ADDENDUM NO. 2
October 22, 2025

PROJECT: **CITY OF MELVIN**
WATER SYSTEM IMPROVEMENTS

BID DATE: **NOVEMBER 20, 2025**

The following changes and/or additions shall be made to the Plans, Specifications, and Contract Documents for the above referenced project. Bidder shall acknowledge receipt of this Addendum by signing below and returning this Addendum with the Bid.

1) GENERAL

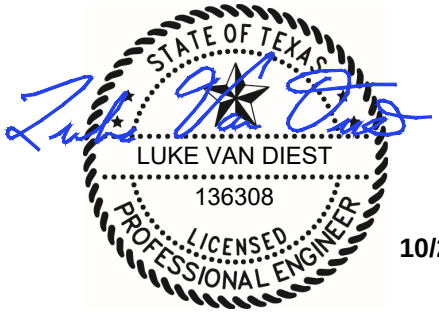
a) The bid opening date has been rescheduled for November 20, 2025 at 10:00 AM.

b) TxDOT Permits are attached.

c) Some bidders have noted an issue reading the specifications in the bid package. A copy is attached.

Prepared by:

JACOB | MARTIN
TBPE Firm No. 2448



10/22/2025

_____
Bidder's Acknowledgment

_____
Date

UTILITY PERMIT APPROVAL

TO:	Davis Marlinda
	City of Melvin
	PO Box 777 Melvin,76858-0777

Date:	10-21-2024
Application/Permit No.:	00002/20241003/377439/462325/UP
District:	Brownwood

Highway	Control Section	Maintenance Section	County
FM2028-K: From milepost 424+1.664 To milepost 426+0.395	0869-03		McCulloch

Schedule Dates: from 10/28/2024 to 03/21/2025

TxDOT offers no objection to the location on the right-of-way of your proposed utility installation, as described by Notice of Proposed Utility Installation No. 00002/20241003/377439/462325/UP dated

10/15/2024 and accompanying documentation, except as noted below.

Special Provisions:
You are required to notify TxDOT 48 hours (2 business days) before you start construction to allow for proper inspection and coordination of workdays and traffic control plans. Use the RULIS website for the 48-hour notification. DO NOT start construction until you have coordinated the construction start date and inspection with TxDOT. You are also required to keep a copy of this Approval and any approved amendments at the job site.

When installing utility lines on controlled-access highways, access for serving this installation shall be limited to access via (a) frontage roads where provided, (b) nearby or adjacent public roads or streets, (c) trails along or near the highway right-of-way lines, connecting only to intersecting roads; from any one or all of which entry may be made to the outer portion of the highway right-of-way for routine service and maintenance operations. The Installation Owner's rights of access to the through-traffic roadways and ramps shall be subject to the same rules and regulations as that apply to the general public except, however, if an emergency occurs and usual means of access for routine service operations will not permit the immediate action required by the Utility Installation Owner in making emergency repairs as required for the safety and welfare of the public, the Utility Owners shall have a temporary right of access to and from the through-traffic roadways and ramps as necessary to accomplish the required emergency repairs, provided TxDOT is immediately notified by the Utility Installation Owner when such repairs are initiated and adequate provision is made by the Utility Installation Owner for the convenience and safety of highway traffic.

The installation shall not damage any part of the highway, and adequate provisions must be made to cause minimum inconveniences to traffic and adjacent property owners. If the Utility Installation Owner fails to comply with any or all the requirements as set forth herein, the State may take such action as it deems appropriate to compel compliance.

1. **PERMIT** - The person in charge of this installation shall have a copy of the permit and its' attachments on the job at all times. Deviations from the approved permit must have prior approval of the Texas Department of Transportation.

2. **EXISTING UTILITIES** - The exact location of any utilities that may conflict with the proposed installation should be field verified by the installer during

3. **SAFETY** - Warning and protective devices, including flagmen, shall be used to prevent creation of a traffic hazard and to ensure the safety of the public in accordance with the Manual of Uniform Traffic Control Devices.

   Parking of employees' cars and trucks on both sides of the pavement will be prohibited and all such vehicles shall be parked on one side of the road and in no instance closer than a minimum of eight feet from the edge of the pavement.

   All construction equipment and materials stored on highway right-of-way shall be stored in such a manner and at such

locations (a minimum of 30 feet from nearest traffic lane) as not to interfere with the safe passage of traffic.

1. **LONGITUDINAL ALIGNMENT** - Installations shall be placed uniformly along the right-of-way line on longitudinal sections “as dimensioned” and approved on the notice form and specified on the plans. State law allows only utility firms and agencies to install lines along highway right-of-way.

SME - Maintenance Section Review
Review Answer:*Recommend Approval*
Response text: *APPROVED*

SME - Area Engineer Review
Review Answer:*Recommend Approval*
Response text: *Approved*

SME ATTACHMENTS:

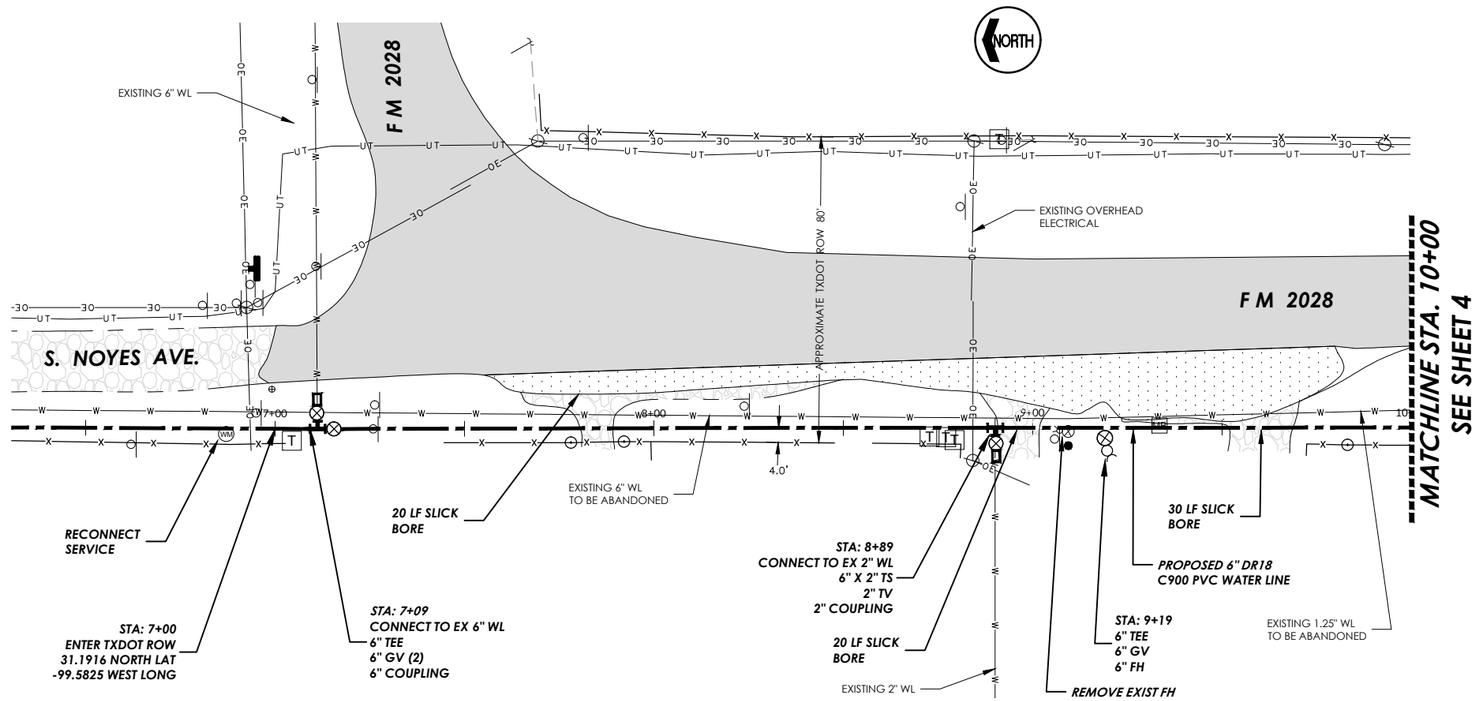
Included attachments:

SME Answers Summary 2802160.pdf

NOTE :
1) LOCATIONS OF EXISTING WATER UTILITIES ARE ESTIMATED. CONTRACTOR SHALL POTHOLE TO LOCATE EXISTING LINES PRIOR TO START OF CONSTRUCTION.
2) IN TXDOT ROW THE PROPOSED WATERLINE SHALL BE INSTALLED AS CLOSE AS POSSIBLE TO THE EDGE OF ROW DEPENDING ON LOCATION OF EXISTING UTILITIES.

NOTES:

1. FOR LONGITUDINAL INSTALLATION INSIDE TXDOT ROW THE MINIMUM COVER FROM TOP OF PIPE TO THE ORIGINAL GROUND SURFACE, SHALL BE AT A MINIMUM 3 FEET (36 INCHES) BELOW THE FLOW LINE. IF WITHIN 50 LF OF A CULVERT MINIMUM DEPTH SHALL BE 4' (48 INCHES) BELOW THE FLOWLINE.



STATE OF TEXAS
LUKE VAN DIEST
136308
LICENSED PROFESSIONAL ENGINEER
09/24/24

ISSUED FOR PERMITTING

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF MELVIN, TEXAS
TWDB 2022 WATER SYSTEM IMPROVEMENTS
WATER LINE PLAN STA. 0+00 TO 10+00

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING.
CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 22172
SCALE 1" = 40'

SEQ. 03 / 10
SHEET 03

Plotted by: ron miller Plot Date: 10/3/2024 1:35 PM
Saved By: ron Save Time: 10/3/2024 1:32 PM
X:\CL_Melvin_Permits\FM 2028 WL\03 WATER LINE PLAN STA. 0+00 TO 10+00.dwg

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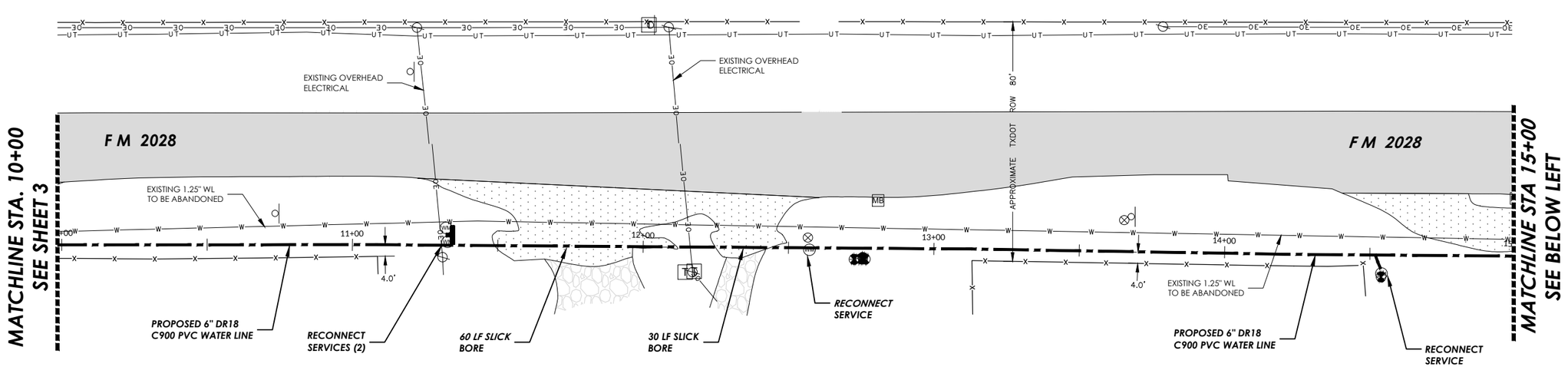

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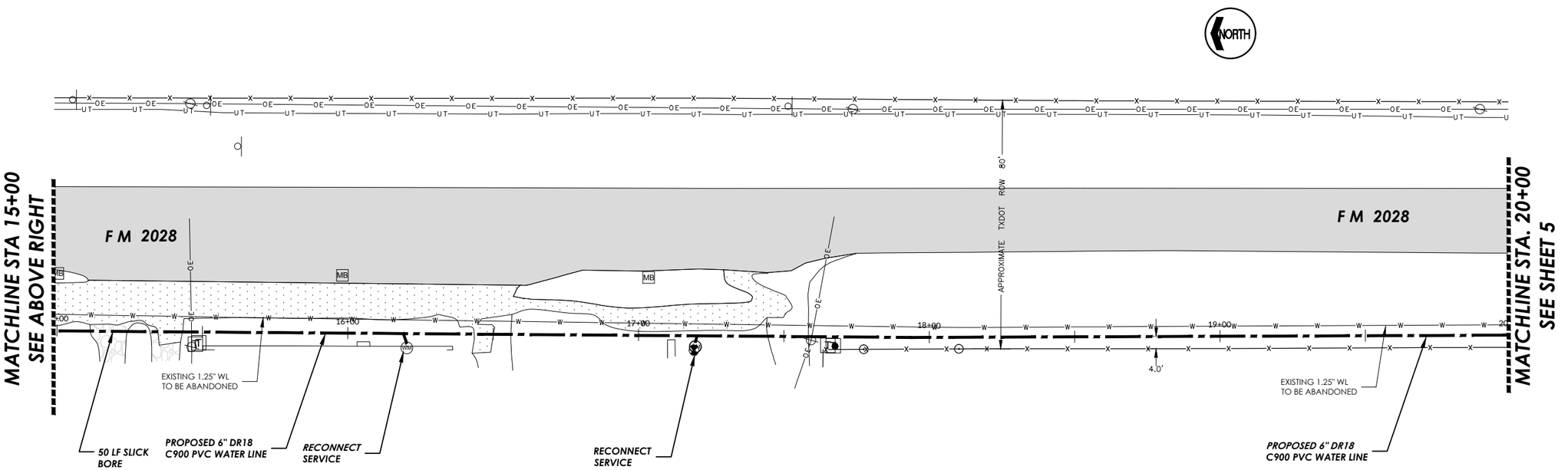

