11, will have strength equal to or greater than the following:

Class of Concrete	Compressive Strength (1lb per Sq. In.)		7-Day Flexural Strength (1 lbs psi)
	28 - Day	7 - Day	
A	3,000	2,250	500
B	2,500	1,875	470
C	3,500	2,600	650

- C. If the strength required for the concrete being produced is not secured with the minimum cement content specified, additional cement shall be used or other aggregates provided at the CONTRACTOR's expense.
- D. Air entrainment shall be used for all exterior concrete.

2.3 CONSTRUCTION JOINTS

Construction joints shall be made only where located on the Plans, unless otherwise approved by the ENGINEER.

2.4 FORMS

All forms shall be of wood or metal and shall be built mortar tight and of sufficient rigidity to prevent distortion due to the pressure of the concrete and other loads incident to the construction operations. Forms shall be constructed and maintained to prevent warping and opening of joints due to shrinkage of the lumber.

2.5 STEEL REINFORCEMENT

- A. Reinforcing steel in the sizes, shapes and lengths as shown shall be placed in the positions as indicated on the Plans. Minimum cover of not less than 1" of concrete shall be provided over the surface of all reinforcing steel.
- B. Stirrups and hoops shall pass around the main reinforcement members and shall be securely attached thereto. The reinforcing steel shall be spaced and secured in the forms by means of approved galvanized metal spacers or precast motor blocks. Steel shall be wired together at all intersections; and when completed, the reinforcement mat shall present practically a rigid cage of steel which will not be distorted or shifted from position in any way by workmen walking on the mat or by concrete placement operations. Reinforcing steel in horizontal slabs shall be supported by chairs to ensure accurate placement. Do not lift reinforcement during concrete placement.
- C. Splicing of bars will be permitted only where shown on the Plans or with the specific approval of the ENGINEER. The bar splice, when so made, shall not be less than 36 bar diameters with the spliced bars securely tied.
- D. Steel bars, when placed in the work, shall be completely free of dirt, grease, loose rust, scale or other foreign matter. After placement, care shall be exercised to keep the steel free of mud, dried concrete or other material. No concrete whatsoever shall be deposited in the forms until the ENGINEER has inspected the final placement and condition of the reinforcement and approved the work for placement of concrete.

PART 3 EXECUTION

3.1 MIXING CONCRETE

- A. Mixing at Site: Concrete shall be thoroughly mixed in a batch mixer of an approved size and type which will insure a uniform distribution of the materials throughout the mass, equipped with

adequate water storage and a device for accurately measuring and automatically controlling the amount of water used in each batch.

- B. Truck Mixing: Truck mixers shall be of the revolving drum type, water tight, and so constructed that the concrete can be mixed to insure uniform distribution of materials throughout the mass.
- C. Time of Hauling and Placing Mixed Concrete: Concrete transported in a truck mixer shall be placed in its final position in the forms within 1 ½ hours after the introduction of the mixing water to the cement and aggregate.
- D. Delivery Rate of Concrete during concrete operations shall be such as to provide for the proper handling, placing and finishing of the concrete, and the interval between batches shall not exceed 20 minutes. Concrete which has partially hardened shall not be retempered or remixed.

3.2 HANDLING AND PLACING OF CONCRETE

- A. During and immediately after depositing, concrete shall be thoroughly compacted by mechanical vibration with satisfactory equipment and in a manner and to the extent as may be approved by the ENGINEER. Concrete shall not be poured in weather below freezing.
- B. In preparation for placement of concrete, all sawdust, chips or other construction debris and extraneous matter shall be completely removed from the interior of the forms. When placing concrete on previously placed construction joints, the surface shall be cleaned by compressed air or vacuum methods, if so directed, and the surface of the existing joint shall be completely free of dust, dirt, sawdust or other foreign material. Concrete shall not be placed in any form prior to specific inspection and approval by the ENGINEER.
- C. Foundations and footings shall be placed on firm, undisturbed earthen subgrade which is free of mud or excessive moisture. If groundwater is encountered, prior to placement of concrete the area shall be dewatered sufficiently for the subgrade to be firm and stable with the last 6 inches of excavation being removed immediately ahead of the concrete placement. Concrete for footing and/or foundations will not be placed on unstable, soggy or otherwise unsatisfactory earthen subgrade.
- D. Concrete shall be placed in a manner to avoid segregation of the materials and the displacement of reinforcement. All chutes, troughs, tremies and pipes shall be kept clean and free from coatings of hardened concrete. When placing operations involving dropping the concrete more than 5 feet, the concrete shall be deposited through approved pipes or tremies. In walls less than 11 feet in height and widths less than 12 inches, tremies will not be required.
- E. During and immediately after depositing, the concrete shall be thoroughly compacted by mechanical vibrating equipment and in a manner and to the extent as may be approved by the ENGINEER. Where placed in sidewalks, pavement or driveways, satisfactory hand methods for compaction and consolidation may be used.
- F. Concrete shall be placed in horizontal layers not more than 12" thick except as provided herein. When less than a complete layer is placed in one operation, it shall be terminated in a vertical bulk head. Each layer shall be placed and compacted before the preceding batch has taken initial set to avoid surfaces of separation between the batches and to avoid the formation of construction joint with a preceding layer and surfaces of separation between batches.
- G. When placement of concrete is unavoidably temporarily discontinued, the concrete, after becoming firm enough to retain its form, shall be cleaned of laitance and other objectionable material to a sufficient depth to expose sound concrete, and the top surface of the concrete adjacent to the forms shall be smoothed with a trowel. Where a "feather" edge might be produced at a construction joint, an inset formwork shall be used to produce an edge thickness of not less than 6" in the succeeding layer. Work shall not be discontinued within 18" of the top of any face, unless provisions have been made for a coping less than 18" thick, in which case,

and if permitted by the ENGINEER, the construction joint may be made at the underside of the coping.

- H. CYLINDER OR BEAM TESTS: During work progress, the OWNER, at his discretion, shall have cylinders or beam tests performed as specified herein. The laboratory testing and services shall be provided by the OWNER. The OWNER does hereby reserve the right to collect all cylinder samples himself, if desired, and deliver same to the testing laboratory approved to perform the tests prior to the placement of concrete. The tests will be performed to maintain a check on the compressive or flexural strength of the concrete that is actually placed. The test shall be defined as the average of the breaking of two cylinders or two beams as the case may be. Test beam or cylinder specimens shall be required for each 167.5 cubic yards, or a portion thereof, placed each day. For smaller concrete placements, the OWNER's Representative may vary the test specimen to 25 cubic yard placement, over a several day period. Cylinders or beam specimens shall be field protected per THD Bulletin C-11 until transported to the testing laboratory. The test specimens shall be cured in accordance with THD Bulletin C-11

3.3 CURING & FINISHING

- A. Concrete surfaces exposed to conditions causing premature drying shall be protected by covering as soon as possible with approved curing compound, burlap, sand, or other satisfactory material and kept moist. Curing shall continue for a period of not less than 7 days after placing the concrete.
- B. Surface finishes shall be classified as follows:
1. Class I - Ordinary Surface Finish
 2. Class II- Rubbed Finish
 3. Class III - Broom Finish
 4. Class IV - Steel Trowel Surface Finish
 5. Class V - Adhesive Grout Finish
 6. Class VI - Sidewalk Finish
- All concrete shall be given Class I, ordinary surface finish, and in addition, if further finishing is required, such other types of finish as specified. If not otherwise specified, the following surfaces shall be given Class II -Rubbed Finish: exposed faces of structures; outside faces of slabs, brackets, curbs, headwalls, railings. Slab surfaces shall be given Class III - Broom Finish and Class IV - Steel Trowel Surface Finish.
- C. Inspector to approve all finishes for slabs prior to their installations. Contractor to acquire from Engineer written instruction of finishing slabs in each specific area of building and exterior slabs.
1. Class I, Ordinary Surface Finish: Immediately following the removal of forms, all fins and irregular projections shall be removed from all surfaces except from those which are not to be exposed. On ALL surfaces, the cavities produced by form ties and other holes, honey comb spots, broken corners or edges and other defects shall be thoroughly cleaned, carefully pointed and cured with a mortar of cement and fine aggregate. The resulting surface shall be to the satisfaction of the ENGINEER.
 2. Class II, Rubbed Finish: After removal of forms, the rubbing of concrete shall be started as soon as its condition will permit. Immediately before starting this work, the concrete shall be kept thoroughly saturated with water for a minimum period of three hours. Surfaces to be finished shall be rubbed with a medium carborundum stone, using a small amount of mortar on its face. The mortar shall be composed of cement and fine sand mixed in proportions used in the concrete being finished. Rubbing shall be continued until all form marks, projections and irregularities have been removed, all voids filled, and a uniform surface has been obtained. The final finish shall be obtained by rubbing with a

- fine carborundum stone and water. This rubbing shall be continued until the entire surface is of a smooth texture and uniform color.
3. Class III, Broom Finish: After the concrete is compacted, the surface shall be carefully rodded and struck off with a strike board to conform to the cross-section and grade shown on the Plans. After striking off and consolidating as specified above, the surfaces shall be made uniform by longitudinal or transverse floating, or both. When the concrete has hardened sufficiently, the surface shall be given a broom finish with a broom of an approved type. The strokes shall be square across the slab, from edge to edge with adjacent strokes slightly overlapped. The surface when finished shall be uniform, free of porous spots, irregularities, depressions and small pockets or rough spots.
 4. Class IV, Steel Trowel Finish: The concrete surface shall be struck off and given a float finish as outlined for Class III finish above. After the surface has been tested with a straight edge and irregularities corrected, the entire system shall be finished with an acceptable steel bladed rotary type mechanical finishing machine to a smooth and uniformly finished condition. Hand troweling methods with a steel trowel will be used to finish corners or other areas inaccessible to the finishing machine and to remove all blade marks, burrs and other irregularities left by the machine, and the entire surface completed in a smooth and workmanlike manner, of uniform texture, and to the entire satisfaction of the ENGINEER.
 5. Class 5, Adhesive Grout Finish: The surface of the concrete shall be given an Class 1 finish, chamfer lines lightly rubbed, irregularities corrected, and then covered with an adhesive grout textured coating a minimum of 1/16" thickness. Coating shall be composed of one part white cement, one part natural (gray) cement, two parts masonry and, one part (latex) emulsion and enough water to form a viscous slurry of a consistency that may be applied by spray gun, brush or roller with appreciable running or sagging. The proportions of white and gray cement may be varied slightly to obtain the desired color. Gradation of the masonry sand shall be as required to produce a texture satisfactory to the ENGINEER. Prepackaged materials meeting these requirements and acceptable to the ENGINEER as to color, texture and appearance will be permitted. The adhesive grout coating shall be applied to the moistened concrete surface in a manner which will provide a uniform texture and color, in the thickness specified, and shall be completely protected from rain and/or freezing for a period of 24 hours minimum. The adhesive grout type coating shall meet the test requirements of TxDot Item 423 for Adhesive Grout Type Coatings. If requested, the CONTRACTOR shall furnish the ENGINEER a certificate from the manufacturer stating the product furnished complies with these specifications.
 6. Class 6, sidewalk Finish: After the concrete has been deposited in place, it shall be compacted, the surface struck off by means of a strike board, and then finished with a steel trowel. An edging tool shall be used on all edges and at all expansion joints and dummy joints. The surface shall not vary more than 1/8" under a 10 foot straight edge. The surface shall then be given a granular or matted texture by light brushing with a wetted brush or broom to provide a non-skid surface when wet and meeting the entire approval of the ENGINEER.
- D. Temperature of Concrete: When placing concrete at a temperature below 45 degrees F., the concrete shall have a temperature not lower than 50 degrees F. and not higher than 95 degrees F. Suitable means shall be provided to maintain the concrete at a temperature not less than 50 degrees F. for the first five days after placement, or until it has hardened sufficiently, or until the first three days if high early strength concrete is used. The method of heating the materials at all times shall be subject to the ENGINEER's approval. No salt, chemical or other foreign matter shall be mixed with the concrete for the purpose of preventing freezing. If warm water is used, the cement shall be put in before other aggregates to prevent a flash set. If concrete is placed when weather is such that the temperature of the concrete would exceed 95 degrees F., as determined by the ENGINEER, the CONTRACTOR shall employ effective

means, such as placing early in the day, as necessary to maintain the temperature of the concrete as it is placed below 95 degrees F.

-- END OF SECTION --

SECTION 31 02 01 - STRUCTURAL EXCAVATING, BACKFILLING AND COMPACTING**PART 1 GENERAL****1.1 REFERENCE STANDARDS**

- 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
- ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
- ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2015.
- ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
- TxDot Item 247 (2004) Flexible Base

1.2 WORK INCLUDED

- A. Excavation, backfill and compaction around structures.
- B. Site excavation and backfilling.
- C. Excavation support systems.
- D. Fill for over-excavation.
- E. Groundwater and surface water control.
- F. Excavation for paving and landscaping.

1.3 QUALITY ASSURANCE

Test material to be used as compacted fill, whether excavated onsite or imported as offsite borrow, for compliance with the requirements of Section 31 06 01 prior to placement.

PART 2 PRODUCTS**2.1 MATERIALS**

- A. Excavation Support System: CONTRACTOR's option, suited for purpose.
- B. Fill Materials: In accordance with schedule in Section 31 06 01, and as shown on the Plans. Material Specifications in Section 31 06 01 shall be met.

PART 3 EXECUTION**3.1 PREPARATION AND LAYOUT**

- A. Establish extent of structural excavation by area and elevation; designate and identify datum elevation.
- B. CONTRACTOR shall set required lines and levels.
- C. Maintain benchmarks and other reference points.

3.2 PROTECTION

- A. Protect, support and/or reroute existing utilities.
- B. Protect adjacent work from damage by excavation and backfilling operations.
- C. Protect adjacent structures from undermining.
- D. Support sides of excavations to prevent soils movement which may diminish the excavation width below width required for working.
- E. Support sides of excavation which interfere with normal 45 degree bearing splay of any foundation.

3.3 EXCAVATION SUPPORT SYSTEMS

- A. Design, installation and maintenance of temporary excavation support systems is the responsibility of the CONTRACTOR. Provide support systems at no additional expense to OWNER.
- B. Design and construct excavation support systems in accordance with OSHA Standards and interpretations 29 CFR 1926.
- C. For excavation exceeding 20 feet, it will be required to have side slopes designed by professional ENGINEER licensed in the State of Texas.

3.4 GROUNDWATER AND SURFACE WATER CONTROL

- A. CONTRACTOR is responsible for designing, providing and maintaining a system for control of groundwater at no additional expense to OWNER.
- B. Provide adequate swales, dams, ditches and grades to prevent surface water from flowing into excavation.
- C. Maintain water control until structure is complete and backfill is brought to final grade unless otherwise directed by ENGINEER.
- D. Groundwater or water from other sources may be present in excavations regardless of whether shown on boring logs.

3.5 EXCAVATION

- A. Excavate to lines and grades shown on the Drawings. Excavations shall be either braced or shored or laid back to a slope no steeper than two horizontal to one vertical unless specifically shown otherwise in CONTRACTOR's Trench Safety Plan.
- B. When excavation is essentially complete, verify depths and dimensions as well as soil classification and bearing capacity.
- C. Perform additional excavation only as approved by the OWNER.
- D. Correct unauthorized excavation as directed at no cost to OWNER.
- E. Fill over-excavated areas under structure bearing surfaces with lean concrete, flowable fill, or compacted Class 3 Aggregate Fill as required by the ENGINEER.
- F. Excavate to within 1-foot of final grade, making final excavation immediately prior to placement of mud slab. Limit area of final excavation to that which is being prepared for concrete placement. Limit exposure of final excavated surface to eight hours. Keep excavations free of standing water until concrete and backfill operations are complete.
- G. Mud slabs shall be used beneath all footings and slabs on grade.

3.6 BACKFILLING

- A. Verify fill materials to be reused are acceptable.
- B. Verify foundation perimeter drainage installation (if required on plans) has been inspected.
- C. Verify underground tanks are anchored to their own foundation to avoid floatation after backfilling.
- D. Generally, compact subgrade to density requirements for subsequent backfill materials.
- E. Cut out soft areas of subgrade not capable of in-situ compaction. Backfill with Class 3 aggregate fill or compact to density equal to or greater than requirements for subsequent backfill material.
- F. Prior to placement of aggregate base course material for paved areas, remove soft or unstable areas and replace with aggregate base course material, then scarify subgrade to a depth of 6 inches and compact to a minimum of 95 percent of ASTM D698 at a moisture content within 3

percent of optimum moisture. Density and moisture content of the compacted subgrade shall be maintained until it has been covered with base course material.

- G. Backfill areas to contours and elevations with unfrozen materials.
- H. Backfill around structures as soon as possible after approval by the ENGINEER.
- I. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- J. Backfill with select fill within two feet of structure unless otherwise indicated on the Drawings.
- K. Fill materials shall be as shown on the Plans and included in the Specifications. Materials are specified in Section 31 06 01. Place and compact in continuous layers not exceeding eight inches loose depth. Avoid heavy or intense compaction against and within five feet of structure.
- L. Maintain specified moisture content of backfill materials to attain required compaction density.
- M. Do not backfill against walls until concrete has been in place at least seven days. Water bearing structures shall not be backfilled until hydrostatic test results are acceptable.
- N. Do not backfill against unsupported foundation walls or partially completed structures until after main floor slabs have been in place at least seven days and placement is approved by the ENGINEER. Water bearing structures shall not be backfilled until hydrostatic test results are acceptable.
- O. Backfill simultaneously on each side of foundation walls and other structures to equalize soil pressures. Provide temporary bracing as required.
- P. Take special care to prevent wedging action against structure. Bench or serrat slopes bounding excavation.
- Q. Slope grade away from building minimum 1/4-inch per foot, unless noted otherwise.
- R. Make grade changes gradual. Blend slope into level areas.
- S. Relocate surplus backfill materials to location indicated on site.
- T. Tolerance for Top Surface of Backfilling: Plus or minus 1 inch from required elevations.

3.7 COMPACTION

- A. Remove shoring and sheeting unless otherwise approved by the ENGINEER. The cost of abandoned shoring and sheeting is to be borne by the CONTRACTOR.
- B. Compact fill materials in accordance with Section 31 06 01.
- C. Remove and replace improperly compacted backfill material at no cost to OWNER.

3.8 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed by OWNER Representative.
- B. Tests and analysis of fill material will be performed in accordance with ASTM Standards.
- C. Compaction testing will be performed in accordance with ASTM D698.
- D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to OWNER.
- E. Frequency of Field Density Tests:
 - 1. Sand Fill: One test per 3000 Square Feet, but not less than 3 tests per 6-inch compacted lifts.
 - 2. Select Fill: One test per 3000 Square Feet, but not less than 3 test per 6-inch compacted lift.
 - 3. Site Fill: One test per 3000 Square Feet, but not less than 3 test per 6-inch compacted lift.

3.9 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 02 01 01.
- B. Recompect fills subjected to vehicular traffic.

3.10 CLEAN UP

Remove surplus fill materials to onsite spoil areas as directed by the ENGINEER.

-- END OF SECTION --

SECTION 31 03 01 - TRENCHING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.1 WORK INCLUDED

Trenching for buried piping systems as well as subsequent embedment, backfill and compaction operations, necessary to install the pipe as specified.

1.2 QUALITY ASSURANCE

1.3 REFERENCE STANDARDS

TxDOT Specification Item 247

TxDOT Specification 334

1.4 PROTECTION

- A. Protect trees, shrubs, and lawn areas to receive planting, and other features remaining as part of final landscaping.
- B. Protect benchmarks, existing structures, roads, sidewalks, paving and curbs against damage from vehicular or foot traffic. Install and maintain bridging, planking and cants to provide access to Work.
- C. Protect excavations by shoring, bracing, sheet piling, underpinning, or by other methods, as required to prevent cave-ins or loose soil from falling into excavations.
- D. Underpin or otherwise support adjacent structures which may be damaged by excavation work. This includes service lines and pipe chases.
- E. Notify the ENGINEER of unexpected subsurface conditions.
- F. Where damage could result from continuing work, discontinue work in area until resident inspector notifies the CONTRACTOR of the required modifications.
- G. Protect bottom of excavations and soil around and beneath foundations from frost, freezing, and excessive moisture changes.
- H. Grade around trenches to prevent surface water runoff into excavated areas.
- I. Protect above or below grade utilities including lateral lines, sprinkler system lines, and all other lines which are to remain. The cost of replacing damaged lines is to be borne by the CONTRACTOR.

PART 2 PRODUCTS

2.1 BED AND FILL MATERIALS

- A. Refer to specifications Section 31 06 01, SITE GRADING AND EARTHWORK, for requirements of Aggregate Fill Classifications and to the Drawings for locations and dimensional requirements.
 - 1. Embedment and initial backfill for PVC pipe larger than 2 inches, steel pipe, and DIP pipe shall be Class 2 Aggregate Fill. If not shown on the Plans, embedment and initial backfill shall be Class 2 Aggregate fill. Embedment and initial backfill for small plastic pipe shall be sand fill.
 - 2. Embedment for RCCP and HCP shall be Class 3 Aggregate Fill. Initial backfill shall be non-expansive earthfill.
 - 3. Flowable fill (foam grout) shall conform to specifications Section 31 01 01, FLOWABLE FILL.
 - 4. Concrete shall conform to Section 03 09 01, GEENERAL CONCRETE.
 - 5. Trench backfill under paving and to 5 feet outside of pavement shall be sand to within top 1 foot. Top 1 foot shall be Flowable fill with top 2 inches being cold mix asphalt.

PART 3 EXECUTION

3.1 PREPARATION AND LAYOUT

- A. Establish extent of excavation by line and elevation. Designate and identify datum elevations.
- B. Set required lines and levels.
- C. Maintain benchmarks, monuments and other reference points.

3.2 UTILITIES

- A. Known underground utilities are indicated on the Drawings.
- B. Before starting excavation, establish the location and extent of underground utilities occurring in the work area.
- C. As excavation approaches utilities, hand excavate to uncover utilities.
- D. Notify the ENGINEER for direction for removal and/or relocation of utility companies' lines which are in the way of excavation.
- E. Maintain, re-route or extend as required, existing utility lines to remain which pass through work area with the approval of the OWNER. Relocations are at the CONTRACTOR's cost.
- F. Protect utility services uncovered by excavation.
- G. Accurately locate and record abandoned and active lines rerouted or extended on Project Record Documents.

3.3 TRENCHING

- A. Ensure trenching does not interfere with normal 45 degree bearing splay of any foundation.
- B. Excavate in accordance with lines and grades. Excavated material which meets respective backfill requirements may be used for backfilling, stockpile or remove as applicable.
- C. Cut trenches sufficiently wide to enable proper installation of services and to allow for inspection. Minimum trench width shall be 6 inches wider than the pipe outside diameter. Pipe shall be installed in center of trench, with not more than 12-inch clearance nor less than 4-inch clearance between pipe wall and trench wall at any point. Trim and shape trench bottoms and leave free of irregularities, lumps and projections. Over excavated trench depths shall be filled to the proper grade with embedment material at no additional cost to the OWNER.
- D. Existing pavement over trenches shall be removed to a width of 6 inches outside the trench on each side by sawing methods and to a neat line. Asphalt pavements shall be sawed for full depth. Concrete pavement shall be sawed to a depth which will allow the section to be removed smoothly without underbreakage. Brick pavement shall be removed by hand methods in a manner that will not damage bricks, and the bricks shall be delivered and hand stacked as designated by the OWNER.
- E. Trench width shall be not more than 24 inches wider than outside diameter of pipes. Walls shall be vertical to elevation equal to 12 inches above the top of the pipe. Whenever the prescribed maximum trench width is exceeded, the CONTRACTOR shall use the next higher class of embedment, at no additional cost to the OWNER.
- F. Do not disturb soil within branch spread of existing trees or shrubs that are to remain. If it is necessary to excavate through roots, perform work by hand and cut roots with a sharp axe.
- G. When complete, request the resident inspector to inspect excavations. Correct unauthorized excavation as directed, at no cost to the OWNER.
- H. If, in the opinion of the resident inspector, the undisturbed material at grade depth is unstable, the CONTRACTOR shall be required to remove the unstable material and fill the trench to the proper subgrade with embedment material. Payment will be made to the CONTRACTOR at the unit price per cubic yard set forth in the Bid Schedule.

- I. Unsuitable excavated subsoil including perishable, spongy material, large rock, or other material designated by the resident inspector shall not be used in backfilling. Unsuitable material shall be disposed of by the CONTRACTOR in a manner approved by the resident inspector.

3.4 SHEETING AND SHORING

- A. In caving ground or in wet, saturated or flowing or otherwise unstable materials, the sides of all trenches and excavations shall be adequately sheeted and braced, to maintain the excavation from slides or cave-ins and to provide safety for workmen.
- B. Sheeting and shoring shall be designed by professional ENGINEER, licensed in the State of Texas.
- C. Sheeting, shoring, and bracing shall be removed unless otherwise approved by the ENGINEER. Removal of sheeting, shoring, and bracing shall be performed in a manner to prevent damage to new or existing structures and to avoid cave-ins or sliding of the banks. All holes and voids from the sheeting shall be immediately and completely filled and compacted with suitable materials. All costs associated with the abandonment of sheeting, shoring and bracing shall be borne by the CONTRACTOR.

3.5 DEWATERING

- A. Keep trenches dry. Provide necessary equipment including pumps, piping and temporary drains. Maintain groundwater level a minimum of 3 feet below bottom of excavations during construction.
- B. Direct surface drainage away from excavated areas. Provisions shall be made for the satisfactory disposal of water pumped to prevent damage to public or private property.
- C. Control the grading in and adjacent to excavations to prevent water running into excavated areas or onto adjacent properties or thoroughfares.
- D. Furnish and operate suitable pumps on a 24 hour basis to keep excavations free of water until services have been placed and backfilling is completed.

3.6 BEDDING

The CONTRACTOR shall install the pipe and complete the bedding so that the installation may be inspected prior to backfilling. The OWNER's inspector shall be notified by the CONTRACTOR when the bedding is complete for each particular segment. Any excavation areas backfilled without the OWNER's prior inspection will require uncovering and checking at the CONTRACTOR's expense.

Manually place and compact bedding material in layers not exceeding six inches.

Manually shape bedding material to conform to pipe barrel and bell or flanges such that the entire length of the pipe barrel is supported by the bedding material.

Embedment and initial backfill materials shall be placed as shown on the plans and compacted in six inch layers along sides of pipe and to a minimum depth of 12 inches over the top of the pipe.

3.7 SETTING VALVES, VALVE BOXES AND FITTINGS

Gate valves and pipe fittings shall be set joint to new pipe in the manner specified for cleaning, laying and jointing pipe.

Valve boxes shall be firmly supported and centered plumb over the wrench nut of the gate valve, with box cover flush with the surface of the finished pavement or at such level as directed.

Standard plugs shall be inserted into the bells of all dead ends of pipe, tees or crosses and spigot ends shall be capped. Plugs or caps shall be jointed to the pipe or fitting in the manner specified above.

