



SAN ANTONIO WATER SYSTEM
WATER TRANSMISSION MAIN – ROGERS RANCH TO I.H. 10 PROJECT

SAWS JOB NUMBER 07-7003

ADDENDUM NO. 3
October 13th, 2010

To Bidder of Record:

This addendum, applicable to work referenced above, is an amendment to the bidding documents and as such will be a part of and included in the Contract Documents. Acknowledge receipt of this addendum by entering the addendum number and issue date in the space provided in submitted copies of the proposal.

SPECIFICATIONS:

Invitation to Bidders

Delete the following Statement:

*Sealed bids will be received by the Contract Administration Division, 2800 U.S. Hwy 281 North, Customer Center Building, Suite 171, San Antonio, Texas 78212, until **10:00 a.m., October 15, 2010**. Bids will then be publicly opened and read aloud in Contract Administration, Suite 169, Customer Center Building, 2800 U.S. Hwy 281 North, San Antonio, Texas. Each bid must be accompanied by a cashier's check, certified check, or bid bond in an amount not less than five percent of the total bid price.*

Add the following Statement:

*Sealed bids will be received by the Contract Administration Division, 2800 U.S. Hwy 281 North, Customer Center Building, Suite 171, San Antonio, Texas 78212, until **10:00 a.m., October 19, 2010**. Bids will then be publicly opened and read aloud in Contract Administration, Suite 169, Customer Center Building, 2800 U.S. Hwy 281 North, San Antonio, Texas. Each bid must be accompanied by a cashier's check, certified check, or bid bond in an amount not less than five percent of the total bid price.*

Section 02400 – Jacking and Boring, Paragraph 2.01 (B)

Delete the following Statement:

Carrier pipe shall be new ...with the provision of Section 02510.

Add the following Statement:

Carrier pipe shall be new ...with the provision of Section 02520, Ductile Iron Pipe and Fittings or Section 02530, Bar-Wrapped Concrete Cylinder Pipe and Fittings.

Section 02530 – Bar-Wrapped Concrete Cylinder Pipe and Fittings

Replace this section in its entirety with the attached section.

Section 02573 – Welded Steel Pipe and Fittings

Delete this specification in its entirety.

Section 02700 – Disinfection, Paragraph 1.03 (7)

Delete the following statement in its entirety:

No flushing shall be permitted into any of the existing creeks, streams or rivers since this project is located within the Edwards Aquifer Recharge and Contribution Zones. Dechlorination Stations shall be provided by the Contractor prior to any testing to the Owner's approval. No Separate Pay Item.

Add the following statement:

No flushing of chlorinated water shall be permitted into any of the existing creeks, streams or rivers since this project is located within the Edwards Aquifer Recharge and Contribution Zones. Apply sodium bisulfate at the point of discharge and neutralize the water prior to discharge into the ground or into a water tank to be disposed according to local, state and federal regulations. A Dechlorination Stations may be required for the Contractor to neutralize the water prior to any pipe testing at the Contractor's expense and to the approval of the Owner. No Separate Pay Item.

Clarification of Specifications:

Section 02083, Valves, Paragraph 2.05 (G)

The required pressure class rating for butterfly valves shall be 250 psi with 250 psi drill pattern.

PLANS:

Sheet B12

Add the following statement for the Construction Notes shown on this sheet:

9. Contractor shall provide flowable fill to pipe installation (between Station 107+24 to 107+88) if the steel pipe casing for the proposed bore is less than 10-feet from the edge of pavement on each side and shall be in conformance to TxDOT regulations and most current specifications.

Sheet C1

Delete the following item(s) from the plan and profile portion for this sheet:

- 6" Combination Air Valve at the following stations: 0+10 and 2+85.*
- 6" Air Vacuum Release Valve at Station 5+35.*

Add the following item(s) to the plan profile portion for this sheet:

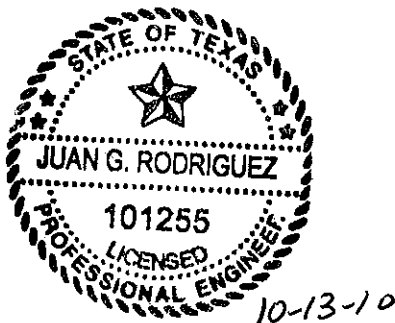
- 4" Combination Air Valve at Station 2+85. Reference attached Exhibit "A".*
- 3" Air Vacuum Release Valve at Station 5+35. Reference attached Exhibit "B".*

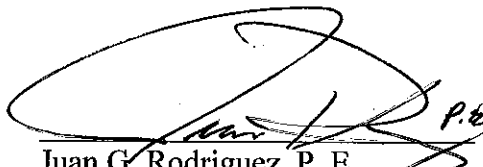
Clarification of Construction Plans:

Sheet GN1

The entire project is located within the SAWS designated Pressure Zone 11 and a minimum 200 psi pressure rating is required for all pipe, valves, fittings, and appurtenances.

Each bidder is requested to acknowledge receipt of this Addendum No. 3 by his/her signature affixed hereto and to file same with and attach to his/her bid.




Juan G. Rodriguez, P. E.
Project Engineer
Production & Transmission Engineering

The undersigned acknowledges receipt of this Addendum No. 3 and the bid submitted herewith is in accordance with the information and stipulations set forth.