STATE OF TEXAS
LUKE VAN DIEST
136308
LICENSED PROFESSIONAL ENGINEER
09/24/24

ISSUED FOR PERMITTING

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF MELVIN, TEXAS
TWDB 2022 WATER SYSTEM IMPROVEMENTS
WATER LINE PLAN STA. 10+00 TO 20+00

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 22172 SCALE 1" = 40'

SEQ. 04 / 10 SHEET 04

Plotted by: ron miller Plot Date: 10/3/2024 1:35 PM
Saved By: ron Save Time: 10/3/2024 1:32 PM
X:\CI_Melvin_Permits\FM 2028 WL\04 WATER LINE PLAN STA. 10+00 TO 20+00.dwg

NOTE :
1) LOCATIONS OF EXISTING WATER UTILITIES ARE ESTIMATED. CONTRACTOR SHALL POTHOLE TO LOCATE EXISTING LINES PRIOR TO START OF CONSTRUCTION.
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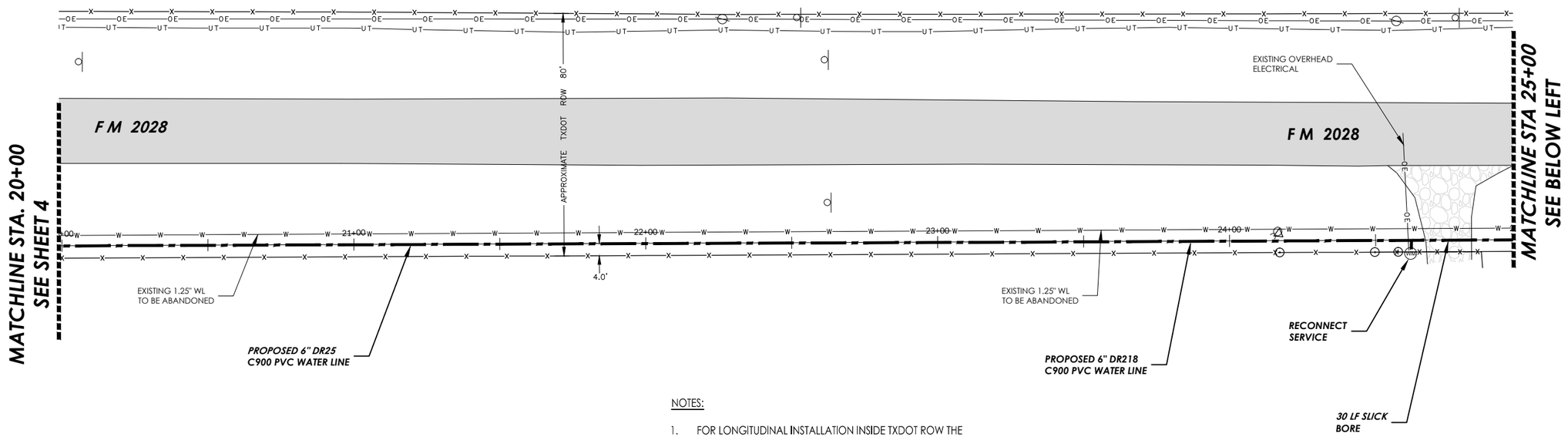

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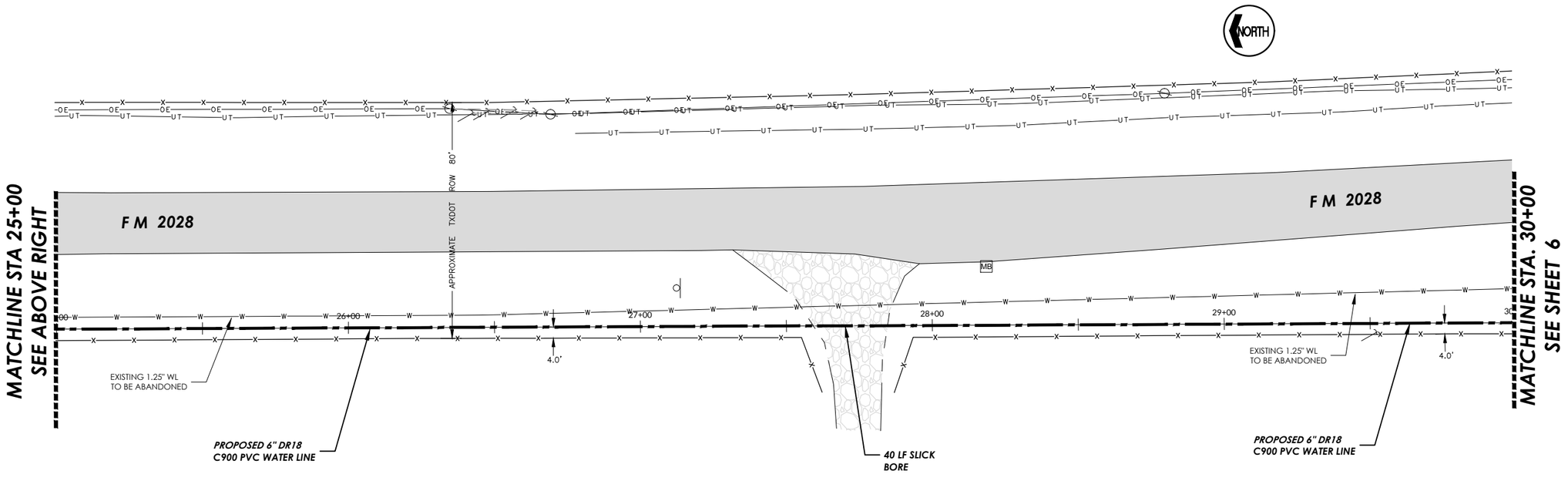

STATE OF TEXAS
LUKE VAN DIEST
136308
LICENSED PROFESSIONAL ENGINEER
09/24/24

ISSUED FOR PERMITTING

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF MELVIN, TEXAS
TWDB 2022 WATER SYSTEM IMPROVEMENTS

WATER LINE PLAN STA. 20+00 TO 30+00

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING.
CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 22172 | SCALE 1" = 40'

SEQ. 05 / 10 | SHEET 05

Plotted by: ron miller Plot Date: 10/3/2024 1:35 PM
Saved By: ron Save Time: 10/3/2024 1:33 PM
X:\C_Melvin_Permits\FM 2028 WL\05 WATER LINE PLAN STA. 20+00 TO 30+00.dwg

NOTE :
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NORTH

MATCHLINE STA. 30+00
SEE SHEET 5

F M 2028

EXISTING OVERHEAD ELECTRICAL

EXISTING 1.25" WL TO BE ABANDONED

PROPOSED 6" DR18
C900 PVC WATER LINE

RECONNECT SERVICE

EXISTING 1.25" WL TO BE ABANDONED

PROPOSED 6" DR18
C900 PVC WATER LINE

MATCHLINE STA 35+00
SEE BELOW LEFT

NOTES:

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MATCHLINE STA 35+00
SEE ABOVE RIGHT

F M 2028

APPROXIMATE TXTDOT ROW 80'

EXISTING 1.25" WL TO BE ABANDONED

PROPOSED 6" DR18
C900 PVC WATER LINE

EXISTING OVERHEAD ELECTRICAL

F M 2028

EXISTING 1.25" WL TO BE ABANDONED

PROPOSED 6" DR18
C900 PVC WATER LINE

MATCHLINE STA. 40+00
SEE SHEET 7

STATE OF TEXAS
LUKE VAN DIEST
136308
LICENSED PROFESSIONAL ENGINEER
09/24/24

ISSUED FOR PERMITTING

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF MELVIN, TEXAS
TWDB 2022 WATER SYSTEM IMPROVEMENTS

WATER LINE PLAN STA. 30+00 TO 40+00

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING.
CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 22172 | SCALE 1" = 40'

SEQ. 06 | SHEET 06 / 10

Plotted by: ron miller Plot Date: 10/3/2024 1:35 PM

Saved By: ron Save Time: 10/3/2024 1:33 PM

X:\C_Melvin_Permits\FM 2028 WL\06 WATER LINE PLAN STA.30+00 to 35+00.dwg

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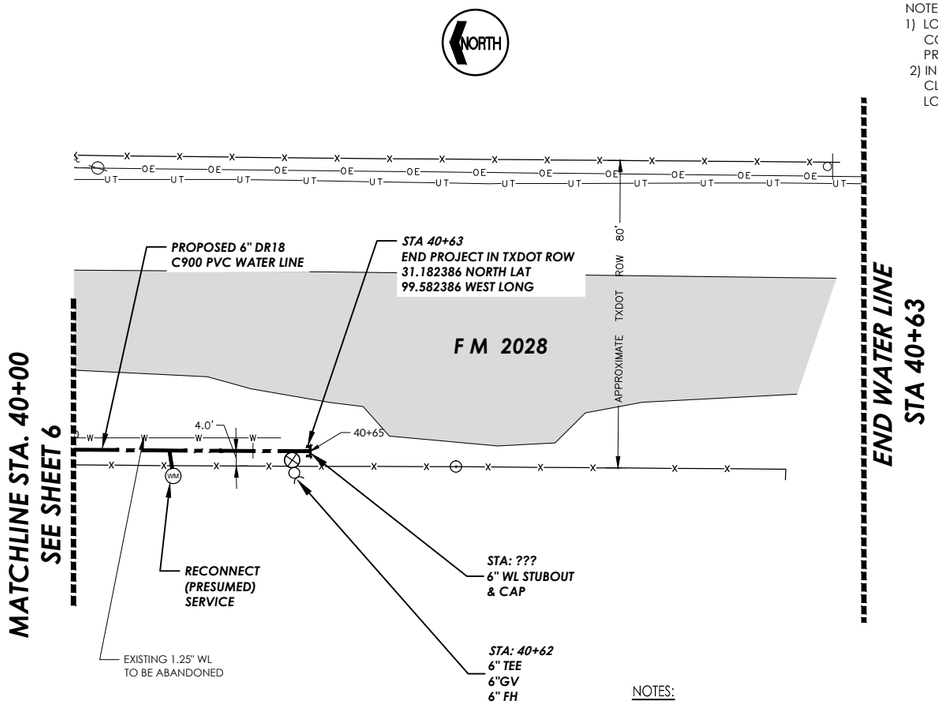

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STATE OF TEXAS
LUKE VAN DIEST
136308
LICENSED PROFESSIONAL ENGINEER
09/24/24

ISSUED FOR PERMITTING

JACOB MARTIN
TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF MELVIN, TEXAS
TWDB 2022 WATER SYSTEM IMPROVEMENTS

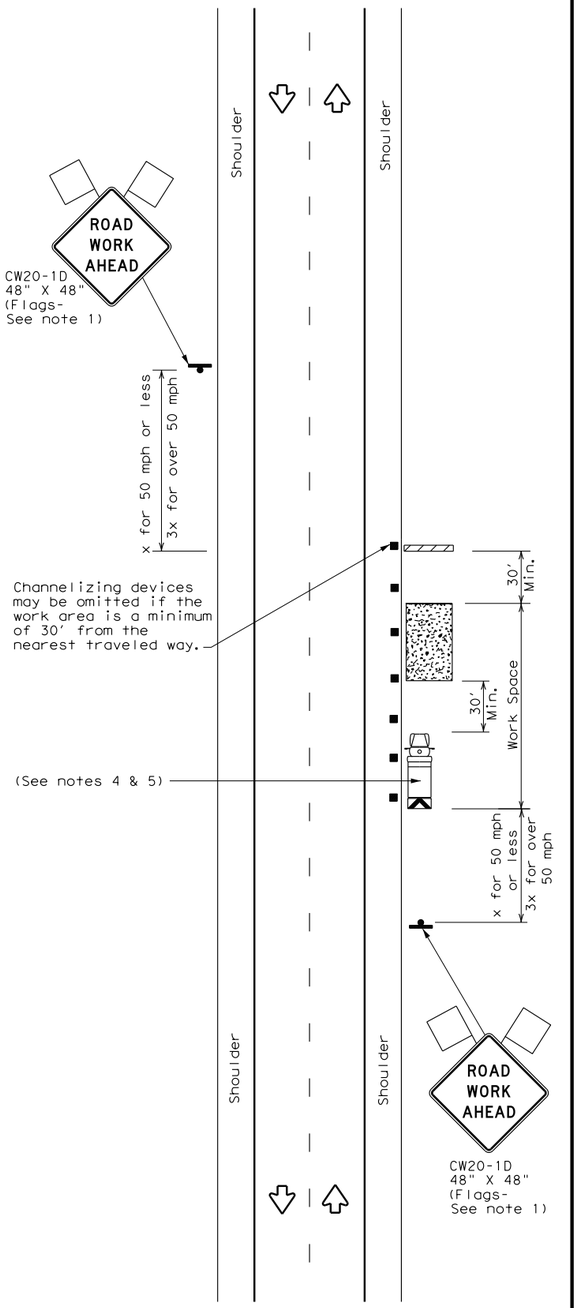
WATER LINE PLAN STA. 40+00 TO 40+63

NO.	REVISION	DATE

PROJECT # 22172
SCALE 1" = 40'
BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.