Concrete blocking will be required at all tees, bends, crosses and fire hydrants as provide herein. Blocking shall be placed between solid ground and the fittings. The bearing on the pipe and ground to be as detailed or as may be directed.

3.8 BACKFILLING

After pipe has been laid on the specified bedding material and all joints have been made, the backfilling of the trench shall begin. All trenches as a minimum shall have the bedding material extended to the top of the pipe and select backfill to a point 8" above top of pipe. Except as specified for backfilling trenches in streets, the remainder of the trench shall be backfilled using material excavated. In areas where the natural terrain provides less than 2 feet of cover for the proposed line, the CONTRACTOR shall construct a backfill mound over the trench. This trench shall be no less than 6 feet wide, not greater than 14 inches tall, and shall provide 24 inches of cover over the proposed line. In areas where the proposed line crosses drainage channels, a 6 inch concrete cap shall be placed over the line to the satisfaction of the ENGINEER.

- A. Do not start backfilling until services have been inspected.
- B. Ensure trenches are free of building debris, snow, ice, and water and that ground surfaces are not in a frozen condition.
- C. Backfill systematically and as early as possible to allow maximum time for natural settlement and compaction.
- D. Place and compact backfill materials in continuous layers according to the approved method of compaction. Use a method which will not disturb or damage services. No excessively large rocks or debris of any sort shall be used as backfill.
- E. Maintain moisture content and compaction density of fill materials as required.
- F. Acceptable backfill shall be placed from eight inches over the pipe to the surface.
- G. Excavated unsuitable material and excess material shall be disposed of by the CONTRACTOR in a manner approved by the resident inspector or OWNER's representative.
- H. Backfilling Trenches in Alleys and Outside Roadways: After pipe has been placed to the grade, alignment and bedding to the top of pipe, the trench shall be backfilled with select material to a level 8 inches above the top of pipe. The select backfill shall be place carefully by depositing the backfill material vertically by hand or by machines in such a manner that the pipe will not be displaced laterally and the pipe will not be damaged by contact with the backfill material, tools or equipment. Above this level, backfill may be shoveled or pushed into the ditch by hand or machine, completely filling the trench. In no event shall the backfill material contain rocks larger than 8 inches. The backfill material shall be neatly rounded over the trench and smoothed such that the height of the backfill mound over the trench does not exceed 14 inches above the original ground surface. Any excess excavated material that is not required to make the mound over the pipe trench shall be disposed of to the satisfaction of the OWNER. Any deficiency of backfill material shall be supplied by the CONTRACTOR.
- I. Backfilling Trenches in Open Country: After bedding material is completed, and the pipe has been placed on the grade and alignment, the trench located in open country or fields shall be backfilled with select material excavated from the trench, free of rocks or clods with dimensions greater than 2" to a level 8 inches above the top of pipe. This select backfill shall be placed carefully by depositing the backfill material vertically by hand or by machines in a manner that the pipe will not be displaced laterally and the pipe will not be damaged by contact with the backfill material, tools or equipment. Above this level, backfill may be shoveled or pushed into

the ditch by hand or machine, completely filling the trench. In no event shall the backfill material contain rocks or clods larger than 8". The backfill material shall be neatly rounded over the trench and smoothed such that the height of the backfill mound over the trench does not exceed 12 inches above the original ground surface. Any excess excavated material that is not required to make the mound over the pipe trench shall be smoothed and leveled on the ROW to the satisfaction of the OWNER. Any deficiency of backfill material shall be supplied by the CONTRACTOR.

1. A minimum of 6 inches topsoil with grass roots shall be replaced for all trenches through existing residential yards.
- J. Backfilling Trenches under Pavement, Concrete, Gravel Streets, Highways: Where the trench crosses or lies within existing paved or graveled areas, the trench shall be backfilled with sand or granular material to top of finish grade for a distance of 8 feet outside the edge of paving and shall be jetted. The base material for the 6" crushed base course shall meet the requirements of TxDOT Specification Item 247, Grade 1, Type A. In paved areas the base course shall be primed with 0.25 gallon per square yard with MC-30. After allowing a minimum of 6 hours curing time, the areas shall receive 2 inches of Type "D" or "F" Cold Laid asphalt at a compacted density of 100 pounds per square yard and applied in a manner to be smooth and level with existing pavement. Asphalt shall meet the minimum requirements of TxDOT Specification 334.

3.9 COMPACTION

- A. Compact embedment and initial backfill materials per General Requirements.
- B. Remove and replace improperly compacted backfill material at no cost to OWNER. Additional trench settlement following completion shall be restored to a level surface. Trench surfaces may be left crowned in open country.
- C. Water jetting for consolidation will not be permitted within 25 feet of any structures, unless acceptable to the ENGINEER.

3.10 TRENCH SETTLEMENT

The CONTRACTOR shall be responsible for all settlement of backfills, fills, and embankments which may occur within one (1) year after final completion of the contract under which the work was performed.

The CONTRACTOR shall make, or cause to be made, all repairs or replacements made necessary by settlement, within thirty (30) days after notice from ENGINEER or OWNER at the CONTRACTOR's own expense.

3.11 CLEAN UP

Remove surplus fill materials to on-site spoil areas as directed by the OWNER's representative or resident inspector.

-- END OF SECTION --

This page intentionally left blank

SECTION 31 04 01 - TRENCH EXCAVATION SAFETY PROTECTION SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

- A. This item will consist of the basic requirements which the CONTRACTOR must comply with in order to provide for the safety and health of workers in a trench. The CONTRACTOR shall develop, design and implement the trench excavation safety protection system. The CONTRACTOR shall bear the sole responsibility for the adequacy of the trench safety system and providing "a safe place to work" for the workman.

1.2 GENERAL

- A. The trench excavation safety protection system shall be used for all trench excavations deeper than five (5) feet. The Excavating and Trenching Operation Manual of the Occupational Safety and Health Administration, U.S. Department of Labor, shall be the minimum governing requirement of this item and is hereby made a part of this Specification. The CONTRACTOR shall, in addition, comply with all other applicable federal, state and local rules, regulations and ordinances. The design of the trench excavation safety protection system shall be performed by or under the supervision of a professional engineer licensed to practice in the State of Texas.
- B. This project whether bid or negotiated shall have a pay item for trench safety that complies with Item 1.02.A above. Payment shall be made at the unit price per linear foot of trench excavation protection.
- C. If evidence of possible cave-ins or slides is apparent, all work in the trench shall cease until the necessary precautions have been taken by the CONTRACTOR to safeguard personnel entering the trench. It is the sole duty, responsibility and prerogative of the CONTRACTOR, not the OWNER or ENGINEER or resident inspector, to determine the specific applicability of the designed trench safety systems to each field condition encountered on the project. The CONTRACTOR shall maintain a permanent record of daily inspections.

1.3 REFERENCE STANDARDS

1.4 INDEMNIFICATION

- A. The CONTRACTOR shall indemnify and hold harmless the OWNER, their employees and agents, from any and all damages, costs, (including without limitation, legal fees, court costs, and the cost of investigation), judgments or claims by anyone for injury or death of persons resulting from the collapse or failure of trenches constructed under this project.
- B. The CONTRACTOR acknowledges and agrees that this indemnity provision provides indemnity for the OWNER and ENGINEER in case the OWNER or ENGINEER is negligent either by act of omission in providing for trench safety, including, but not limited to inspections and failure to issue stop work orders.

1.5 MEASUREMENT AND PAYMENT

- A. All methods used for a trench excavation safety protection system shall be measured by the linear foot of trench and paid at the unit price in the CONTRACTOR's schedule of values, which shall be total compensation for furnishing design, materials, tools, labor equipment, and incidentals necessary, including removal of the system. Measurement for pipeline trench excavation safety protection system shall be based on the linear feet along the centerline of the pipeline trench. Measurement for structural trench excavation safety protection system shall be based on the linear feet around the outside perimeter of the structure's walls.

Where pipelines intersect structures, measurement for the pipeline shall begin/end at the outside of the structure's wall.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

-- END OF SECTION --

SECTION 31 06 01 - SITE GRADING AND EARTHWORK

PART 1 GENERAL

1.1 REFERENCE STANDARDS

ASTM C88 - Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate; Latest Edition.

ASTM C131/C131M - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine; Latest Edition.

ASTM C535 - Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine; Latest Edition.

ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction; 2012.

ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.

ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.

ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

ASTM D4221 - STANDARD TEST METHOD FOR DISPERSIVE CHARACTERISTICS OF CLAY SOIL BY DOUBLE HYDROMETER; Latest Edition.

ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table; Latest Edition.

TXDOT Item 247

1.2 WORK INCLUDED

- A. General excavation and fill operations for buildings. Rough grading and contouring of site, and drainage ditches.
- B. Aggregate fill and earth fill material classifications and requirements.
- C. OWNER is responsible for payment of all soils test. ENGINEER is responsible for determining all tests necessary. CONTRACTOR is responsible for allowing time in the construction schedule for testing any required rework.

1.3 QUALITY ASSURANCE

- A. All materials to be used whether excavated on-site or imported as offsite borrow, shall be tested for compliance with the requirements of this section prior to placement.
- B. Notify OWNER and ENGINEER when bearing material (bottom of excavation) is reached for observation of founding strata.
- C. Prior to furnishing any soils to the site, CONTRACTOR shall furnish a written, notarized certification from the landowner of each proposed offsite soil borrow source stating that to the best of the landowner's knowledge and belief, there has never been contamination at the borrow source site with hazardous toxic materials.

1.4 SUBMITTALS

Submit test reports for all specified parameters for each material classification used prior to placing material and at intervals of 2000 cy during placement. Obtain representative samples from multiple locations from stockpiles for each test.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Stockpile excavated materials and/or borrow in designated areas or in areas as approved by the ENGINEER. Do not stockpile material in the flood plain.

- B. Lightly compact and slope top of stockpiles to prevent excessive erosion and ponding of water.

1.6 PROTECTION

- A. Protect trees, shrubs, lawns, and other features remaining as portion of final landscaping.
- B. Protect benchmarks, existing structures, fences, roads, sidewalks and paving.
- C. Protect above or below grade utilities which are to remain. Do not take existing utilities out of service without specific authorization by the OWNER. Notify OWNER at least five working days prior to taking existing utilities out of service to make connections or for removal of utility.
- D. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods, as required to prevent cave-ins or loose soil from falling into excavations.
- E. Underpin adjacent structures which may be damaged by excavation work, including service lines and pipe chases.
- F. Notify the ENGINEER of unexpected subsurface conditions.
- G. Where damage could result from continuing work, discontinue work in area until ENGINEER notifies the CONTRACTOR of the required modifications.
- H. Protect bottom of excavations and soil around and beneath foundations from frost, freezing, and excessive moisture changes.
- I. Grade around excavations to prevent surface water runoff into excavated areas. During excavation, maintain grades for complete drainage. Install temporary drains or drainage ditches as needed to intercept or divert surface water and prevent interference or delay of the Work. Install groundwater pumping facilities and hoses/piping required to perform the work. The pumping of water shall be included in the appropriate lump sum bid items. No separate payment will be made for drainage control or ground water pumping.
- J. Repair damage, promptly, at no cost to OWNER.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Class 1 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131/C131M or ASTM C535. When material is subjected to five (5) cycles of the sodium sulfate soundness test in accordance with ASTM C88, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the ENGINEER and shall meet the following gradation in accordance with ASTM D448, size number 57:

SIEVE SIZE SQUARE OPENING	PERCENT PASSING
1-1/2 inches	100
1-inch	95-100
1/2 inch	25-60
No. 4	0-10
No. 8	0-5

- B. Class 2 Aggregate Fill: Consist of durable particles of crushed or weathered limestone free of unsuitable, soft, or organic material will be considered. The source of the material shall be approved by the ENGINEER. Bin #10 or chat material complying with the following gradation requirements:

SIEVE SIZE SQUARE OPENING	PERCENT PASSING
3/4-inch	100
1/2-inch	95-100

3/8-inch	90-100
1/4-inch	65-80
No. 4	30-40
No. 20	0-5

- C. Class 3 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable material and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131/C131M or ASTM C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the ENGINEER and meet the following gradation:

SIEVE SIZE SQUARE OPENING	PERCENT PASSING
1-3/4-inch	100
7/8-inch	65-90
3/8-inch	50-70
No. 4	35-55
No. 40	15-30
No. 100	0-12
	Wet Sieve Method

- D. Crushed Limestone Base Material: Shall meet the requirements of 2004 TXDOT Item 247, Type A, Grade 2 or better.
- E. Non-Expansive Earth Fill: Consist of soil materials with a liquid limit of 35 or less, a plasticity index between 5 and 15, a minimum of 35 percent passing the No. 200 sieve, a minimum of 85 percent passing the No. 4 sieve, and which are free of organics or other deleterious materials. When compacted to the recommended moisture and density, the material shall have a maximum free swell value of 0.5 percent and a maximum hydraulic conductivity (permeability) of 1 E-05 cm/sec, as determined by laboratory testing of remolded specimens of the actual materials proposed for the non-expansive earth fill.
- F. General Earth Fill: Consist of any soil materials which have a minimum plasticity index of 8, a minimum of 20 percent passing the No. 200 sieve, a minimum of 75 percent passing the No. 4 sieve, and which are free of organics or other deleterious material. On-site soils are sometime suitable for use as general earth fill.
- G. Select Fill:
1. Non-organic, sandy clay or clayey sand.
 2. Liquid limit less than 36.
 3. Plasticity index ranging from 5 to 18.
 4. Sieve Analysis: Maximum percent retained on No.4 sieve = 25 to 50 and on No.40 sieve = 50 to 75.
 5. Maximum of 70 percent passing #200 sieve.
 6. Maximum size of aggregate 1-3/4 inches.
 7. On-site soils may be blended and utilized for select fill if approved by the ENGINEER and if the blended material complies with the select fill requirements above.
- H. Sand Fill or Sandy Select:
1. Granular material of uniformly graded crushed rock from 3/4-inch U.S. sieve downward.
 2. Plasticity Index: Maximum of 5.
 3. Sieve Analysis:

SIEVE NO.	MAX. PERCENT PASSING
1-inch	100

No. 10	50
No. 40	30
No. 200	8

- I. Low-Permeability Earth Fill: Consist of soil materials classified as CH or CL in accordance with ASTM D2487. The materials also shall have a minimum liquid limit of 40, a minimum plasticity index of 20, a minimum of 50 percent passing the No. 200 sieve, and shall be free of organics or other deleterious materials. The material shall have a Percent Dispersion of less than 20 when tested in accordance with ASTM D4221. When compacted to the recommended moisture and density, the material shall have a maximum hydraulic conductivity of 1 E-07 cm/sec, as determined by laboratory testing of remolded specimens of the actual materials proposed for the low-permeability fill.
- J. Unclassified Material: All material excavated from site not meeting the requirements for topsoil, or classified materials.

PART 3 EXECUTION

3.1 PREPARATION AND LAYOUT

- A. Establish extent of site grading by area and elevation; designate and identify datum elevation.
- B. CONTRACTOR shall set required lines and levels.
- C. Maintain benchmarks, monuments and other reference points.

3.2 UTILITIES

- A. Approximate locations of known underground utilities are indicated on the Drawings. The CONTRACTOR is responsible for locating all existing utilities prior to construction.
- B. Before starting excavation, the CONTRACTOR is to establish location and extent of underground utilities occurring in work area.
- C. Notify the ENGINEER for direction for removal and/or relocation of lines which are in the way of excavation.
- D. Maintain, reroute or extend as required, existing utility lines to remain which pass through work area with the approval of the OWNER.
- E. Support and protect utility services uncovered by excavation.
- F. Accurately locate and record abandoned and active lines rerouted or extended, on Project Record Documents.
- G. As excavation approaches utilities, hand excavate to uncover utilities.

3.3 EXCAVATION

- A. Before starting excavation, clear and grade work area to minimum depth shown on Plans. Strip top soil approximately 6 inches to 12 inches, depending on location and stockpile.
- B. Excavate in accordance with lines and levels required for construction of the Work.
- C. When excavation is through paved areas, cut pavement to provide a square, uniform edge with minimum disturbance of remaining pavement and replace in accordance with the Drawings.
- D. In all areas requiring rock excavation, the CONTRACTOR shall install the pipe and complete the "rock free" bedding so that the installation may be inspected prior to backfilling. The OWNER's inspector shall be notified by the CONTRACTOR when the bedding is complete for each particular segment. Any rock excavation areas backfilled without the OWNER's prior inspection will require uncovering and checking at the CONTRACTOR's expense.
- E. Machine slope banks.
- F. Hand trim excavations and leave free from loose or organic matter.

- G. Provide and maintain surface and groundwater control until backfilling is complete. Keep excavations free from standing water.
- H. Do additional excavation only by written authorization of ENGINEER.
- I. Correct unauthorized excavation as directed, at no cost to OWNER. Areas that are excavated to elevations below those shown on the Plans shall be backfilled and compacted with crushed rock (Class 3 Aggregate Fill) if area is under aggregate fill, pipe, or structure, and otherwise with non-expansive earth fill.
- J. Excavations should not interfere with normal 45 degree bearing splay of any foundation unless sheeting and/or shoring is designed and provided for excavation.
- K. Stockpile excavated material in areas designated by ENGINEER according to classifications given under materials portion of this section.
- L. Do not disturb soil within branch spread of existing trees or shrubs that are to remain.
- M. Coordinate with OWNER's representative prior to reaching founding level for foundations and prior to placing mud slabs to request observation.

3.4 COMPACTED FILL

- A. Preparation for Fill Placement:
 - 1. Do not start backfilling operations until structures have been inspected and backfilling authorized by OWNER's representative or the ENGINEER. Backfill against structures in accordance with Section 31 02 01, STRUCTURAL EXCAVATING, BACKFILLING AND COMPACTING.
 - 2. Ensure areas to be filled are free from debris, snow, ice and water, and that ground surfaces are not in a frozen condition.
 - 3. Do not place fill over existing subgrade surfaces which are porous, wet or spongy.
 - 4. Proofroll subgrade with minimum 25-ton pneumatic roller or loaded dump truck under observation of OWNER's representative. Remove soft or unstable areas and replace with select fill, then scarify subgrade to a depth of 6 inches and compact to a minimum of 95 percent of ASTM D698 at a moisture content within 3 percent of optimum moisture. Density and moisture content of the compacted subgrade shall be maintained until it has been covered with the next course of construction.
 - 5. Place compacted fill to grades, contours, levels and elevations shown on Drawings. After dumping, spread the material in horizontal layers. Place fill in maximum 6-inch compacted lifts compacted to a minimum of 95 percent Standard Proctor (ASTM D698) at a moisture content within 3 percent of optimum moisture. Density and moisture content of each lift of fill must be maintained until the next lift is placed.
 - 6. Existing hillsides or slopes which will receive fill should be loosened by scarifying or plowing to a depth of not less than 8 inches. The fill material shall be benched into the existing slope in such a manner as to provide adequate bonding between the fill and slope, as well as to allow the fill to be placed in horizontal lifts.
 - 7. Fills should extend a minimum of 5 feet outside of building lines and slope to natural grade.
- B. Material Placement:
 - 1. General:
 - a. Place fill in maximum 6-inch compacted lifts compacted to a minimum of 95 percent Standard Proctor (ASTM D698) at a moisture content within 3 percent of optimum moisture. Density and moisture content of each lift of fill must be maintained until the next lift is placed. Use a method so as not to disturb or damage completed work constructed in the excavations.
 - b. If the surface is too smooth and hard to bond properly with a succeeding layer, the surface shall be roughened and loosened by diskings before the succeeding layer is placed.

- c. Where fill is to be placed next to existing fill, that fill shall be removed to unweathered, dense material. Each layer shall be benched and disked as adjoining lifts are placed. Material hauling equipment shall be so routed to prevent the formation of ruts.
 - d. The surface of the fill shall be graded to drain freely and maintained throughout construction. During the dumping and spreading process, all roots, debris and all rocks greater than 3 inches in maximum dimension shall be removed.
 - e. Following the spreading and mixing of the soil, it shall be processed by disking or pulverizing throughout its thickness to break up and reduce clod size, and provide additional blending of materials.
 - f. The moisture content of the soil shall be adjusted, if necessary, by either aeration or the addition of water to bring the moisture content within the recommended range. Water required for sprinkling to bring the fill material to the proper moisture content shall be applied evenly through each layer.
 - g. Any layers which become damaged by weather conditions shall be processed to meet recommended requirements. The compacted surface of a layer of fill shall be lightly loosened by disking before the succeeding layer is placed.
- C. Compaction:
- 1. Compact fill materials listed below to required percentages of maximum dry density.
 - a. Compact non-expansive earth fill in top 12 inches under paving or building to a minimum of 95 percent of maximum dry density of an ASTM D1557 Modified Proctor at a moisture content with 3 percent of optimum moisture.
 - b. Compact non-expansive earth fill and general earth fill not under roads or in embankment and more than 1 foot beneath roads to a minimum of 95 percent of ASTM D698 at a moisture content within 3 percent of optimum moisture.
 - c. Compact non-expansive earth fill against underground walls to between 95 and 100 percent of ASTM D698 at a moisture content within 3 percent of optimum moisture.
 - d. Place Select Fill in maximum 6-inch compacted lifts compacted to a minimum of 95 percent Standard Proctor (ASTM D698) at a moisture content within 3 percent of optimum moisture.
 - e. Minimum Frequency of Density Tests:
 - 1) Bearing: 1 test/3000 square feet per lift or minimum of 2 tests per lift.
 - 2) Structure Fills: 1 test/3000 square feet per lift, minimum 2 test per lift.
 - 3) Backfill: 1 test/6000 square feet per lift, minimum 2 tests per lift.
 - 4) Trench backfill: 1 test/150 Lf trench per lift, minimum 2 tests per lift.
 - f. The CONTRACTOR shall be responsible for the actual quality of the fill, in place. Satisfactory test results shall not be considered as the sole factor of the quality of the fill operation.
 - g. The moisture content and density of all fill shall be maintained at the specified range of moisture and density.
 - 2. Compact aggregate fill material in maximum 6-inch thick lifts.
 - a. Aggregate fill for pipe bedding shall be compacted to a minimum of 95 percent of maximum density as determined by ASTM D4253. The moisture content shall be in a range that will accommodate efficient placement and compaction.
 - 3. Prior to placement of aggregate base course material for paved areas, remove soft or unstable areas and replace with aggregate base course material, then scarify subgrade to a depth of 6 inches and compact to a minimum of 95 percent of ASTM D698 at a moisture content within 3 percent of optimum moisture. Density and moisture content of the compacted subgrade shall be maintained until it has been covered with base course material.

3.5 SUBGRADE

- A. The CONTRACTOR shall excavate or fill to the top of proposed subgrade so that the specified thickness of base course material will be obtained across the section. After excavation or fill has been made to the subgrade elevation as shown on the Plans, the CONTRACTOR shall

prepare the subgrade for compaction by scarifying and disking the subgrade a minimum of 6 inches and a maximum of 8 inches. Water shall be added to the soil if necessary, and the soil disked again to obtain a uniform moisture content throughout the depth of the subgrade.

Moisture of the compacted subgrade shall be at optimum moisture content or at a tolerance of +/- 3%, which will be determined by soil laboratory analysis. If it is determined the moisture content is not uniform or within the limits specified, water shall be added and the subgrade disked again; or the soil shall be disked to the extent necessary to dry the soil to the specified limits, all at the CONTRACTOR's expense.

- B. After the subgrade has been prepared to the specified moisture content, subgrade shall be compacted for the full street section to 95% per ASTM D698 for a depth of 6 inches. Any areas of subgrade failing to meet the specified density shall be re-disked and recompacted until the correct density is obtained, all at the CONTRACTOR's expense. If determined by the ENGINEER or City Representative, a minimum of one density test per 6,000 square feet shall be made by an independent soil testing laboratory for Quality Control of the finished work.
- C. Compaction of the subgrade shall be performed with sheep foot rollers, pneumatic rollers and flat steel wheel rollers to the extent necessary to obtain the specified soil density. Final compaction shall be made by flat steel wheel rollers or pneumatic tire rollers to leave a smooth surface on which to install the base course material.
- D. The subgrade shall be shaped with a self-propelled grader, and all holes, ruts and depressions filled with an approved material and rolled to the extent directed by the ENGINEER. The surface of the subgrade shall be finished to the required lines and grade; and any deviation in excess of 1/4 inch, when checked with a 16 foot straight edge, shall be corrected by the CONTRACTOR.

3.6 SCHEDULE

- A. General Earth Fill:
 - 1. Use under seeded areas, backfill at depths of more than 5 feet below and 5 feet outside of roads and in embankments (except for clay liner material) unless, otherwise shown on Drawings.
 - 2. Fill to within 4 inches of finished grade as backfill adjacent to structures.
- B. Non-Expansive Earth Fill: Use as backfill for the top 5 feet depth under roads as shown on Drawings. Use to 5 feet outside the limits of roads.
- C. Low Permeability Earth Fill: Use for top 2 feet of interior slope of embankments.
- D. Select Fill: Use as backfill against structure walls and beneath structures.
- E. Class I Aggregate Fill: Use for over excavated areas under structures and as otherwise shown on Drawings.
- F. Class 2 Aggregate Fill: Use for pipe embedment and initial backfill per details in the Plans.
- G. Sand Fill: Use for small pipe embedment (#2-inch diameter).
- H. Topsoil: Use within limits of seeded areas after substantial completion of construction and other fill has been placed.
- I. Unclassified Material: Dispose of on-site as directed by the OWNER.

3.7 TOLERANCES

- A. Site grading to conform to Plans within the following tolerances:
 - 1. Drainage ditches: 0.10 feet.
 - 2. Excavations: plus zero to -0.10 feet.
 - 3. Compacted fill: 0.10 feet.

3.8 SURPLUS MATERIAL

- A. Unclassified material, surplus fill materials and excess topsoil shall be disposed of by the CONTRACTOR as approved by the OWNER and ENGINEER.
- B. Leave stockpile areas and entire jobsite clean and raked, ready to receive seeding.

3.9 WATER INJECTION

General specifications for water injection under the new building are included below.
Compliance with this Specification is essential. The injection depth is a minimum of 10 feet below existing grade.

- A. Injection process shall be observed on a full-time basis by a qualified inspector under the direction of the OWNER's designated geotechnical ENGINEER.
- B. A surfactant (wetting agent) shall be added to the water. The amount of surfactant used should be in accordance with the manufacturer's recommendations.
- C. The lower portion of the injection nozzle shall consist of a hole pattern that will uniformly disperse the water throughout the entire depth.
- D. Injection pressures should be adjusted to disperse as large a volume of water as possible within a pressure range of 50 to 200 pounds per square inch.
- E. Injection pipe shall be forced downward (not jetted or washed) in 12 to 18 inch intervals, injecting to refusal at each interval. For an injection depth of 10 feet a minimum of 7 intervals shall be used and for an injection depth of 5 feet a minimum of 4 intervals shall be used. Refusal will be determined on site by the inspector.
- F. Spacing for the injections not to exceed five feet on center each way, and injections shall be carried at least five feet outside building lines. Subsequent injections should be offset from initial locations in a pattern that maximizes distribution of the mixture.
- G. After the recommended number of injection passes the moisture content of the soils shall be evaluated by the OWNER's designated geotechnical ENGINEER on the basis of laboratory tests on tube samples (not cuttings) obtained from borings under his supervision following a twenty-four-hour curing period. This ENGINEER shall develop recommendations on the need for any additional injections.
- H. In the event that more than three injections passes are required, the surface of the injected area shall be scarified to a depth of at least eight inches and re-compacted prior to the next injection.
- I. The surface of the injected area should be sealed or otherwise protected against moisture loss as soon as possible after acceptance of the water injection process.