Date

Signature of Bidder

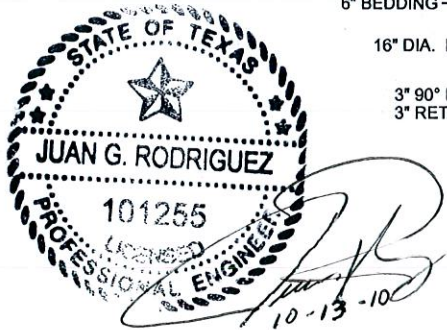
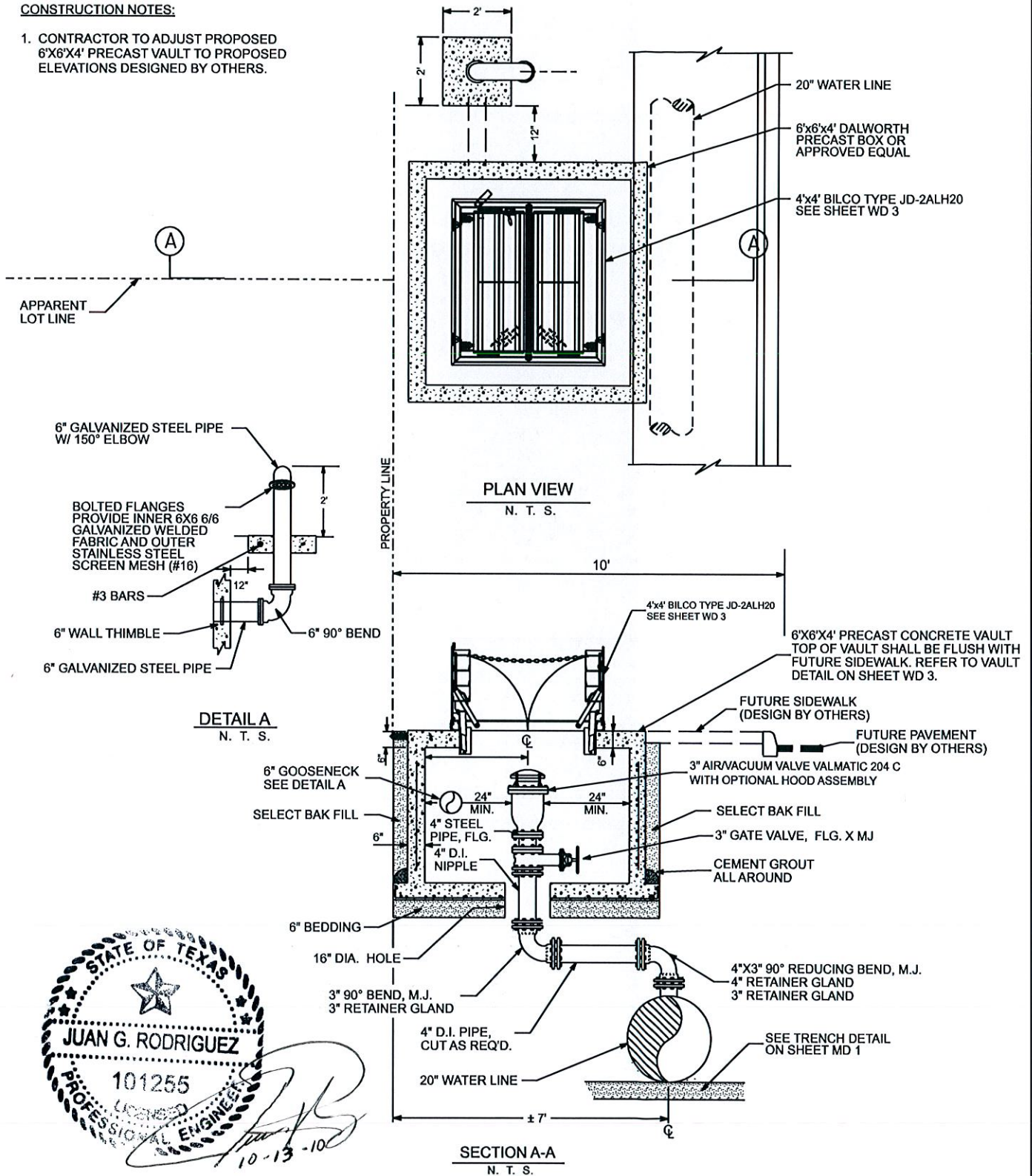
This Addendum, including these three (3) pages, is 40 pages with attachment in its entirety.

- Attachments:
- Exhibit A – 4" Combination Air Valve Exhibit
 - Exhibit B – 3" Air Vacuum Release Valve Exhibit
 - Exhibit C – Contractor Questions and Clarifications
 - Specification 02530 – Bar-Wrapped Concrete Cylinder Pipe and Fittings

EXHIBIT B

CONSTRUCTION NOTES:

1. CONTRACTOR TO ADJUST PROPOSED 6'X6'X4' PRECAST VAULT TO PROPOSED ELEVATIONS DESIGNED BY OTHERS.



1. REPLACED 6" AIR VACUUM VALVE WITH 3" AIR VACUUM VALVE AT STA. 5+35 LINE C. REVISED VAULT TO FIT PROPOSED SIDEWALK AND CURB LOCATION AS NOTED ON DETAILS.

WATER TRANSMISSION MAIN ROGERS RANCH TO IH 10 PROJECT (ADDENDUM NO. 3 - SHEET C1)



Exhibit C

Contractor Questions and Clarifications

1. **Question:** I am inquiring the above referenced contract. What are the pipe types allowed by the specifications, i.e. CCP, DIP, WSP, HDPE etc...?