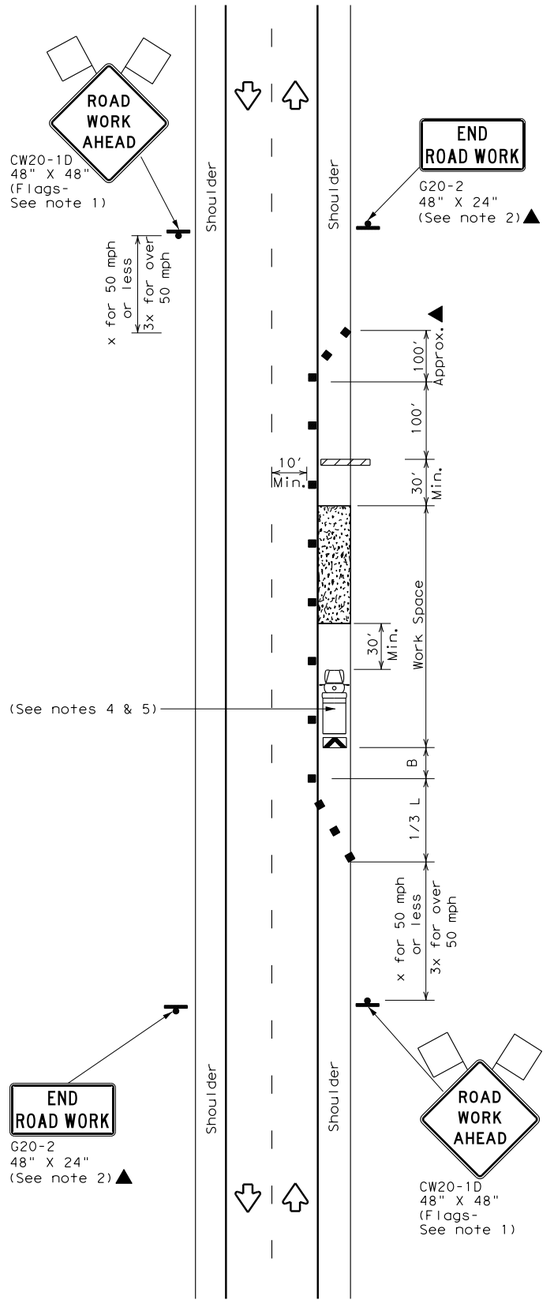
SEQ. 07 / 10
SHEET 07

DATE:
FILE:



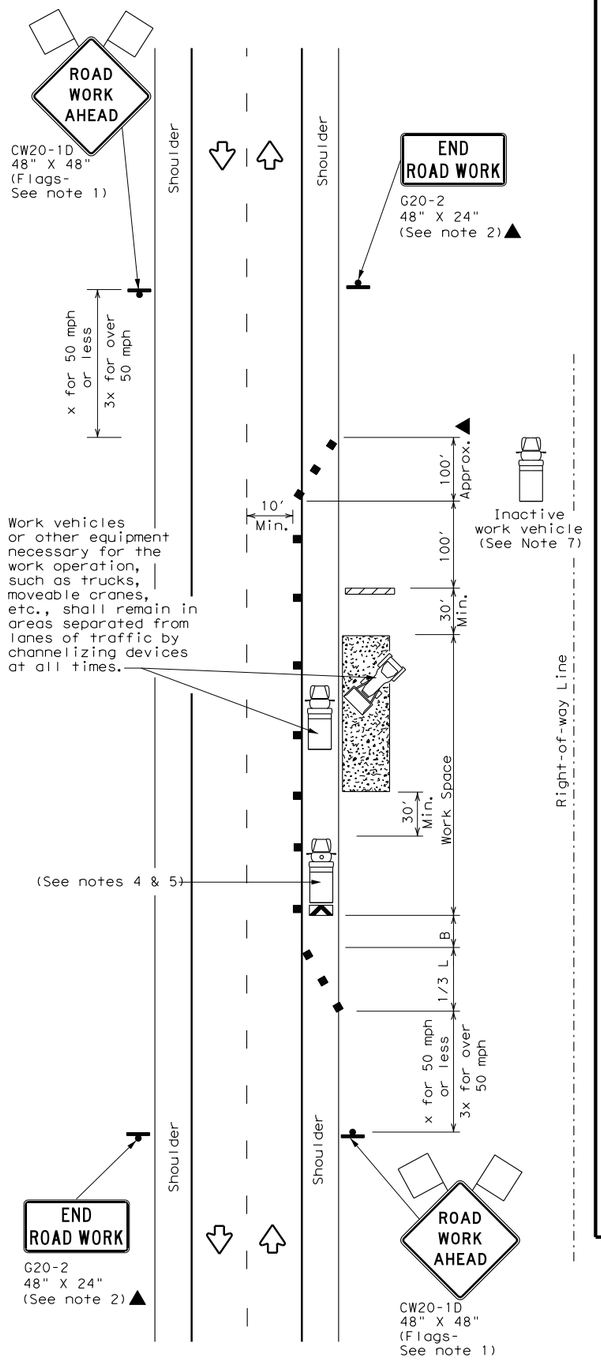
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	✓

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
3. Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
8. CW21-5 "SHOULDER WORK" signs may be used in place of CW21-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS				
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12				
1-97 2-18				

September 24, 2024

Mr. Greg Cedillo, P.E.
District Engineer
Texas Department of Transportation
2495 Hwy 183 North
Brownwood, Texas 76802

Re: City of Melvin TxDOT Permit Abandonment in Place Request
43 TAC: Rule 21.39

Via: Email

Dear Mr. Cedillo:

The City of Melvin has received funding from the Texas Water Development Board to replace a portion of the City's existing distribution line. An existing line proposed for replacement is located in the west side of the FM 2028 right of way from approximately 1,260 feet north of reference marker 426 to 2,816 feet south of reference marker 426.

Per City Staff, the existing water line does not contain, nor is it composed of hazardous or contaminated materials. The existing pipe will be disconnected and removed from water sources and abandoned in place. There are no known crossings of FM 2028 which will be abandoned.

It is requested that TxDOT allow the abandonment of the existing water line in place along FM 2028.

If you need more information to consider our abandonment request, please let me know.

Sincerely,

City of Melvin

Mayor Marelina Brown

Cc: Jacob & Martin, LLC

UTILITY PERMIT APPROVAL

TO:	Davis Marlinda
	City of Melvin
	PO Box 777 Melvin,76858-0777

Date:	10-16-2025
Application/Permit No.:	00002/20250930/420266/577294/UP
District:	McCulloch County

Highway	Control Section	Maintenance Section	County
1168907: At milepost 0.371	LQ45-19		McCulloch
FM2028-K: At milepost 0.371	LQ45-19		McCulloch

Schedule Dates: from 10/20/2025 to 04/17/2026

TxDOT offers no objection to the location on the right-of-way of your proposed utility installation, as described by Notice of Proposed Utility Installation No. 00002/20250930/420266/577294/UP dated

09/30/2025 and accompanying documentation, except as noted below.

Special Provisions:
You are required to notify TxDOT 48 hours (2 business days) before you start construction to allow for proper inspection and coordination of workdays and traffic control plans. Use the RULIS website for the 48-hour notification. DO NOT start construction until you have coordinated the construction start date and inspection with TxDOT. You are also required to keep a copy of this Approval and any approved amendments at the job site.

When installing utility lines on controlled-access highways, access for serving this installation shall be limited to access via (a) frontage roads where provided, (b) nearby or adjacent public roads or streets, (c) trails along or near the highway right-of-way lines, connecting only to intersecting roads; from any one or all of which entry may be made to the outer portion of the highway right-of-way for routine service and maintenance operations. The Installation Owner's rights of access to the through-traffic roadways and ramps shall be subject to the same rules and regulations as that apply to the general public except, however, if an emergency occurs and usual means of access for routine service operations will not permit the immediate action required by the Utility Installation Owner in making emergency repairs as required for the safety and welfare of the public, the Utility Owners shall have a temporary right of access to and from the through-traffic roadways and ramps as necessary to accomplish the required emergency repairs, provided TxDOT is immediately notified by the Utility Installation Owner when such repairs are initiated and adequate provision is made by the Utility Installation Owner for the convenience and safety of highway traffic.

The installation shall not damage any part of the highway, and adequate provisions must be made to cause minimum inconveniences to traffic and adjacent property owners. If the Utility Installation Owner fails to comply with any or all the requirements as set forth herein, the State may take such action as it deems appropriate to compel compliance.

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   Parking of employees' cars and trucks on both sides of the pavement will be prohibited and all such vehicles shall be parked on one side of the road and in no instance closer than a minimum of eight feet from the edge of the pavement.

All construction equipment and materials stored on highway right-of-way shall be stored in such a manner and at such locations (a minimum of 30 feet from nearest traffic lane) as not to interfere with the safe passage of traffic.

1. **UNDERCROSSINGS** - Crossings shall be bored under the highway. The annular void between the drilled hole and the casing pipe (if more than one inch) shall be pressure-filled with a satisfactory material to prevent settlement of any part to the highway facility over the casing. No more than three pilot bores will be permitted. Abandoned pilot bores shall be pressure-filled.

   Bore pits should be located at least: 30 feet from all freeway main lanes and other high-speed (exceeding 40 mph) highways except as indicated as follows: 16 feet for high-speed highways with current average daily traffic volumes of 750 vehicles per day or less; 16 feet for ramps; and 10 feet for low-speed (40 mph or less) highways. For urban (curbed) highway cross sections, all borings shall extend beyond the back of curb plus: 30 feet from high-speed (greater than 40 mph) facilities; and three feet from low-speed (40 mph or less) facilities, plus any additional width to clear an existing sidewalk. The pits or trenches excavated to facilitate boring and pipeline installation shall be backfilled to a density approximating that of the adjacent soil immediately after operations have been completed.

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1. **ENCASEMENT** - Encasement pipe can either be HDPE, PVC, or Welded Steel, and must be made of load bearing materials. Roadway crossing should be encased from right of way line to right of way line or as far as possible. Refer to TAC RULE §21.40.

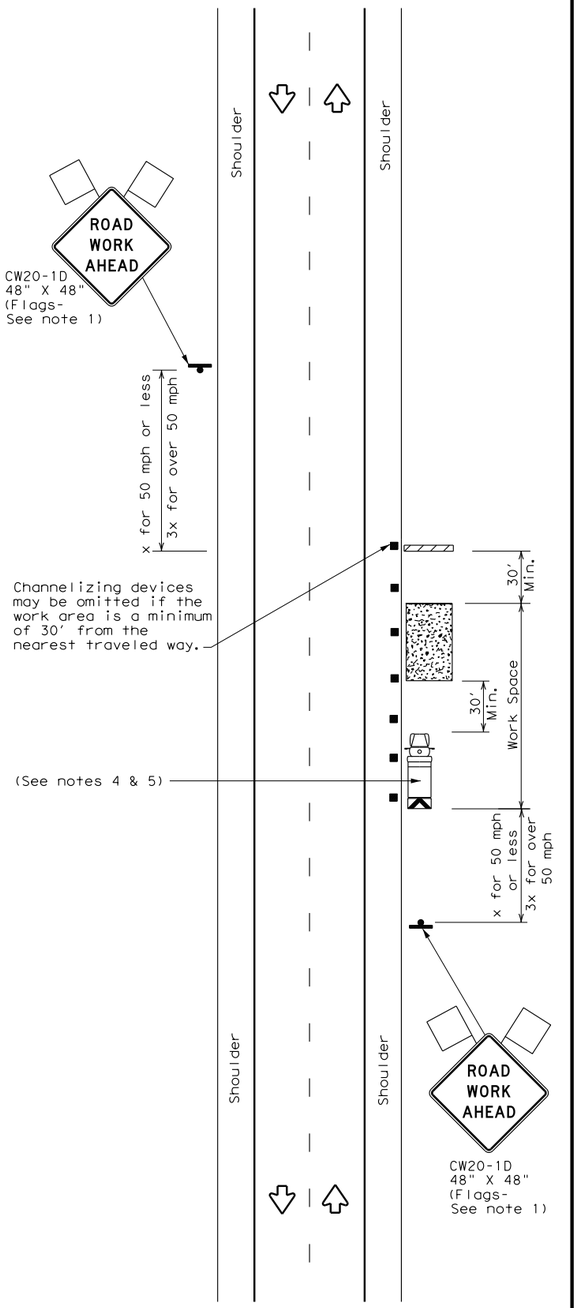
SME - Maintenance Section Review **Review Answer:**Recommend Approval **Response text:** Approved.
SME - Area Engineer Review **Review Answer:**Recommend Approval **Response text:** Approval