3.10 MAINTENANCE

Following the final shaping of material, the base course shall be maintained throughout its entire length by the use of a standard road machine or motor grade and rollers until such time as, in the judgment of the ENGINEER, base course meets the required density, is properly bonded and is suitable for priming. The base shall be properly drained at all times. During this maintenance period, any deficiencies in thickness, composition, smoothness or density shall be corrected in a satisfactory manner.

The CONTRACTOR shall be fully responsible for maintaining and preserving the completed base course during the period prior to surface treatment. Upon completion of the base course, if the asphaltic surface cannot be applied, the CONTRACTOR shall apply an emulsion of primer coat to the base surface in order to afford dust control and assist in base maintenance.

CONTRACTOR shall return to the project as often as required to fill holes in the base surface and add primer as required or recommended by the ENGINEER.

JACOB|MARTIN
City of Azle - Dunaway Lane
Reconstruction

31 06 01
SITE GRADING AND
EARTHWORK

-- END OF SECTION --

This page intentionally left blank

SECTION 31 08 01 - LIME TREATED SUBGRADE

PART 1 GENERAL

1.1 DESCRIPTION

This item shall consist of constructing one or more courses of a mixture of soil, lime, and water in accordance with this Specification, and in conformity with the lines, grades, thicknesses, and typical cross sections shown on the Plans. Lime-treated subgrade shall fully comply with City of Abilene requirements and shall be applied at 24 LBS/SY.

1.2 REFERENCE STANDARDS

AASHTO T 26 - Standard Method of Test for Quality of Water to Be Used in Concrete; Latest Edition.

ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).

ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.

ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2015.

ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Hydrated Lime shall conform to the requirements of ASTM C207, Type N or pelletized lime will be allowed.
- B. Commercial Lime Slurry shall be a pump-able suspension of solids in water. The water or liquid portion of the slurry shall not contain dissolved material in sufficient quantity naturally injurious or objectionable for the purpose intended. The solids portion of the mixture, when considered on the basis of "solids content", shall consist principally of hydrated lime of a quality and fineness sufficient to meet the following requirements as to chemical composition and residue.
 - 1. Chemical Composition: The "solids content" of the lime slurry shall consist of a minimum of 70%, by weight, of calcium and magnesium oxides.
 - 2. Residue: The percent by weight of residue retained in the "solids content" of lime slurry shall conform to the following requirements:

Residue retained on a No. 6 (3360 micron) sieve	Max. 0.0%
Residue retained on a No. 10 (2000 micron) sieve	Max. 1.0%
Residue retained on a No. 30 (590 micron) sieve	Max. 2.5%
 - 3. Commercial lime slurry shall conform to one of the following two grades:
 - Grade 1 - The "dry solids content" shall be at least 31% by weight, of the slurry.
 - Grade 2 - The "dry solids content" shall be at least 35%, by weight, of the slurry.
 - 4. Water used for mixing or curing shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product. Water shall be tested in accordance with and shall meet the suggested requirements of AASHTO T 26. Water known to be or potable quality may be used without test.
 - 5. Soil for this work shall consist of materials on the site or selected materials from other sources and shall be uniform in quality and gradation, and shall be approved by the ENGINEER. The soil shall be free of roots, sod, weeds, and stones larger than 2-1/2 inches (60 mm).

2.2 COMPOSITION

- A. Lime shall be applied at the rate specified on the Plans for the depth of subgrade treatment of 6 inches.
- B. Tolerances: At final compaction, the lime and water content for each course of subgrade treatment shall conform to the following tolerances:

<u>Material</u>	<u>Tolerance</u>
Lime	+0.5%
Water	+2% / -0%

2.3 WEATHER LIMITATIONS

The lime-treated subgrade shall not be mixed while the atmospheric temperature is below 40 degrees F (4 degrees C) or when conditions indicate that temperatures may fall below 40 degrees F (4 degrees C) within 24 hours, when it is foggy or rainy, or when soil or subgrade is frozen.

2.4 EQUIPMENT

The equipment required shall include all equipment necessary to complete this item such as: grading and scarifying equipment, a spreader for the lime or lime slurry, mixing or pulverizing equipment, sheepfoot and pneumatic or vibrating rollers, sprinkling equipment, and trucks.

PART 3 EXECUTION

3.1 CONSTRUCTION METHODS

- A. General: It is the primary requirement of this Specification to secure a completed subgrade containing a uniform lime mixture, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth, and with a smooth surface suitable for placing subsequent courses. It shall be the responsibility of the CONTRACTOR to regulate the sequence of his/her work, to use the proper amount of lime, maintain the work, and rework the courses as necessary to meet the above requirements.

Prior to beginning any lime treatment, the subgrade shall be constructed and brought to grade and shall be shaped to conform to the typical sections, lines, and grades as shown on the Plans. The material to be treated shall then be excavated to the secondary grade (proposed bottom of lime treatment) and removed or windrowed to expose the secondary grade. Any wet or unstable materials below the secondary grade shall be corrected, as directed by the ENGINEER, by scarifying, adding lime, and compacting until it is of uniform stability. The excavated material shall then be spread to the desired cross section.

If the CONTRACTOR elects to use a cutting and pulverizing machine that will remove the subgrade material accurately to the secondary grade and pulverize the material at the same time, he will not be required to expose the secondary grade nor windrow the material.

However, the CONTRACTOR shall be required to proof-roll the subgrade, as directed by the ENGINEER and correct any soft areas that this rolling may reveal before using the pulverizing machine. This method will be permitted only where a machine is provided which will ensure that the material is cut uniformly to the proper depth and which has cutters that will plane the secondary grade to a smooth surface over the entire width of the cut. The machine must give visible indication at all times that it is cutting to the proper depth.

- B. Application: Lime shall be spread only on the area where the first mixing operations can be completed during the same working day. The application and mixing of lime with the soil shall be accomplished by the methods hereinafter described as "Dry Placing" or "slurry Placing".

LIME TREATED SUBGRADE

When hydrated lime is specified, the CONTRACTOR may use either method. Pelletized lime will also be allowed.

1. Dry Placing. The lime shall be spread uniformly over the top of the subgrade by an approved screw-type spreader box or other approved spreading equipment. The amount of lime spread shall be the amount required for mixing to the specified depth which will result in the percentage determined in the job mix formula.
The lime shall be distributed in such a manner that scattering by wind will be minimal. Lime shall not be applied when wind conditions, in the opinion of the ENGINEER, are detrimental to a proper application. A motor grader shall not be used to spread the lime. The material shall be sprinkled, as directed by the ENGINEER, until the proper moisture content has been reached.
 2. Slurry Placing. The lime shall be mixed with water in trucks with approved distributors and applied as a thin water suspension of slurry. Commercial lime slurry shall be applied with a lime percentage not less than that applicable for the grade used. The distribution of lime shall be attained by successive passes over a measured section of subgrade until the proper amount of lime has been spread. The amount of lime spread shall be the amount required for mixing to the specified depth which will result in the percentage determined in the job mix formula. The distributor truck shall continually agitate the slurry to keep the mixture uniform.
- C. Mixing: The mixing procedure shall be the same for "Dry Placing" or "Slurry Placing" as hereinafter described.
1. First Mixing. The full depth of the treated subgrade shall be mixed with an approved mixing machine. Lime shall not be left exposed for more than 6 hours. The mixing machine shall make two coverage's. Water shall be added to the subgrade during mixing to provide a moisture content above the optimum moisture of the material and to ensure chemical action of the lime and subgrade. After mixing, the subgrade shall be lightly rolled to seal the surface and help prevent evaporation of moisture. The water content of the subgrade mixture shall be maintained at a moisture content above the optimum moisture content for a minimum of 48 hours or until the material becomes friable. During the curing period, the material shall be sprinkled as directed. During the interval of time between application and mixing, lime that has been exposed to the open air for 6 hours or more, or to excessive loss due to washing or blowing will not be accepted for payment.
 2. Final Mixing. After the required curing time, the material shall be uniformly mixed by approved methods. If the mixture contains clods, they shall be reduced in size by blading, discing, harrowing, scarifying, or the use of other approved pulverization methods so that the remainder of the clods shall meet the following requirements when tested dry by laboratory sieves:

	<u>Percent Passing</u>
Minimum of clods passing 1-1/2" sieve	100%
Minimum of clods passing No. 4 sieve	60%

- D. Compaction of the mixture shall begin immediately after final mixing. The material shall be aerated or sprinkled as necessary to provide optimum moisture. The field density of the compacted mixture shall be at least 93 percent of the maximum density of laboratory specimens prepared from samples taken from the material in place that passed the sieve analysis. The specimens shall be compacted and tested in accordance with ASTM D698. The in-place field density shall be determined in accordance with ASTM D1556/D1556M or ASTM D2167. Any mixture that has not been compacted shall not be left undisturbed for more than 30 minutes. The moisture content of the mixture at the start of compaction shall not be below nor more than 2 percentage points above the optimum moisture content. The optimum moisture content shall be determined in accordance with ASTM D698 and shall be less than that amount which will cause the mixture to become unstable during compaction and finishing.

The material shall be sprinkled and rolled as directed by the ENGINEER. All irregularities, depressions, or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required, and reshaping and recompacting by sprinkling and rolling. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed thereon or the work is accepted.

In addition to the requirements specified for density, the full depth of the material shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section is completed, tests will be made by the ENGINEER. If the material fails to meet the density requirements, it shall be reworked to meet these requirements. Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and shall conform with the typical section shown on the plans and to the established lines and grades. Should the material, due to any reason or cause, lose the required stability, density, and finish before the next course is placed or the work is accepted, it shall be recompact and refinished at the sole expense of the CONTRACTOR.

- E. Finishing and Curing: After the final layer or course of lime-treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The completed section shall then be finished by rolling, as directed, with a pneumatic or other suitable roller sufficiently light to prevent hair cracking. The finished surface shall not vary more than 3/8 inch when tested with a 16-foot straightedge applied parallel with and at right angles to the pavement centerline. Any variations in excess of this tolerance shall be corrected by the CONTRACTOR, at his/her own expense, in a manner satisfactory to the ENGINEER.

The completed section shall be moist-cured for a minimum of 7 days before further courses are added or any traffic is permitted, unless otherwise directed by the ENGINEER. Subsequent courses shall be applied within 14 days after the lime-treated subgrade is cured.

- F. Thickness: The thickness of the lime-treated subgrade shall be determined by depth tests or cores taken at intervals so that each test shall represent no more than 600 square yards. When the base deficiency is more than 1/2 inch, the CONTRACTOR shall correct such areas in a manner satisfactory to the ENGINEER. The CONTRACTOR shall replace, at his/her expense, the subgrade material where borings are taken for test purposes.
- G. Maintenance: The CONTRACTOR shall maintain, at his/her own expense, the entire lime-treated subgrade in good condition from the start of work until all the work has been completed, cured, and accepted by the ENGINEER.

-- END OF SECTION --

SECTION 31 09 01 - ROCK RIPRAP

PART 1 GENERAL

1.1 WORK INCLUDED

This item of the Specification covers the labor, materials, equipment, tools and incidentals necessary to produce and place rock riprap as noted in the plans.

1.2 REFERENCE STANDARDS

ASTM C88 - Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate; Latest Edition.

ASTM C127 - Standard Test Method for Relative Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate; 2015.

1.3 DELIVERY AND STORAGE

Riprap temporarily stockpiled for construction purposes shall be located in an area approved by the OWNER. Riprap materials shall not be located so as to block or restrict equipment and vehicle access to existing structures.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Stone for riprap shall be durable and of a suitable quality to insure permanence in the structure and in the climate in which it is to be used. The stone shall be free from cracks, seams, and other defects which would tend to increase unduly its deterioration from natural causes and shall be reasonably well graded between the prescribed limits as specified herein.
- B. Riprap shall have a minimum unit weight of one hundred forty-five (145) pounds per solid cubic foot based upon the bulk specific gravity (saturated surface-dry) when tested in accordance with ASTM C127. A minimum of one (1) bulk specific gravity (saturated surface dry) shall be performed on riprap material delivered to the site.
- C. Riprap shall have a loss of less than eighteen (18%) percent after five (5) cycles when tested for soundness in magnesium sulfate in accordance with ASTM C88. The test shall be run using particles passing a 2-1/2" sieve and retained on a 1-1/2" sieve. After final drying, the material shall be screened over the 1-1/4" sieve. A minimum of one (1) soundness in magnesium sulfate test shall be performed on riprap material delivered to the site.

2.2 FOUNDATION PREPARATION

- A. Trim and dress areas on which bedding and rock riprap are to be placed to conform to cross sections shown on the drawings within an allowable tolerance of plus or minus 3" from the theoretical slope lines and grades.

PART 3 EXECUTION

3.1 RIPRAP PLACEMENT

- A. Place stone for riprap on the blanket in such manner as to produce a reasonably well graded mass of rock with the minimum practicable percentage of voids, and construct within the specified tolerance to the lines and grades shown on the Drawings or staked in the field. A tolerance of plus 3" or minus 0" from the slope lines and grades shown on the Drawings shall be allowed in the finished surface of the riprap. Place riprap to its full course thickness at one operation. Distribute the larger stones evenly and conform the entire mass of stones in their final position to the specified gradation.
- B. The finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones. Place riprap loads along horizontal rows and progress up the slope. Place each

load against previously placed riprap. Placing riprap in layers shall not be permitted. Placing riprap by dumping from top of slope, dumping into chutes, or by similar methods likely to cause segregation of the various sizes shall not be permitted. The desired distribution of the various sizes of stones throughout the mass shall be obtained by methods of placement which produces the specified results. Rearrange individual stones by mechanical equipment or by hand to the extent necessary to obtain a reasonably well graded distribution of stone sizes.

Maintain the riprap protection until accepted and replace any material displaced by any cause to the lines and grades shown on the drawings.

The CONTRACTOR shall be responsible for providing compliance with the requirements of the Contract Documents. The CONTRACTOR shall bear all costs of the correction materials which fail to meet the requirements of the Contract Documents.

-- END OF SECTION --

SECTION 31 11 01 - CRUSHED AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 GENERAL

This item consists of a base course composed of crushed aggregate and binder constructed on the prepared subgrade in accordance with these Specifications and in conformity with the dimensions and typical cross section shown on the Plans to the lines and grades established by the Engineer.

1.2 REFERENCE STANDARDS

AASHTO T 11 - Standard Method of Test for Materials Finer Than 75 Micrometer (No.200)

Sieve in Mineral Aggregates by Washing; 2005; R 2013.

AASHTO T 27 - Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates; 2014.

TxDOT Item 249

TEX-113-E

PART 2 PRODUCTS

2.1 MATERIALS

- A. The aggregate shall be either crushed stone, crushed gravel or crushed slag. The fine aggregate shall be screenings obtained from crushing stone, gravel or slag. Sand or approved binder may be used as filler, but shall not exceed 15 percent by weight of the total combined aggregates.
- B. The crushed stone shall consist of hard durable particles or fragments of stone which is free of an excess of flat or disintegrated pieces, dirt or other objectionable matter.
- C. The crushed gravel shall consist of hard, durable stones, rock and boulders of acceptable quality and gradation and shall be free of an excess of flat or disintegrated pieces, dirt or other objectionable matter. The methods used in production of the crushed gravel shall be such that the finished product shall be as uniform as practical. The crushing of the gravel shall result in a product of which 100% of the material particles will have at least one fractured face. If necessary to meet this requirement or to eliminate an excess of fine particles, the gravel shall be screened before crushing.
- D. The crushed aggregate shall meet the gradation requirements specified in the proposal and given in the following table, using AASHTO T 11 and AASHTO T 27.

TABLE I - REQUIREMENTS FOR GRADATION OF AGGREGATE

TxDOT Item 249, Type A, Grade 1

<u>Sieve Designation</u>	<u>% by Weight Retained</u>
1-3/4 inch	0
7/8 inch	10 - 35
3/8 inch	30 - 50
No. 4 sieve	45 - 65
No. 40 sieve	70 - 85
Maximum P.I.	10
Maximum Liquied Limit	35

- E. All material shall be stockpiled as specified prior to sampling. Samples will be taken from the stockpile by approved sampling techniques, and no deliveries shall be made prior to acceptance of the stockpile by the ENGINEER. The processed material shall be stockpiled to a

uniform height. The stockpile shall be a minimum of 15 feet and a maximum of 20 feet in height and is to be formed with at least 10 layers with each layer being leveled before placing the next layer. Each layer shall be no more than 2 feet thick. In loading from the stockpile for delivery to the job site, the material shall be loaded by making successive vertical cuts through the entire depth of the stockpile.

- F. The material supplier shall furnish the ENGINEER certification that all materials furnished are from the approved stockpile. The CONTRACTOR shall furnish the ENGINEER certification that no material other than that from the approved stockpile is delivered to the job site and shall also furnish a certified weight ticket for each load of material delivered to the job site.

2.2 ADDITIONAL FINE MATERIAL

- A. If additional fine material in excess to that naturally present in the base course material is necessary for correcting the gradation to the limitations of the specified gradation, for satisfactory bonding of the base material or for changing the soil constants of the material passing the No. 40 mesh sieve, it shall be uniformly blended and mixed with the base course material at the crushing plant or by an approved plant. The additional fine material for this purpose shall be obtained primarily from the crushing of stone or gravel; and when used, shall be of a gradation as necessary to accomplish the specified gradation in the final mixed base course material. The additional fine material may be composed of sand, but the amount of sand shall not exceed 10 percent by weight of the combined base material. The sand shall all pass a No. 40 mesh sieve and not more than 5 percent by weight shall pass a No. 200 mesh sieve.

PART 3 EXECUTION

3.1 CONSTRUCTION METHODS

- A. Operation at Sources of Supply: All work involved in clearing and stripping of quarries and pits including handling unsuitable material encountered shall be performed by the CONTRACTOR at his own expense. The base material shall be obtained from approved sources. The material shall be handled in such a manner that a uniform and satisfactory product will be secured.
- B. Equipment: All equipment necessary for the proper construction of this work shall be on the project site in first class working condition and shall be approved by the ENGINEER before construction is permitted to begin. The flat wheel roller shall be of the three-wheel type, weighing not less than ten tons. The roller shall have a rear wheel compression of not less than 330 pounds per linear inch of tire width and shall be equipped with adjustable scrapers. The pneumatic roller shall consist of pneumatic tired wheels arranged in a manner to provide a satisfactory compacting unit. The roller shall have an effective rolling width of at least 60 inches and shall give a compression of at least 275 pounds per inch of width of tread when fully loaded. Other equipment may be used for compacting and consolidating the base course upon approval by the ENGINEER. Such equipment shall be routed over the area being compacted and shall be operated until the required density is obtained. Equipment for spreading and shaping shall consist of spreader boxes having strike-off templates, screeds or other approved spreading devices which will place the base material in a uniform layer with a minimum of segregation. Provisions shall be made by the CONTRACTOR for furnishing water at the plant or at the site of the work by equipment of ample capacity and of such design as to assure uniform application.
- C. Subgrade: Subgrade and existing street surface shall be prepared as specified and checked and accepted by the ENGINEER before placing and spreading operations are begun. Any ruts or soft, yielding places which appear by reason of improper drainage conditions, hauling or from any other cause shall be corrected and roller to the required compaction before the base

course is placed thereon. Grade control between the edges of the gutters shall be by means of grade stakes, steel pins or forms placed in lanes parallel to the center line of the street by the CONTRACTOR and at intervals sufficiently close that string lines or check boards may be placed between the stakes, pins or forms.

- D. Plant Mix: The base material shall be uniformly blended during crushing operations in an approved plant. The type of plant may either be a central proportioning and mixing or a traveling mix plant. The plant shall blend and mix the materials to meet these Specifications.
- E. Placing and Spreading: The crushed aggregate base material that has been proportioned in a crushing and screening plant or proportioned and processed in a central mixing plant shall be placed on the prepared subgrade and compacted in layers of thickness of not more than 6 inches.

Depositing and spreading of material shall commence where designated and shall progress continuously without breaks. The material shall be deposited and spread in lanes in a uniform layer and without segregation of size to such loose depth that when compacted the layer will have the required thickness. It shall be the charge of the CONTRACTOR that the required amount of approved material be delivered in each 100-foot station. The base material shall be spread by use of spreader boxes or other approved devices or methods that will spread the material in the required amount in a manner to avoid or minimize the need for re-handling material and to prevent the rutting of underlying course. The spreader boxes or other devices shall be equipped with strike-off templates or screeds that can be adjusted or controlled to secure the required thickness of material. Dumping from vehicles in piles on the subgrade so as to require re-handling will be permitted; however, in such event, the material shall be graded into windrows and sample of material taken from windrows shall meet the gradation specified. Use of motor graders for spreading, manipulating or working the base may be used if desired.

METHOD OF PLACING - The base course shall be constructed in a layer of not less than 2-1/2 inches nor more than 6 inches of compacted thickness. The aggregate as spread shall be of uniform gradation with no segregation or pockets of fine or coarse materials. The aggregate, unless other permitted by the ENGINEER, shall not be spread more than 4,000 square yards in advance of the rolling. Any necessary sprinkling shall be kept within these limits. No materials shall be place in snow or on a soft, muddy or frozen subbase or underlying course.

For the second layer, the construction procedure herein described shall apply.

The ENGINEER will make tests to determine the maximum density and the proper moisture content of the base material and this information will be available to the CONTRACTOR. The base material shall be at a uniform moisture content and optimum moisture content with a tolerance of +/-2% when rolling is started. Any minor variations shall be corrected by sprinkling or by aeration until the specified moisture content is obtained. During the placing and spreading caution shall be exercised to prevent the incorporation of subgrade, subbase or shoulder material in the base course mixture.

- F. Finishing and Compacting: After spreading, the base material shall be thoroughly compacted by rolling and sprinkling when necessary. Any single roller shall perform the rolling for not more than 25 cubic yards per hour and additional rollers shall be provided when spreading is greater than this rate. Rolling shall progress gradually from the sides to the center of the land under construction or from one side toward previously placed material by lapping uniformly each preceding pass by one-half the width of such pass and shall continue until the entire area of the course has been rolled. Rolling shall continue until the base material has been compacted to not less than 100% per TEX-113-E. In addition to the requirements specified for density, the full depth of the base course shown on the Plans shall be compacted to the extent necessary to

remain firm and stable under construction equipment. Blading and rolling shall be done alternately as required or as directed to obtain a smooth, even and uniformly compacted base. For final rolling, either 10 ton three-wheel or 8 ton tandem rollers may be used. The course shall not be rolled when the underlying course is soft or yielding or when the rolling causes a wavelike motion in the base course. When the rolling develops irregularities, which exceed 3/8 inch when tested with a 16 foot straight edge, the irregular surface shall be loosed, refilled with the same kind of materials as that used in constructing the course, and rolled again as required above. Along places inaccessible to rollers, the base course material shall be thoroughly tamped with mechanical or hand tampers. Each hand tamper shall weight not less than 50 pounds and have a face area or not more than 100 square inches.

3.2 TESTING

- A. After the base course is completely compacted, the surface shall be tested for smoothness and accuracy of grade and crown. If any portions are found to lack required smoothness or fail in accuracy of grade or crown, such portions shall be scarified, reshaped, recompactd and otherwise manipulated as the ENGINEER may direct until the required smoothness and accuracy are obtained. The finished surface shall be such that it will not vary more than 3/8 inch from the 16-foot straight edge applied to the surface parallel to the center line and at right angles.

3.3 PROTECTION OF BASE COURSE

- A. Work on the base course shall not be performed during freezing temperatures nor when the subgrade is wet. When the base materials contain frozen material or the underlying course is frozen, the construction operations shall be stopped. In general, hauling equipment may be routed over completed portions of the base course provided no excessive damage results and such equipment is routed over the full width of the base course to avoid rutting or uneven compaction. However, the ENGINEER shall have full and specific authority to stop all hauling over completed or partially completed base course when, in his opinion, such hauling is causing damage. Any damage resulting to the base course from routing of equipment over the base course shall be repaired by the CONTRACTOR at his own expense.

3.4 MAINTENANCE

- A. Following the final shaping of the material, the base course shall be maintained throughout its entire length by the use of a standard road machine or motor grade and rollers until such time as, in the judgment of the ENGINEER, base course meets the required density, is properly bonded and is suitable for priming. The base shall be properly drained at all times. During this maintenance period, any deficiencies in thickness, composition, smoothness or density shall be corrected in a satisfactory manner.
- B. The CONTRACTOR shall be fully responsible for maintaining and preserving the completed base course during the period prior to surface treatment. Upon completion of the base course, if the asphaltic surface cannot be applied, the CONTRACTOR shall apply an emulsion or primer coat to the base surface in order to afford dust control and assist in base maintenance. CONTRACTOR shall return to the project as often as required to fill holes in the base surface and add primer as required.

-- END OF SECTION --

SECTION 32 01 01 - ASPHALTIC CONCRETE SURFACE

PART 1 GENERAL

1.1 DESCRIPTION

This item shall consist of a surface course compound of a compacted mixture of mineral aggregate and asphaltic material in a compacted thickness of 1.5", 165#/SY for Type D Hot Mix surface and 2", 200 #/SY for Type C Hot Mix as described in the Plans. The pavement shall be constructed on the previously completed and approved base in accordance with the details shown on the Plans and in the provisions of these Specifications.

1.2 REFERENCE STANDARDS

TxDot Item 300 (2014) Item 300 Asphalts, Oils, And Emulsions

TxDot Item 340 (2014) Item 340 Dense-Graded Hot-Mix Asphalt (Method)

PART 2 PRODUCTS

2.1 MATERIALS

- A. Coarse Aggregate, Fine Aggregate and Mineral Filler shall conform with the requirements of TxDot Item 340.2.
- B. Asphalt for the paving mixture shall conform with the provisions of TxDot Item 300.2, Table 2, for AC-10 Asphalt Cement or other only as approved by the ENGINEER.
- C. Prime Coat Material shall be AEP or Cut-Back Asphalt conforming with TxDot Item 300.2, Table 5 for MC-30 Cut-Back or Table 11 for AEP.
- D. Paving Mixture shall conform with the provisions of TxDot Item 340.4, Type "D" or Type "C" grading with the asphaltic material forming 4.5 to 7.5 percent of the mixture by weight. It shall be the CONTRACTOR's entire responsibility to determine the asphalt content within above limits that will produce a mixture that when tested will conform to the minimum requirements of TxDot Item 340.4, Table 4.