Clarification: (a) The primary pipe material for the 30" water main in Lines A, B & D shall be Ductile Iron Pipe or Concrete Steel Cylinder Pipe (C303). HDPE is allowed only on the line segments where there will be directional drilling.

(b) The primary pipe material for the 20" water main in Lines C shall be Ductile Iron Pipe or Polyvinyl Chloride Pipe (C905).

2. **Question:** How much directional drilling associated with the above referenced project? If any, are the bores short in length or long in length?

Clarification: The construction plans illustrate the linear footage for all the horizontal directional drilling. The total amount of horizontal directional drilling is approximately 1,975 linear feet. The bores and encasement are illustrated in the construction plans and vary in lengths. The total amount of bore and encasement is approximately 1,400 linear feet.

3. **Question:** Does the proposal have any unit pricing for water line items? I could not locate any...

Clarification: This project is a lump sum project and does not contain unit pricing itemization. The construction plans contain the information require to make your assessment.

4. **Question:** A Geo Technical Report is not included in the contract documents for this project. Please advice when or how a Geo Technical Report can be obtained.

Clarification: A geotechnical report is available in Addendum #1 issued for this project on Thursday, October 7th, 2010.

5. **Question:** Would equal i.d. and pressure class Fusible PVC(tm) be allowed on the trenchless sections of this project?

Clarification: The Fusible PVC(tm) pipe is not considered as an option for this project. The proposed pipe material for Horizontal Directional Drilling is HDPE; Ductile Iron or Concrete Steel Cylinder Pipe is allowed for bore and encasement as shown on the plans and as stated on Section 02400 Jacking or Boring. Refer to Addendum #3.

6. **Question:** Note 53 on Sheet GN1 states that trenches/bore pits open longer than 24 hours shall be backfilled with rock rubble (2'x2'x0.5'). Do we need to do this and why? It also states trench/bore pit open longer than 30 days shall be backfilled with a semi-permanent repair backfill. What is that and do we need to do this?

Clarification: *These notes are included to adhere to the floodplain permit requirements set forth by the City of San Antonio.*

7. **Question:** Note 21 on Sheet GN1 states SAWS will chlorinate the new main. Is that correct?

Clarification: *As per Section 02700 Disinfection and Note 21, SAWS will provide the machine chlorination. The contractor shall provide all appurtenances to the pipe to allow for machine chlorination.*

8. **Question:** Do we need to place mulch on top of the reveged areas?

Clarification: *Refer to construction plans and Section 02360, Vegetation Restoration.*

9. **Question:** Is it the intent to only clear what is stated on the plans as the “Canopy to be removed area”? Does that mean vertical at that point? Can we clear the temporary easement? Can we under-brush the temporary easement?

Clarification: *In order to comply with the City of San Antonio, most current Tree Ordinance 35-523 and the approved tree permit requirements issued in October 4, 2010 , the Contractor shall clear the easement and right-of-way areas as shown on the construction plans, specifically in the Tree Plans (Sheets TP1-TP8). The Contractor may clear vertically within the clearing limits as shown in the tree plans. The temporary easement shall not be cleared completely, but only as shown on the tree plans. The under-brush for the temporary easement is considered as tree canopy area and shall comply with the tree plans.*

10. **Question:** What are the fines for damaging trees that are not supposed to be damaged?

Clarification: *As per City of San Antonio, most current Tree Ordinance 35-523, the penalties for removing and/or damaging trees that are supposed to be protected shall be fined as follows:*

- (a) Heritage Trees.....\$600.00 per inch of tree dia.*
- (b) Significant Trees.....\$200.00 per inch of tree dia.*
- (c) Civil Penalties.....\$1,000.00 per incident*
- (d) Criminal Penalties.....\$200.00 per day*

The City Arborist may stop work order if Contractor is not in compliance with Tree Permit requirement and Tree Plans and Permit shall be revised to recalculate the canopy removed and resubmit for City Arborist approval.

11. **Question:** Floodplain Note 1 states “No equipment, spoils, or fill material shall be stored within the floodplain at any time. What is meant by this? Can we store our gravel for backfill by the ditch? Can we leave our trench spoils there until we are ready to haul it out?

Clarification: *These notes are included to adhere to the floodplain permit requirements set forth by the City of San Antonio. This note is referred to any material or equipment that may erode or affect the existing creek systems and impede drainage flow and to prevent any flooding occurrence to the immediate areas. The Contractor shall adhere to the Floodplain Permit requirements (currently under review) and will require the City of San Antonio Storm Water Division Engineer to allow*

any backfill by the ditches and to leave trench spoils within the floodplain limits.

12. **Question:** Do you have to stay within the specified easement?

Clarification: Yes. The clearing limits shall be as shown on the Tree Plans.

13. **Question:** The plan says to save trees on Muir Glen, but there is no bore set up there. The trees are in the ditch line. They cannot be saved unless they are bored. Do we need to a bore at that location?

Clarification: Based on the Tree plans (Sheet TP7), minimal canopy is shown within the future Muir Glen right-of-way and the canopy shown is mitigated to remain in compliance with the tree permit. Any modification to the tree permit shall require the approval from the City Arborist. Vertical clearance is allowed but is limited to the Tree Permit requirements. No bore is required for this area.

14. **Question:** Why is this project bid Lump Sum when other projects are not bid this way?

Clarification: It was SAWS management and staff preference to bid this project Lump Sum due to successful projects previously completed.

15. **Question:** Technical Specifications 01451 (“Quality Control”) states the contractor is responsible for all material testing by an independent, certified, commercial testing laboratory. We need SAWS to specify exactly what testing and frequency of testing will be required so we can get pricing for this?