SME ATTACHMENTS:

Included attachments:

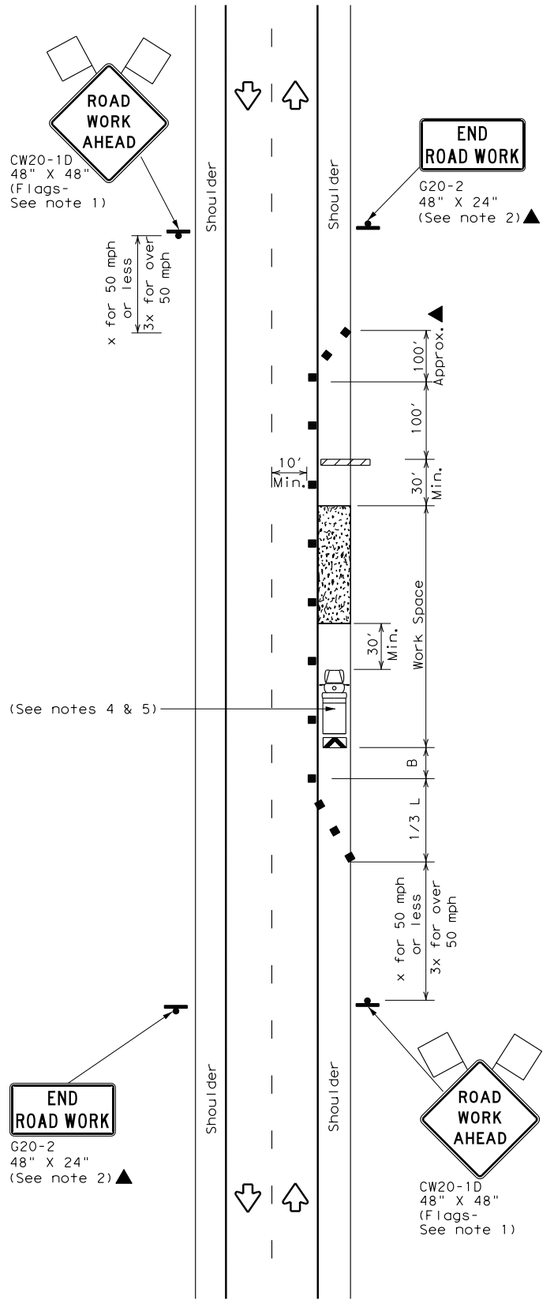
SME Answers Summary 3140079.pdf

DATE:
FILE:



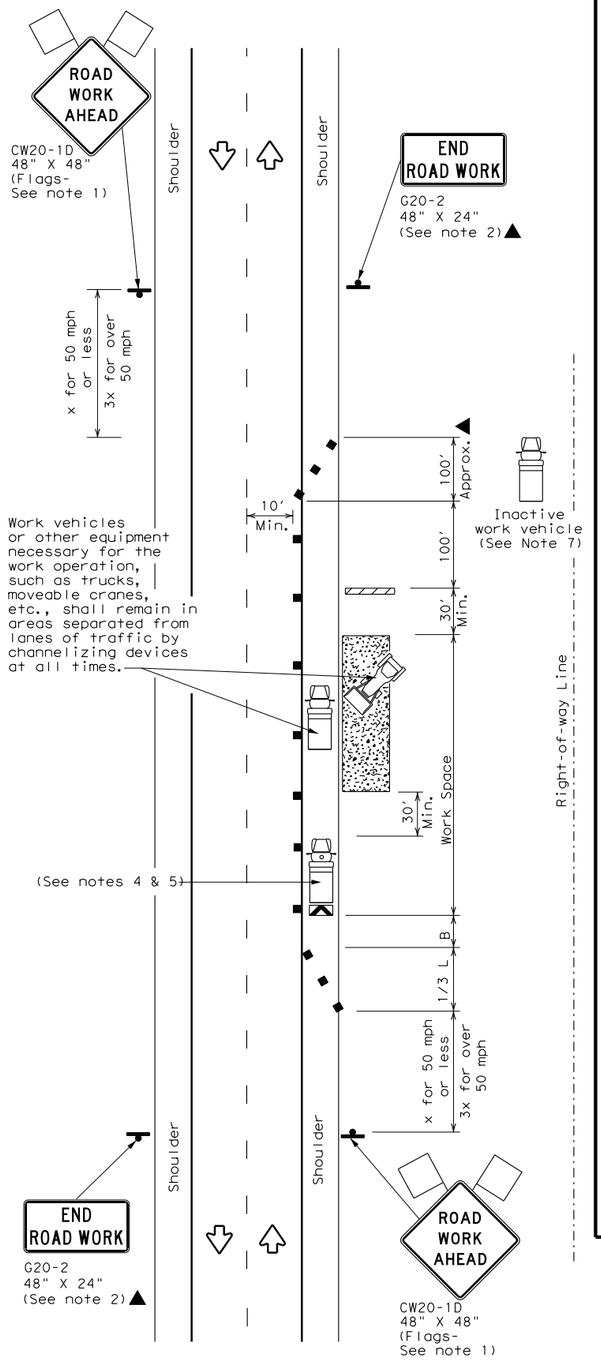
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	✓

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
3. Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
8. CW21-5 "SHOULDER WORK" signs may be used in place of CW21-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

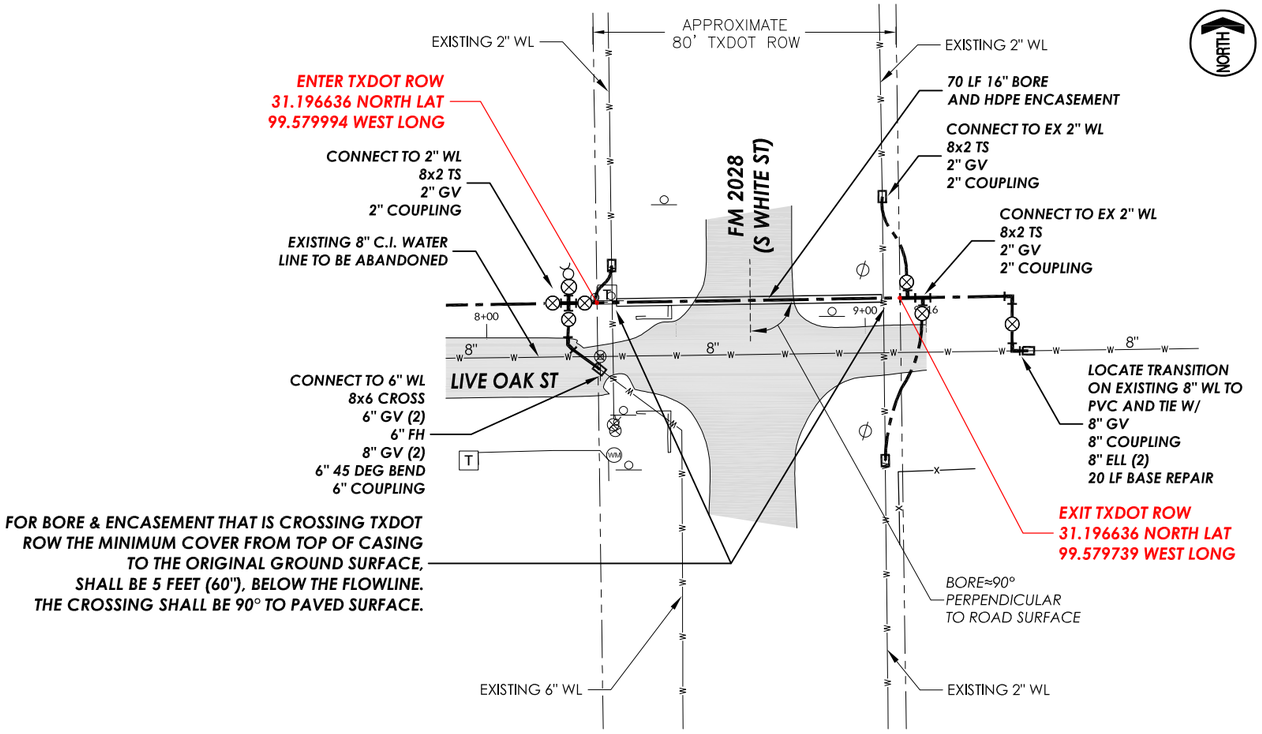
Texas Department of Transportation

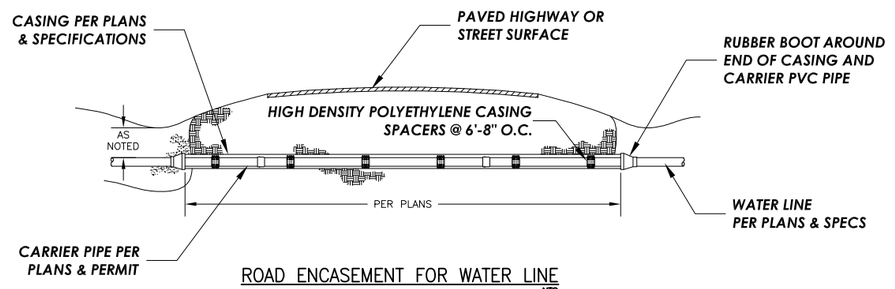
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

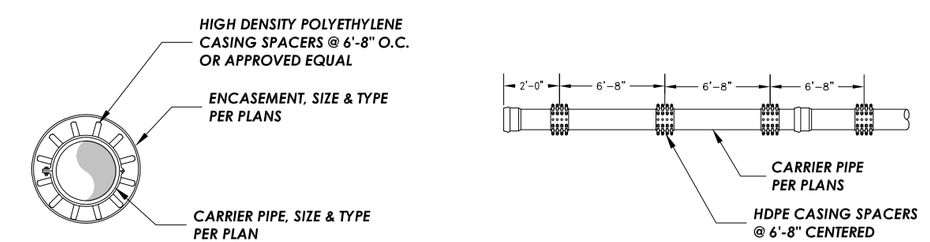
TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS				
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12				
1-97 2-18				





ROAD ENCASEMENT FOR WATER LINE
NTS



SPACER SECTION DETAIL

SPACING DETAIL

ENCASEMENT SPACER DETAILS
NTS

NOTES:

1. BORE & ENCASEMENT LENGTH SPECIFIED ON PLANS SHALL NOT BE INCREASED W/O PRIOR PERMISSION FROM ENGINEER.
2. FOR BORE & ENCASEMENT THAT IS CROSSING TXDOT ROW THE MINIMUM COVER FROM TOP OF CASING TO THE ORIGINAL GROUND SURFACE, SHALL BE 5 FEET (60"), BELOW THE FLOWLINE. THE CROSSING SHALL BE 90° TO PAVED SURFACE.
3. FOR LONGITUDINAL INSTALLATION INSIDE TXDOT ROW, THE MINIMUM COVER FROM TOP OF PIPE TO THE ORIGINAL GROUND SURFACE, SHALL BE AT A MINIMUM 3 FEET (36" BELOW THE FLOWLINE).

ISSUED FOR PERMITTING

JACOB MARTIN

TBPELS FIRM # 10194493
TBAE FIRM # BR 2261
TBPE FIRM # 2448

CITY OF MELVIN, TEXAS

TXDOT PERMIT REQUEST

8" PVC DISRIBUTION WATER LINE CROSSING

NO.	REVISION	DATE

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING.
CHECK SCALE AND ADJUST ACCORDINGLY.

PROJECT # 1001 | SCALE 1" = 40'

SEQ. 1/1 | SHEET 1

September 30, 2025

Mr. Greg Cedillo, P.E.
District Engineer
Texas Department of Transportation
2495 Hwy 183 North
Brownwood, Texas 76802

Re: City of Melvin TxDOT Permit Abandonment in Place Request Via: Email

43 TAC: Rule 21.39

Dear Mr. Cedillo:

The City of Melvin has received funding from the Texas Water Development Board to replace a portion of the City's existing distribution line. An existing 8" cast iron water line, proposed for replacement, is in the center of Live Oak St and crosses the FM 2028 ROW there.

Per City Staff, the existing water line does not contain, nor is it composed of hazardous or contaminated materials. The existing pipe will be disconnected and removed from water sources and abandoned in place. Finally, the abandoned facility will be grout filled and capped.

It is requested that abandonment of existing water line be permitted. If you need more information to consider our abandonment request, please let me know.

Sincerely,

City of Melvin

Mayor Marelina Brown

xc Jacob & Martin, LLC

DocuSigned by:
Blake Stembridge
A2E1607EC542461...
Area Engineer, Blake Stembridge, P.E.

DocuSigned by:
77D14777834646F...
Director of TP&D, Jason Scantling, P.E.

DocuSigned by:
Greg Cedillo
58E2D01C26B344F...
District Engineer, Greg Cedillo, P.E.

TABLE OF CONTENTS

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 Melvin
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 ENGINEERS'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.