PART 3 EXECUTION

3.1 INSTALLATION

The prime coat, tack coat or the asphaltic mixture when placed with a spreading and finishing machine shall not be placed when the air temperature is below 60 degrees F. and is falling, but may be placed when air temperature is above 50 degrees F. and rising. It is further provided that the prime coat, tack coat or asphaltic mixture shall be placed only when the humidity, general weather conditions and temperature and moisture conditions of the base, in the opinion of the ENGINEER, are suitable.

If the temperature of the asphaltic mixture of a load or any part of a load becomes 50 degrees F. (or more) less than the temperature specified at discharge from the mixer after being dumped from the mixer and prior to placing while passing through the lay-down machine, all or any part of the load may be rejected, and payment will not be made for the rejected material.

- A. Prime Coat shall be applied on the completed base course in an amount of 0.25 gallon per square yard, evenly and with complete coverage of the base course surface and without streaks or "fat" spots. The prime coat shall be protected from traffic until it has cured to the satisfaction of the ENGINEER. Allow 48 hours for curing of prime coat. Immediately prior to placement of the asphaltic surfacing material, the primed surface shall be completely cleaned of foreign material of any nature whatsoever by brooming or other satisfactory methods.
- B. Weight Tickets: The CONTRACTOR shall provide the ENGINEER with weight or volumetric tickets for each truck load of asphaltic material delivered, setting out the truck number, the

gross tare and net weights, the source, the date and the Street on which the material was used. These tickets are to be furnished to the ENGINEER not later than the day following delivery of the material.

- C. Placing: The asphaltic mixture shall be dumped and spread on the approved prepared surface with the specified spreading and finishing machine in such a manner that when properly compacted, the finished pavement will be smooth, of uniform density and will meet the requirements of the typical cross sections and the surface tests. During application of the asphaltic material, care shall be taken to prevent splattering of adjacent pavement, curb and gutter, and structures. Bucket lids shall be utilized on the end of asphaltic spray bars to prevent the asphalt prime coat from being sprayed on the new curb and gutter. When the asphaltic mixture is placed in a narrow strip along the edge or placed in small irregular areas where the use of a finishing machine is not practical, the finishing machine may be laminated when authorized by the ENGINEER, provided a satisfactory surface can be obtained by other methods.
- D. Compacting: As directed by the ENGINEER, the pavement shall be compressed thoroughly and uniformly with the specified rollers and/or other approved rollers. Rolling with the three wheel tandem rollers shall start longitudinally at the sides and proceed toward the center of the pavement, overlapping on successive trips by at least one-half the width of the rear wheel unless otherwise directed by the ENGINEER. Alternate trips of the roller shall be slightly different in length. Rolling with the pneumatic tire roller shall be done as directed by the ENGINEER. Rolling shall be continued until no further compression can be obtained and all roller marks are eliminated. One tandem roller and one pneumatic tire roller shall be provided for each job. The motion of the roller shall be slow enough at all times to avoid displacement of the mixture. If any displacement occurs, it shall be corrected at once by the use of rakes and of fresh mixtures where required. All rollers must be in good mechanical condition. Necessary precautions shall be taken to prevent dropping of gasoline, oil, grease or other foreign matter on the pavement while rollers are in operation or when standing.
- E. In Place Density: If considered necessary by the ENGINEER, in place density and thickness tests will be made by a commercial testing laboratory in the locations as may be selected at the entire expense of the CONTRACTOR. Should the tests indicate the in-place materials do not conform with the minimum thickness, density and stability, the asphaltic surfacing shall be removed to the extent directed by the ENGINEER and satisfactorily replaced by the CONTRACTOR at his entire expense. The hot mix density shall have a minimum of 91% of the Rice Theoretical.

-- END OF SECTION --

SECTION 32 02 01 - SEEDING

PART 1 GENERAL

1.1 GENERAL

This item includes permanent erosion control measures to be implemented after construction.

1.2 REFERENCE STANDARDS

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 INSTALLATION

After the work for the project, including all excavation, embankment, piping and fencing has been completed, the area within the new fencing shall be sprigged. Limits of sprigging shall be within one foot of the new fence and within one foot of the proposed water level in the ponds. Sprigging activities shall occur in March or April. If construction activities have been completed prior to seeding, the CONTRACTOR shall disc the area within the fence to the extent as necessary to prepare good seed bed and sow a cover crop of oats or wheat. Sowing of cover crop shall be such that approximately 1 1/2 bushels per acre is sown. Acceptable type grain drill shall be used for sowing of the cover crop.

Sprigging and seeding of the area shall be accomplished by discing or other approved equipment to a depth of at least 4 inches of the area as necessary to prepare a good seed bed.

If a cover crop has been planted prior to the seeding and sprigging operation, the cover crop shall be disc-ed and undercut as necessary to kill the vegetation then growing and getting the seed bed in condition. Seed bed shall be conditioned by plowing to a depth of at least 4 inches at least twice by disc or other approved equipment.

CONTRACTOR shall then sprig the site with good quality live sprigs of Coastal Bermuda at rate of 24 bushels per acre on the flat area and, at a rate of 48 bushels per acre on the slopes and in the bottom of the drainage channel.

Following the sprigging operation, the area shall be over-seeded with a mixture of three grass seeds of the following types and rates:

1. KR blue stem at the rate of 1.2 lbs./acre
2. Kline grass at the rate of 2 lbs./acre
3. Lehman's love grass at the rate of 2 lbs./acre

CONTRACTOR may substitute side oats gamma in place of the Lehman's love grass applied at a rate of 5 lbs./acre.

All seeding and sprigging operations shall be watered and maintained by the CONTRACTOR-entirely at his expense until a grass height of 2" has been achieved.

-- END OF SECTION --

This page intentionally left blank

SECTION 32 92 13 - HYDROMULCH SEEDING

PART 1 GENERAL

1.1 SCOPE

- A. Refer to the Drawings, Schedules, and Details for type and locations of work required herein. Furnish all labor, materials, equipment, and supervision for the installation of items included in these specifications. Such work includes, but is not limited to the following:
 - 1. Furnishing and applying hydromulch seeding including all materials and equipment required for the specified method of lawn installation.
 - 2. Site cleanup.
 - 3. Maintenance and guarantee.

1.2 APPLICABLE PUBLICATIONS

- A. The following publications of the latest issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by references thereto:
 - 1. Texas Department of Transportation 2004 Standard Specifications for construction of Highways, Street and Bridges (TxDOT).
 - 2. Item 162 - Sodding for Erosion Control
 - 3. Item 164 - Seeding for Erosion Control

1.3 SUBMITTALS

- A. Samples:
 - 1. The OWNER reserves the right to request samples of materials for conformity to specifications at any time. CONTRACTOR shall furnish samples upon request. Rejected materials shall be immediately removed from the site at CONTRACTOR's expense. Cost of replacement of materials not meeting the specifications shall be paid by CONTRACTOR.
 - 2. Typical requests from the owner may include copies of manufacturers' literature, certifications, or laboratory analytical data for the following items:
 - a. Fibre Mulch.
 - b. Tank Mix Fertilizer.
 - c. Top Dress Fertilizer.

1.4 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
 - 1. Perform Work in accordance with all applicable laws, codes, and regulations required by authorities having jurisdiction over such work and provide for all inspections and permits required by Federal, State, and local authorities in furnishing, transporting, and installing materials.

1.5 SCHEDULE

- A. Submit a proposed work schedule to the OWNER for approval at least fifteen (15) days prior to start of work under this Section. After approval, no modification shall be made to this schedule without written authorization by the OWNER.
- B. Submit written requests for inspections to the ENGINEER at least seven (7) days prior to anticipated inspection date.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Furnish standard products in manufacturer's standard containers bearing original labels showing quantity, analysis and name of manufacturer.
- B. Submit written requests for inspections to the ENGINEER at least seven (7) days prior to anticipated inspection date.

PART 2 PRODUCTS

2.1 SEED

- A. All seed used shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of Invitation for Bids. All seed shall be furnished in sealed standard containers unless exception is granted in writing by the Engineer. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. The minimum percentage by weight or pure live seed in each lot of seed shall be as follows and seed shall be planted at the rate per acre indicated under pure live seed required per acre.

<u>Kind of Seed</u>	<u>Minimum % Pure Live Seed Required</u>	<u>Pounds Pure Live Seed Required Per Acre</u>
Bermuda Grass	85	7
K.R. Bluestem	85	1
Bahiagrass (Pensacola)	85	9

Note: % Pure Live Seed = (% Purity) X (% Germination)

- B. Weed seed shall not exceed ten (10%) of weight of the total of pure live seed and other material in the mixture. Johnson grass, nut grass, or other noxious weed seed will not be allowed.

2.2 FERTILIZER FOR TANK MIX

- A. Shall be 13-13-13 grade, pelleted, uniform on composition, free-flowing, and suitable for application with approved equipment. The fertilizer shall be delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable state fertilizer laws, and bearing the name or trademark and warrant of the producer.

2.3 WOOD CELLULOSE FIBER MULCH

- A. Wood Cellulose fiber mulch, for use with the hydraulic application of grass seed and fertilizer, shall consist of specially prepared wood cellulose fiber. It shall be processed in such a manner that it will not contain germination or growth inhibiting factors. It shall be dyed a green color to allow visual metering of its application. The wood cellulose fibers shall have the property of becoming evenly dispersed and suspended when agitated in water. When sprayed uniformly on the surface of the soil, the fibers shall form a blotter-like groundcover which readily absorbs water and allows infiltration to the underlying soil. Weight specifications from suppliers for all applications shall refer only to air dry weight of the fiber, a standard equivalent to eighteen (18%) percent moisture. The mulch material shall be supplied in packages having a gross weight not in excess of 100 pounds and be marked by the manufacturer to show the dry weight content. Suppliers shall be prepared to certify that laboratory and field testing of their product has been accomplished and that meets all of the foregoing requirements.

2.4 WATER

- A. Water used for mixing or curing shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable matter or other substances injurious to the finished product.
- B. Water sources other than the local municipal domestic water supply must be approved by the OWNER.
1. If onsite reclaimed water sources are used, tanks and apprentices must be clearly marked with the words "non-potable" water.

2.5 SLURRY MIX COMPONENTS PER ACRE

- A. Wood Cellulose Fiber Mulch = 2,000 pounds.

- B. Grass Seed = (as specified)
- C. Fertilizer (13-13-13) = 800 pounds

2.6 TOP DRESS FERTILIZER

- A. (Delayed Application) Complete fertilizer, fifty (50%) percent of the nitrogen to be derived from natural organic sources or urea-form. Available phosphoric acid shall be from superphosphate, bond, or tankage. Potash shall be derived from muriate of potash containing sixty (60%) percent potash:
 - 1. 16% Nitrogen
 - 2. 6% Phosphoric Acid
 - 3. 8% Potash

PART 3 EXECUTION

3.1 HYDROMULCH SEEDING ON PREPARED FINISHED GRADE

- A. Bed Preparation: Immediately after the finished grade has been approved, begin hydroseeding operation to reduce excessive weed growth.
- B. Special Mulching Equipment and Procedures: Hydraulic equipment used for the application of fertilizer, seed, and slurry of prepared wood fiber mulch shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry containing up to forty (40) pounds of fiber plus a combined total of seventy (70) pounds of fertilizer solids for each one hundred (100) gallons of water. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of hydraulic spray nozzles which provide even distribution of the slurry on the slopes to be seeded. The slurry tank shall have a minimum capacity of eight hundred (800) gallons and shall be mounted on a traveling unit which may be either self-propelled or drawn with a separate unit which will place the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded so as to provide uniform distribution without waste. The ENGINEER may authorize equipment with smaller tank capacity provided that the equipment has the necessary agitation system and sufficient pump capacity to spray the slurry in a uniform coat.
- C. Mixing: Care shall be taken that the slurry preparation should be accomplished per the material supplier's recommendations and the equipment manufacturer's written operations manual. Spraying shall commence immediately when the slurry is mixed and the tank is full. The operator shall spray the area with a uniform, visible coat by using the green color of the wood pulp as a guide.
- D. Application:
 - 1. CONTRACTOR shall obtain approval of hydromulch area preparation from the ENGINEER prior to application.
 - 2. Operators of hydromulching equipment shall be thoroughly experienced in this type of application. Apply specified slurry mix in a motion to form a uniform mat at specified rate.
 - 3. Keep hydromulch within areas designated and keep from contact with other plant material.
 - 4. Slurry mixture which has not been applied within four (4) hours of mixing shall not be used and shall be removed from the site.
 - 5. After application, the CONTRACTOR shall not operate any equipment over the covered area.
 - 6. Immediately after application, thoroughly wash off any plant material, planting areas, or paved areas not intended to receive slurry mix. Keep all paved and planting areas clean during maintenance operations.
 - 7. Refer also to the maintenance portion of this section.
 - 8. All areas designed on drawings shall be covered uniformly with specified materials using hydromulching processes. If surfaces remain uncovered within the designated area, the CONTRACTOR shall seed with required grasses or ground cover materials those areas

missed by the hydromulch application. Method used to seed these missed surfaces shall be an alternate seeding operation approved by the ARCHITECT/ENGINEER/OWNER's Representative and shall be accomplished at no additional cost to the OWNER.

3.2 CLEAN UP

- A. Keep all areas of work clean, neat, and orderly at all times. Keep all paved areas clean during installation operations. Clean up and removal all deleterious materials and debris from the entire work area prior to Final Acceptance to the satisfaction of ENGINEER.

3.3 INSPECTIONS

- A. Make written request for inspection prior to seeding and after areas have been seeded.
- B. Submit requests for inspections to ENGINEER at least two (2) days prior to the anticipated inspection date.

3.4 MAINTENANCE BY THE CONTRACTOR

- A. The CONTRACTOR's Maintenance Period shall begin upon inspection and approval at Substantial Completion and shall be for the period of 60 days.
- B. The CONTRACTOR's maintenance of new planting shall consist of watering, weeding, repair of all erosion and reseeding and resodding as necessary to establish a uniform stand of the specified grasses. CONTRACTOR shall guarantee growth and coverage of hydromulch planting under this Contract to the effect that a minimum of ninety five (95%) percent of the area planted will be covered with specified planting after sixty (60) days with no bare spots greater than ten (10) square feet. Any sod panels that are dead or dying shall be replaced.
- C. The CONTRACTOR shall be responsible for one (1) mowing in the event that the time between seeding or sodding and Final Acceptance exceeds thirty (30) days.
- D. CONTRACTOR shall make a second application of specified hydromulch planting to bare areas not meeting specified coverage as determined by the ENGINEER. Such replanting to be performed within sixty (60) days of initial application and immediately upon notification by ENGINEER to replant.
- E. Apply top dress fertilizer (16-6-8) at the rate of ten (10) pounds per 1,000 square feet at no less than nor more than twenty five (25) days after seeding unless approved in writing by the OWNER.

3.5 FINAL ACCEPTANCE

- A. Work under this Section will be accepted by ENGINEER upon satisfactory completion of all work, but exclusive of re-application under the Guarantee Period. Final Acceptance of lawn establishment shall be as follows:
- B. For Seed: Ninety Five (95%) percent uniform coverage of grass in excess of one (1") inch height. No bare spots of greater than two (2) square feet will be accepted.
- C. The ENGINEER and/or OWNER shall interpret the above. Upon Final Acceptance, the OWNER will assume the responsibility for maintenance of the work.

END OF SECTION

SECTION 33 01 01 - GENERAL REQUIREMENTS FOR PIPING SYSTEMS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.
- MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.
- MSS SP-69 - Pipe Hangers and Supports - Selection and Application; 2012.
- NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

1.2 WORK INCLUDED

- A. All exposed, submerged and buried plant and station piping including modifications to existing systems as well as new pipe systems.
- B. Potable water and raw water mains, sanitary sewers, storm drains and culverts shown on Drawings.

1.3 RELATED WORK

- A. Section 31 03 01 TRENCHING, BACKFILLING AND COMPACTING
- B. Division 33 UTILITIES

1.4 QUALITY ASSURANCE

- A. All material may be rejected for failure to meet any of the requirements of this specification. Material rejected by the ENGINEER shall be removed from the site.
- B. Inspection: The quality of all materials, process or manufacture and the finished installation shall be subject to the inspection and approval of the ENGINEER.
- C. All surfaces and materials in contact with water, or in contact with a chemical being added to water that is being treated for potable use, shall conform to NSF/ANSI 61 and be certified by an organization accredited by ANSI, or shall meet the TCEQ requirements for contact with potable water.
- D. The use of pipes and pipe fittings that contain more than 8.0% lead or solders and flux that contain more than 0.2% lead is prohibited.

1.5 DESCRIPTION OF PIPING SYSTEMS

- A. The configuration and layout of yard, process, and station piping systems are shown on the Drawings.
- B. The type of pipe and joints, and embedment (if buried) to be used for each system are shown on the Drawings or included in the appropriate Specifications.
- C. In certain locations, pipe supports, anchors, and expansion joints have been indicated on the Drawings, but no attempt has been made to indicate every pipe support, anchor, and expansion joint. It shall be the CONTRACTOR's responsibility to provide a complete system of pipe supports, to provide expansion joints, and to provide restraints and anchor all piping, in accordance with the requirements set forth herein. Additional pipe supports may be required adjacent to expansion joints, couplings, or valves.
- D. Pipe and fittings shown on yard piping Drawings are general in nature. CONTRACTOR shall determine exact lengths and fittings required and make field adjustments necessary to complete piping and avoid conflicts. Changes to Plans and profiles of piping shall be submitted to ENGINEER for approval. Pipe and fittings not incorporated into the project shall remain the property of the CONTRACTOR. Costs will not be paid by the OWNER for materials not used in

the project, even if shown on the Drawings. Additions and deletions to the scope shall be incorporated by Change Order.

1.6 SUBMITTALS

- A. Shop Drawings and Product Data:
 - 1. Comply with the provisions of Section 01 04 01 and the supplemental requirements below.
 - 2. Submit detailed layout drawings for all piping systems. Those drawings may be organized by system or by areas. Prepare drawings to scale and show the following information on them:
 - a. Type of piping including material, weight, linings, and coatings. If desired, use code and key to product data sheet specified below.
 - b. Location and type of joints, fittings, taps, supports, restraint systems, kickers and blocking (as applicable).
 - 3. Submit fabrication drawings for specials including fabricated fittings, wall pipes and wall sleeves. Show dimensions and materials of construction.
 - 4. Submit manufacturer's standard drawings showing dimensions, configuration and materials of construction for the following items:
 - a. Joints.
 - b. Flanges.
 - c. Couplings.
 - d. Expansion joints.
 - e. Hangers, brackets and other similar accessories.
 - 5. Submit the following product data on all piping materials.
 - a. Reference standard.
 - b. Type material.
 - c. Wall thickness, schedule or class as appropriate.
 - d. Outside diameter.
 - e. Type and thickness of lining.
 - f. Type and thickness of coating.
 - g. Pressure rating, if applicable.
- B. Affidavits of Compliance:
 - 1. Submit manufacturer's affidavits of compliance with the reference standards.
- C. CONTRACTOR shall mark actual flowline or top of pipe elevations and actual coordinates on record drawings when pipelines are being installed.

1.7 DELIVERY, STORAGE AND HANDLING

- A. General: Comply with manufacturer's instructions.
- B. Delivery and Handling:
 - 1. Do not deliver piping materials to project site prior to ENGINEER's approval of required submittals.
 - 2. Unload and handle piping materials using proper materials handling equipment.
 - 3. Do not drop, roll, skid piping materials.
 - 4. Take such additional precautions as necessary to avoid damaging piping materials and coatings thereon.
- C. Storage:
 - 1. Store piping materials in a manner which will reduce risk of damage.
 - 2. Block piping materials to prevent rolling.
 - 3. Protect materials from weather and sun as recommended by the manufacturer.

PART 2 PRODUCTS

2.1 GENERAL

- A. See other Sections in Division 33 for piping materials specifications.
- B. No asbestos materials shall be used in any piping materials, linings, and gaskets for this project.

- C. PVC piping shall not be used beneath structures except for chlorine gas and chemical service. Where PVC pressure pipe is called out for a system, furnish continuous copper tubing for less than 4-inch diameter and DIP for 4 inches and larger sizes. Transition 3 feet outside slabs and 1-foot above slabs unless otherwise shown. All piping beneath slabs and to 2 feet outside of slab shall be concrete encased.
- D. Gravity drain systems beneath slabs shall be ductile iron except for chemical drains, unless shown specifically on the Plans. Encase all piping beneath slabs.
- E. All buried potable water piping installed in this project shall have metal detectable tape indicating "Potable Water Line" installed 12 inches above the pipe.
- F. Install cleanouts on sludge piping so that all runs between bends may be accessed and at intervals not exceeding 250 feet on straight runs. Refer to Standard details.
- G. All bolts and fasteners on buried fittings and valves and fittings and valves in manholes shall be 304 stainless steel. Buried MJ fitting bolts may be Corten. Bolts and fasteners on submerged fittings and valves shall be 316 SS.
- H. For buried pipes, provide a flexible joint (Dresser coupling or push on or mechanical joint) within 10 feet from a structure connection to allow differential movement. Provide proper restraint on pressure systems.
- I. Provide taps and connections for flushing, testing, and disinfecting pipeline systems.
- J. Provide taps or weld-u-lets with stainless steel ball valves and piping at all high points in the piping systems for addition of air valves.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Install all piping systems in accordance with the Drawings, Technical Specifications, approved shop drawings and manufacturer's installation instructions at CONTRACTOR's expense.
- B. Examine all piping materials prior to installation and replace items that are damaged or otherwise defective.
- C. Thoroughly clean inside of all piping, valves, and accessories, and outside of all materials which will be exposed. Clean before installation and maintain in that condition until accepted by OWNER.
- D. Provide secure temporary caps or inflatable plugs at all pipe ends at the end of each day to prevent foreign material from entering the piping systems. Brace pipe to restrain from floating.
- E. Do not modify structures, equipment, or piping for the purpose of installing piping unless specifically authorized by the ENGINEER.
- F. All piping systems shall be cleaned and tested prior to making connections at structures and to existing pipe systems. Small diameter pipes shall be flushed and large diameter pipes shall have mandrels pulled or other acceptable verification furnished that pipes are clean and no construction debris remains. Temporary blocking and forms used to grout inverts and blockouts shall be removed and manholes and pipes shall be tested before payment will be approved for the last 10 percent of the respective pipe pay estimate items.
- G. CONTRACTOR shall be responsible for, development, and comply with the trench safety plan and a confined space entry plan.
- H. Where indicated on the Plans, the CONTRACTOR shall furnish and install Polyvinyl Chloride (PVC) plastic water stops, Sealtight, Duo-PVC water stops as manufactured by W.R. Meadows, Inc., Electrovert, Inc., or approved equal. The water stops shall meet the requirements of COE CRD-C 572 for PVC water stops. The water stops shall be 9" or 6" width as shown on the Plans and shall have a minimum web thickness of 3/8". The PVC water stops shall be of the "U" bulb design or center circle design, having a minimum inside diameter 3/4.

3.2 INSTALLATION OF BURIED PIPING SYSTEMS

- A. Line and Grade:
 - 1. Install piping to lines and grades shown on Drawings or as stated.
 - 2. Temporary support, adequate protection and maintenance of all underground utilities such as gas service, poles, guy wires, drains, sewer or any other underground utility shall be furnished by the CONTRACTOR at his own expense whether or not such services are shown on the Plans.
 - 3. Slope piping uniformly between flowline elevations shown.
 - 4. If centerline and flowline elevations are not shown on Drawings, install piping so that there is at least 30 inches of cover over same, except under ditches where the minimum cover is to be 24 inches. Piping less than 4-inch diameter may be installed with 3 feet of cover.
 - 5. Comply with requirements for minimum and maximum trench widths shown in the Plans. If maximum trench width is exceeded, use next higher class of embedment at no additional cost.
 - 6. Refer to special detail for installation of chemical and small diameter PVC piping.
 - 7. Service lines shall have a minimum cover of 24-inches.
 - 8. The top of the water line must be located below the frost line and in no case shall the top of the water line be less than 24 inches below the ground surface.
- B. Dewatering:
 - 1. Keep trenches free of water when performing any type of work in them.
 - 2. Discharge groundwater from construction pumps as directed by OWNER.
- C. Bedding:
 - 1. Install bedding as shown on Drawings. Shape bedding to allow for coupling and bells and to provide support over full length of pipe section. Place embedment under haunches and on sides of pipe and compact in lifts and in a manner which does not disturb pipe from line and grade.
 - 2. If bedding is not called for on Drawings or Specifications, piping less than 4-inch diameter shall be installed and encased in sand or granular material. Use embedment type shown in the standard details for larger pipes.
 - 3. Provide concrete encasement for all pipe under structures and to 2' beyond structure and as shown on Drawings.
 - 4. Provide concrete cradle (Class V) Embedment to first pipe joint at all connections to structures unless otherwise shown.
- D. Laying of Pipe:
 - 1. Do not drop or roll pipe into trench. Inspect thoroughly prior to laying and then place carefully by hand or materials handling equipment.
 - 2. Do not lay pipe in water.
 - 3. Lay bell and spigot type piping with bell end facing direction of laying which is normally upgrade.
 - 4. Joint pipe as specified in piping material specifications.
 - 5. Do not deflect pipe unless shown on Drawings or approved by ENGINEER.
 - 6. When deflection of pipe is authorized, do not exceed the manufacturer's recommended maximum deflection.
 - 7. Shoring or other trench safety systems utilized shall be of thin cross-section such that when the sections are pulled, the embedment is not disturbed or displaced.
- E. Encasement of Piping and Valves:
 - 1. Provide polyethylene encasement for steel, RCCP, cast iron and ductile iron piping and valves.
 - 2. Comply with Section 31 03 01, TRENCHING, BACKFILLING AND COMPACTING, for embedment of PVC pipe.
 - 3. Embedment shall extend at least eight inches above pipe and four inches below Pipe.