Clarification: All testing requirements shall include but not limited to: Backfill, Compaction, Moisture Content, and Soil Sampling (pre and post conditions).

16. **Question:** Floodplain Note 1 states that we can not disturb more than 1/10 of an acre in the floodplain. We will have to disturb more than that. Can you delete that note? How can we handle that problem?

Clarification: This note is included to minimize the impact of disturbed areas within the floodplain and will not be deleted. If the disturbed area exceeds the 1/10 acre and are within the Navigable Waters of the U.S., it may require submitting for a Section 404 Nationwide Permit. Contractor shall minimize impact inside the floodplain areas.

17. **Question:** The casing pipe under N.W. Military is stated as 48” and 42 “on Sheet EC6, and as 54” on Sheet B12. Please clarify which is correct.

Clarification: The 54” Steel Casing Pipe or as Approved by Engineer shall be the correct note to follow as shown on the plan and profile sheets.

18. **Question:** Do we need to develop, prepare and submit a Storm Water Pollution Prevention Plan at our own cost?

Clarification: Yes. Per Section 01500, Construction Facilities and Temporary Controls, the Contractor shall be responsible to follow the NPDES/TPDES requirements.

19. **Question:** What is meant by note 12 on the erosion control & sedimentation plan by stating no chlorine discharge into the creek? Can we flush the water line onto the existing ground or do we have to put the water into a water truck.

Clarification: *No discharged pollutants are allowed to enter any creek, stream or river since the area is located within the Edwards Aquifer Recharge and Contribution Zones per Texas Commission on Environmental Quality (TCEQ) Edwards Aquifer regulations. Refer to Addendum #3 for response.*

20. **Question:** Note 12 also states “a dechlorination station must be provided for testing purposes.” Will this be provided by SAWS?

Clarification: *No. The Contractor shall provide the Dechlorination station as needed. Refer to Addendum #3 for response.*

21. **Question:** Please supply a list of plan holders for use in soliciting subcontractors.

Clarification: *A “Plan Holders List” is available on the SAWS website.*

22. **Question:** What is the specification on the topsoil and hydromulch to be used in the revegetation?

Clarification: *Topsoil is required for all disturbed areas within the project. Hydromulch shall be applied as required specifically in TxDOT right-of-way or as indicated on the plans.*

23. **Question:** Do we have to use a registered surveyor to stake the line?

Clarification: *Yes. Per Section 01720, Field Engineering, it is the responsibility of the Contractor to hire a surveyor or engineer as required for the construction of the project. Construction Staking shall be provided by the Contractor at their expense.*

24. **Question:** Will be required to follow MSHA in the MMM mine area?

Clarification: *The Martin Marietta Materials mine area is regulated by the Mine Safety and Health Administration (MSHA), Title 30 CFR regulation. Contractor shall comply with the Part 46 Training prior to any construction activity. The Martin Marietta Materials staff will require for all person(s) working inside the facility to meet and sign a Site Specific Hazard Awareness Training form which explains all the parameters for MSHA requirements.*

25. **Question:** Please include Electric Line requirements as far as height and distance?

Clarification: *This project scope of work is limited to the easement areas and the CPS easement may be used to transport equipment from one place to another. The maximum height allowed through the easement shall be 15 feet and the distance shall be as shown on the plans.*

26. **Question:** We request that SAWS have a mandatory site visit for all bidders to discuss everything that was discussed in the meeting today?

Clarification: *No mandatory site visit is scheduled for this project.*

27. **Question:** Who was the contractor that provided information that indicated the horizontal directional drilling was feasible for this project?

Clarification: *SAWS utilized input from various sources for the design of this project. SAWS does not dictate the means or methods to potential bidders. Therefore, contractors should bid the project based on the contract documents provided.*

28. **Question:** I am trying to be proactive and get my paperwork to our bonding company early but I have a couple of questions that I cannot find answers to in the specifications. What is the estimated completion time and the liquidated damages for the above referenced project?

Clarification: *Estimated calendar days to complete is on page BP-3 (3rd page of the bid proposal). LD's are on page 35 of the general conditions.*

SECTION 02530

BAR-WRAPPED CONCRETE CYLINDER PIPE AND FITTINGS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section but are not limited to:

1. The American Society for Nondestructive Testing: SNT-TC-1A, Personnel Qualification and Certification of Non-Destructive Testing.
2. The most current edition of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, (a) Section V, Nondestructive Examination, (b) Section VIII, Pressure Vessels, (c) Section IX, Welding and Brazing Qualifications, (d) Part QW Welding.
3. American Water Works Association (AWWA):
 - a. C200, Steel Water Pipe—6 in. (150 mm) and Larger.
 - b. C205, Cement-Mortar Protective Lining and Coating for Steel Water Pipe—4 in. (100 mm) and Larger—Shop Applied.
 - c. C206, Field Welding of Steel Water Pipe.
 - d. C207, Steel Pipe Flanges for Waterworks Service—Sizes 4 in. through 144 in. (100 mm through 3,600 mm).
 - e. C208, Dimensions for Fabricated Steel Water Pipe Fittings.
 - f. C303, Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type.
 - g. M9, Concrete Pressure Pipe, most current edition.
 - h. M11, Steel Water Pipe: A Guide for Design and Installation, most current edition.
4. American Welding Society (AWS):
 - a. A2.4, Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 - b. A3.0, Standard Welding Terms and Definitions Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying.
 - c. D1.1/D1.1M, Structural Welding Code—Steel.
 - d. D1.3, Structural Welding Code—Sheet Steel.
 - e. D1.4, Structural Welding Code—Reinforcing Steel.
 - f. QC1, Standard for AWS Certification of Welding Inspectors.
5. ASTM International (ASTM):

- a. A675/A675M, Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties.
 - b. E329, Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
6. International Organization for Standardization (ISO): ISO 9001:2000, Quality Management Systems—Requirements.
 7. Lloyd’s Register requirements.