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. ** SEE BID ADVERTISEMENT ***

1.5 TIME OF COMPLETION

A. The time to be allowed under this Contract to complete all work is as stated in the contract documents. 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 UNDER OTHER CONTRACTS

A. The OWNER will release the construction contracts for the other project while this Contract is in progress (see list below). Cooperate with other Contractors as required with regard to scheduling, storage of materials, coordination, use of land, tie-ins, security, site restoration, and job site harmony. Report any potential conflicts between this work and other Contracts

immediately to the OWNER. Other contracts for the City of Melvin project may include but are not limited to:

1. n/a

1.8 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.

1.9 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.

1.10 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 than15% 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, $500 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 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 TEXAS DEPARTMENT OF TRANSPORTATION RIGHT-OF-WAY

A. The OWNER has received, and will make available to the CONTRACTOR, permits authorizing construction work on the State Highway Department right-of-way. The CONTRACTOR shall perform all construction operations and clean up in accordance to the permit issued by the Texas State Department of Highways, and under the supervision of the representative of the Department of Highways, as well as in accordance with the Technical Specification of this contract as directed by the ENGINEER. All highway crossings or paralleling in highway right-of-way shall have right-of-way markers installed at the entrance and exit points and a detectable metal wire or tape shall be installed in the pipeline ditch while in the highway right-of-way.

B. It shall be the responsibility of the CONTRACTOR to notify the proper highway official 48 hours prior to any construction activity on highway right-of-way. The CONTRACTOR shall have a copy of the appropriate permits on site at all times.

1.26 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.**

1.27 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.

1.28 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.

1.29 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.

1.30 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.

1.31 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.

1.32 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 Contactor 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.**

1.33 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.

1.34 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.

1.35 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.

1.36 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.

1.37 "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.

1.38 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.

1.39 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 $1000.00 (one thousand 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.

1.40 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.

PART 2 NOT USED

PART 3 NOT USED

-- END OF SECTION --

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SECTION 01 03 01 - MEASUREMENT AND PAYMENT

PART 1 PAYMENT ITEMS

LUMP SUM PAYMENT ITEMS

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.

1.1 MOBILIZATION, BONDS, & INSURANCE

A. PAYMENT

Mobilization, bonds, & insurance shall be measured and paid for according to the lump sum in the proposal. Payment shall constitue full reimbursement for mobilization fo personnel, equipment, and supplies to the project site in preparation for beginning work on contract items to be performed by the contractor. This shall include, but is not limited to, the movement of equipment, personnel, materials, supplies, etc. to the project site, application and permit fees (if necessary), and establishment of contractor's facilities prior to beginning work. The cost of required insurance and bonds shall also be included in this item. The total amount of this item shall not exceed 3% of the total bid amount.

B. UNIT OF MEASURE: Lump Sum

UNIT PRICE PAYMENT ITEMS

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.

2.1 WATER LINE

A. PAYMENT

Payment will be made for costs associated with operations necessary to furnish and install water line as specified and shown on the Plans. Water pipelines shall be measured and paid for at the unit prices for each size and class of water pipeline, which payment shall include

trenching, laying, bedding, jointing, backfilling, connection to or plugging of existing water lines and furnishing water pipelines, metal tape, tracer wire, fittings, couplings and accessories as specified, including labor, equipment, testing, sterilization, cleanup and supervision necessary to complete the water pipeline and place the water system in operation in accordance with these Specifications and may be directed by the ENGINEER.

No extra payment shall be made for special backfill in public ROW or gravel repair and asphalt repair. These shall be considered subsidiary to the pipeline installation and reimbursement for these items shall be included in the price bid for furnishing and installing the water line.

* Asphat repair shall be paid under the item "Asphalt Repair". *Base repair shall be paid under the item "Base Repair".

B. Unit of measure: LINEAR FOOT

2.2 GATE VALVES

A. PAYMENT

Payment will be made for costs associated with operations necessary to furnish and install gate valves as specified and shown on the Plans. Gate valves, tapping valves, and sleeves with Valve Boxes shall be measured and paid for at the unit price bid for each size valve, and incidentals furnished and installed.

B. Unit of measure: EACH

2.3 FIRE HYDRANTS

A. PAYMENT

Payment will be made for costs associated with operations necessary to furnish and install fire hydrants as specified and shown on the Plans. Fire Hydrants shall be measured and paid for at the unit price contained in the bid proposal. Payment shall constitute full reimbursement for furnishing and installing a fire hydrant for 3 foot bury with megalug. Connecting pipe shall be paid as 6" pipe per the bid schedule. Gate valves shall be paid as gate valves per the bid schedule.

B. Unit of measure: EACH

2.4 BORE & ENCASEMENT

A. PAYMENT

Payment will be made for costs associated with operations necessary to furnish and install bore & encasement as specified and shown on the Plans. Bore & encasement shall be measured and paid for at the unit price bid per linear foot as "Bore & Encasement" for the respective size and shall constitute reimbursement in full for all labor, equipment and incidentals necessary to complete the trenching, encasement and backfill in accordance with the permit.

Pipeline to be placed in the pipe encasement will be paid for at the unit price bid for the water or sewer line and is not included in this bid item.

B. Unit of measure: LINEAR FOOT

2.5 SLICK BORE

A. PAYMENT

B. Payment will be made for costs associated with operations necessary to furnish and install slick bore as specified and shown on the Plans. Slick bore shall be measured and paid for at the unit price bid per linear foot as "Slick Bore" for the respective nominal pipe size and shall constitute full reimbursement in full for all labor, equipment, and incidentals necessary to complete the directional bore, and backfill. Pipeline to be placed through the slick bore will be paid for at the unit price bid for the water or sewer line and is not included in this bid item.

C. Unit of Measure: Linear Foot

2.6 5/8 X 3/4" WATER SERVICE RECONNECTIONS

A. PAYMENT
Payment will be made for costs associated with operations necessary to furnish, install, and restore water service as specified and shown on the Plans. Water meter reconnections shall be measured and paid for at the unit bid price per each as shown in the Bid Proposal. Payment shall constitute full reimbursement for furnishing and installing main line connection, couplings, fittings, service line, meter box, pressure regulator, and incidentals. The same price shall be paid for meter reconnections regardless of main line size. Service line extension shall be paid under this item. Connections where meter is within 25 feet of the main line shall be paid for as a "Short Service Connection". Connections where meter is greater than 25 feet away from main line shall be paid for as a "Long Service Connection" and include any necessary gravel, base, or pavement repair.

B. Unit of measure: EACH

2.7 ASPHALT OR BASE REPAIR

A. PAYMENT
Payment will be made for costs associated with operations necessary to furnish and install asphalt or base repair as specified and shown on the Plans.

B. Unit of measure: LINEAR FOOT

2.8 REMOVE EXISTING FIRE HYDRANT

A. PAYMENT

B. Payment shall be made for costs associated with operations necessary to remove existing fire hyrant including cutting and plugging of existing water line as required, backfill of void with approved material and incidentals as specified and shown on the plans.

C. Unit of Measure: EACH

2.9 WATER LINE CONNECTIONS

A. PAYMENT
Payment will be made for costs associated with operations necessary to furnish and install water line connections as specified and shown on the Plans. Water line connections including piping, fittings, and coupling shall be measured and paid for at the unit price bid for each size and type of water line connection and incidentals furnished and installed.

B. Unit of measure: EACH

PART 2 NOT USED

PART 3 NOT USED

-- END OF SECTION --

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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 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.

2.7 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.

2.8 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.

2.9 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.

2.10 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.

2.11 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.

PART 3 NOT USED

-- 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; 2011.
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 CONTRACTOR 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 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 --

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 --

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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 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.

-- 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 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 presssure, 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 (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						
	225	250	275	300	350	400	450
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.

3.2 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 --

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; 2012.
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 dilectric 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 04 - STEEL PIPE AND FITTINGS

PART 1 GENERAL

1.1 WORK INCLUDED

Furnishing, installing and testing black and galvanized steel mill pipe in sizes through 144-inch. Hydrostatic testing, cleaning, and disinfecting of installed pipe and fittings.

1.2 REFERENCE STANDARDS

AASHTO T 99 - Standard Method of Test for Moisture–Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop; Latest Edition.
ASME B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges; 2011.
ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.
ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.
ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 2007 (Reapproved 2013).
ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2015.
ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.
AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015 (Errata 2016).
AWWA C200 - Steel Water Pipe, 6 In. (150 mm) and Larger; 2012.
AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe, 4 in. (100 mm) and Larger - Shop Applied; 2012.
AWWA C206 - Field Welding of Steel Water Pipe; 2011.
AWWA C207 - Steel Pipe Flanges for Waterworks Service, Size 4 In. Through 144 In. (100 mm Through 3,600 mm); 2007.
AWWA M11 - Steel Water Pipe - A Guide For Design and Installation; 2004 w/Errata.
AWWA M9 - Concrete Pressure Pipe; 2008, with Errata.
NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

1.3 QUALITY ASSURANCE

A. Qualifications for Welding Work:
   1. Qualify welding processes and welding operators in accordance with AWS D1.1/D1.1M.
   2. Provide certification that all welders employed on or to be employed for the Work have satisfactorily passed AWS qualification tests within the previous 12 months. The CONTRACTOR shall ensure that all certifications are kept current.

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:
   1. Shop drawings and data shall he submitted in accordance with Sections 01 04 01,SUBMITTALS, and 33 01 01, GENERAL REQUIREMENTS FOR PIPING SYSTEMS, to provide information as to the general character, style and manufacture of the pipe material, coatings, linings, restraints, pipe joints, fittings, gaskets, pipe layout and

appurtenances, miscellaneous items to allow the OWNER to adequately identify the materials or equipment to be incorporated into the project. Data shall be provided for all materials of construction.

2. Shop drawings shall be complete to indicate where the material is to be incorporated into the project. The CONTRACTOR shall provide schedules of pipe and fittings and their use, pipe classes and other information which would allow this material to be identified at some future date.

B. Certificates

Submit certificates of compliance with referenced standards for all products specified in Part 2. Pipe systems submitted upon without the certificates of compliance shall be returned without review.

C. Certificate of Adequacy of Design

The CONTRACTOR shall also submit a certificate of adequacy of design showing the necessary provisions required in the design of the pipe to comply with the applicable sections of this Specification. The pipe layout drawings and data shall clearly indicate where pipe requiring special provisions is required. The certificate of adequacy of design shall be sealed by a Texas Registered Professional Engineer. Special provisions shall include, but not be limited to, closure pieces, restraints, connections, special modified designs for fittings, etc.

1.5 DELIVERY STORAGE AND HANDLING

A. Comply with the requirements of Section 33 01 01, GENERAL REQUIREMENTS OF PIPING SYSTEMS.

B. Steel pipe larger than 12 inches in diameter shall have internal blocking installed at both ends and every 20 feet along the pipe to maintain dimensions of pipe and true round shape of +/- 1 percent during shipping and handling.

C. Pipe blocking shall be installed at a minimum of two directions. Pipe shall be stored so that one of the blocking struts is positioned vertically.

D. Coated pipe shall be shipped on padded bunks with nylon belt tie-down straps or padded banding located approximately over internal blocking.

E. Coated pipe shall be handled with wide belt slings. Chains, cables, or other equipment likely to cause damage to the pipe or coating shall not be used.

F. Dielectrically coated pipe shall be visually inspected for damage to the coating by the following procedure:

1. An electric holiday test shall be performed when visual inspection shows the dielectric coating has sustained physical damage.
2. When the area is tested and there are no holidays and no tearing of the material, no patching is required.
3. When the damaged area shows damage going clear to the steel from either a visual inspection or a beep from a holiday detector, the area shall be repaired.

PART 2 PRODUCTS

2.1 STEEL PIPE, THREE INCHES AND SMALLER

A. Pipe:

1. Referenced Standard: ASTM A53/A53M.
2. Type: Mill pipe, Type E, F, or S.
3. Grades: A or B.
4. Size: Nominal diameters shown on Drawings.
5. Schedule: Standard weight unless otherwise specified on Drawings or in Pipe Schedule.
6. Type Ends: Threaded, unless otherwise noted.
7. Factory finish:
   a. Black unless otherwise specified.

b. Galvanized when shown on Drawings or specified in Piping Schedule.
c. Buried piping to be shop coated and wrapped with hot applied coat tar enamel.

B. Fittings:
1. Referenced Standard: ASME B16.3.
2. Type: Threaded malleable iron.
3. Class: 150 or 300 whichever is required to make fitting rating equal to or greater than maximum non-shock working pressure specified in Piping Schedule.
4. Factory Finish: As specified above for pipe.

2.2 STEEL PIPING, FOUR INCHES AND LARGER

A. Pipe, Four-Inch Only:
1. General: As specified above for smaller pipe except as specified below.
2. Type Ends:
a. Flanged unless otherwise specified. See flange specification below.
b. Plain end where flexible couplings or flange coupling adaptors are shown on Drawings.