4. Use Class C concrete or flowable fill when concrete encasement is called for on Drawings. Such encasement to extend a distance of Pipe OD/6 with a minimum of six inches from pipe in all directions unless otherwise noted on Drawings.
- F. Concrete Blocking:
 1. Concrete thrust blocking shall be used for all buried piping two inches in diameter and larger that is under pressure.
 2. Provide thrust and restraint blocks at all bends, tees, wyes, hydrants, valves, and plugs.
 3. Use Class B concrete or thoroughly mixed sacrete if approved by ENGINEER.
 4. Place concrete against undisturbed firm earth.
 5. Area of concrete in contact with earth to be as required to prevent pipe movement at specified field test pressure or working pressure plus surge allowance.
 6. Provide thrust blocking on back side of tees on pressure lines without adequate length to restrain joints.
 7. No blocking shall be covered up until it has been inspected and approved by the OWNER's representative or resident inspector. If covered prior to inspection, the CONTRACTOR shall uncover the blocking for inspection at his expense.
- G. Restrained Joints:
 1. Use restrained joint piping and fittings for all mechanical joint fittings and valves under pressure. Joint restraint shall be provided for test pressures shown on the Plans and Specified for each piping system with a safety factor of 1.5 minimum, except for the following: The potable water, service water, and high service pump discharge pipes restraint design shall account for surge pressure based on 6 fps velocity in addition to working pressure shown on the Plans and safety factor of 1.5.
 2. Joint Restraints shall be Megalug Joint Restraints as manufactured by EBAA Iron, or approved equal.
- H. Backfilling:
 1. Comply with Section 31 03 01, TRENCHING, BACKFILLING AND COMPACTING, and the following supplemental requirements.
 2. Backfill as soon as practicable after installation of piping, valves, encasement, restraint and blocking.
 3. Touch up damaged protective coatings prior to backfilling.
 4. Exercise care to avoid damaging piping or protective coatings with tamping equipment.
 5. When authorized by the ENGINEER, sheeting and bracing may be left in trench. Cut off all members so that tops of same are at least 18 inches below ground. Sheeting and bracing left in place shall be indicated on Record Drawings.
- I. Connections to New Manholes:
 1. Couplings for pipe connections shall be cast into the manhole walls. PVC sleeves with rubber gaskets and abrasive silica outer coating may also be utilized.
 2. All clamps shall be 316 stainless steel.
 3. Support manhole connection to first pipe joint with concrete cradle.
- J. Making Field Connections to Manholes (when approved by ENGINEER):
 1. Cut neat opening in manhole no larger than necessary to insert pipe.
 2. Utilize PVC sleeves with rubber gaskets and abrasive silica outer coating. After installing new lines, place concrete collar around pipe on outside of manhole to seal joint. Make collar approximately 8 inches wide by 8 inches deep. Use Class B concrete.
 3. Modify invert channel in manhole to provide smooth transition into or out of new pipe. Use Class B concrete.
- K. Valves:
 1. Provide restrained joints on buried valves. Flanges may be utilized for valves 12 inches and larger when approved by the ENGINEER.
- L. Testing:
 1. Comply with Section 33 01 02, FIELD TESTING OF PIPING SYSTEMS, and pipe Specifications and Drawings.

3.3 INSTALLATION OF EXPOSED PIPING SYSTEMS

- A. Alignment and Elevation:
 - 1. Install straight runs true to line and elevation.
 - 2. Install vertical pipe truly plumb in all directions.
 - 3. Install piping parallel or perpendicular to building walls. Piping at odd angles and 45 degree runs across corners will not be accepted unless specifically shown on Drawings.
 - 4. Install small diameter piping generally as shown on Drawings when specific locations and elevations are not indicated. Locate such piping as required to avoid ducts, equipment, beams, etc.
 - 5. Install piping so that pipe, flanges, valves, and associated appurtenances are at least eight feet above finish floors, stairs, and landings unless lesser clearances are specifically dimensioned on the Drawings.
 - 6. Bring piping to alignment and elevation without forcing or springing pipe.
 - 7. For PVC or CPVC or ABS piping runs of 10 feet or longer, provide supports that accommodate expansion and contraction without bending the pipe out of alignment.
- B. Joints:
 - 1. Joint pipe in accordance with piping material specifications and the supplemental requirements below.
 - 2. Wire brush flange faces and threads before jointing.
 - 3. Bring piping to proper alignment and elevation with permanent support system before tightening flange bolts and nuts.
- C. Unions for Threaded Piping:
 - 1. Install unions near threaded valves and equipment to facilitate assembly and disassembly of piping, in addition to the specific locations shown on Plans.
 - 2. Install dielectric unions wherever dissimilar metals are joined.
- D. Expansion Joints:
 - 1. Install in accordance with Drawings, Specifications for expansion joints and approved shop drawings.
 - 2. Use of additional couplings and adaptors to be approved by ENGINEER prior to installation.
 - 3. All expansion joints shall be restrained.
- E. Flexible Couplings and Flanged Coupling Adaptors:
 - 1. Install in accordance with Drawings, Specifications for couplings and adaptors, and approved shop drawings.
 - 2. CONTRACTOR may use couplings and adaptors over and above those shown on Drawings to facilitate installation of piping. Use of additional couplings and adaptors to be approved by ENGINEER prior to installation.
 - 3. All flexible couplings and flanged coupling adapters shall be restrained.
- F. Piping Supports and Restraints:
 - 1. General:
 - a. Restrain, block, brace, support, or suspend pipe and fittings to prevent displacement, vibration, sagging, warping, deformation, or failure of piping and fittings, and to allow for expansion and contraction.
 - b. Support and restrain piping so that no piping loads from weight or thrust will be imparted to pumps or other equipment.
 - c. Materials: Unless otherwise specified, all pipe supports shall comply with MSS SP-58 and MSS SP-69. Materials of construction for fabricated steel supports are covered in the structural steel section. All pipe support materials shall be packaged as necessary to ensure delivery in satisfactory condition.
 - d. Unless otherwise specified or indicated on the Drawings, pipe supports shall be fabricated of manufacturer's standard materials and provided with manufacturer's standard finish.

- e. Except as specified herein, the use of supports which rely on stressed thermoplastic components to support the pipe will not be acceptable. PVC pipe 4 inches and smaller, interior locations and exterior chemical storage area locations, shall be supported by pultruded vinylester channel and components as specified below:
 - 1) Material: Vinylester Fiberglass, Class 1 Fire Rated per ASTM E84, Premium Grade, pultruded channel as manufactured by Entrum Industries, Strut Tech Series 200 or equal. Support system shall be as specified herein and as recommended by the manufacturer.
 - 2) Adjustable strap type pipe clamps are not acceptable. Any metal components, if required, for this type support system shall be Type 316 stainless steel.
 - f. Contact between dissimilar metals, including contact between stainless steel and carbon steel, shall be prevented. Supports for brass or copper pipe or tubing shall be copper plated. Those portions of pipe supports which contact other dissimilar metals shall be rubber or vinyl coated.
 - g. All pipe supports, fasteners, anchors and hardware in wetwells, manholes, vaults, pipe trenches and submerged locations shall be AISI Type 316 stainless steel. Stainless steel supports fabricated by welding shall be AISI Type 316L material.
- G. Supports for Horizontal Piping and Spacing of Expansion Joints:
- 1. Location: Unless closer spacing is indicated on the Drawings, the maximum spacing for pipe supports and expansion joints shall be:

<u>Type of Pipe</u>	Pipe Support Max Spacing, Feet	Max Run Without Expansion Joint, Loop, or Bend (Note a), Feet	Expansion Joint Max Spacing (Note b), Feet
Cast Iron	15	80	80
Cast Iron, glass-lined	12	80	80
<u>Steel for hot water heating</u>			
1-1/4 inch and smaller	7	30	100
1-1/2 inch to 4 inch	10	30	100
Over 4 inch	15	30	100
<u>Steel for other services</u>			
1-1/4 inch and smaller	7	30	100
1-1/2 inch to 4 inch	10	30	100
Over 4 inch	15	80	80
<u>Stainless Steel</u>			
1-1/4 inch and smaller	7	30	100
1-1/2 inch to 4 inch	10	30	100
Over 4 inch	15	80	80
<u>Copper for hot water</u>			

1 inch and smaller	5	20	100
Over 1 inch	7	20	100
<u>Copper for other services</u>			
1 inch and smaller	5	--	--
Over 1 inch	7	50	100
<u>CPVC, PVC, and ABS Schedule 80</u>			
1/8 inch and 1/4 inch	continuous support	20	60
1/2 inch	3-1/2	20	60
3/4 inch	4	20	60
1 inch and 1-1/4 inch	4-1/2	20	60
1-1/2 inch and 2 inch	5	20	60
2-1/2 inch	5-1/2	20	60
3 inch	6-1/2	20	60
4 inch	7	20	60
6 inch	8	20	60
8 inch	9	20	60
10 inch	9-1/2	20	60
12 inch	10	20	60
<u>Polypropylene</u>	6	--	--
<u>Cast Iron Soil</u>	10	--	--
<u>PVC, Schedule 40</u>			
1/2 inch	3-1/2	20	60
3/4 inch and 1 inch	4	20	60
1-1/4 inch and 1-1/2 inch	4-1/2	20	60
2 inch	5	20	60
2-1/2 inch	5-1/2	20	60
3 inch	6	20	60
4 inch	6-1/2	20	60
6 inch	7-1/2	20	60
8 inch	8	20	60
10 inch	8-1/2	20	60
12 inch	9-1/2	20	60

NOTES:

- a. Unless otherwise permitted, an expansion joint shall be provided in each straight run of pipe having an overall length between loops or bends exceeding the maximum run specified herein.
- b. Unless otherwise permitted, the spacing between expansion joints in any straight pipe run shall not exceed the maximum spacing specified herein.
- c. Expansion joint fittings shall be as specified in the pipe joint and expansion joints section.
- d. Correction factors shall be applied to the above table as recommended by the manufacturer to adjust for fluid specific gravities other than 1.0.
- e. Maximum allowable spacing for PVC pipe shall be reduced when required by manufacturer's recommendations for maximum fluid temperatures.
2. Locate hangers or supports immediately adjacent to or at any change in piping direction, on both sides of valves, couplings, and heavy fittings, and on either end of pipe sections being removed unless specifically noted otherwise on Drawings.
3. Install all hangers and supports so as not to interfere with the free expansion and contraction of the pipe.
4. When hangers are used to support insulated piping, provide shields to protect insulation.
5. Provide concrete supports as shown on Drawings, or when required to comply with these Specifications. Construct in accordance with concrete Specifications and details shown on Drawings.
6. Rubber hose and flexible tubing shall be provided with continuous angle or channel support, except at injector and chemical feed pump locations.
7. Unless otherwise indicated on the drawings or permitted by the ENGINEER, piping shall be supported approximately 1-1/2 inches out from the face of walls and at least 3 inches below ceilings.
8. Concrete inserts or L-shaped anchor bolts shall be used to support piping from new cast-in-place concrete. Capsule anchors shall be used to fasten supports to existing concrete and masonry. Design loads for inserts, brackets, clamps, and other support items shall not exceed the manufacturer's recommended loads.
9. Pipe supports shall be manufactured for the size and type of pipe to which they are applied. Strap hangers will not be acceptable. Threaded rods shall have sufficient threading to permit the maximum adjustment available in the support item.
10. Anchorage shall be provided to resist thrust due to temperature changes, changes in diameter or direction, or dead ending. Anchors shall be located as required to force expansion and contraction movement to occur at expansion joints, loops, or elbows, and as required to prevent excessive bending stresses and opening of mechanical couplings. Anchorage for temperature changes shall be centered between elbows and mechanical joints used as expansion joints. Anchorage for bellows type expansion joints may be located adjacent to the joint.
11. Pipe guides shall be provided adjacent to bellows type expansion joints. Guides will not be required when mechanical couplings are permitted as expansion joints. Guides shall be placed on both sides of expansion joints except where anchors are adjacent to the joint. Unless otherwise indicated on the Drawings, one guide shall be within four pipe diameters from the joint and a second guide within 14 pipe diameters from the first guide. Pipe supports shall allow adequate movement; pipe guides shall not be used for support. Pipe guides shall be installed as recommended by the manufacturer.
- H. Drain Valves and Air Bleed Valves:
 1. Provide drain petcocks 1/4-inch diameter opening at all low points in air piping.
 2. Provide air bleed valves 1/8-inch diameter opening at all high points in force mains unless specifically indicated otherwise.
- I. Supports for Vertical Piping:
 1. Support in accordance with Drawings and approved shop drawings.
 2. For piping 4 inches and smaller, install riser clamps so as to support piping at each floor sleeve.

3. Use at least 3/4-inch of nonshrink grout in setting base elbows and tees. See Section 03 05 01, GROUT, for nonshrink grout requirements.
 4. For piping larger than 4 inches, locate supports at change of direction, at both sides of valves and couplings, and at maximum spacing of 10 feet.
- J. Piping Restraints:
1. Provide kickers and mechanical restraint system as shown on Drawings and required herein.
 2. Use at least 3/4-inch of nonshrink grout between kickers and walls or floors and between piping supports and floors or walls unless otherwise shown on Drawings. See Section 03 05 01, GROUT, for nonshrink grout requirements.
- K. Supports for Valves:
1. Provide supports for valves 16 inches and larger. Use the type of support shown on Drawings. If type is not shown, use concrete cradle type. CONTRACTOR may utilize an alternate type if acceptable to the ENGINEER.
 2. Install floor stands as shown on Drawings and as recommended by the manufacturer.
 3. Provide lateral restraints for extension bonnets and extension stems as shown on Drawings and as recommended by the manufacturer.
 4. Provide sleeves where operating stems pass through floor.
 5. Place approved asphalt fill in recessed areas as shown on Drawings where flush bottom sluice gates or special valve installations are indicated. Size recessed areas as recommended by valve or gate manufacturer. Compact fill after placement.
 6. Install valve boxes so that they will not transmit shock or stress to valve and will be centered and plumb over the operating nuts.
- L. Wall Fittings:
1. Wall fittings shall be as shown on the Plans and the standard detail sheets.
 2. Wall fittings shall match the wall thickness, pipeline diameters, and connection types specified for the applicable pipeline designation.
- M. Field Painting: Comply with Section listed.
1. Buried Piping: Ductile iron, cast iron and steel coatings per Sections 33 01 03, DUCTILE IRON PIPE, and 33 01 04, STEEL PIPE AND FITTINGS, as applicable.
 2. Exposed Piping: Paint all exposed piping, supports, fittings and valves except stainless steel and fiberglass in accordance with Section 09 03 01, COATINGS & PAINTING FOR WATER TREATMENT PLANTS.
- N. Pipe Testing.
- Comply with Section 33 01 02, FIELD TESTING OF PIPING SYSTEMS, and pipe Specifications.
- O. Insulation and Heat Trace
- Insulate all exposed pipes 8-inch and smaller and where specifically called for on the plans.

-- END OF SECTION --

SECTION 33 01 02 - FIELD TESTING OF PIPING SYSTEMS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Provide all necessary labor, materials and equipment, including test pumps and gauges, as well as temporary valves and piping to perform the testing operations of piping systems as specified herein.
- B. If demonstrated workmanship on one or more tests show that lines are sufficiently watertight, the ENGINEER may waive remaining testing on any given type or section of line.
- C. CONTRACTOR's Responsibility:
 - 1. Take such precautions as required to prevent damage to lines and appurtenances being tested.
 - 2. Repair any damage resulting from tests.
 - 3. Repair and retest all items which do not pass the tests as specified herein.
 - 4. Conduct all tests in the presence of the Resident Inspector, and to the satisfaction of the ENGINEER and all State and local authorities having jurisdiction.
 - 5. All necessary pumps, water, pipe connections, meters, gauges, and any necessary apparatus to perform and conduct the tests shall be furnished by the CONTRACTOR. CONTRACTOR shall furnish all necessary equipment and make all tests at CONTRACTOR's expense without separate measurement and payment, but said expense shall be subsidiary to installation of pipe.
- D. Test pressures are shown on the Plans. If not shown, refer to schedule at end of this section.
- E. Water used for testing shall be potable water only, unless approved by OWNER.

1.2 REFERENCE STANDARDS

AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings; 2013.

AWWA M23 - PVC Pipe - Design and Installation; 2002.

1.3 SUBMITTALS

- A. Submit information and data describing proposed testing methods, procedures, pressures, time periods, schedule, and apparatus for ENGINEER's record, prior to testing.
- B. Conform to any other applicable requirements of Section 01 04 01, SUBMITTALS.
- C. Submit a certified test report for each test to ENGINEER certifying the date tests were performed, names of the people in attendance, brand name of the pipe and pressure rating, the location of the joint or section tested, the test pressures at the start and end of each test, duration of the test, leakage and pertinent observations and comments.

1.4 GENERAL SEQUENCE OF WORK

- A. Obtain the OWNER's approval of proposed testing methods, procedures, and apparatus, before performing any test.
- B. Upon receipt of the OWNER's approval, submit a schedule of testing dates and times at least 24 hours in advance of testing.
- C. Perform tests as specified herein.

1.5 DEFINITIONS

- A. "Gravity lines" shall refer to CCFRP, PVC, clay pipe, reinforced concrete (non-cylinder type) pipe, and other such pipes designed to normally operate in a partially full condition.
- B. "Pressure lines" shall refer to all pipes indicated as such in the plans and in general to ductile iron, PVC, RCCP, steel, and other such pipes designed to operate in a full condition, with the system's energy grade line more than 20 feet above the top of the pipe during normal operating conditions.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

Test equipment shall be selected, obtained, and maintained by the CONTRACTOR. All gauges shall be calibrated prior to beginning testing and as often as is necessary to provide accurate, reliable information.

PART 3 EXECUTION

3.1 TESTING OF DRAINS, SEWERS, AND OTHER GRAVITY LINES

A. General:

1. For all pipe, the method of testing shall be an exfiltration test using either a hydrostatic test or a pneumatic test. For any flexible, non-metallic or nonconcrete pipe, such as plastic (PVC, HDPE, PE, etc.) or fiber reinforced plastic pipe or similar flexible pipe materials, a deflection test shall be performed in addition to an exfiltration test.
2. Do not perform any test until backfill has been completed to proposed final grade.
3. Make first test promptly after first joint or section of line is laid and backfilled (as applicable). A section of pipe will normally be a run between two manholes, or between structures.
4. Do not lay additional piping of the type being tested until test of first section is complete.
5. Settlement in backfill during exfiltration tests will be taken as an indication of leakage.

B. Hydrostatic Exfiltration Test Procedure:

1. Seal ends of section being tested with watertight plugs.
2. Fill section with water 24 hours prior to start of test.
3. Vent line during filling so that no air is trapped in line.
4. Leave outlets of stacks, inlets, and service lines exposed and unplugged until after exfiltration test has been made.
5. Outlets terminating below level of test water surface to be temporarily extended upward by installing lengths of pipe.
6. Measure leakage or exfiltration during test period by adding measured quantities of water to maintain water level in test structure.
7. Quantity of water added to maintain water level is amount of leakage or exfiltration.
8. Test for at least two hours with minimum head of four feet measured above top crown, inside pipe at upper end of run being tested.
9. Storm sewer leads to be tested with water level at gutter grade.
10. After completion of satisfactory test, remove lengths of pipe added for test.
11. Allowable Leakage: Allowable leakage for exfiltration test in any individual section or entire sewer line under construction shall not exceed 10 gallons per inch of inside diameter per mile of pipe per 24 hours.

C. Pneumatic Test Method (Air Test):

1. Air tests shall be made by the pressure drop versus time method, in accordance with UNI-B-6.
2. Equipment: The equipment used shall meet the following minimum requirements:
 - a. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.
 - b. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
 - c. All air used shall pass through a single control panel.
 - d. Three individual hoses shall be used for the following connections:
 - 1) From the control panel to pneumatic plugs for inflation.
 - 2) From the control panel to a sealed line for introducing the low pressure air.
 - 3) From a sealed line to control panel for continually monitoring the air pressure rise in the sealed line.
 - e. Air compressor of adequate capacity for charging the system.

3. Procedures: All pneumatic plugs shall be seal-tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.
After a manhole-to-manhole reach of pipe has been backfilled and the pneumatic plugs have been checked by the above-mentioned procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig. Allow at least two minutes for the air temperature to stabilize, adding only the amount of air required to maintain pressure. If the pipe to be tested is submerged in ground water, insert a pipe probe by boring or jetting into the backfill material adjacent to the center of the pipe, and determine the pressure in the probe when air passes slowly through it. This is back pressure due to ground water submergence over the end of the probe. All gauge pressure in the test should be increased by this amount. After the stabilization period (3.5 psig of minimum pressure in the pipe), start stopwatch. Determine time in seconds that is required for the internal air pressure for each 2.5 psig.
4. Allowable Leakage: For sections of pipe less than 36-inch average inside diameter, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be computed from the following equation:

$$T = 0.0850 (D) (K) / (Q)$$

Where,

T= shortest time for pressure to drop 1.0 pound per square inch gauge in seconds

K= $0.000419(D)(L)$, but not less than 1.0

D= average inside diameter in inches

L= length of line in feet of same pipe size being tested

Q= rate of loss, 0.0015 cubic feet per minute per square foot internal surface shall be used

Since a K value of less than 1.0 shall not be used, there are minimum testing times for each pipe diameter as follows:

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	99	17.309 (L)
30	1700	80	21.369 (L)
33	1870	72	25.856 (L)

D. Low Pressure Air Joint Test:

1. Pipe joints shall be tested in accordance with this Section.
2. Equipment shall be the product of manufacturers having more than 5 years regular production of successful joint testers. Joint tester shall be as Manufactured by Chane Industrial, Inc., of Edina, Minnesota, or approved equal.

3. Testing shall be performed on all joints after backfill has been installed and properly compacted. As installation progresses, at no time shall pipe installation exceed 100 feet beyond the last joint tested.
 4. Joints failing to meet the requirements of this test should be repaired to the satisfaction of the ENGINEER or the defective pipe shall be replaced. Rejected pipe shall be removed from the project. Installation shall be stopped until defective joints are repaired or replaced.
 5. Follow equipment manufacture's recommendations when performing tests; only experienced technicians shall perform tests.
 6. The testing equipment shall be assembled and positioned over the center of the pipe joint and the end element tubes inflated to a maximum of 25 psi.
 7. Pressurize the center joint test area to 4.0 psig and allow the temperature and pressure to stabilize at the minimum of 2.5 psig for a period of 2.0 minutes prior to testing.
 8. To test, adjust the pressure to 4.0 psig and measure the time required to decrease the pressure from 4.0 psig to 2.0 psig.
 9. The joint is acceptable if the time for the pressure to drop from 4.0 psig to 2.0 psig is greater than 15 seconds.
- E. Deflection Test
1. For all flexible and/or semi-rigid non-metallic, non-concrete pipe such as PVC, HDPE, FRP, etc., a deflection test shall be performed in addition to any other required leakage tests.
 2. Two deflection tests using a mandrel will be required for each pipe segment after installation. The first deflection test shall be performed after the pipe has been completely installed and backfilled where a mandrel shall be pulled through the entire line segment to determine whether the maximum allowable percent of deflection has been exceeded. The first deflection test shall be performed a maximum of 800 feet behind pipe laying operations. A second test shall be performed following installation of the entire time but a minimum of two (2) months after installation and backfill for any section by pulling a mandrel through the entire line to determine whether the maximum allowable deflection percent has been exceeded.
 3. The diameter of the mandrel shall be the maximum allowable percent deflection specified less than the inside diameter of the sewer line. The maximum allowable percent deflection shall be based on the nominal diameter. All mandrels and measurements shall be based on the nominal diameter (e.g., 42-inch nominal pipe diameter with a maximum 5 percent deflection requirement will have a maximum allowable 5 percent deflection of 2.1 inches ($0.05 \times 42 = 2.1$); a mandrel outside diameter (minimum) of 39.9 inches ($42 - 2.1 = 39.9$); and a minimum deflection measurement of 39.90 inches).
 4. In cases where the mandrel may hang due to excess deflection, the pipe shall be uncovered at this point and the conditions shall be corrected. Correction may be by reworking of the embedment and backfill, or by replacing that section of the pipe. This portion of the pipe shall again be backfilled, and the mandrel pulled through again, and this process repeated until the pipe is clear of all obstructions. The test shall be performed without mechanical pulling devices.

3.2 TESTING OF PRESSURE LINES

- A. General:
1. Allow concrete blocking to cure for at least 7 days before testing.
 2. Backfill and compact soil behind all blocking.
 3. Backfill over pipe to extent necessary to restrain the piping. Backfill shall extend to within 1-foot of proposed final grade.
 4. Conduct water leakage test after completing hydrostatic pressure tests.
 5. Lines which fail to hold the specified test pressure for at least four hours or which exceed an allowable leakage rate specified below, shall be repaired to the satisfaction of the ENGINEER and retested at the CONTRACTOR's expense.

B. Procedures for Leakage and Hydrostatic Pressure Tests:

1. Slowly fill isolated section of line with water.
2. Insure that all air has been expelled through air and vacuum release valves, taps, or connections shown on Plans for permanent piping, valves, or accessories. Do not make additional taps solely for air expulsion purposes unless approved by ENGINEER. No additional compensation will be made for additional taps.
3. Apply test pressure at 1.5 times the working pressure or rated pressure of the pipe, whichever is greater. Duration of test shall be four hours.
4. Allow concrete pipe to stand full of water at least 12 hours before starting leakage test.
5. For HDPE pipe the test procedure consists of initial expansion, and test phases. During the initial expansion phase, the test section is pressurized to the test pressure, and sufficient make-up water is added each hour for three (3) hours to return to test pressure. After the initial expansion phase is complete then the four (4) hour test phase can begin.
6. At the end of the four-hour test, the entire route of the pipeline shall be inspected to locate any leaks or breaks. Any defective joints, cracked or defective pipe, fittings, or valves discovered in consequence of this pressure test shall be removed and replaced with sound material in the manner provided and the test shall be repeated until satisfactory results are obtained. Any and all noticeable leaks shall be repaired regardless of whether the actual leakage is within the allowable. The pipe shall be tested again for a period of four hours.
7. All pipe shall be tested for leakage by a hydrostatic pressure test. Lines shall be filled slowly, with a maximum velocity of 1-foot per second, while venting all air. If permanent air vents have not been installed, the CONTRACTOR shall install corporation cocks at all high points to expel air during initial filling and testing of the lines.
Leakage is defined as the net quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, necessary to return to the initial pressure of the specified leakage test pressure after the pipe has been filled with water and the air in the pipeline has been expelled. No pipe installation shall be accepted if the leakage is greater than that determined by the following formula:

$$L = (SD(P)^{1/2}) / 148,000 \text{ (See AWWA M23 Equation No. 5)}$$

Where,

L = allowable leakage in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, inches

P = average test pressure during the leakage test, in pounds per square inch

The above equation is based on a leakage rate of 10.5 gallons per day per mile per inch of nominal diameter of pipe. Leakage values determined by the above formula for 1000 feet of pipe are presented in the table below. These values are similar to those presented in AWWA C605 and DIPRA (DIPRA, 2003).