1.02 DEFINITIONS

- A. Fittings and Specials: Including, but not limited to fittings, closure pieces, bends, elbows, reducers, tees, wyes, bifurcations, crosses, outlets, manifolds, nozzles, wall sleeves, bulkheads, and other piping and appurtenances fabricated from steel plate, sheet, or coils as required to provide the Work, complete. Specials shall also include piping above ground or inside structures.
- B. Acronyms:
 1. CJP: Complete Joint Penetration.
 2. CWI: Certified Welding Inspector.
 3. MT: Magnetic Particle Testing.
 4. NDE: Nondestructive Examination.
 5. NDT: Nondestructive Testing.
 6. PJP: Partial Joint Penetration.
 7. PQR: Procedure Qualification Record.
 8. PT: Liquid Penetrant Testing.
 9. RT: Radiographic Testing.
 10. UT: Ultrasonic Testing.
 11. VT: Visual Testing.
 12. WPQ: Welder/Welding Operator Performance Qualification.
 13. WPS: Welding Procedure Specification.

1.03 DESIGN REQUIREMENTS

- A. Design piping in accordance with AWWA C303, AWWA Manual M9, Contract Drawings, and the following conditions:
 1. Pipe shall be designed to withstand the simultaneous application of external loads and internal pressures, and the maximum stress determined on combinations of the parameters indicated below.
 2. Working Pressure: 250 psi.
 3. Surge Pressure: 100 psi in excess of working pressure.

4. Field Test Pressure: 250 psi.
 5. External Loading Conditions: Dead Load plus Live Load.
 6. Earth Loading: Compute in accordance with AWWA Manual M9.
 7. Depth of Earth Cover: As shown on the Drawings.
 8. Weight of Earth Cover: 120 pounds per cubic foot.
 9. Trench Bedding Condition: As indicated in Section 02317, Excavation, Backfilling, and Compaction of Utilities and as shown on the Drawings. Assume MOD 5 bedding condition for pipe calculations.
 10. Backfill Condition: As indicated in Section 02317, Excavation, Backfilling, and Compaction of Utilities and as shown on the Drawings.
 11. Live Load: HS-20 traffic load with 1.5 impact factor, AASHTO Standard Specification for Highway Bridges.
 12. Allowable E' Value: 1,000 psi.
 13. Maximum allowable deflection shall be as specified in AWWA Manual M9. The Deflection Lag factor, DL, shall be a minimum of 1.00.
 14. Deflection at Joints: The design horizontal and vertical deflection of the pipe shall be 75 percent of the manufacturer's recommendation.
 15. Thermal Change: 30 degrees F.
 16. Thrust Force: The greater of the following load combinations:
 - a. Full test pressure times area ($Pt \cdot A$) plus soil drag.
 - b. Temperature change plus effect of Poisson's ratio plus soil drag.
 17. Allowable Vacuum: The pipe shall be designed to withstand a full internal vacuum (-14.7 psi).
 18. Inside Diameter: The inside diameter of the pipe shall be 30 inches.
 19. Pipe Dimensions: The pipe shall be of the diameter and minimum wall thickness as specified herein. Unless shown otherwise, the inside diameter shall be considered the finished diameter after lining.
- B. Provide a polyethylene or other suitable bulkhead on the ends of the pipe and on specials and fitting openings to prevent drying out of the lining. Bulkheads

shall be substantial enough to remain intact during shipping and storage until the pipe is installed.

- C. Design fittings and specials in accordance with AWWA C303 and Manual M9. Provide minimum wall thickness as shown in AWWA 303.
- D. Deflection calculations shall be based on the as per trench details as shown on drawings, unless noted otherwise.
- E. Pipe Layout Drawings: Prepare complete pipeline layout, in accordance with AWWA Manual M9 including the following:

1. General:

- a. Base stationing and elevation convention as shown on Contract Drawings.
- b. Maximum Laying Lengths: 40 feet maximum per AWWA C303, unless specifically shown otherwise.
- c. Joint deflection shall be limited to 75 percent of manufacturer's recommended amount. Deflection of joints shall be reserved for unforeseen field changes in alignment or grade.
- d. Include on Drawings as Minimum: Specific pipe number, location, and direction of each pipe, joint, and fitting or special. Number each pipe in sequence.
 - 1) Station and centerline elevation at changes in grade or horizontal alignment.
 - 2) Station and centerline elevation to which bell end of each pipe will be laid.
 - 3) Elements of curves and bends, both in horizontal and vertical alignment.
 - 4) Location of mitered pipe sections, beveled ends for alignment conformance, butt straps, and special joints for temperature stress control.
 - 5) Location of closures, cutoff sections for length adjustment, temporary access manways, vents, and welds lead outlets for construction convenience.
 - a) Provide for adjustment in pipe laying headings and to conform to indicated stationing.
 - b) Changes in location or number will require Engineer approval.
 - 6) Location of bulkheads, both those shown and as required, for hydrostatic testing of pipeline, including details for removal of test bulkheads and repair of the lining. Testing against closed valves is not allowed unless approved by the Owner, and if the pressure rating of the valve exceeds the hydrostatic test pressure.
 - 7) Limits within each reach of restrained and/or welded joints and of concrete encasement.
 - 8) Dimensional drawings of all valves, fittings, and appurtenances.