B. Pipe, Six Inches and Larger:
1. The pipe shall be manufactured or fabricated, coated and lined (if lining is required) at one location by a manufacturer with at least 5 years' experience. Pipe material shall be ASTM A572/A572M, or other material approved by ENGINEER.
2. Referenced Standard: AWWA C200.
3. Type:
a. 6-inch through 20-inch: Mill or fabricated pipe. O.D. controlled.
b. Over 24-Inch: Fabricated pipe. I.D. or O.D. controlled.
4. Fabrication: Pipe to be shop fabricated to the largest extent practical. Field welding and cutting is to be avoided. Utilize flanges or couplings at joints to be assembled in the field. Incorporate plate lugs for restraint where necessary to restrain couplings. Elbows shall be fabricated with multiple miter joints (minimum 4 for 90 degrees elbow).
5. Size:
a. Drawings show nominal diameters.
b. Outside diameters to be compatible with specified flanges.
6. Internal design pressure: Maximum allowable non-shock work pressure and test pressure of 50 psi (plus surge allowance of 200 psi) unless otherwise shown on the plans.
7. Minimum wall thickness of 1/4-inch except for air pipe. Minimum wall thickness for buried pipe shall be as required by AWWA M11 design criteria (1/4-inch minimum). Air piping shall be Schedule 10 minimum.
8. Laying lengths:
a. Mill pipe: 20-foot single random or 40-foot double random lengths.
b. Fabricated pipe: As determined by CONTRACTOR to suit transportation, handling and erection constraints.
9. Maximum Seam Spacing in Fabricated Pipe:
a. Girth Seams: At least six feet (except specials and fittings) and not more than 20 feet.
b. Longitudinal Seams:
1) 6-Inch to 20-Inch Pipe: One seam.
2) 22-Inch to 54-Inch Pipe: Two seams.
3) 56-Inch and Larger Pipe: Three seams.
10. Type Ends:
a. Buried steel pipe shall use rubber gasket bell and spigot joints except where restrained joints are required and unless otherwise shown on plans. Gasketed joints shall conform to AWWA C200. The gasketed joints shall consist of a flared bell end formed and sized by forcing the pipe over a plug die or formed from an expanded cylinder welded to the end of the pipe. The spigot end may be the rolled gasket type or Carnegie shape.

b. Welded joints, if utilized, shall utilize butt straps or lap joints. Exposed and submerged steel pipe shall have flanged ends or plain ends with couplings unless otherwise specified.
c. Pipe shall be plain end where flexible couplings or flanged coupling adapters are shown on the Plans.
d. Exposed pipe for air service shall not utilize welded joints. Flanges or flexible couplings shall be used for all joints. Gaskets shall be suitable for 240 Degrees F with lubrication oil present.
e. Flexible couplings shall be Baker Series 200 or Brico Type FxE or approved equal with fusion bonded epoxy coating interior and exterior.
f. Provide a restrained flexible joint (coupling, push-on, or mechanical joint) 10 feet outside of connections to structures.

C. Linings and Coatings for inside of Pipe and Fittings:
1. General: All piping and fittings size 6-inch and larger shall be cement mortar lined per AWWA C205.
2. Welding shall only be performed after the lining is applied in instances when the pipe is large enough to access joints for recoating.
3. Linings for air pipe, fittings, and couplings shall be suitable for temperatures of 240 Degrees F.

D. Coatings for Outside of Pipe and Fittings:
1. Exposed and submerged piping and fittings: One shop coat of primer compatible with finish paint system as specified in painting specifications. Provide field primer and finish coatings on piping and fittings.
2. Buried steel piping shall be mortar coated in accordance with AWWA C205.
3. Coatings on air piping shall be compatible with 240 Degrees F temperature.

E. Flanges:
1. Referenced Standard: AWWA C207.
2. Flange Type: Steel (AWWA C207).
3. Flange Class: To meet pressure requirements Class "D" to 150 psi; Class "E" from 150 psi to 275 psi, and Class "F" from 275 psi to 300 psi.

F. Bolts:
1. For exposed, noncorrosive environments, Referenced Standard: ASTM A307.
2. Grade: B.
3. Head: Hex.
4. Length: So that end extends beyond nut by at least one nominal bolt diameter.
5. Bolts, nuts, and fasteners on couplings, flanges or joints that are buried or in vaults, or manholes shall be 304 stainless steel. Buried MJ fitting bolts may be Corten. Bolts, nuts, and fasteners on submerged couplings, flanges, or joints shall be 316 stainless steel.

G. Nuts:
1. Exposed Location Referenced Standard: ASTM A563M.
2. Type: Hex.
3. Grade: C, D, or DH.
4. Refer to Paragraph F for buried and submerged locations.

H. Gaskets:
1. Referenced Standard: ASME B16.21.
2. Description:
a. Full face 1/16-inch-thick full-face neoprene with 80-durometer minimum unless otherwise specified.
b. Gaskets for air service to be Buna-N.
3. Fabrication: Factory cut.

I. Flexible Coupling: Baker Series 200, Brico Type ExE or approved equal with fusion bonded epoxy coating interior and exterior.

2.3 WALL PIPES AND SLEEVES

A. General:
Laying lengths and end connections to be as shown on Drawings.

B. Wall Thickness:
1. Wall pipes: Equal to or greater than that of adjoining pipe.
2. Wall sleeves: Standard weight.

C. Wall Collars:
1. Provide for all wall pipes to serve as a water stop and prevent axial movement of wall pipe.
2. Size Collars as follows:

Pipe Size (in.)	Collar O.D. (in.)	Collar Thickness (in.)
6 to 12	Pipe O.D. Plus 4	1/2
14 to 18	Pipe O.D. Plus 4	3/4
20 to 24	Pipe O.D. Plus 6	3/4
26 to 42	Pipe O.D. Plus 8	1
48 and Larger	Pipe O.D. Plus 10	1-1/4

2.4 PIPE DESIGN CLASSES

A. The pipe fittings and joints shall be designed for a working pressure, test pressure, and surges shown on the Plans, as well as soil loads and stresses from thermal expansion and contraction. Test pressures shall be per Section 33 01 02, FIELD TESTING OF PIPING SYSTEMS, unless otherwise shown on the Plans. Fittings, specials and connections shall be same class as the associated pipe unless otherwise indicated. All pipe and fittings shall be clearly marked with the pressure class and piece number to permit easy identification in the field.

B. Pipe design shall be based on trench embedment and backfill requirements shown on the Drawings, and as specified herein. The select material in the pipe zone will be selected or processed material as specified in other sections of this Contract Document. Material will be consolidated or compacted to at least 95 percent of maximum density, Standard Proctor, as determined by ASTM D698, "Standard Test Methods for Laboratory Compaction Characteristics of Soils."

C. Pipe shall be designed for the trench depths indicated using a Soil Reaction Modulus E' of 1000, and a maximum pipe deflection of 2 percent of D for mortar lined and coated pipe (3% for mortar lined and flex coated; 5 percent for flexible lined and coated) where D = Diameter.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:
1. Comply with the general installation requirements for piping systems as specified in Section 33 01 01, GENERAL REQUIREMENTS OF PIPING SYSTEMS, and the supplemental specifications below.
2. Do not perform any welding, cutting, or grooving of steel piping in field unless specifically called for on Drawings or authorized in writing by ENGINEER. This restriction applies to attachment of lugs and brackets to pipe as well as to joining of pipe.
3. Provide a restrained flexible joint (restrained flexible coupling also acceptable) within 10 feet of connections to structures.
4. All buried pipe and fittings shall be wrapped with 10-mil polyethylene.

B. Joining of Threaded Piping:
1. Cut piping accurately and squarely.
2. Ream inside of pipe to full diameter.

3. Thread pipe per the referenced standard.
4. Remove all cuttings and other foreign matter from inside of pipe before making joints.
5. Clean rusty or dirty threads with a wire brush.
6. Apply approved joint compound or tape to male threads before making joints.

C. 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 bringing pipe to alignment and elevation with permanent supports, place flange bolts with all heads in same direction.
   b. Tighten nuts, each in turn, at uniform rate around joint until all are tightened to the manufacturer's recommended torque values.

D. Joining of Welded Pipe:
1. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.
2. Immediately after erection, clean field welds, bolted connections, and all damaged and abraded areas of the shop paint. Apply paint to exposed areas with the same material as used for shop painting.
3. Welded joints shall have interior and exterior coatings or tape applied consistent to the adjoining pipe. CONTRACTOR shall coordinate access to the interior for painting following welding. Adequate time shall be provided in the schedule to allow cure times per manufacturer recommendations.

E. Restrained Joints: Unless otherwise indicated on the drawings, the CONTRACTOR shall use mechanical restrained pipe joints and fittings (no thrust blocks). The length of pipe requiring thrust restraint shall be calculated as described in Chapter 13 of AWWA M11.

All joints requiring thrust restraint shall be welded (buried) in accordance with AWWA C206 or restrained with mechanical systems (exposed).

CONTRACTOR shall design restrained joints based on the specified pressures or as shown in the Plans and AWWA M11. The design for restrained joints, including the length necessary to resist the design thrust and the certified approval of the fill material and compaction, shall be in accordance with the following, and shall be performed and sealed by a Texas Registered Professional Engineer, obtained by the CONTRACTOR. CONTRACTOR shall bear all costs for the design and will not receive reimbursement from the OWNER.

The length of pipe with restrained joints to resist thrust forces shall be determined in accordance with Chapter 9 of the AWWA M9 manual and in accordance with the following minimum requirements:

1. The weight of earth (We) shall be calculated as the weight of the projected soil column above the pipe.
2. Soil Density: 110 lbs/ft3.
3. Coefficient of Friction: 0.3.
4. All backfill above the pipe springline shall be compacted to a minimum of 85 percent standard density (AASHTO T 99) in areas where pipe joints are restrained.

The above applies to unsaturated soil conditions. In location where ground water is encountered, the soil density shall be reduced to its buoyant weight for all backfill below the water table and the coefficient of friction shall be reduced to 0.25.

3.2 3.2 FIELD TESTING

Comply with the requirements of Section 33 01 02, FIELD TESTING OF PIPING SYSTEMS.

-- END OF SECTION --

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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; 2013.
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 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.

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. 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 --

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 F2620 - Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings; 2013.
ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter; 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. Referc 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 --

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SECTION 33 02 01 - MISCELLANEOUS VALVES

PART 1 GENERAL

1.1 REFERENCE STANDARDS

ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.
ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2014).
NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

1.2 QUALITY ASSURANCE

A. Referenced Standards: As specified for individual valves in Part 2.
B. Each valve shall have manufacturer's nameplate in stainless steel showing the pressure ratings, serial and model numbers, year manufactured and other pertinent data.
C. Valve supplier shall maintain a complete stock of spare parts in the State of Texas or shall indicate that parts will be delivered upon 48 hours of receipt of request.
D. 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.

1.3 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 type of valve furnished:
      a. Description including type of valve, type of operator and accessories included.
      b. Size and type of end connections.
      c. Maximum non-shock working pressure for which valve is designed.
      d. Materials of construction and coatings for valves and accessories.
      e. Manufacturers make and model.
   4. If catalog bulletins are used to communicate above information, mark out inapplicable information.
B. Affidavits: Submit affidavits of compliance with the reference standards when standards are specified. Submittals without affidavits of compliance shall be returned without review.
C. Operation and Maintenance Data: Comply with the requirements of Section 01 04 01, SUBMITTALS.

1.4 DELIVERY, STORAGE AND HANDLING

Comply with the requirements of Section 33 01 01, GENERAL REQUIREMENTS FOR PIPING SYSTEMS, and manufacturer's recommendations.

PART 2 PRODUCTS

2.1 GENERAL

A. Obtain all valves, extensions, and associated manual operators of a given type from a single manufacturer.
B. Furnish valves in the sizes specified on the Drawings.
C. Valves shall be capable of withstanding the maximum system pressures.
D. Valve operators to turn to left, counter clockwise, to open and to right, clockwise, to close.
E. End connections shall be compatible with those specified for pipe.

F. Paint valves and operators as shown on the Plans, Painting, colors to be selected by OWNER.

2.2 BALL CHECK VALVES

A. For water, chemical, and gas vacuum service, 1/2-inch to 3-inch:
   1. Type: Non-shock, true union connections.
   2. Material: PVC to match piping on chemical service lines.
   3. Seal Material: Viton or as suitable for service intended.
   4. 150 psig at 75 Degrees F water.
   5. Acceptable Manufacturers:
      a. GF Plastic Systems, Inc: Type 360
      b. Chemtrol.
      c. Or approved equivalent.

2.3 BALL CHECK VALVE (3-INCH AND LARGER)

A. Flanged end, iron body valve with cleanout and sinking type hollow steel ball, vulcanized nitrile rubber exterior, flanges ASME B16.1, Class 125, rated 150-pound WOG, suitable for vertical up or horizontal flow.
   1. Manufacturers and Products:
      a. Flygt Corporation, Type HDL.
      b. Golden Anderson, Figure 240.

2.4 PLASTIC BALL VALVES

A. For water, chemical, and gas vacuum service, 1/2-inch to 3-inch:
   1. Type: True union, EPDM or Viton o-ring seals as applicable for service. For acid service, use Teflon o-ring seals.
   2. 150 PSI at 75 Degrees F water
   3. Material: PVC to match piping on service lines.
   4. Acceptable Manufacturers:
      a. Asahi "Duo-Bloc."
      b. Hayward "True Union."
      c. George Fischer (GF) Type 346.