ALLOWABLE LEAKAGE (gal/hr) FOR 1000 FT OF GASKETED PVC OR DIP PIPE							
Nominal Pipe Size (in)	Average Test Pressure in Pipeline, psi						
	50	75	100	125	150	175	200
2	0.10	0.12	0.14	0.15	0.17	0.18	0.19
3	0.14	0.18	0.20	0.23	0.25	0.27	0.29
4	0.19	0.23	0.27	0.30	0.33	0.36	0.38
6	0.29	0.35	0.41	0.45	0.50	0.54	0.57
8	0.38	0.47	0.54	0.60	0.66	0.72	0.76

10	0.48	0.59	0.68	0.76	0.83	0.89	0.96
12	0.57	0.70	0.81	0.91	0.99	1.07	1.15
14	0.67	0.82	0.95	1.06	1.16	1.25	1.34
16	0.76	0.94	1.08	1.21	1.32	1.43	1.53
18	0.86	1.05	1.22	1.36	1.49	1.61	1.72
20	0.96	1.17	1.35	1.51	1.66	1.79	1.91
24	1.15	1.40	1.62	1.81	1.99	2.15	2.29
30	1.43	1.76	2.03	2.27	2.48	2.68	2.87
36	1.72	2.11	2.43	2.72	2.98	3.22	3.44
42	2.01	2.46	2.84	3.17	3.48	3.75	4.01
48	2.29	2.81	3.24	3.63	3.97	4.29	4.59
54	2.58	3.16	3.65	4.08	4.47	4.83	5.16
60	2.87	3.51	4.05	4.53	4.97	5.36	5.73
64	3.06	3.75	4.32	4.83	5.30	5.72	6.12

ALLOWABLE LEAKAGE (gal/hr) FOR 1000 FT OF GASKETED PVC OR DIP PIPE

Nominal Pipe Size (in)	Average Test Pressure in Pipeline, psi						
	<u>225</u>	<u>250</u>	<u>275</u>	<u>300</u>	<u>350</u>	<u>400</u>	<u>450</u>
2	0.20	0.21	0.22	0.23	0.25	0.27	0.29
3	0.30	0.32	0.34	0.35	0.38	0.41	0.43
4	0.41	0.43	0.45	0.47	0.51	0.54	0.57
6	0.61	0.64	0.67	0.70	0.76	0.81	0.86
8	0.81	0.85	0.90	0.94	1.01	1.08	1.15
10	1.01	1.07	1.12	1.17	1.26	1.35	1.43
12	1.22	1.28	1.34	1.40	1.52	1.62	1.72
14	1.42	1.50	1.57	1.64	1.77	1.89	2.01
16	1.62	1.71	1.79	1.87	2.02	2.16	2.29
18	1.82	1.92	2.02	2.11	2.28	2.43	2.58
20	2.03	2.14	2.24	2.34	2.53	2.70	2.87
24	2.43	2.56	2.69	2.81	3.03	3.24	3.44
30	3.04	3.21	3.36	3.51	3.79	4.05	4.30
36	3.65	3.85	4.03	4.21	4.55	4.86	5.16
42	4.26	4.49	4.71	4.92	5.31	5.68	6.02
48	4.86	5.13	5.38	5.62	6.07	6.49	6.88
54	5.47	5.77	6.05	6.32	6.83	7.30	7.74
60	6.08	6.41	6.72	7.02	7.58	8.11	8.60
64	6.49	6.84	7.17	7.49	8.09	8.65	9.17

Note: The allowable leakage for test sections with different diameters is the sum of the computed leakage for each pipe size.

The test pressure shall be applied by means of a pump connected to the pipe and to an approved water container, or other approved method, for accurate measurement. The test pressure shall be maintained (by additional pumping, if necessary) for the specified time. While the line is under pressure, the system and all exposed pipe, fittings, valves, and hydrants shall be carefully examined for leakage. All defective elements shall be

repaired or replaced and the test repeated until all visible leakage has been stopped and the allowable leakage requirements have been met.

8. On completion of tests, any newly installed, approved taps shall be tightly plugged with brass fittings.
9. Thoroughly purge all compressed air lines after testing.

3.3 TEST PRESSURES FOR PRESSURE LINES

All pressure (force mains, plant water, and potable water) shall be tested to 1.5 times the working pressure or the rated pressure of the pipe, whichever is greater. Chemical piping shall be tested to 100 psig. Process, sludge, and drain piping using pressure pipe shall be tested at 75 psig if not specified elsewhere.

All potable, filtered, finished, and chemical pipe shall be disinfected in accordance with Section 01 09 01, DISINFECTION OF POTABLE WATER PIPING AND TANKS.

-- END OF SECTION --

This page intentionally left blank

SECTION 33 01 03 - DUCTILE IRON PIPE

PART 1 GENERAL

1.1 WORK INCLUDED

The work included in this section of the Specifications shall consist of furnishing, installing, and testing:

- A. Mechanical joint, push-on and flanged ductile iron pipe in sizes 4-inch through 48-inch.
- B. Mechanical joint and flanged ductile iron and cast iron fittings in sizes 4-inch through 60-inch.
- C. Gaskets and fasteners for above pipe and fittings.
- D. Restrained pipe and fittings, 4-inch thru 64-inch.
- E. Protective coatings, linings and encasements for above pipe and fittings.
- F. Hydrostatic testing, cleaning, and disinfecting of installed pipe and fittings.

1.2 REFERENCE STANDARDS

ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.

AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water; 2013.

AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.

AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2012.

AWWA C116/A21.16 - Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings; Latest Edition.

AWWA C150/A21.50 - Thickness Design of Ductile-Iron Pipe; 2014.

AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2009.

AWWA C153/A21.53 - Ductile-Iron Compact Fittings; 2011.

AWWA M41 - Ductile-Iron Pipe and Fittings; 2009.

NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

1.3 QUALITY ASSURANCE

- A. All surfaces and materials in contact with water, or in contact with a chemical being added to water that is being treated for potable use, shall conform to NSF 61 and be certified by an organization accredited by ANSI, or shall meet the TCEQ requirements for contact with potable water.

1.4 DELIVERY, STORAGE AND HANDLING

Comply with the requirements of the Contract Documents, Specifications and the manufacturer's recommendations.

1.5 SUBMITTALS

Submit the following information in accordance with the requirements of the Contract Documents:

- A. Submit the following for all pipe systems:
 - 1. Pipe material
 - 2. Fittings
 - 3. Appurtenances
 - 4. Adaptors
 - 5. Pipe layout schedule/drawings including pipeline stationing and elevations with pressure classes, design and surge pressure ratings.
 - 6. All materials, coatings, and linings furnished.
 - 7. Thrust restraint design.The pipe layout drawings and data shall clearly indicate where pipe requiring special provisions are provided.

- B. Certificate of Compliance with all applicable and appropriate reference standards certifying that all pipe, fittings, and specials, and other products and materials furnished, comply with the applicable provision of the Specification. Pipe systems submitted without the certificate of compliance may be returned without review.
- C. Certification of Adequacy of Design: The Certificate of Adequacy of Design shall show the necessary provisions required in the design of the pipe to comply with applicable sections of this Specification. The Certificate of Adequacy of Design shall be sealed by a Texas Registered Engineer.

PART 2 PRODUCTS

2.1 GENERAL

Ductile iron pipe shall be made of good quality ductile iron, tough, resilient, even-grained, and soft enough to satisfactorily permit drilling and cutting. All pipe shall be sound and free of cracks. Ductile iron pipe shall have a minimum tensile strength of 60,000 psi, a yield strength of 42,000 psi, and shall have a minimum working pressure rating of 150 psi, thickness Class 50. Ductile iron pipe shall be manufactured to the requirements of AWWA C150/A21.50 and AWWA C151/A21.51 standards. The raw material for ductile iron shall have an average minimum content consisting of 90% recycled iron and steel.

The ductile iron pipe joint shall be rubber gasketed, push-on joint, similar to that known as Bell-Tite, Tite-On, Fastite, Tyton Joint by US Pipe or equal, as may be approved by the ENGINEER; mechanical joint or flanged as called for on the Plans. The rubber gasket push-on joints and mechanical joints specified on the Plans shall be manufactured to the requirements of AWWA C151/A21.51 and AWWA C111/A21.11.

2.2 PUSH ON AND MECHANICAL JOINT PIPE AND FITTINGS

- A. Thickness Class: As required for working pressures and test pressures shown on the Plans for each pipe system.
- B. Laying Length: 18 or 20 feet.
- C. Gaskets: Neoprene, vulcanized styrene butadiene rubber (SBR) or equivalent material.

2.3 FLANGED PIPE AND FITTINGS

- A. All exposed ductile iron pipe shall have ductile iron flanged fittings unless otherwise noted. CONTRACTOR shall coordinate ductile iron flanges with connecting flanges of pump and valves. Thrust collars shall be provided where required for connection to restrained or harnessed flanged coupling adapters (FCA) and flexible couplings.
- B. Flanges: Thread pipe, tighten flanges, and face in shop equipped with machinery designed for such work. Hand or field work is not acceptable.
- C. Gaskets:
 - 1. Full face rubber 1/16-inch-thick factory cut unless otherwise specified. For ductile iron pipe and fittings between pump and steel discharge header gaskets shall be Toruseal by American or equal as approved by ENGINEER.
 - 2. For air systems only, full-face Buna-N gaskets, 1/16-inch thick factory cut. Gaskets shall be suitable for temperatures of 200 F with lubrication oil present.
- D. Bolts and Nuts:
 - 1. Type: Hex heads and nuts.
 - 2. Material: Low carbon steel conforming to ASTM A307 Grade B except for submerged and buried locations.
 - 3. Submerged bolts and nuts shall be 316 stainless steel.
 - 4. Bolts and nuts in buried locations or in manholes shall be 304 stainless steel.
- E. Thickness Class: As noted on Plans. Use Class 150 if not shown on Plans.

2.4 FITTINGS

- A. Fittings shall be ductile iron castings, all conforming to AWWA C110/A21.10 or AWWA C153/A21.53. Flanged ends shall be made of ductile iron, and shall have comparable pressure rating to pipe.
- B. Coatings shall be as specified for ductile iron pipe.
- C. All buried fittings shall be wrapped with a polyethylene wrapping.
- D. All fasteners, bolts, and hardware that are buried or in manholes shall be 304 stainless steel. Buried MJ fitting bolts may be Corten.

2.5 PROTECTIVE COATINGS, LININGS, AND ENCASEMENT

- A. Inside of Pipe:
 - 1. Unless otherwise shown, all ductile iron shall be provided with a cement-mortar lining in accordance with AWWA C104/A21.4. A bituminous seal coat shall be applied over the mortar lining in accordance with AWWA C104/A21.4.
 - 2. Inside of Pipe: Where specifically shown or specified, epoxy lining shall be provided. Epoxy lining shall be high solids, high build fusion bonded epoxy per AWWA C116/A21.16 suitable for use in potable water, minimum 16 mils dft.
- B. Outside of Pipe:
 - 1. For exposed piping including piping in vaults provide one shop coat of primer and field paint with one coat of primer and one finish coat in accordance with Section 09 03 01, COATING & PAINTING FOR WATER TREATMENT PLANTS.
 - 2. For buried piping, provide bituminous coating.
- C. Provide V-Bio Enhance Polyethylene Encasement for all buried piping and fittings except for concrete encased pipe and fittings and pipes in tunnels or bores.

2.6 INSULATED CONNECTIONS

The pipe vendor shall furnish dielectric insulation gaskets and/or bushings at all places where steel pipe or valves connect to ductile and cast iron pipe and fittings. Where flanges are to be insulated, furnish and install a complete flange isolation kit including a flange gasket, isolating sleeve for each bolt, and two isolating washers for each bolt. Flange isolation kits shall be Saint Ferrer Model #105-EK2 by Westermann, or approved equal.

2.7 RESTRAINED PIPE AND FITTING JOINTS

Restrained pipe and fitting joints shall utilize push on type joint fittings with ductile iron components as fabricated by U.S. Pipe - TR FLEX or approved equivalent. Field cut pipe shall be provided with U.S. Pipe - TR FLEX gripper ring US Pipe HDSS or approved equivalent sized for working pressures shown on plans (150 psi minimum) for sizes through 36-inch. At CONTRACTOR's option, restrained buried fittings and pipes with working pressures at or below 100 psi may utilize mechanical joints with EBAA iron Megalug type joint restraint with Corten bolts. Pipe and fittings that are concrete encased do not require mechanical restraint.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Use the types of pipe and joints specified and shown on the Plans.
 - 2. Follow the manufacturer's installation instructions.
 - 3. Wrap all buried piping and fittings with polyethylene.
 - 4. Pipe shall be installed on constant grade between control depths as shown on the Plans, with minimum depth of cover maintained.
 - 5. Utilize [Class III] embedment if not shown on Plans.
 - 6. Provide a restrained push-on joint or MJ joint 10 feet outside of structures. Alternatively, provide a restrained coupling 10 feet outside of structures.

- B. Flexible Couplings and Flanged Coupling Adaptors:
 - 1. Install in accordance with the Plans, specifications for couplings and adaptors, and approved shop drawings.
 - 2. Use of additional couplings and adaptors to be approved by OWNER prior to installation.
 - 3. All flexible couplings and flanged coupling adaptors shall be restrained.
- C. Joining of Push-on Piping:
 - 1. Preparation of pipe ends: Remove from bell and spigot ends all lumps, blisters, excess coal-tar coating, oil and grease, then wire brush and wipe clean and dry before laying pipe.
 - 2. Installation of ring gasket:
 - a. Wipe gasket seat in socket with clean dry cloth.
 - b. Place gasket with large end entering first.
 - c. Spring gasket into seat in bell so that groove fits overhead in seat.
 - d. Apply thin film of food grade lubricant to inside surface of gasket.
 - 3. Setting spigot:
 - a. Apply food grade lubricant to engaging surface of spigot if necessary.
 - b. Align spigot with bell and start into bell so that it contacts gasket.
 - c. Pipe 6 inches and smaller may be driven with a bar lever on end of pipe.
 - d. For larger pipe, use only approved ratchet-type jacking tool to pull pipe "home."
- D. Joining of Mechanical Joint Pipe:
 - 1. Remove all mud and foreign matter from pipe ends, gaskets and fittings before installation.
 - 2. Wash pipe ends, gaskets and fittings with soapy water before installation.
 - 3. Mechanical joints must be suitably restrained to prevent movement.
- E. Joining of Flanged Pipe:
 - 1. Setting gasket:
 - a. If non-graphited gaskets are used, apply graphite and water solution to gasket before placing on flange.
 - b. Wire-brush flange and clean inside of pipe before placing gasket.
 - 2. Tightening bolts:
 - a. After initial alignment, place flange bolts with all heads in same direction.
 - b. Tighten flange bolts, each in turn, at uniform rate around joint until all are tightened to the manufacturer's recommended torque.
 - 3. All flanged coupling adaptors must be restrained.
- F. Restrained Joints
Install restrained joints in strict accordance to manufacturer's recommendations. Pressure utilized shall be working pressures shown and/or specified, plus an additional 100 psig for surge for potable water and service water piping, and high service pump discharge piping. Use test pressure times 1.5 for all other pipelines.

-- END OF SECTION --

SECTION 33 01 06 - POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

PART 1 GENERAL

1.1 WORK INCLUDED

Furnishing, installing (by General CONTRACTOR), and testing (by General CONTRACTOR) of polyvinyl chloride (PVC) pressure pipe and fittings in sizes 1/2-inch through 36-inch.

Hydrostatic testing, cleaning, and disinfecting installed pipe and fittings.

1.2 REFERENCE STANDARDS

ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds; 2011.

ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.

ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2015.

ASTM D2464 - Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2015.

ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2015.

ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2015.

ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.

ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2015.

ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 1998 (Reapproved 2011).

ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe; 2014.

ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2014.

AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution; 2016.

AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution; Latest Edition.

NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

1.3 SUBMITTALS

- A. Submit shop drawings and product data in accordance with the requirements of Sections 01 04 01, SUBMITTALS and 33 01 01, GENERAL REQUIREMENTS FOR PIPING SYSTEMS.
- B. Submit manufacturer's installation instructions.
- C. Submit affidavits of compliance with the referenced standards. Pipe systems submitted upon without the affidavits of compliance shall be returned without review.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Comply with the general requirements of Section 33 01 01, GENERAL REQUIREMENTS FOR PIPING SYSTEMS and the supplemental requirements below.
- B. Comply with the manufacturer's handling and storage recommendations.
- C. Use nylon slings or rope to lift bundles of pipe. Do not use chains.
- D. Do not drop pipe.
- E. Support pipe every 4 feet.
- F. Limit stacking height of pallets to prevent any undue stress or deflection in pipe materials.

PART 2 PRODUCTS

2.1 GENERAL

- A. Pressure pipe for potable water systems shall bear the seal of approval of the National Sanitation Foundation for use in potable water systems.
- B. All PVC pipe shall be new and shall be stamped to show the design working pressure.
- C. Pressure pipe shall be as manufactured by JM Eagle, North American, Diamond Plastics or approved equal.
- D. The pipe shall have true section complying with the sizes specified. All pipe shall be free from cracks, holes, blisters, voids, projections, defects, roughness and chalking, sticky or tacky material.
- E. All pipe and fittings furnished under this section shall be clearly marked by the manufacturer with the following information in such a manner that it will remain legible after inspection:
 - 1. Manufacturer's name, trademark and code which includes the date, shift, plant and extruder of manufacturer.
 - 2. Nominal pipe size in inches.
 - 3. PVC cell classification.
 - 4. AWWA/ASTM designation.

2.2 EXPOSED PIPING

- A. Pipe:
 - 1. Referenced Standard: ASTM D1785.
 - 2. Type: Type 1, Grade 1, unplasticized.
 - 3. Schedule: Schedule 80 is required, unless otherwise shown on Drawings or specified in Piping Schedule.
- B. Joints:
 - 1. Type: Solvent welded unless otherwise shown on Drawings or specified in Piping Schedule.
 - 2. Referenced Standard for Cement ASTM D2564.
- C. Fittings:
 - 1. Referenced Standards: ASTM D2464, ASTM D2466 and ASTM D2467.
 - 2. Type: Solvent weld unless otherwise shown on Drawings or specified in Piping Schedule.

2.3 BURIED PRESSURE PIPING

- A. Sized Under 1-1/2 Inches:
As specified above for exposed piping.
- B. Sizes Through 4 Inches:
 - 1. Pipe:
 - a. Referenced Standard: ASTM D1785 and ASTM D2241.
 - b. Type: Type 1, Grade 1, unplasticized.
 - c. Schedule as shown on the Plans.
 - 2. Joints:
 - a. Referenced Standard: ASTM D3139.

- b. Gasket Type: ASTM F477.
- 3. Fittings:
 - a. Referenced Standard: ASTM D2466.
 - b. Type: Solvent weld unless otherwise shown on drawings or specified in piping schedule.
- C. Sizes 4 Inches Through 36 Inches:
 - 1. Pipe:
 - a. Referenced Standards: AWWA C900.
 - b. Type: Bell and spigot with elastomeric gasket joint formed integral with Pipe.
 - c. Pressure Class and Dimension Ratio: 235 psig; D.R. 18 if not shown on Plans.
 - 2. Joints:
 - a. Referenced Standard: ASTM D3139.
 - b. Gasket Type: ASTM F477.
 - 3. Fittings:
 - a. Type: Mechanical joint or push-on type, ductile iron fittings.
 - b. Fittings shall utilize mechanical joint restraint systems designed by Supplier. If not shown, utilize 150 psig test pressure and 7 fps velocity for surge calculation.
 - c. Bolts, fasteners, and hardware for buried fittings shall be 304 stainless steel. Buried MJ fitting bolts may be Corten. Submerged bolts, fasteners, and hardware shall be 316 stainless steel.

2.4 CHEMICAL PIPING

- A. PVC Piping: PVC pipe for chemicals, vacuum and solution, shall be ASTM D1785, Type 1, Grade 1, Schedule 80 for exposed piping and Schedule 40 for buried piping, rigid, unplasticized PVC, normal impact, bearing NSF seal. Fittings shall be molded, bearing NSF seal, as manufactured by Tube Turn Plastics, or equal. Pipe threads, if used, shall conform to ASA 82.1, NPT, and shall be full and cleanly cut with sharp dies.
 - 1. If glued joints are used, cement shall be of type which welds plastic surfaces together. Cement shall be as recommended by the pipe manufacturer and shall be compatible with the chemical conveyed. Teflon tape shall be used on all threaded joints. Teflon tape shall be mil spec P-77304 or as recommended by the pipe supplier for the chemical service. Tubing connecting to piping shall utilize barbed fittings and 316 stainless steel tube clamps, two per connection. Barbed fittings shall be CPVC or other material recommended by the manufacturer rated for working pressure of 50 psig and chemical service up to 110 Degrees F.
 - 2. Gaskets and O-rings for chlorine vacuum and solution piping shall be Viton. Gaskets and O-rings for other chemicals shall be compatible with the chemical being used.
 - 3. Cement and primers shall be suitable for use in potable water. Cement shall be industrial grade and primer shall be purple color. Cement used shall have a manufacture date within 14 months of the date being utilized. Containers shall be kept tightly closed when not in use. Brush or swab applicators shall be appropriately sized and utilized as recommended by the manufacturer.
 - 4. Chemical piping shall be tested to a hydrostatic pressure of 150 psig in accordance with Section 33 01 02, FIELD TESTING OF PIPING SYSTEMS.
 - 5. Mark pipe in accordance with ASTM D1785.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Comply with the general requirements of Sections 33 01 01, GENERAL REQUIREMENTS FOR PIPING SYSTEMS and the supplemental requirements following.
 - 2. Install all piping in accordance with pipe manufacturer's instructions.
 - 3. Chemical piping shall be installed at uniform grades or slopes without any high points in the pipe except at the pumps.

B. Making of Joints:

1. General:
 - a. Make joints in accordance with pipe manufacturers recommendations and the supplemental specifications below.
 - b. For shorter than standard pipe lengths, field cuts may be made with either hand or mechanical saws with fine tooth blade (16-18 teeth per inch) or plastic pipe cutters. Cut piping accurately and squarely within 1/8 inch and install without forcing or springing.
 - c. Ream out all pipes and tubing to full inside diameter after cutting.
 - d. Remove all cuttings and foreign matter from the inside of pipes and ends shall be smoothly beveled by a mechanical beveller or by hand with a rasp or file before installation. Field spigots shall be stop-marked with an adequate marker for the proper length of assembly insertion.
 - e. Joints shall not be covered until approved by ENGINEER or his representative. Connections which are made for future use shall be properly capped.
2. Solvent Weld Joints Only:
 - a. Comply with the requirements of ASTM D2855 and ASTM F493.
 - b. File end of PVC Pipe to form a 10 to 15 degree bevel 1/16-inch to 3/32-inch wide on the exterior of the pipe end.
 - c. The pipe and fittings shall be cleaned of all loose dirt and moisture and then lightly roughened with emery cloth over the entire surfaces to be glued, after cutting pipe and removing all burrs and prior to applying the primer.
 - d. Apply primer to the female end, then the male end and then reapply to female end, keeping the surface wet with primer over 5- to 15-second period.
 - e. Apply solvent cement to pipe end and socket and then apply a second coat to pipe end using a brush one-half of the diameter of the pipe. Hold for 30 seconds.
 - f. Immediately insert pipe end in socket and wipe off excess cement.
 - g. Rotate pipe under 6 inches about one-quarter turn after inserting in socket.
 - h. Completed glue joints shall not have any gaps or voids in the glue between the pipe and the fitting.
 - i. Do not perform solvent welding operations when temperature is below 40 Degrees F or above 90 Degrees F, or when rain or drizzle is present.
 - j. Do not move or disturb the glued joints for 3 minutes after completion. Joints shall not have any pressure or deflection applied for at least 1 hour after completing the joint. Allow all joints to set 24 hours prior to performing pressure test on system.
 - k. All joints shall be checked for leakage 48 hours and again 15 days after placing them in service with the proposed chemical. Joints which show signs of leaking or signs of salt buildup shall be replaced and system retested and checked again 48 hours and 15 days after repair until satisfactory results are obtained.
 - l. Small diameter pipes shall be checked for excess glue after the joints have set. Joints with more than one-half of the pipe area blocked shall be drilled or reamed out.
 - m. All pipe systems shall be flushed at velocity greater than 5 fps for a minimum of 5 minutes and longer for pipes larger than 300 feet.
3. Threaded Joints Only:
 - a. Use liquid lubricant for permanent joints.
 - b. Use tape lubricant at valves and equipment where piping may have to be disconnected for maintenance.
4. Gasketed Joints Only:
 - a. Thoroughly clean pipe ends and gaskets before installation.
 - b. Apply lubricant recommended by manufacturer.
5. Plastic to Metal Connections:
 - a. Make all plastic to metal connections by means of PVC adapters.
 - b. Do not cut threads on PVC Pipe.

- C. Buried Piping:
 - 1. All excavation shall be done in an approved manner to the elevations and grades shown on the Plans or specified. The trench bottom shall be free of sharp rocks and large clods of dirt.
 - 2. Bedding for PVC pipe (larger than 2-inch) shall be as shown on the Plans: Utilize Class IV embedment if not called out on the Plans.
 - 3. Backfill shall be placed according to Section 31 03 01, TRENCHING, BACKFILLING AND COMPACTING.
 - 4. Sand or granular embedment material shall be used for PVC pipe 2 inches and smaller.
- D. Exposed Piping:
 - 1. Where required, PVC piping shall be installed in the locations indicated with hangers, brackets, supports, etc., at spacings specified in Section 33 01 01, GENERAL REQUIREMENTS FOR PIPING SYSTEMS and recommended by the pipe manufacturer.
 - 2. Flexible connections shall be required at locations where pipe passes through a concrete wall.
- E. Restrained Joints
All buried pressure pipe systems utilizing mechanical joints shall be restrained as specified in Section 33 01 01, GENERAL REQUIREMENTS FOR PIPING SYSTEMS.

3.2 FIELD TESTING

Comply with the requirements of Section 33 01 02.

-- END OF SECTION --

This page intentionally left blank

SECTION 33 01 07 - POLYVINYL CHLORIDE (PVC) SANITARY SEWER PIPE

PART 1 GENERAL

1.1 WORK INCLUDED

Furnishing, installing (by General CONTRACTOR), and testing (by General CONTRACTOR) of Polyvinyl Chloride (PVC) sanitary sewer pipe and fittings in sizes 1/2-inch through 36-inch.

1.2 REFERENCE STANDARDS

ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.

ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals; Latest Edition.

ASTM F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings; 2015.

ASTM F1336 - Standard Specification for Poly(Vinyl Chloride) (PVC) Gasketed Sewer Fittings; Latest Edition.

PART 2 PRODUCTS

2.1 GENERAL

- A. All PVC pipe shall be new and shall be stamped to show the design working pressure.
- B. Sanitary sewer pipe shall be as manufactured by JM Eagle, North American, Diamond Plastics or approved equal.
- C. The pipe shall have true section complying with the sizes specified. All pipe shall be free from cracks, holes, blisters, voids, projections, defects, roughness and chalking, sticky or tacky material.
- D. All pipe and fittings furnished under this section shall be clearly marked by the manufacturer with the following information in such a manner that it will remain legible after inspection:
 - 1. Manufacturer's name, trademark and code which includes the date, shift, plant and extruder of manufacturer.
 - 2. Nominal pipe size in inches.
 - 3. PVC cell classification.
 - 4. ASTM designation.