F. Welding Procedure Specification (WPS):

1. Welding of steel cylinders shall be qualified by testing in accordance with ASME BPVC SEC IX for shop welds and AWS D1.1/D1.1M for field welds.
2. Shop welding of reinforcing steel shall be qualified per AWS D1.4.
3. Shop welding of sheet steel, less than 1/8 inch thickness, shall be qualified per AWS D1.3.
4. PQRs conducted on unlisted base metal (most coil products are unlisted base metals) to be production welded as required in the referenced welding code shall be traceable to heat lots.
5. Written WPS required for welds, both shop and field.

G. Stulling (Strutting):

1. Designed and provided by pipe manufacturer on specials, fittings, and straight pipe so as to avoid damage to pipe and fittings during handling, storage, hauling, and installation as required by Manufacturer requirements.

1.04 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:

- a. Design calculations for pipe, reinforcing, fittings, specials, welding, and joints, including the following:
 - 1) Cylinder thickness, bar wrap diameter and spacing for each pipe pressure and load classification design.
 - 2) Manufacturing tolerances.
 - 3) Maximum angular deflection limitations of field joints.
 - 4) All other pertinent information required for the manufacture and installation of the product.
- b. Complete data and fabrication plans and details for pipe, fittings, and joints, including all reinforcement dimensions and spacing.
- c. Design calculations shall include a complete stress analysis of each section of pipe wall, girth joints, restrained joints, and bell and spigot joints, all sufficient to ascertain conformance of pipe and fittings with the specifications. Joint details and design calculations shall be submitted for all welded joint types, including beveled

ends for alignment conformance and deep butt strap joints for pipeline restraint and control of temperature stresses.

- d. Certified pipeline layout drawings, compatible with the requirements of AWWA Manual M-9, showing the specific number of each pipe and fitting and the location of each pipe section, and the direction of each fitting in the completed line including the following:
 - 1) Closure sections and cutoffs for field length adjustment.
 - 2) Bulkheads, including details for removal of test bulkheads and repair of lining.
 - 3) Weld lead outlets and plugs.
 - 4) Stulling size, spacing, and layout, and other methods proposed for pipe support and handling during manufacturing, transport, and installation. Submit design calculations, drawings, and documentation supporting and confirming that the handling and support systems have been designed appropriate for the methods to be used on this project.
 - 5) The station and centerline elevation to which the bell end of each pipe will be laid.
 - 6) All elements of curves and bends, both in horizontal and vertical alignment.
 - 7) Limits of each reach of restrained and/or welded joints and of concrete encasement.
 - 8) The location of all beveled ends for alignment conformance and deep butt strap joints for temperature stress control.
 - 9) Dimensional drawings of all valves, fittings, and appurtenances.
 - 10) Submit final line layout drawings with project record documents. Record line layout drawings shall indicate the actual locations of components within the pipeline that are required by this Section to be included in the Line Layout drawings.
- e. Type and amount of concrete admixtures.
- f. Welding procedure specifications.
- g. Proposed thrust restraint system for restrained joints including drawing details, materials, calculations, assembly ratings, and pipe attachment methods.
- h. Dissimilar Buried Pipe Joints: Joint types and assembly drawings.
- i. Coating and lining holdbacks.
- j. Drawings and calculations shall be sealed by a professional engineer licensed in the State of Texas.

2. Product data for the following:

- a. Pipe:
 - 1) Mill certificates.

- 2) Material data and steel reinforcement schedules which describe all materials to be utilized.
 - 3) Chemical and physical test reports showing data consistent with specified requirements for each heat of steel proposed for use. Records should indicate heat of steel for each pipe joint listed in line layout.
- b. Rubber Gasket Joint:
 - 1) Material data.
 - 2) Details with dimensions and fabrication tolerances for both bell and spigot ends.
 - 3) Performance history or test data.
 - c. Material for protecting exterior of joints.
 - d. Material for protecting interior of joints.
3. Ground Profile and Utility Locations:
- a. Prior to preparation of line layouts, Contractor shall verify the existing ground profile and the location and depth of all underground utilities crossing the pipeline using centerline stakes set by the Contractor at no less than 100 feet intervals. Contractor shall carefully locate and excavate utility, survey, document, and submit this information to the Owner.
 - b. Engineer shall review this information and if necessary make adjustment to the pipeline profile. Any plan sheets that are modified by the Owner shall be reissued to the Contractor.
4. Welding Data (Shop and Field):
- a. Show on a weld map, complete information regarding base metal specification designation, location, type, size, and extent of welds with reference called out for WPS and NDE numbers in tail of welding symbol.
 - b. Distinguish between shop and field welds.
 - c. Indicate, by welding symbols or sketches, details of welded joints and preparation of base metal. Provide complete joint welding details showing bevels, groove angles, and root openings for all welds. Joints or groups of joints in which the welding sequence or technique are especially important shall be carefully controlled to minimize shrinkage stresses and distortion.
 - d. For pipe fittings, provide a joint weld beveling diagram. Refer to AWS D1.1/D1.1M, Annex G Local Dihedral Angle that can be used to calculate bevels for weld joint details of intersecting pipes.
 - e. Welding and NDE symbols shall be in accordance with AWS A2.4.
 - f. Welding terms and definitions shall be in accordance with AWS A3.0.