B. At no time shall ball valves be acceptable for use on sodium hypochlorite solution service.

C. Buried valves shall have extension handles (GF Type 615 or equal) to position the handle to within 12 inches of grade.

2.5 BACKFLOW PREVENTION VALVES

A. REDUCED-PRESSURE PRINCIPLE BACKFLOW PREVENTER
   1. Reduced-Pressure Principle Backflow Preventer approved by the Foundation for Cross Connection Control and Hydraulic Research at the University of Southern California.
   2. Shall create a vertical internal air separation equal to two times the pipe air separation equal to two times the pipe diameter under back siphonage conditions.
   3. Connections: Flanged and sized as indicated on the Drawings.
   4. Maximum Allowable Headloss: Not applicable.
   5. Operator shall be completely automatic.
   6. Non-shock work pressure: 150 psig.
   7. Furnish inlet and outlet shut-off valves in resilient seated non-rising stem design with flanged connections.
   8. Furnish gate valves at each end of double check assembly. Refer to drawings.
   9. Acceptable Manufacturers:
      a. Watts Company
      b. CLA VAL Company
      c. Or approved equivalent.

B. DOUBLE CHECK BACKFLOW PREVENTER
   1. Double Check Backflow Preventer approved by the Foundation for Cross Connection Control and Hydraulic Research at the University of Southern California.

2. Connections: Flanged and sized as indicated on the Drawings.
3. Maximum Allowable Headloss: Not applicable.
4. Operator shall be completely automatic.
5. Non-shock work pressure: 150 psig.
6. Furnish inlet and outlet shut-off valves in resilient seated non-rising stem design with flanged connections.
7. Furnish gate valves at each end of double check assembly. Refer to drawings.
8. Acceptable Manufacturers:
    a. Watts Company
    b. Model RP Series by CLA-VAL Company.
    c. Or approved equivalent.

2.6 PRESSURE REDUCING VALVE

A. Type: Single seated, globe body, direct-acting, spring loaded, diaphragm actuated valve.
B. To reduce inlet high pressure to a lower outlet pressure on 1/2-inch to 6-inch and function as a check. Provide field adjustment capability.
C. Size: As indicated on plans, 1/2-inch to 6-inch.
D. Materials of Construction for 1/2-inch to 2-inch:
    1. Body: Bronze.
    2. Stainless steel stem.
    3. Replaceable rubber seat.
    4. Pressure rating of body: 300 Psi.
E. Materials of Construction for 3-inch through 6-inch:
    1. Body: Cast iron ASTM A126.
    2. Trim: Bronze 862.
    3. Seats: Renewable rubber.
    4. Hardware: 304 SS.
    5. Pressure rating of body: 300 psi.
F. End connections: Threaded (NPT) to 2-inch, flanged for 3-inch to 6-inch.
G. Acceptable Manufacturers:
    1. CLA-VAL.
    2. or approved equal.

2.7 CHEMICAL FEED SOLENOID VALVE

A. Type: Continuous duty, pilot operated, chemical resistant, 2-way, solenoid valve with manual override in sizes 1/2-inch to 1-1/2-inch, normally closed unless otherwise shown.
B. End Connections: True Union Style.
C. Materials of Construction:
    1. Body: PVC with 85 psi minimum pressure rating.
    2. Seals: EPDM or Viton suitable for intended service.
    3. Fully encapsulated coil suitable for corrosive environment.
    4. Diaphragm of EPDM or Teflon suitable for intended service.
    5. 316 stainless steel body screws.
    6. Coil Voltage: Refer to drawings 120v,60 Hz, 5 watts if not shown.
    7. Differential Pressure Required: 7 to 10 psi with differential pressure range of 7 psi to 85 psi.
D. Acceptable Manufacturers:
    1. Cole Parmer E-98604.
    2. Or approved equivalent.

2.8 SAMPLE PORT AND INJECTOR VALVES

Valves for piping injectors and sample points shall be stainless steel ball valves, with threaded connections, mounted to a 316 stainless steel pipe nipple, size as shown on Plans.

2.9 PLASTIC BODY DIAPHRAGM VALVES

Valves for sodium hypochlorite solution, chlorine solution and as shown on Plans.

A. Manufacturers: The following or equal:
   1. Asahi America.
B. Materials:
   1. Body: CPVC or match piping.
   2. Diaphragm: Three diaphragm layers, Teflon (PTFE), PVDF, and ethylene-propylenediene (EPDM) or Viton backing cushion.
   3. Bonnet: Reinforced polypropylene with cast iron or silicon bronze drive nut, double lead acme stem threads, acrylic protective cap and visual position indicator.
      a. Adjustable Travel Stop: Stainless Steel.
      b. Compressor: Cast Iron.
   4. Handwheel: Polypropylene.
   5. Sleeve: Cast Iron.
   6. Stem: Stainless Steel.
   7. Bolt, Nut, and Washer: Stainless Steel.
   8. Thrust Bearing: Teflon disc or carbon steel.
   9. End Connector: CPVC.
   10. End Connector Seal (Flange Gasket): Hypalon 1/8-inch thick gaskets.
   11. Position Indicator: Carbon Steel.
C. Valve Design:
   1. End Connections: Flanged.
   2. Operator Handle: Handwheel, with position indicator and adjustable travel stop to prevent overtightening. Provide acrylic stem cap.
   3. Diaphragm Valves: Weir Type.
   4. Pressure: 150 psig at 70 Degrees F.

2.10 ELECTRIC ACTUATED BALL VALVES

A. Type: Continuous duty rated True Union ball valve with manual override and NEMA 4X nonmetallic housing over actuator in sizes 1/2-inch through 2-inch. Closure time 6 seconds for 90 Degree cycle.
B. Materials of Construction:
   1. Body: PVC or CPVC to match piping, minimum pressure rating 230 psi.
   2. Seals: EPDM or Viton as applicable for intended service.
   3. Motor: Heavy duty gear train, reversible motor with thermal overload switch, 12O-volt, 60 Hz, with position indicator.
C. Manufacturer:
   1. GF Model 346 ball valve with Type EA20 actuator and Type 126 bracket.

2.11 ACCESSORIES

Furnish accessories specified in valve specifications and as required for a complete system.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install all valves, floor stands, and appurtenances in complete accordance with manufacturers instructions and recommendations.
B. Installation shall be in accordance with the Plans, approved shop drawings and the manufacturers instructions.
C. Install valves and valve operators to provide for ease of access and operation.

3.2 FIELD QUALITY CONTROL

A. Retain a qualified representative of the manufacturer to perform the following services:
   1. Inspect the completed installation and note deficiencies.

2. Assist the CONTRACTOR during start-up, adjusting, and site testing of competed installation as required.
3. Instruct OWNER personnel in the operations and maintenance of the equipment.

B. FIELD TESTING: Plant testing and startup will be in accordance with Section 01 07 01, PLANT TESTING AND STARTUP.

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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.

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SECTION 33 02 08 - AIR VALVES

PART 1 GENERAL

1.1 REFERENCE STANDARDS

ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.
ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2013.
ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2014).
ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service; 2016.
ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2016.
ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.
ASTM A313/A313M - Standard Specification for Stainless Steel Spring Wire; Latest Edition.
ASTM A351/A351M - Standard Specification for Castings, Austenitic, for Pressure-Containing Parts; 2016.
ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).
ASTM B148 - Standard Specification for Aluminum-Bronze Sand Castings; Latest Edition.
ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications; 2014.
ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2015.
AWWA C512 - Air-Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service; Latest Edition.
NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

1.2 WORK INCLUDED

The CONTRACTOR shall furnish air valves, complete, operational and installed on the filters, piping, and high service pump discharge piping and other locations shown in the Plans and as specified in these Contract Documents.

1.3 QUALITY ASSURANCE

A. Referenced Standards: All materials of construction shall conform to ANSI and ASTM specifications. All air valves shall be in accordance with AWWA C512.
B. Each valve shall have manufacturer's name plate in stainless steel showing the pressure ratings, serial and model numbers, year manufactured and other pertinent data.
C. Manufacturers of air valves shall demonstrate a minimum of 20 years of experience in similar applications for sizes of valves being furnished. References shall be furnished upon request.
D. Valve supplier shall maintain a complete stock of spare parts in the State of Texas or shall indicate that parts will be delivered upon 48 hours of receipt of request.
E. 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. Specific application in plant expressed in terms of service and contract drawing number where shown.
    b. Description including type of valve, type of mechanism and accessories included.
    c. Size and connection type.
    d. Maximum non-shock working pressure for which each component of valve is designed.
    e. Materials of construction and coatings for valves and accessories.
    f. Manufacturer's make and model.

B. Operation and Maintenance Data: Comply with the requirements of Section 01 04 01, SUBMITTALS.

1.5 DELIVERY, STORAGE AND HANDLING

Comply with the requirements of the General Conditions and manufacturer's recommendations.

PART 2 PRODUCTS

2.1 GENERAL

A. Air valves shall be suitable for use in potable water application.
B. Paint valves as specified in these Contract Documents.
C. Furnish stainless steel ball valve for isolation at connection to pipeline.
D. Provide 2 inch Schedule 80 PVC pipe from discharge of air valve and air release to drain as shown on Plans. Furnish combination valves pre-assembled with all components factory piped and connected, for a single unit.

2.2 AIR / VACUUM VALVE

A. This Specification is intended to cover the design, manufacture, and testing of 1/2 inch through 20 inch Air/Vacuum Valves suitable for pressures up to 740 psig clean or raw water service.
B. Air/Vacuum valves shall be fully automatic float operated valves designed to exhaust large quantities of air during the filling of piping systems and close upon liquid entry. The valve shall re-open during draining or if a negative pressure occurs.
C. Connections
    1. Valve sizes 3 inch and smaller shall have full size NPT inlets and outlets equal to the nominal valve size. The body inlet connections shall be hexagonal for a wrench connection.
    2. Valve sizes 4 inch and larger shall have bolted flange inlets with threaded or plain outlets and protective hoods to prevent debris from entering the valve. Flanges shall be in accordance with ASME B16.1 for Class 125 or Class 250 iron flanges and ASME B16.5 for Class 150 or Class 300 steel flanges.
    3. The valve shall have two additional NPT connections for the addition of Air Release Valves, gauges, testing, and draining.
D. Design
    1. The valve body shall provide a through flow area equal to the nominal valve size. A bolted cover with alloy screws and flat gasket shall be provided to allow for maintenance and repair.
    2. Floats shall be unconditionally guaranteed against failure including pressure surges. The float shall have a hexagonal guide shaft supported in the body by circular bushings to prevent binding from debris. The float shall be protected against direct water impact by an internal baffle.
    3. The resilient seat shall provide drop tight shut off to the full valve pressure rating. The seat shall be a minimum of .5 in. thick on 2 in. and larger valves and secured in such a manner as to prevent distortion. Valves with working pressures above 400 psig shall have metal

seats with synthetic seals.

4. On valve sizes 4 in. and larger, the cover shall be fitted to the valve body by means of a machined register to maintain concentricity between the top and bottom guide bushings at all times. The float shall be double guided with a guide shaft extending through the float to prevent any contact with the body. A resilient bumper shall be provided to cushion the float during sudden opening conditions.

E. Materials

1. The valve body, cover, and baffle shall be constructed of ASTM A126 Class B cast iron for Class 125 and Class 250 valves. Class 300 ductile iron valves shall be constructed of ASTM A536 Grade 65-45-12 ductile iron. Class 300 steel valves shall be constructed of ASTM A216/A216M Grade WCB cast steel.
2. The float, guide shafts, and bushings shall be constructed of Type 316 stainless steel. Non-metallic guides and bushings are not acceptable. Resilient seats shall be Buna-N. Class 300 steel valves shall have a 316 stainless steel Seat with Buna- N seal to provide an initial contact to Buna-N with final metal to metal contact to prevent over compression of the resilient seal.

F. Options

1. An optional Regulated Exhaust Device shall be provided when specified to reduce pressure surges due to column separation or rapid changes in velocity and pressure in the pipeline.
    a. The Regulated Exhaust Device shall be mounted on the inlet of the Air/Vacuum Valve, allow free air flow in and out of the valve, close upon rapid air exhaust, and control the air exhaust rate to reduce pressure surges.
    b. The device shall have a flanged globe-style body with a center guided disc and seat assembly. The disc shall have threaded holes to provide adjustment of the air exhaust rate through the valve. The holes shall provide for a flow area of 5% of the nominal valve size.
    c. The material of the body shall be consistent with the Air/Vacuum Valve. The seat and disc shall be ASTM A351/A351M Grade CF8M stainless steel.
2. A flanged or screwed outlet connection shall be provided when specified for vault piping.
3. A stainless steel screened outlet shall be provided when specified for outdoor installations.
4. Optional body materials include ASTM A536 Grade 65-45-12 ductile iron, ASTM A351/A351M Grade CF8M stainless steel, and ASTM B584 Alloy 836 cast bronze.
5. An optional threaded hood with screen on 1/2 - 4 in valves when specified.
6. An optional isolation valve shall be furnished under the Air/Vacuum valve when specified. For sizes with threaded inlets, the isolation valve shall be a fully-ported brass ball valve. For sizes with flanged inlets, the isolation valve shall be an AWWA class 150B or 250B Butterfly Valve with quarter-turn gear actuator and handwheel.