2.2 BURIED SANITARY SEWER PIPING

- A. Sizes 4 Inches Through 15 Inches:
 - 1. Pipe:
 - a. Referenced Standards: ASTM D3034.
 - b. Type: Bell and spigot with elastomeric gasket joint formed integral with pipe.
 - 2. Joints:
 - a. Referenced Standard: ASTM D3212.
 - b. Gasket Type: ASTM F1336.
- B. Sizes 18 Inches Through 60 Inches:
 - 1. Pipe:
 - a. Referenced Standards: ASTM F679.
 - b. Type: Bell and spigot with elastomeric gasket joints formed integral with pipe.
 - 2. Joints:
 - a. Referenced Standard: ASTM D3212.
 - b. Gasket Type: ASTM F1336.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General:

1. Comply with the general requirements of Section 33 01 01, GENERAL REQUIREMENTS FOR PIPING SYSTEMS and the supplemental requirements following.
 2. Install all piping in accordance with pipe manufacturer's instructions.
- B. Making of Joints:
1. General:
 - a. Make joints in accordance with pipe manufacturers recommendations and the supplemental specifications below.
 - b. For shorter than standard pipe lengths, field cuts may be made with either hand or mechanical saws with fine tooth blade (16-18 teeth per inch) or plastic pipe cutters. Cut piping accurately and squarely within 1/8 inch and install without forcing or springing.
 - c. Ream out all pipes and tubing to full inside diameter after cutting.
 - d. Remove all cuttings and foreign matter from the inside of pipes and ends shall be smoothly beveled by a mechanical beveller or by hand with a rasp or file before installation. Field spigots shall be stop-marked with an adequate marker for the proper length of assembly insertion.
 - e. Joints shall not be covered until approved by ENGINEER or his representative. Connections which are made for future use shall be properly capped.
 2. Gasketed Joints Only:
 - a. Thoroughly clean pipe ends and gaskets before installation.
 - b. Apply lubricant recommended by manufacturer.

3.2 BURIED PIPING

- A. All excavation shall be done in an approved manner to the elevations and grades shown on the Plans or specified. The trench bottom shall be free of sharp rocks and large clods of dirt.
- B. Bedding for PVC pipe (larger than 2-inch) shall be as shown on the Plans: (Class II aggregate fill, per Section 31 06 01, SITE GRADING AND EARTHWORK, embedment below the pipe to a depth 4" on each side of the pipe to the trench wall (maximum 12") and to 8" over the pipe. All bedding and granular backfill material shall be consolidated to 85 percent standard proctor density.) Utilize Class III embedment if not called out on the Plans.
- C. Backfill shall be placed according to Section 31 03 01, TRENCHING, BACKFILLING AND COMPACTING.

3.3 GRADING PIPING

The ENGINEER will set line and grade stakes every 100 feet and furnish the CONTRACTOR with cut sheets. CONTRACTOR shall furnish and set grade boards, grade lines, plumb bobs, and measure poles necessary for laying pipe within the tolerances allowed. Grade boards shall be set at intervals not to exceed 50 feet, and the CONTRACTOR shall keep at least three grade boards in place during grading and laying operations. Use of Laser control will be acceptable for use in lieu of grade boards.

3.4 HORIZONTAL CURVATURE

Gravity sewers shall be laid in straight alignment with uniform grade between manholes when possible. Deviations from straight alignment shall be justified to the satisfaction of the Texas Commission on Environmental Quality and comply with the following criteria. Deviations from uniform grade without manholes, i.e., grade breaks or vertical curves, shall not be allowed.

- A. Construction methods which utilize both flexure of the pipe and deflection at the pipe joint shall not be allowed. The ENGINEER shall detail the proposed curvature on the Plans. Deflection design shall be based upon either joint deflection or pipe flexure as described below:
 1. Joint Deflection. The maximum allowable joint deflection shall be the lesser of the following three alternatives:
 - a. equal to 5 degrees; or,

- b. 80% of the manufacturer's recommended maximum deflection; or,
 - c. 80% of the appropriate ASTM, AWWA, ANSI or nationally-established standard for joint deflection.
- 2. Pipe Flexure. The minimum radius of curvature shall be computed by assuming standard lengths of straight pipe with deflections at each joint.
For purposes of this subparagraph the standard pipe length shall be considered to be the maximum length manufactured for the specific type of pipe to be installed. Gravity sewers with horizontal curvature shall be sloped greater than the minimum allowable slope for the same diameter pipe as specified by TCEQ in order to account for additional losses due to curvature and potential for solids deposition.
- B. The maximum allowable manhole spacing for sewers with horizontal curvature shall be 300 feet.
- C. Trench excavation shall be parallel to the proposed pipe curvature, i.e., curved pipe shall be laid in a curved trench. To obtain the proposed pipe curvature, a construction method shall be used which specifies using either the flexure of the pipe installed completely "home" or equal deflections at each joint with straight lengths of pipe. Construction methods which utilize both flexure of the pipe and deflection at the pipe joint shall not be allowed. Specific care shall be taken to ensure that the joint is placed in the center of the trench and properly bedded.
- D. Reaches of sewer which include horizontal curvature using joint deflection shall be tested with a rigid mandrel.
- E. All reaches of sewer which include horizontal curvature shall be hydrostatically tested using a maximum allowed exfiltration of 10 gallons per inch diameter per mile of pipe.

3.5 FIELD TESTING

Comply with the requirements of Section 33 01 02, FIELD TESTING OF PIPING SYSTEMS.

-- END OF SECTION --

This page intentionally left blank

SECTION 33 01 08 - PIPE COUPLINGS AND EXPANSION JOINTS

PART 1 GENERAL

1.1 WORK INCLUDED

Flexible couplings, flange coupling adapters, expansion joints, and restraining hardware for above items.

1.2 REFERENCE STANDARDS

ASTM A183 - Standard Specification for Carbon Steel Track Bolts and Nuts; 2014.

ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).

AWWA C606 - Grooved and Shouldered Joints; 2015.

NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

1.3 QUALITY ASSURANCE

A. Factory Assurance:

1. Test each item for mechanical and material defects per manufacturer's standard practice.
2. Hydrostatically test each item to 150 percent of its maximum allowable working pressure.

B. All surfaces and materials in contact with water, or in contact with a chemical being added to water that is being treated for potable use, shall conform to NSF 61 and be certified by an organization accredited by ANSI, or shall meet the TCEQ requirements for contact with potable water.

1.4 SUBMITTALS

A. Shop Drawings, Product Data and Samples:

Comply with the general requirements of Section 01 04 01, SUBMITTALS and supplemental requirements below.

B. Submit the following items for each type flexible coupling, flanged coupling adaptor, and rubber expansion joint.

1. Description and illustration of construction.
2. List of materials.
3. Description of factory-applied protective coatings.
4. Dimensions.
5. Pressure rating.
6. For expansion joints only, the movement, force, and spring rate capabilities.
7. Shop drawings for restraining systems such as tie bolt assemblies. Drawings to show layout, dimensions, number and size of bolts, and lug details.
8. Manufacturer's installation instructions.

C. Product data described in the previous paragraph may be submitted in the form of catalog bulletins or other standard manufacturer literature and drawings as long as all the data specified are furnished. If catalog bulletins are submitted, they are to be marked up to show the styles, options, and other data which are applicable.

D. If CONTRACTOR elects to use more couplings and expansion joints than are shown on Drawings, submit piping layout drawings showing the location of each proposed additional unit and describing the type of each such unit.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

Comply with the requirements of Section 33 01 01, GENERAL REQUIREMENTS FOR PIPING SYSTEMS.

PART 2 PRODUCTS

2.1 FLEXIBLE COUPLINGS

- A. Flexible couplings to be mechanical compression type with sleeve two follower glands, two resilient wedge-shaped gaskets, and a set of bolts and nuts to draw the two follower glands together.
- B. Construction of Coupling:
 - 1. Middle ring: Carbon steel.
 - 2. Followers: Carbon steel except that ductile or malleable iron may be used in sizes 12 inches and smaller.
 - 3. Gaskets:
 - a. Resilient rubber compound suitable for air, water, and sewage service and temperatures below 15° F. Buna-N for 240° F for air service.
 - b. Wedge shaped.
 - 4. Bolts and nuts:
 - a. Cadmium-plated high strength steel for exposed couplings in noncorrosive environments.
 - b. Number and size as required for size and type coupling and as recommended by manufacturer for test pressure.
 - c. Buried couplings or couplings in manholes shall utilize 304 SS bolts and hardware.
 - d. Submerged couplings shall utilize 316 SS bolts and hardware.
- C. Restraining System:
 - 1. To be used for all flexible couplings unless specifically noted otherwise.
 - 2. Description:
 - a. Restraining system or harness to consist of tie bolts anchored on each side of coupling to prevent separation of pipe and coupling due to pressure or other causes.
 - b. Tie bolts to be anchored to lugs bolted to nearest flange each side of coupling. On steel pipe, tie bolts may be anchored to lugs shop welded to pipe.
 - c. Number and size of tie bolts to be as determined by manufacturer for specified piping system test pressure. A minimum of two tie bolts diametrically opposite one another are required for each restrained coupling.
 - 3. Tie bolts and nuts: As specified above for flexible coupling.
- D. Factory Painting:
 - 1. Apply epoxy-type protective coating system to interior suitable for potable water contact, and exterior of couplings. Coating to be manufacturer's standard epoxy system complete with prime and finish coats.
 - 2. Do not paint bolts, nuts, and gaskets.
 - 3. Coatings used on exterior of couplings which will be exposed to be compatible with specified coating system for piping so that pipe and couplings can be painted a common color. Coating for buried couplings shall be epoxy.
 - 4. Coatings on air pipe systems shall be suitable for 240° F.
- E. Manufacturer and Model:
 - 1. Hymax
 - 2. Smith Blair - Type 411.
 - 3. Or approved equivalent.

2.2 FLANGED COUPLING ADAPTERS

- A. Flanged coupling adapters to consist of a body or sleeve with pipe flange on one end and compression-type coupling on the other end. Compression coupling to consist of follower, resilient wedge-shaped gasket, and a set of bolts to draw follower against gasket. All flanged coupling adapters shall include restraining systems unless otherwise noted on Drawings.
- B. Construction:

1. Body and follower: Carbon steel except that cast iron is acceptable in sizes 12 inches and smaller.
2. Flange: ANSI Class 125 or 250 flat face. Match class to that of piping system.
3. Bolts and nuts:
 - a. Cadmium plated high strength steel for exposed locations in noncorrosive environments.
 - b. Number and sized to suit specified piping system test pressure.
 - c. All bolts and nuts in buried applications or in manholes shall be 304 stainless steel. Bolts and nuts in submerged or intermittently submerged applications shall be 316 stainless steel.
4. Gasket:
 - a. Resilient rubber compound suitable for air, water, and sewage service, and temperatures below 150° F. Buna-N for 240° F for air service.
 - b. Wedge shaped.
- C. Restraining System:
 1. Restraining or harnessing system to be as specified for flexible couplings except that anchor studs or locking pins may be used on sizes 12 inches and under.
 2. Anchor studs or locking pins extend through threaded tap or boss in body of adaptor into pipe that has been inserted into compression coupling, thus preventing further longitudinal movement.
 3. Number and size for tie bolts and anchor studs or locking pins to suit specified piping system test pressure. Minimum of two diametrically opposed restraints required for restrained adapters.
- D. Factory Painting:
 1. Apply epoxy-type protective coating system to interior suitable for potable water contact, and exterior of adapters. Coating to be manufacturer's standard epoxy system complete with prime and finish coats.
 2. Do not paint bolts and gaskets.
 3. Coatings used on exterior of couplings which will be exposed to be compatible with specified coating system for piping so that end coupling can be painted a common color. Coating for buried couplings shall be epoxy.
- E. Manufacturer and Model:
 1. All sizes:
 - a. Dresser Industries, Inc. - Dresser type 128.
 - b. Smith Blair - Type 913 for all sizes.
 - c. Or approved equivalent.
 2. Twelve inches and smaller alternate:
 - a. Dresser Style 127.
 - b. Smith Blair Style 912.
 - c. Or approved equivalent.

2.3 EXPANSION JOINTS

- A. Expansion Joints for General Service:
 1. Expansion Joints: Flexible bellows type with equalizing rings, except as otherwise specified or indicated on the Drawings.
 2. Manufacturers:
 - a. Expansion Joints: One of the following or equal:
 - 1) Flexonics Inc., Controlled Flexing Expansion Joint.
 - 2) Flex-Weld Inc., Keflex, Series 308.
 - b. Pipe Alignment Guides: One of the following or equal:
 - 1) Flexonics Inc.
 - 2) Flex-Weld, Inc.
 - c. Intermediate Supports: Provide with protective saddles. One of the following or equal:

- 1) Unistrut Corporation, Roller-type.
 - 2) Bergen-Paterson Pipesupport Corp.
 3. Design:
 - a. Expansion Joint Rating: 150 pounds per square inch gauge, at 400 degrees Fahrenheit.
 - b. Bellows: Laminated stainless steel, equipped with a self-draining liner guide.
 - c. Axial Travel of Expansion Joints: Not less than 1.50 inches.
 - d. Ends: 150-pound ANSI flanges, or plain suitable for welding connections, as required for piping in which installed.
- B. Copper Piping Expansion Joints:
 1. Expansion Joints for Copper Pipe: As specified before, except externally guided, without equalizing rings, and provide for 3-1/4-inch expansion per 100 feet of piping.
- C. Rubber Expansion Joints:
 1. Manufacturers: One of the following or equal:
 - a. Mercer Rubber Company, Style 500 or 700.
 - b. Red Valve Company, Inc., Type J-1.
 2. Provide rubber expansion joints complete with control units and split retaining rings.
 3. Design:
 - a. Neoprene rubber, reinforced with embedded steel rings, and a strong synthetic fabric.
 - b. Expansion rings, suitable for pressures of at least 125 pounds per square inch gauge, except as follows:
 - 1) Expansion joints in pump suction piping and where indicated on the drawings suitable for minimum 90 pounds per square inch gauge, pressure and minimum 30 inches mercury vacuum.
 - 2) Split retaining rings, galvanized.
 - 3) Ends of expansion joints, 150-pound ANSI flanges with drilling to match that of the piping.
 - 4) Expansion Joints for Blowers: Butyl type rubber formulated for service application and for maximum temperature of 250 degrees Fahrenheit, suitable for minimum 40 pounds per square inch gauge pressure, and minimum 15 inches mercury vacuum.
- D. Expansion Joints for Chemical Service:
 1. Manufacturers: One of the following or equal:
 - a. Red Valve Company, Inc., Type T-205, Teflon Lined.
 - b. Mercer, Teflon Lined, Series 700.
 2. Provide Teflon-lined Hypalon or rubber expansion joints, reinforced with embedded steel rings, and a strong synthetic fabric. Teflon lined rubber expansion joints shall be required to have Teflon liner extend through the entire length of the joint and cover end flanges completely. Teflon-lined Hypalon expansion joints shall be required to have the Teflon liner extend through the entire length of the joint up into the outer edge of the raised flanged faces.
 3. Expansion rings, suitable for pressures of at least 125 pounds per square inch.
 4. Ends of expansion joints, 150-pound ANSI flanges with drilling to match that of the piping.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General:
 1. Inspect each coupling, adaptor, and expansion joint for damage and defects before installation and replace defective items.
 2. Install each item in accordance with the Drawings, TECHNICAL SPECIFICATIONS, approved piping layout shop drawings, and approved manufacturer's installation instructions.

3. CONTRACTOR may provide additional flexible couplings, flanged coupling adapters, and expansion joints over and above those shown on Drawings to facilitate installation of piping.
 - a. Use of such additional items is to be approved by the ENGINEER prior to installation.
 - b. Additional joints are to be at no expense to the OWNER.
 4. Verify that inside diameters of flexible couplings and flanged coupling adapters are compatible with outside diameters of piping with which couplings or adapters are being used.
- B. Flexible Couplings:
1. Clean and lubricate pipe ends before installation.
 2. Leave a gap between the pipe ends to permit pipe expansion and increase flexibility of the joint. Gaps between pipe ends to be approximately as follows:
 - a. 12-inch diameter and smaller: +/- 1 inch.
 - b. 24-inch diameter through 36-inch: +/- 1 1/2 inch.
 - c. Over 36 inches: 2 inch.
 3. Tighten bolts in manner and to torques prescribed by manufacturer.
- C. Expansion and Vibration Control Joints:
1. Prevent equipment vibration transmitted through piping system, and prevent damaging stresses due to normal expansion and contraction with temperature changes in piping and connected equipment.
 - a. Where anticipated expansion is greater than can be absorbed by the normal piping configuration, install loops, bends, and expansion joints as indicated on the drawings, to absorb excess expansion.
 2. Install expansion joints so as to allow 2 1/4-inch expansion per 100 linear feet of piping.
 3. Where possible, install expansion joints adjacent to an anchor, and provide one concentric guide on piping within 12 pipe diameters, but not more than 5 feet, from the end of the joint opposite the anchor. Locate a similar guide approximately 30 diameters but not more than 10 feet from the first.
 4. For expansion joints not installed adjacent to an anchor, provide two concentric guides similarly located at each end of the joint.
 5. Provide control rods and additional guides where indicated on the Drawings, but at no greater intervals than recommended by the joint manufacturer in published instructions.
 6. Space intermediate supports a minimum of 10 feet, and tack weld the protective saddles to the pipe.
- D. Field Painting:
1. Touch up factory finishes which have been damaged.
 2. Apply protective coating to bolts and nuts after tightening. Use same coating system as that specified for adjoining piping.
- E. Testing:
1. Joints are tested as a part of the overall piping system.
 2. See Section 33 02 01, FIELD TESTING OF PIPING SYSTEMS.

-- END OF SECTION --

This page intentionally left blank

SECTION 33 01 11 - HIGH-DENSITY POLYETHYLENE (HDPE) PIPE

PART 1 GENERAL

1.1 WORK INCLUDED

Furnishing, installing (by General CONTRACTOR), and testing (by General CONTRACTOR) of high-density polyethylene (HDPE) pipe and fittings in sizes 1/2-inch through 36-inch.

Hydrostatic testing, cleaning, and disinfecting installed pipe and fittings.

1.2 REFERENCE STANDARDS

ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2014.

ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings; 2007 (Reapproved 2015).

ASTM D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping; 2012.

ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; 2015.

ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing; 2015.

ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Material; 2014.

ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter; 2013.

ASTM F2620 - Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings; 2013.

AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service; 2008.

AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission; 2007.

ISO 9000 - Quality management systems -- Fundamentals and vocabulary; 2015.

NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

PPI TN-38 - Bolt Torque For Polyethylene Flanged Joints; Latest Edition.

PPI TR-33 - Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe; Latest Edition.

PPI TR-41 - Generic Saddle Fusion Joining Procedure for Polyethylene Gas Piping; Latest Edition.

1.3 SUBMITTALS

- A. Submit shop drawings and product data in accordance with the requirements of Sections 01 04 01, SUBMITTALS and 33 01 01, GENERAL REQUIREMENTS FOR PIPING SYSTEMS.
- B. Submit manufacturer's installation instructions.
- C. Submit affidavits of compliance with the referenced standards. Pipe systems submitted upon without the affidavits of compliance shall be returned without review.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Comply with the general requirements of Section 33 01 01, GENERAL REQUIREMENTS FOR PIPING SYSTEMS, and the supplemental requirements below.
- B. Comply with the manufacturer's handling and storage recommendations.
- C. Use nylon slings or rope to lift bundles of pipe. Do not use chains.

- D. Do not drop pipe.
- E. Support pipe every 4 feet.
- F. Limit stacking height of pallets to prevent any undue stress or deflection in pipe materials.

1.5 QUALIFICATION OF MANUFACTURER

- A. The Manufacturer shall have manufacturing and quality assurance testing facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The Manufacturer's production facilities shall be open for inspection by the OWNER or his Authorized Representative.
- B. The Pipe and Resin manufacturers shall maintain ISO 9000 certification at the facility/facilities producing the product(s). The Manufacturer's production facilities shall be open for inspection by the OWNER or his Authorized Representative.
- C. The Pipe and Resin manufacturing sites shall have the same ownership, and/or be of the same company. Manufacturer shall be Performance Pipe, a Division of Chevron Phillips Chemical Company LP, or approved equal. Products from unapproved manufacturers are prohibited.
- D. The Pipe and Resin manufacturers shall have at least 15 years of experience producing a similar size pipe and similar resin types.
- E. The Pipe Manufacturer shall provide support for the Industry through active membership and participation in Plastic Pipe Institute (PPI), American Water Works Association (AWWA), American Society of Testing and Materials (ASTM), American Gas Association (AGA), American Society of Civil Engineers (ASCE), and American Society of Mechanical Engineers (ASME).

PART 2 PRODUCTS

2.1 GENERAL

- A. Pressure pipe for potable water systems shall bear the seal of approval of the National Sanitation Foundation for use in potable water systems.
- B. All HDPE pipe shall be new and shall be stamped to show the design working pressure.
- C. The pipe shall have true section complying with the sizes specified. All pipe shall be free from cracks, holes, blisters, voids, projections, defects, roughness and chalking, sticky or tacky material.

2.2 MATERIALS

- A. High Density Polyethylene (HDPE) materials used for the manufacture of polyethylene pipe and fittings shall be PE 4710/3408/3608. The materials shall also meet ASTM D3350 cell class of PE 445574C/345464C.
- B. High Density Polyethylene (HDPE) materials used for potable water applications shall be listed and approved in accordance with NSF 61.
- C. The HDPE resin used in the manufacture of the pipe and fittings shall be listed by the manufacturer in PPI (Plastics Pipe Institute) TR-4 with a standard grade HDB rating of 1600 psi at 73°F.

2.3 POLYETHYLENE PIPE

- A. Polyethylene Pipe for potable water applications shall be manufactured in accordance with AWWA C901 for sizes 1-1/4" thru 3" IPS diameters and to the requirements of ASTM D3035. Pipe sizes 4" and larger shall be manufactured as either IPS or DIPs sizes in compliance with the requirements of ASTM F714 and AWWA C906.
- B. Standard IPS sized pipes are solid black. Four equally spaced color stripes shall be co-extruded into the pipe outside surface; blue stripe for potable water, green stripe for sewer and purple for reclaimed water.

- C. Standard DIPS sized pipes are solid black. Three equally spaced pairs of longitudinal color stripes shall be co-extruded into the pipe outside surface; blue stripe for potable water, green stripe for sewer and purple for reclaimed water.

2.4 POLYETHYLENE FITTINGS AND ACCESSORIES

- A. Molded fittings shall be manufactured and tested in accordance with ASTM D3261 and shall be so marked. Molded fittings shall be tested in accordance with AWWA C906.
- B. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full-service pressure rating of the mating pipe. Fabricated fittings shall be tested in accordance with AWWA C906.
- C. Polyethylene Flange Adapters shall be made with sufficient through-bore length to be clamped in a butt fusion-joining machine. The sealing surface of the flange adapter shall be machined with a series of small serrations to promote gasket-less sealing and to restrain the gasket where used, against blowout.
- D. Flange adapters shall be fitted with back-up rings that are pressure rated equal to or greater than the mating pipe. The back-up ring bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts and nuts shall be SAE Grade 2 or higher.
- E. MJ Adapters. MJ Adapters IPS and DIPS may be specified with optional Stainless Steel Stiffener.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Comply with the general requirements of Sections 33 01 01, GENERAL REQUIREMENTS FOR PIPING SYSTEMS, and the supplemental requirements following.
 - 2. Install all piping in accordance with pipe manufacturer's instructions.

3.2 JOINING

- A. Heat Fusion Joining. Joints between plain end pipes and fittings shall be made by butt fusion. Joints between the main and saddle branch fittings shall be made using saddle fusion. The butt fusion and saddle fusion procedures used shall be consistent with ASTM F2620, PPI TR-33, PPI TR-41 and/or the Manufacturer's recommended procedure. External and internal beads shall not be removed.
 - 1. Butt Fusion of Unlike Wall Thickness. Butt fusion shall be performed between pipe ends, or pipe ends and fitting outlets that have the same outside diameter and are not different in wall thickness by more than one Standard DR, for example, SDR 13.5 to SDR 17, or SDR 11 to SDR 13.5. Transitions between unlike wall thickness greater than one SDR shall be made with a transition or by mechanical means or electrofusion. SDR's for polyethylene pipe are 7.3, 9, 11, 13.5, 17, 21, 26 and 32.5.
 - 2. Joining by Other Means. Polyethylene pipe and fittings may be joined together or to other materials by means of:
 - a. Flanged connections (flange adapters and back-up rings).
 - b. Mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material.
 - c. MJ Adapters.
 - d. Electrofusion.When joining by other means, the installation instructions of the joining device manufacturer shall be observed.
 - 3. ID Stiffener and Restraint. A stiffener shall be installed in the bore of the polyethylene pipe when an OD compression mechanical coupling is used and may be needed when connecting plain end PE pipe to a mechanical joint pipe, fitting or appurtenance. External

clamp and tie rod restraint shall be installed where PE pipe is connected to the socket of a mechanical joint pipe, fitting or appurtenance except where an MJ Adapter is used.

4. The CONTRACTOR shall ensure that persons making heat fusion joints have received training in the Manufacturer's recommended procedures. The CONTRACTOR shall maintain records of trained personnel, and shall certify that training was received not more than 12 months before commencing construction. Upon request by the OWNER at the CONTRACTOR's expense, training personnel from the Manufacturer or his representative shall be made available.
- B. Branch Connections. Branch connections to the main shall be made with saddle fittings or tees. Polyethylene saddle fittings shall be saddle fused to the main pipe.

3.3 INSTALLATION

- A. General. When delivered, a receiving inspection shall be performed and any shipping damage shall be reported to the manufacturer within 7 days. Installation shall be in accordance with ASTM D2774, ASTM D2321 or Manufacturer's recommendations and this Specification. All necessary precautions shall be taken to ensure a safe working environment in accordance with all applicable safety codes and standards.
- B. Excavation. Trench excavations shall conform to elevations and grades as shown on the Plans and as specified. The CONTRACTOR shall remove excess groundwater. Where necessary, trench walls shall be shored or reinforced, and all necessary precautions shall be taken to ensure a safe working environment.
- C. Mechanical Joint & Flange Installation. Mechanical joint and flange connections shall be installed in accordance with the Manufacturer's recommended procedure. MJ Adapters and flanges shall be centered and aligned to the mating component before assembling and tightening bolts. In no case shall MJ gland or flange bolts be used to draw the connection into alignment. Bolt threads shall be lubricated, and flat washers should be used under the nuts. Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations. At least 1 hour after initial assembly, flange connections shall be retightened following the tightening pattern and torque step recommendations. Refer PPI TN-38.
- D. Bedding. Bedding shall be as shown on the Plans. Utilize Class 2 embedment if not called out otherwise on the Plans.
- E. Pipe Handling. When lifting with slings, only wide fabric choker slings capable of safely carrying the load shall be used to lift, move, or lower pipe and fittings. Wire rope and chain are prohibited. Slings shall be of sufficient capacity for the load, and shall be inspected before use. Worn or damaged equipment shall not be used.
- F. Backfilling. Backfill shall be placed according to Section 31 03 01, TRENCHING, BACKFILLING AND COMPACTING.
- G. Protection against shear and bending loads. In accordance with ASTM D2774, connections shall be protected where an underground polyethylene branch or service pipe is joined to a branch fitting such as a service saddle, branch saddle or tapping tee on a main pipe, and where pipes enter or exit casings or walls. The area surrounding the connection shall be embedded in properly placed, compacted backfill, preferably in combination with a protective sleeve or other mechanical structural support to protect the polyethylene pipe against shear and bending loads.