B. Informational Submittals:

1. Manufacturer's Certificate of Compliance that products furnished meet requirements of this specification and of all reference standards, in accordance with Section 01430, Manufacturers' Field Services.

Certificates shall also include:

- a. Compliance with the additional requirements included in these Contract Documents.
- b. Physical and chemical properties of all steel.
- c. Hydrostatic test pressures.
- d. Results of production weld tests.
- e. Sand, cement, and mortar tests.
- f. Rubber gasket tests.
- g. Pipe temperature complies with specifications prior to and during welding temperature control joints (including supporting data).
- h. All welds were performed in conformance with these documents.

2. Manufacturing material test specimens and test reports.
3. Letter from Certified Welding Inspector shall be provided to the Owner certifying that pipe furnished meets requirements of this section.
4. Pipe manufacturer's written Quality Assurance/Control Plan.

5. Statements of Qualification:

- a. Pipe manufacturer.
- b. Fittings and specials fabricator.
- c. Welders or Welding Operators:
 - 1) Name of welder.
 - 2) Welding procedures/positions for which welder is qualified to weld.
 - 3) Assigned certification stamp number.
 - 4) Certification date.
 - 5) Current certification status.
- d. Certified Welding Inspector. Submit the credentials of the Contractor's CWI and quality control specialists for review prior to starting any welding in the shop or field. The credentials shall include, but not be limited to, American Welding Society QC-1 certification.
- e. NDT Quality Control Personnel. NDT Quality Control Personnel shall be certified as required by AWS D1.1 and as specified.

6. Procedures:

- a. Shop and Field Welding: At a minimum include a complete welding code paper trail with linkage to Shop Drawings that includes the following:

- 1) Written WPS and PQR: Provide complete joint dimensions and details showing bevels, groove angles, root face, and root openings for welds.
- 2) Written NDT procedures.
- 3) Current WPQ shall be submitted for each welder prior to performing any work in the shop or field.
- 4) Written description of proposed sequencing of events or special techniques such as:
 - a) Controlling pipe wall temperature stress during installation.
 - b) Minimizing distortion of steel.
 - c) Shop-Applied Cement-Mortar Lining: Include description of machine to be used and list of similar projects where machine was used. Identify pipe size and total footage.
 - d) Monitoring pipeline temperatures during installation.
- b. Written weld repair procedures for each shop and field weld for the Work.
- c. Field coating application and repair.
- d. Field lining application and repair.
- e. Written consumable control procedure for welding materials demonstrating:
 - 1) How consumables will be stored to comply with manufacturer's written instructions.
 - 2) How consumables, such as welding rod, will be dried in ovens, prior to use.
 - 3) How consumables that become wet will be reconditioned.

7. Reports:

- a. Submit all NDT data for each shop and field welded joint. All test data shall be reviewed and signed by the welding inspector.
- b. Source Quality Control Test Reports:
 - 1) Hydrostatic testing.
 - 2) Destructive weld testing.
 - 3) Nondestructive weld testing.
 - 4) Steel impact testing using Charpy V-notch method.
 - 5) Coating and lining factory Site visit letter by qualified manufacturer's technical representative.
- c. Field Quality Control Test Reports:
 - 1) Weld tests, including re-examination of repaired welds, on each weld joint for the following tests, as applicable:
 - a) Visual Testing (VT).
 - b) Radiographic Testing (RT).
 - c) Ultrasonic Testing (UT).
 - d) Magnetic Particle Testing (MT).
 - e) Liquid Penetrant Testing (PT).
 - f) Leak Testing (LT).

- 2) Coating and lining Site inspection letter by qualified technical representative.
 - d. Cement-mortar lining compressive strength tests in accordance with AWWA C205.
 - e. Cement-mortar coating absorption tests in accordance with AWWA C205.
8. Field Hydrostatic Testing Plan: Submit at least 15 days prior to testing and at minimum, include the following:
 - a. Testing dates.
 - b. Piping systems and section(s) to be tested.
 - c. Method of isolation.
 - d. Method of conveying water from source to system being tested.
 - e. Calculation of maximum allowable leakage for piping section(s) to be tested.
9. Certification of Calibration: Approved testing laboratory certificate if pressure gauge for hydrostatic test has been previously used. If pressure gauge is new, no certificate is required.
10. Certificate of Proper Installation: Pipe manufacturer's onsite representative shall provide certificate that pipe was properly installed.
11. Test report documentation.
12. Temperature Stress Control Submittal:
 - a. Submit proposed sequencing of events to control temperature stresses in the pipe wall during installation prior to starting of any field welding.
 - b. Submit the proposed sequencing of events or special techniques to minimize distortion of the steel as may result from shop welding procedures.
 - c. Submit plan for monitoring pipeline temperatures.
13. Submit production schedule for manufacturing/fabricating pipe for the work as part of Contractor's CPM schedule in accordance with the provisions of Section 01321, Progress Schedules. Pipe production schedule shall be included in all versions of the Contractor's CPM schedule beginning with the first schedule submitted.
14. Detailed drawings indicating loading and shipping procedures that are designed to minimize damage to coating. Submittal must be accepted by Owner prior to any shipment of pipe.
15. Manufacturer's written Quality Assurance/Control Program.