G. Manufacture

1. The manufacturer shall demonstrate a minimum of five (5) years experience in the manufacture of air valves. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.
2. The exterior of the valve shall be coated with a universal alkyd primer.
3. Air/Vacuum Valves shall be Series 100 as manufactured by Val-Matic and Manufacturing Corporation, Elmhurst, Il, USA or approved equal.

2.3 COMBINATION AIR VALVE

A. This Specification is intended to cover the design, manufacture, and testing of 1 in. through 20 in. Combination Air Valves suitable for pressures up to 740 psig clean water or raw water service.

B. Combination Air Valves shall be automatic float operated valves designed to exhaust large quantities of air during the filling of a piping system and close upon liquid entry. The valve shall open during draining or if a negative pressure occurs. The valve shall also release accumulated air from a piping system while the system is in operation and under pressure. The valve shall perform the functions of both Air Release and Air/Vacuum Valves and furnished as a single body or dual body type as indicated on the Plans.

C. Connections
   1. Dual body valve sizes 3 in. and smaller and single body valve sizes 4 in. and smaller shall have full size NPT inlets and outlets equal to the nominal valve size. The body inlet connection shall be hexagonal for a wrench connection.
   2. Larger sizes shall have bolted flanged inlets and plain outlets and protective hoods to prevent debris from entering the valve. Flanges shall be in accordance with ASME B16.1 for Class 125 or Class 250 iron flanges and ASME B16.5 for Class 300 steel flanges.
   3. The valve shall have two additional NPT connections for the connection to gauges, testing, and draining.

D. Design
   1. Both single and dual body valves shall provide a through flow area equal to the nominal size. Floats shall be unconditionally guaranteed against failure including pressure surges. The cover shall be bolted to the body and sealed with a flat gasket. A resilient bumper shall be provided on 4 in. and larger sizes to cushion the float during sudden opening conditions. The resilient seat shall be replaceable and provide drop tight shut off to the full valve pressure rating.
   2. Dual body combination valves shall consist of an Air Release Valve piped to an Air/Vacuum Valve with a quarter-turn, full-ported bronze ball valve.
      a. The Air Release Valve shall have a leverage mechanism with sufficient mechanical advantage so that the valve will open under full operating pressure. Simple lever designs shall consist of a single pivot arm and a resilient orifice button. Compound lever designs shall consist of two levers and an adjustable threaded resilient orifice button.
      b. The Air/Vacuum Valve sizes 4 in. and larger shall have a cover fitted to the valve body by means of a machined register to maintain concentricity between the top and bottom guide bushings at all times. The float shall be double guided with a guide shaft extending through the float to prevent any contact with the body. The float shall be protected against direct water impact by an internal baffle bolted to the cover or integrally cast in the body. The seat shall be a minimum of .5 in. thick on 2 in. and larger valves and secured in such a manner as to prevent distortion. Valves with working pressures above 400 psig shall have metal seats with synthetic seals.
   3. Single body combination valves shall have an expanded outlet to provide full flow area around the guide mechanism. The valve shall have a double guided plug on 2 in. and larger sizes, and an adjustable threaded orifice button. The plug shall be protected against direct water impact by an internal baffle. On valve sizes 4 in. and smaller, the plug shall have a precision orifice drilled through the center stem. On valve sizes 6 in. and larger, air release and air/vacuum mechanisms shall be provided as separate units contained within the same body and meet the same design specifications for the Dual Body Combination Valve in Section 2.04 D.2 above.

E. Materials
   1. The valve body and cover shall be constructed of ASTM A126 Class B cast iron for Class 125 and Class 250 valves. Class 300 ductile iron valves shall be constructed of ASTM A536 Grade 65-45-12 ductile iron. Dual Body Class 300 steel valves shall be constructed of ASTM A216/A216M Grade WCB cast steel.
   2. The float, guide shafts, and bushings shall be constructed of Type 316 stainless steel. Non-metallic floats, linkage, or bushings are not acceptable. Resilient seats shall be Buna-N. Class 300 steel dual body valves shall have a 316 stainless steel seat with Buna-N

seal to provide an initial contact to Buna-N with a final metal-to-metal contact to prevent over compression of the resilient seal.

F. Options
   1. An optional Regulated Exhaust Device shall be provided when specified to reduce pressure surges due to column separation or rapid changes in velocity and pressure in the pipeline.
      a. The Regulated Exhaust Device shall be mounted on the inlet of the Combination Air Valve, allow free air flow in and out of the valve, close upon rapid air exhaust, and control the air exhaust rate to reduce pressure surges.
      b. The device shall have a flanged globe-style body with a center guided disc and seat assembly. The disc shall have threaded holes to provide adjustment of the air exhaust rate through the valve. The holes shall provide for a flow area of 5% of the nominal valve size.
      c. The material of the body shall be consistent with the Combination Air Valve. The seat and disc shall be ASTM A351/A351M Grade CF8M stainless steel.
   2. A flanged or screwed outlet connection shall be provided when specified for vault piping.
   3. A stainless steel screened outlet shall be provided when specified for outdoor installations.
   4. Optional body materials include ASTM A536 Grade 65-45-12 ductile iron, ASTM A351/A351M Grade CF8M stainless steel, and ASTM B584 Alloy C83600 cast bronze.
   5. Optional threaded hoods with screens shall be provided on the outlet when specified.
   6. An optional isolation valve shall be furnished under the combination air valve when specified. For sizes with threaded inlets, the isolation valve shall be a fully-ported brass ball valve. For sizes with flanged inlets, the isolation valve shall be an AWWA Class 150B or 250B Butterfly Valve with quarter-turn gear actuator and handwheel.

G. Manufacture
   1. The manufacturer shall demonstrate a minimum of five (5) years experience in the manufacture of air valves. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.
   2. The exterior of the valve shall be coated with a universal alkyd primer.
   3. Combination Air Release Valves shall be Series 201C.2 (single body) or Series 100/22 (Dual Body) as manufactured by Val-Matic and Manufacturing Corporation, Elmhurst, Il, USA or approved equal.

2.4 VACUUM BREAKER VALVE (2 INCH - 42 INCH)

A. The Vacuum Breaker shall be of the globe style high flow type with rapid linear opening to automatically admit large quantities of air to enter a system on negative pressure. An optional Air Release Valve can be directly piped to relieve air under positive pressures.

B. Connections
   1. Valves shall be provided in sizes 2 in. through 42 in. and have flanges in accordance with ASME B16.1 for Class 125 or Class 250 iron flanges. Iron flanges shall be flat faced. Sizes 10 in and smaller shall be capable of mating directly to a wafer butterfly valve without disc interference.

C. Design
   1. The valve design shall incorporate a center guided, spring loaded disc, guided at opposite ends and having a short linear stroke that generates a flow area equal to the pipe size.
   2. The valve shall be installed in the vertical position with top protective screened hood.
   3. All component parts shall be field replaceable without the need of special tools. A replaceable guide bushing shall be provided and held in position by the spring. The spring shall be designed to withstand 100,000 cycles without failure and provide a cracking pressure of 0.25 psi (1.7 kPa) and to fully open at a pressure differential of 2 psi (14 kPa).
   4. The valve disc and seat shall have a seating surface finish of 32 micro-inch or better to ensure positive seating at all pressures. A Buna-N seal shall be provided on the seat to

provide zero leakage at both high and low pressures without overloading or damaging the seal. The seal design shall provide both a metal to metal and a metal to Buna-N seal.

D. Materials
   1. The valve body shall be constructed of ASTM A126 Class B cast iron for Class 125 and Class 250 valves. Optional body material include ASTM A536 Grade 65-45-12 ductile iron.
   2. The seat and plug shall be ASTM B584 Alloy C83600 cast bronze or ASTM B148 Alloy C95200 aluminum bronze. Optional trim material include ASTM A351/A351M Grade CF8M stainless steel.
   3. The compression spring shall be ASTM A313/A313M Type 316 stainless steel with ground ends.

E. Options
   1. An Air Release Valve shall be furnished and integrally piped with bronze full-ported ball valve when specified.
      a. The Air Release Valve shall be automatic float operated and designed to release accumulated air from a piping system while the system is in operation and under pressure.
      b. The valve body shall be threaded with NPT inlets and outlets. The body inlet connection shall be hexagonal for a wrench connection. The cover shall be bolted to the valve body and sealed with a flat gasket. Resilient seats shall be replaceable and provide drop tight shut off to the full valve pressure rating.
      c. Floats shall be unconditionally guaranteed against failure including pressure surges. Mechanical linkage shall provide sufficient mechanical advantage so that the valve will open under full operating pressure and consist of two levers and an adjustable threaded resilient orifice button.
      d. The valve body and cover shall be constructed of cast iron. The orifice, float and linkage mechanism shall be constructed of Type 316 stainless steel. Non-metallic floats or linkage mechanisms are not acceptable. The orifice button shall be Buna-N or Viton.
   2. A flanged inlet per ASME B16.1, Class 125 shall be furnished when specified.

F. Manufacture
   1. The valves shall be hydrostatically tested at 1.5 times their rated cold working pressure. Additional tests shall be conducted per AWWA, ANSI, MSS or API standards when specified. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.
   2. The exterior of the valve shall be coated with a universal alkyd primer.
   3. Vacuum Breakers shall be Series 1800VB as manufactured by Val-Matic and Manufacturing Corporation, Elmhurst, Il, USA or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall be in accordance with Plans, approved shop drawings, and the manufacturer's instructions.

3.2 CROSS CONTAMINATION AND SECURITY PROTECTION

All Air (Release, Vacuum, etc.) Valves installed in vaults or flood prone locations shall include an inflow preventer to prevent the introduction of contaminated water through the air valve outlet. The inflow preventer shall allow the admittance and exhausting of air while preventing contaminated water from entering during normal operating conditions. The third party shall be an approved testing lab of the American Society of Sanitary Engineers.

3.3 FIELD QUALITY CONTROL

For start-up and testing, see Section 01 07 01, PLANT TESTING AND STARTUP, for additional requirements.

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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 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.

2.6 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.

2.7 FLUSH VALVES

A. 4" flush valves shall be 4" MJ gate valve and box, 4" C-900 PVC and ductile iron pipe with 16" x 4" Tee, 4" ells, and 4" x 3" galvanized bell reducer with cap as noted on the Plans. The riser shall be placed adjacent to the ROW line.

B. 2" flush valves shall be 2" gate valve and box, 2" galvanized steel pipe riser with 2" galvanized 90-degree bend, and 2" galvanized plug as noted on the Plans. A 2-inch galvanized nipple shall be used between the gate valve and riser and a Schedule 80 PVC nipple with PVC coupling between the gate valve and the main line. If tied directly to the saddle or tee, a brass nipple shall be used between the gate valve and saddle. The riser shall be placed adjacent to the ROW line.

2.8 INTAKE SCREENS

Intake screens shall be 14" 316 SS as manufactured by Johnson Screens capable of 900 gpm each.

2.9 STRAINERS

Strainers installed ahead of the microfilters shall be Amiad SAF 6000 or approved equal. Screen size shall be 500 microns. Backwash motor shall be 1 hp, 460 volts, 3 phase. Inlet and outlet shall be 10" diameter.

2.10 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

2.11 WATER LINE, VALVE AND ROW MARKERS

The CONTRACTOR shall furnish and install markers which shall be 5'-6" long, 3-3/4" wide blue colored, fiberglass-type, flexible post with the appropriate identifying decal. The white and blue decal shall be standard No. 38 for water line ROW markers and valve markers. The phone number for the decal shall be ("###-###-####"). The marker locations shall be determined by the OWNER. The Supplier shall also furnish the OWNER one post driver and one pilot hole driver.

2.12 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.

2.13 INSULATION

A. All exposed piping, valves and fittings 16 inches and smaller shall be completely insulated. All lines shall be insulated with Pittsburgh-Corning "Foamglas", or approved equal.

B. Insulation shall be 4-inch-thick, with vapor barrier jacket, sealed with mastic and fastened with the factory-made aluminum bands per section of insulation. An outside protective jacket made of sheet aluminum not less than 0.016-inch-thick shall be installed over the insulation.

C. All pipe fittings, valves, and accessories except moving parts shall be insulated with white hydraulic setting insulating cement to the thickness of the adjacent pipe insulation. the insulation shall be sealed and covered with an aluminum jacket.

D. Freeze protection shall be provided from a point eighteen (18) inches below the finished grade.

E. Insulated pipe shall be color coded with steel straps on 10 inch centers. Straps shall be constructed from 2-inch side by 1/16 inch steel and be secured around the insulation by a single SS bolt.

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.

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" I.P. thread inlet and outlet for insta-tite or pack joint connection to polyethylene pipe, ball type, 300 psi rated. Use AYMcDonald, Ford Meter Box, or approved equal.

2.4 METER STOPS

Meter Stops shall be 3/4", angle-type, ball valve for polyethylene pipe and swivel nut I.P.T. outlet, 300 psi rated, with padlock wing. One required for each meter. Use AYMcDonald, Ford Meter Box, or approved equal.

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 --