3.4 FIELD TESTING

- A. Leak Testing: Comply with the requirements of Section 33 01 02, FIELD TESTING OF PIPE SYSTEMS.
- B. Fusion Quality: The CONTRACTOR shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the CONTRACTOR's fusion operator while on site. Upon request by the OWNER, the CONTRACTOR shall verify field fusion quality by

making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The CONTRACTOR at his expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions.

-- END OF SECTION --

This page intentionally left blank

SECTION 33 02 04 - GATE VALVES

PART 1 GENERAL

1.1 REFERENCE STANDARDS

AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.
AWWA C500 - Metal-Seated Gate Valves for Water Supply Service; 2009.
AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; 2009.
AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2013.
NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

1.2 WORK INCLUDED

The CONTRACTOR shall furnish and install resilient-seated vertical gate valves, and appurtenances, including valve boxes, operators, bolts, nuts and gaskets completely as specified herein.

1.3 QUALITY ASSURANCE

- A. All gate valves shall be manufactured and tested to meet the requirements of AWWA C509 unless otherwise specified.
- B. Body thickness and stem thickness will conform to AWWA C500.
- C. Each valve shall have manufacturer's name plate in stainless steel or cast into body or bonnet showing the pressure ratings, serial and model numbers, year manufactured and other pertinent data.
- D. Manufacturers of gate valves shall demonstrate a minimum of 5 years experience for the design of gate valves, with at least 1-year experience in the design of resilient seated gate valves (AWWA C509) being furnished. References shall be furnished upon request.
- E. Valve supplier shall maintain a complete stock of spare parts in the State of Texas and shall be capable of delivering parts within 48 hours of receipt of request.
- F. All surfaces and materials in contact with water, or in contact with a chemical being added to water that is being treated for potable use, shall conform to NSF 61 and be certified by an organization accredited by ANSI, or shall meet the TCEQ requirements for contact with potable water.

1.4 SUBMITTALS

- A. Shop Drawings and Product Data:
 - 1. Comply with the general requirements of Section 01 04 01, SUBMITTALS, and the supplemental requirements below.
 - 2. Submit one drawing or illustration showing unit construction for each type and size valve used.
 - 3. Submit the following information for each valve:
 - a. Description including type of valve, type of operator and accessories included.
 - b. Size and end connections.
 - c. Maximum non-shock working pressure for which valve is designed.
 - d. Materials of construction and coatings for valves, operators and accessories.
 - e. K or Cv value.
 - f. Manufacturer's make and model.
 - 4. Submit the following information for geared operators:
 - a. Type of gearing.
 - b. Type of lubrication.
 - c. Size of handwheel, lever or crank.
 - d. Input torque required to develop required output torque.
 - e. Orientation and dimensions of operator.
 - f. Manufacturer's make and model.

5. If catalog bulletins are used to communicate above information, mark out inapplicable information.
6. Location of nearest stocking distributor.
- B. Affidavits:
 1. Submit affidavits of compliance with the reference standards.
- C. Operation and Maintenance Data:
 1. Comply with the requirements of Section 01 04 01, SUBMITTALS.
- D. Special Equipment Warranty as in the Special Conditions.
- E. Installation reports as specified in Section 01 04 01, SUBMITTALS.
- F. Valve manufacturer shall provide certification from an independent testing laboratory that its valve can operate through 1000 cycles at unbalanced closing pressure (working pressure) and flow to open discharge without causing damage to any of the epoxy coating on the body or rubber coating on the gate.

1.5 DELIVERY, STORAGE AND HANDLING

Comply with the requirements of the Section 33 01 01, GENERAL REQUIREMENTS FOR PIPING SYSTEMS and manufacturer's recommendations.

PART 2 PRODUCTS

2.1 GENERAL

- A. Obtain all gate valves, extensions, and associated manual operators from a single manufacturer.
- B. Valve operators to turn to left, counter clockwise, to open and to right, clockwise, to close.
- C. End connections on valves to be as shown on the Drawings.
- D. All flanges shall conform to the standard specification of the American National Standards Institute (ANSI), Class 125 unless otherwise noted.
- E. Valve body and bonnet shall be coated on all exterior and interior surfaces with a fusion-bonded epoxy conforming to the requirements of AWWA C550.
- F. Furnish geared operators for all valves 12 inches and larger, unless otherwise specified.
- G. Furnish geared operators with the following features unless otherwise specified.
 1. Weatherproof enclosure.
 2. Grease lubricated design.
 3. Operate with an input force of not more than 80 pounds pull.
- H. Buried valves shall utilize solid 316 stainless steel shaft extensions with 2-inch square nut within 18 inches of grade and valve boxes with covers.
- I. Exposed valves shall utilize handwheel or chainwheel operators unless otherwise noted.
- J. Valves in buried and submerged service shall utilize 304 stainless steel hardware and bolts.
Buried MJ fitting bolts may be Corten.

2.2 RESILIENT-SEATED GATE VALVE DETAILS

- A. Provide valves as shown on the Plans.
- B. Install in vertical position only.
- C. Non-shock working pressure: 200 psig through 12 inches, 150 psig larger than 12 inches.
- D. Valve body: Ductile iron with full round port opening and integrally cast guides; smooth valve bottom with no recessed areas; bonnet cover.
- E. Gate shall be completely covered with rubber on all interior and exterior ferrous surfaces. The rubber shall be secured to the gate body, including the part which houses the stem nut.
- F. Stem: Valve stem shall be cast, forged, or rolled bronze.
- G. Stem seals: Double O-ring, Buna-N protected by grit and dust cap.
- H. Stem nut: Brass or bronze.

- I. Nylon bushing and Teflon washer for friction protection.
- J. Interior coating: 2-part epoxy coating or approved equal.
- K. Acceptable Manufacturers:
 - 1. M&H
 - 2. Mueller
 - 3. Clow
 - 4. Approved Equal

2.3 ACCESSORIES

- A. Valve boxes for buried service:
 - 1. Three piece screw type 5-1/2-inch diameter, cast iron construction.
 - 2. 6 inch PVC pipe with cast iron cover marked "Water", cast iron mushroom insert with top 12" above ground unless directed otherwise.
- B. All components of shaft extensions shall be 316 stainless steel including nut shaft, shaft housing and guides. Minimum shaft diameter shall be 1-inch or diameter of valve shaft, whichever is larger. All components shall have continuous welded joints. Provide stem guides or rock shields at 5-foot intervals.
- C. Acceptable Manufacturers:
 - 1. Three piece screw type valve boxes for buried service: East Jordon Iron Works, Model 8560
 - 2. Or approved equivalent.

PART 3 EXECUTION

3.1 INSTALLATION

- A. The Construction CONTRACTOR shall install the valves in accordance with the following requirements:
 - 1. Installation shall be in accordance with the Plans, approved shop drawings and the manufacturers instructions.
 - 2. Install valves and valve operators to provide for ease of access and operation.
 - 3. Install buried valve by carefully lowering into position in such a manner to prevent damage to any part of the valves. The valve shall be placed in proper position and shall be securely held until all connections have been made. All buried pipe and appurtenances shall be wrapped in polyethylene encasement in accordance with AWWA C105/A21.5.
- B. The Equipment Manufacturer shall furnish all accessories and hardware necessary for installation.

3.2 FIELD QUALITY CONTROL

- A. The Equipment Manufacturer shall perform the following services:
 - 1. Inspect the completed installation and note deficiencies.
 - 2. Assist the CONTRACTOR during start-up, adjusting, and site testing of completed installation as required.
 - 3. Instruct OWNER personnel in the operations and maintenance of the equipment.
- B. TESTING: Testing will be in accordance with Sections 33 01 02, FIELD TESTING OF PIPING SYSTEMS. All valves shall be tested by manufacturer in accordance with AWWA C500.
- C. All valves shall be operated over the full range of travel without excessive force for at least two complete cycles; open-closed-open-closed. Valve shall not hang and shall seat and unseat to/from fully closed position. Testing shall be done after actuators and stem extensions are installed. Verify valve tag is installed and correct. Verify valve position indicator correctly reflects valve positions and limit switches (if used) are set correctly. Valves with motor or pneumatic actuators shall be operated with handwheel as well as automatic actuator.

-- END OF SECTION --

This page intentionally left blank

SECTION 33 06 01 - MISCELLANEOUS WATER LINE MATERIALS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2013.
ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).
ASTM B61 - Standard Specification for Steam or Valve Bronze Castings; 2015.
ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2015.
ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.
ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 1998 (Reapproved 2011).
ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Material; 2014.
AWWA C502 - Dry-Barrel Fire Hydrants; 2014.
AWWA C703 - Cold-Water Meters -- Fire-Service Type; 2015.
AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold- Water Meters; Latest Edition.
AWWA C707 - Encoder-Type Remote-Registration Systems for Cold-Water Meters; 2010.
AWWA C800 - Underground Service Line Valves and Fittings; 2014.
NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
UL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.

1.2 WORK INCLUDED

The CONTRACTOR shall furnish, install and test (as needed) all materials needed to complete this Project as described in these Specifications.

1.3 QUALITY ASSURANCE

- A. This item of the Specifications covers the type and/or quality of materials common to other sections of the Specifications. These Specifications are intended to be so written that only materials 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 protecting them adequately until incorporation in the Project. The Specifications for materials set out the minimum standard of quality which the OWNER believes necessary to procure a satisfactory Project. No substitutions will be permitted until the CONTRACTOR has received written permission from the ENGINEER to make a substitution for the material which has been specified.
- B. Where the term "or equal", or "or approved equal" is used, it is understood that if a material, product, or piece of equipment of the specified name and quality is furnished it will be approvable, as the particular name was used for the purpose of establishing a standard of quality acceptable to the OWNER. If a product of any other name is proposed for use, the ENGINEER's approval thereof must be obtained before the proposed substitute is procured by the CONTRACTOR. Wherever the term "or equal" is used, it is understood to mean "or approved equal".
- C. In the event the type or quality of materials required for installation on the project are inadvertently omitted from these Specifications, it is the intent that only high quality materials meeting industry accepted standards be furnished and installed by the CONTRACTOR. Such omission of materials Specifications shall be directed to the attention of the ENGINEER by the CONTRACTOR and materials shall receive approval by the ENGINEER prior to purchase. All materials used on this project shall be new.

1.4 SUBMITTALS

Submit the following information in accordance with the requirements of the Contract Documents:

- A. Pipe material
- B. Fittings and appurtenances

The pipe layout Drawings and data shall clearly indicate where pipe requiring special provisions are provided.

PART 2 PRODUCTS

2.1 MEGA-LUG JOINT RESTRAINTS

The CONTRACTOR shall furnish and install Megalug Joint Restraints Series 2000PV, as manufactured by EBAA Iron, for all mechanical joint fittings and valves. The joint restraints shall comply with the requirements of ASTM D3139. The joint restraints shall be adaptable for use with C-900 or IPS PVC Pipe.

2.2 RETAINER GLANDS

Retainer glands for restraining cast iron mechanical joint fittings used with PVC pipe shall be cast from high strength ductile iron, ASTM A536 Grade 65-45-12. Glands shall be Uni-Flange Series 1300 Restrainer, or approved equal. Retainer glands for restraining cast iron mechanical joint fittings used with ductile iron pipe shall be cast from 60-40-10 ductile iron. Glands shall be EBAA Iron Series 100, or approved equal.

2.3 COPPER TUBING AND ASSOCIATED FITTINGS

Copper tubing shall conform fully with the requirements of ASTM B88 for seamless copper tubing. Use Type L for above ground installation and Type K for underground. All copper tubing connections shall be made using cast brass or copper sweat fittings and Sil-Fos, or equal, hard solder. Union adapters shall be used at the ends of copper lines and at connections to equipment so that piping can be disconnected without unsoldering the joints. Joints in copper piping shall be sweated with 50-50 solder. Before making up joints, all copper shall be cleaned to bright metal with emery cloth and treated with No-Kerrode, or equal, flux. All solder composition shall meet current requirements of EPA Guidelines.

2.4 POLYETHYLENE TUBING AND ASSOCIATED FITTINGS

Polyethylene pipe for connecting new and existing service lines and chemical piping shall be P.E. 3408 meeting classification ASTM D3350 of 345434C with NSF 61 approved resin. The pipe shall have a SDR of 9 for each size as noted on the Plans. Connections to fittings shall include stainless steel inserts to prevent collapse of the pipe when the connections are tightened.

2.5 CORPORATION STOPS

Ground key type; bronze, ASTM B61 or ASTM B62; and suitable for the working pressure of the system. Ends shall be suitable for solder-joint, or flared tube compression type joint.

Threaded ends for inlet and outlet of corporation stops, AWWA C800; coupling nut for connection to flared copper tubing, ASME B16.26.

2.6 CURB OR SERVICE STOPS

Ground key, round way, inverted key type; made of bronze, ASTM B61 or ASTM B62; and suitable for the working pressure of the system. Ends shall be as appropriate for connection to the service piping. Arrow shall be cast into body of the curb or service stop indicating direction of flow.

2.7 DIELECTRIC FITTINGS

Dielectric fittings shall be installed between threaded ferrous and nonferrous metallic pipe, fittings and valves, except where corporation stops join mains. Dielectric fittings shall prevent metal-to-metal contact of dissimilar metallic piping elements and shall be suitable for the required working pressure.

2.8 TAPPING SLEEVES

Tapping sleeves of the sizes indicated for connection to existing main shall be the stainless steel, split-sleeve type with flanged or grooved outlet, and with bolts, follower rings and gaskets on each end of the sleeve. Construction shall be suitable for a maximum working pressure of 150 psi. Bolts shall have square heads and hexagonal nuts. Longitudinal gaskets and mechanical joints with gaskets shall be as recommended by the manufacturer of the sleeve.

When using grooved mechanical tee, it shall consist of an upper housing with full locating collar for rigid positioning which engages a machine-cut hole in pipe, encasing an elastomeric gasket which conforms to the pipe outside diameter around the hole and a lower housing with positioning lugs, secured together during assembly by nuts and bolts as specified, pre-torqued to 50 foot-pounds.

2.9 FIRE HYDRANTS

- A. Fire hydrants shall be standard three-way, 5¼" valve opening, two 2½" nozzles and one pump nozzle, 150 psi working pressure, complying with AWWA C502. Fire hydrants shall have mechanical joint inlet. Megalug joint restraints shall be used from the fire hydrant to the tee. The fire hydrants shall be red in color and any damage to the point shall be repaired by the Supplier.
- B. Approved Manufacturers:
 - 1. Mueller
 - 2. M&H
 - 3. Clow
 - 4. Approved Equal

2.10 METAL DETECTABLE TAPE

- A. Detectable marking tape shall consist of one layer of metalized foil laminated between two layers of inert plastic film. The lamination bond shall be strong enough that the layers cannot be separated by hand. Tape shall be a minimum of 5 mils thick with a minimum tensile strength of 56 pounds per 2-inch width strip. Tape shall be imprinted with a continuous warning message repeated every 30 inches. It shall be inductively locatable and conductively traceable using a standard pipe and cable locating device for a minimum of 8 years after direct burial at 18-inch depth. Test results showing minimum 8-year life must be furnished with the submittals.
- B. Tape for this project shall be 2 inches wide, blue in color on one side with black lettering. The warning message shall read "CAUTION WATER LINE BURIED BELOW." The tape shall be as manufactured by Reef Industries, Inc., Houston, Texas, or an approved equal. The water line ditch shall be backfilled to 18 inches below ground level; backfill shall be graded uniformly; then the tape shall be laid continuously in the center of the ditch line with lettered side up. Tape shall be installed for all water line trench except through casing and the tape shall be pulled into valves boxes for access.

PART 3 EXECUTION

3.1 INSTALLATION

The CONTRACTOR shall install miscellaneous water line materials in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that the components serve their intended purpose.

-- END OF SECTION --

SECTION 33 07 01 - SERVICE METERS, BOXES, REGULATORS AND SERVICE LINES**PART 1 GENERAL****1.1 REFERENCE STANDARDS**

ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Material; 2014.

AWWA C700 - Cold-Water Meters -- Displacement Type, Metal Alloy Main Case; 2015.

AWWA C702 - Cold-Water Meters -- Compound Type; 2015.

AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold- Water Meters; Latest Edition.

AWWA C707 - Encoder-Type Remote-Registration Systems for Cold-Water Meters; 2010.

AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service; 2008.

NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

1.2 WORK INCLUDED

The CONTRACTOR shall furnish, install and test (as needed) service meters, service pressure regulators, service lines, meter boxes, corporation stops, meter stops, customer shut-off valves and all materials needed to complete this project as described in these Specifications.

1.3 QUALITY ASSURANCE

- A. This item of the Specifications covers the type and/or quality of materials common to other sections of the Specifications. These Specifications are intended to be so written that only materials 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 protecting them adequately until incorporation in the Project. The Specifications for materials set out the minimum standard of quality which the OWNER believes necessary to procure a satisfactory Project. No substitutions will be permitted until the CONTRACTOR has received written permission from the ENGINEER to make a substitution for the material which has been specified.
- B. Where the term "or equal", or "or approved equal" is used, it is understood that if a material, product, or piece of equipment of the specified name and quality is furnished it will be approvable, as the particular name was used for the purpose of establishing a standard of quality acceptable to the OWNER. If a product of any other name is proposed for use, the ENGINEER's approval thereof must be obtained before the proposed substitute is procured by the CONTRACTOR. Wherever the term "or equal" is used, it is understood to mean "or approved equal".
- C. In the event the type or quality of materials required for installation on the project are inadvertently omitted from these Specifications, it is the intent that only high quality materials meeting industry accepted standards be furnished and installed by the CONTRACTOR. Such omission of materials Specifications shall be directed to the attention of the ENGINEER by the CONTRACTOR and materials shall receive approval by the ENGINEER prior to purchase. All materials used on this project shall be new.

1.4 SUBMITTALS

Submit the following information in accordance with the requirements of the Contract Documents:

- A. Pipe material

B. Fittings and appurtenances

The pipe layout Drawings and data shall clearly indicate where pipe requiring special provisions are provided.

PART 2 PRODUCTS**2.1 3/4" METER SERVICE AND SERVICE LINE**

3/4" Meter Service and Service Line shall be 3/4" SDR 9 polyethylene tubing. Polyethylene water service tubing shall meet or exceed all requirements of AWWA C901. The polyethylene pipe shall be P.E. 3408 meeting cell classification ASTM D3350 of 345434C with NSF 61 approved resin. Service tubing shall be equipped with stainless stiffeners and insta-tite or pack joint type connections.

The service line shall be 2" CL200 PVC when the meter is located across a paved road from the main line.

2.2 SADDLES

Saddles shall be bronze, single strap with O-ring seal cemented in place. Service clamps shall have threads to correspond with the corporation stop inlet, Ford S71 or S91, or equal.

2.3 CORPORATION STOPS

Corporation Stops shall be 3/4" Ford-F1100-G, or equal, I.P. thread inlet and outlet for insta-tite or pack joint connection to polyethylene pipe.

2.4 METER STOPS

Meter Stops shall be 3/4" Ford BA41-233WRG ball valve for polyethylene pipe and swivel nut I.P.T. outlet. One required for each meter.

2.5 METER BOXES

Meter Boxes shall be pre-cast, reinforced plastic water meter box DFW JUMBO Model D-1500, or approved equal, marked "Water Meter". The boxes shall be of sufficient size to completely enclose the meter and shutoff valve or service stop.

Meter boxes set in paved areas subject to vehicular traffic shall be cast iron, or concrete with cast iron lid and cast iron meter reader lid. Boxes set in sidewalks, not subject to vehicular traffic shall,

1. Use concrete covers with cast iron meter reader lids
2. Be concrete with cast iron lid and cast iron meter reader lid

Plastic boxes and lids shall be used in unpaved areas or grass areas not subject to vehicular traffic. Box height shall extend from invert of the meter to final grade at the meter location. The lid shall have the word "WATER" cast in it.

2.6 SERVICE PRESSURE REGULATORS

Service Pressure Regulators shall be Wilkins, Model BR4 with stainless steel screen or approved equal, 3/4" with 50 psi pressure differential. Service pressure regulators shall be installed with all service meters. Provide straight brass connection with I.P.T. each end for connection to meter stop and Ford Meter Coupling C3823-1.625, or equal, for connection from meter to 1" CL 200 PVC stub.

2.7 CUSTOMER SHUT-OFF VALVES

The CONTRACTOR shall furnish and install one 3/4" Nibco rubber seat gate valve, 4" plastic valve box and 3/4" CL 200 PVC connecting pipe as shown on the Plans.

PART 3 EXECUTION**3.1 INSTALLATION**

The meter shall be set where indicated by the OWNER with top of meter box set flush with ground and service line laid with 24 inches of cover. Trenching for service line and backfill shall be in accordance with Sections 31 03 01, TRENCHING, BACKFILLING AND COMPACTING, and 31 04 01, TENCH EXCAVATION SAFETY PROTECTION SYSTEM. Service lines shall be installed prior to pressure testing any particular section of the water main, and service lines shall be examined for possible leakage prior to approval of the work by the Inspector. For service line taps on mains, an approved type tapping saddle shall be used to provide a threaded connection for the corporation stop. Meters and service lines shall be installed as directed by the OWNER, providing water customers have paid the meter deposit prior to time the CONTRACTOR selects to construct the adjacent water main. After installation of the box, the area shall be backfilled and compacted and the surface left in a smooth and uniform condition and graded to drain. Pressure reducers shall be installed on the outlet side of meter and coupling inside the meter box on all meters

-- END OF SECTION --

This page intentionally left blank

SECTION 33 08 01 - INLET / OUTLET STRUCTURES

PART 1 GENERAL

1.1 WORK INCLUDED

This item of the Specifications covers the Inlet and Outlet structures at the new wastewater treatment facility

1.2 REFERENCE STANDARDS

PART 2 PRODUCTS

2.1 GENERAL

The CONTRACTOR shall construct inlet and outlet structures for the facultative lagoon and stabilization ponds to the grades and dimensions shown on the Plans with materials as specified below. Concrete outlet structures may be cast-in-place or precast as shown on the Plans and approved by the ENGINEER.

- A. Concrete: Class A concrete and reinforcement of concrete for all of the structures shall be as set forth in Specifications 03 09 01, GENERAL CONCRETE. All exposed corners shall receive a 3/4" chamfer. Side walls of structures shall receive Class 2, Rubbed Finish. Slabs of the structures shall receive Class 4, Steel Trowel Finish. All concrete shall be placed upon thoroughly compacted backfill or excavated materials.
- B. Excavation and Backfill: Excavation for the structures shall be made to the lines and dimensions required. Embankment work shall have been completed and acceptable prior to excavation and placement of concrete for structures. Backfill around the structures shall be performed with mechanical hand tamps or other approved methods as necessary to compact the backfill around structures or the concrete water curb or cut-off on the inlet and outlet structure piping to 95 percent Standard Proctor Density.
- C. Baffles and Weirs: Aluminum baffles and weirs for the outlet structure and anchor bolts shall be as dimensioned on the Plans. The weir for each outlet structure of the Lagoon or ponds shall be accurately set to the same elevation as shown on the Plans for the respective structure. Baffles and weirs shall be 3/8-inch-thick aluminum plate alloy 6061 - T6 with a mill finish. Anchor bolts shall be as shown on Plans.
- D. Pipe Bar Screen: Pipe bar screen for each of the outlet structures shall be as shown on the Plans and galvanized after fabrication.
- E. Inlet Marker: The PVC pipe marker at each of the inlet structures shall be Schedule 80 PVC pipe with a PVC cap. Pipe shall be set plumb.
- F. Concrete Walkways: The CONTRACTOR shall cast and place concrete or provide precast walkway panels for each outlet structure as detailed on the Plans. Concrete shall be Class A as set forth in Specification 03 09 01, GENERAL CONCRETE, and the top of the walkways shall receive a broom finish.

PART 3 EXECUTION

3.1 NOT USED

-- END OF SECTION --

This page intentionally left blank

SECTION 33 10 01 - CULVERTS

PART 1 GENERAL

1.1 WORK INCLUDED

This item shall consist of furnishing and installing new culvert crossings in the designated locations. The culvert will receive concrete headwalls, wing walls, sloped end treatment or riprap protection for each culvert as shown on the Plans.

1.2 REFERENCE STANDARDS

PART 2 PRODUCTS

2.1 CULVERT

- A. Reinforced Concrete Box (RCB): The box culvert shall be new pre-cast reinforced concrete box which conforms to all TxDOT and local standards. Pre-Cast Box shall be Hanson Precast or approved equal.
- B. High Density Polyethylene Pipe (HDPE) Culvert: HDPE pipe shall have smooth interior and annular exterior corrugations. HDPE pipe shall be ADS, or approved equal.
- C. Corrugated Metal Pipe (CMP): CMP shall have standard interior and exterior corrugations or smooth interior as directed on Plans. The CMP shall be Contech or approved equal.
- D. Reinforced Concrete Pipe (RCP): The pipe culvert shall be new reinforced concrete pipe which conforms to all TxDOT and local standards. RCP shall be Hanson Precast or approved equal.

2.2 CONCRETE AND REINFORCING

- A. Concrete: Concrete for this item shall conform to the requirements of Class "A" Concrete, THD Specifications.
- B. Reinforcement: Reinforcing steel shall either be wire mesh or bar reinforcement as shown on Plans. If wire mesh is used, it shall be 6" x 6" Number 10 or Number 6 plain electric welded reinforcing fabric or its equal. A minimum lap of 6 inches shall be used at all splices. At the edge of the riprap, the wire mesh shall not be less than 1 inch nor more than 3 inches from the edge of the concrete and shall not have wire projecting beyond the last member parallel to the edge of the concrete. If bar reinforcement is used, the sectional area of steel in each direction shall not be less than the sectional area of the wire mesh described above. The spacing of bar reinforcement shall not exceed 19 inches in each direction, and the distance from the edge of the concrete to the first parallel bar shall not exceed 6 inches.

PART 3 EXECUTION

3.1 GENERAL

- A. The ditch shall be excavated and shaped in order that the culvert may be set to the designated grade. The ditch shall be backfilled with sand, or other granular material, approved by ENGINEER, and compacted to the density of the adjacent compacted base material under the entire roadway. Backfill will be compacted around sides and ends of culvert.
- B. Reinforcement shall be properly supported throughout the placement to maintain its position equidistant from the top and bottom surfaces of the slab.
- C. The slopes and bottom of the trench for the walls shall be sprinkled and consolidated to the satisfaction of the ENGINEER. All surfaces shall be moist when concrete is placed.
- D. After concrete has been placed, compacted, and shaped to conform to the dimensions shown on the Plans, and has set sufficiently to avoid slumping, the surface shall be finished with a wooden float to secure a reasonable smooth surface. Curing of concrete shall conform to Section 03 09 01, GENERAL CONCRETE.

JACOB|MARTIN
City of Azle - Dunaway Lane
Reconstruction

33 10 01
CULVERTS

-- END OF SECTION --