16. Contractor must submit all certificates for each portion of the Work for which Contractor is requesting payment before acceptance of such payment will be made.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Pipe Manufacturer:

- a. Experienced in fabricating pipe of similar diameters, lengths, and wall thickness required for the Work.
- b. Certification by Lloyd's Registry or ISO 9001:2000.
- c. Demonstrate current production capability for volume of work required for this Project.
- d. Experience shall include successful fabrication to AWWA C303 standards of at least 45,000 linear feet of 30-inch diameter or larger pipe, with steel cylinder thickness of 0.25 inches or greater, within past 5-year period.
- e. Experience shall be applicable to fabrication plant facilities and personnel, not company or corporation that currently owns fabrication facility or employs personnel.
- f. Credentials shall include reference names; telephone numbers; and descriptions of projects for pipe conforming to AWWA C303 standards. Project descriptions shall include, but not be limited to, length, diameter, wall thickness, steel metallurgy, location of facility where pipe was manufactured/fabricated and key plant personnel involved with the work. Submit names and qualifications of current plant personnel to be used to manufacture/fabricate pipe for the work and the experienced staff member proposed for onsite observation. The fabricator or manufacturer shall also demonstrate, using the Contractor's Preliminary CPM schedule, current production capability for the volume of work required for this project.

2. Fittings and Specials Fabricator:

- a. Experienced in fabricating fittings and specials of similar diameters and wall thickness required for the Work.
- b. Certification by Lloyd's Registry or ISO 9001:2000.
- c. Demonstrate current production capability for volume of work required for this Project.
- d. Experience shall include successful fabrication to AWWA C200/AWWA C208 standards of at least 25 fittings of 30-inch or larger pipe, with wall thickness of 0.25 inch(es) or greater, within past 5-year period.

- e. Experience shall be applicable to fabrication shop facilities and personnel, not company or corporation that currently owns fabrication facility or employs personnel.
- f. Verification of experience and production capability will be conducted as part of the bid proposal review process for AWWA C303 pipe and the Contractor's Preliminary CPM schedule. As part of Contractor's Bid Documents, submit a letter from the pipe manufacturer stating that he can comply with the fabrication and delivery of the pipe as indicated in the Contractor's Preliminary CPM schedule.

3. Welders and Welding Operators:

- a. Shop Welders: In accordance with ASME BPVC SEC IX.
- b. Field Welders: In accordance with AWS D1.1/D1.1M.
- c. Written WPS shall be required for all welds, both shop and field. WPS's qualified per the ASME BPVC shall also include Supplementary Essential Variables for notch-tough welding. All provisions of ANSI/AWS D1.1 pertaining to notch-tough welding shall apply.

4. Certified Welding Inspector (CWI):

- a. In accordance with AWS QC1, with knowledge of appropriate welding code for the Work.
- b. After receiving CWI qualification, CWI shall have at least 5 years of professional experience related to welding inspection similar to the Work.

5. NDT Quality Control Personnel:

- a. In accordance with requirements of ASNT SNT-TC-1A, Level II.
- b. After receiving NDT qualification, NDT personnel shall have at least 5 years of professional experience related to NDT inspection similar to the Work.

B. Certified Welding Inspector (CWI) for Shop Welding:

- 1. In accordance with AWWA C303 and as follows. Testing shall include submitting written documentation of procedures per Section V, and acceptable criteria shall be in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code.

2. Responsibilities:

- a. Verify conformance to use of specified materials and their proper storage.
- b. Monitor conformance to approved WPS.
- c. Monitor conformance to approved NDT procedure specifications.
- d. Monitor conformance of WPQ.

- e. Provide 100 percent visual inspection before, during, and after shop welding.
- f. Supervise NDT personnel and evaluate test results.
- g. Maintain records and prepare report confirming results of inspection and testing.

C. Certified Welding Inspector (CWI) for Field Welding:

1. In accordance with AWWA C206, AWS D1.1/D1.1M, and as follows.

2. Responsibilities:

- a. Verify conformance to use of specified materials and their proper storage.
- b. Monitor conformance to approved WPS.
- c. Monitor conformance to approved NDT procedure specifications.
- d. Monitor conformance of WPQ.
- e. Provide 100 percent visual inspection before, during, and after field welding.
- f. Supervise NDT personnel and evaluate test results.
- g. Maintain records and prepare report confirming results of inspection and testing.

D. Prefabrication Meeting: Hold prior to fabrication of pipe, fittings, or specials between representatives of Owner, Contractor, Engineer, and pipe fabricator to review the following:

- 1. Project scope.
- 2. Submittal requirements.
- 3. Testing.
- 4. Inspection responsibilities.
- 5. Shop welding requirements.
- 6. Field welding requirements.
- 7. Shop and field coating and lining requirements.
- 8. Production and delivery schedule.
- 9. Other issues pertinent to the Work.

E. The Contractor shall be responsible for performing and paying for all tests. The Owner shall have the right to witness all testing conducted by the

Contractor; provided that the Contractor's schedule is not delayed for the convenience of the Owner.

- F. In addition to those tests specifically required, the Owner may request additional samples of any material including mixed concrete and lining and coating samples for testing by the Owner. The additional samples shall be furnished as part of the Work.
- G. Onsite Observation: The pipe fabricator shall provide an experienced staff member to be onsite for the initial installation of pipe and fittings. Additional periodic site visits will be at the request and discretion of the Owner. The staff member's duties shall include, but not be limited to, the following:
 - 1. Observe the installation and welding of the pipe and fittings.
 - 2. Report any concerns to the Owner.
 - 3. Answer questions and provide assistance to the Owner and Contractor.
 - 4. Copies of all field reports and test results shall be submitted in accordance with the Contract Documents.

1.06 DELIVERY, HANDLING, AND STORAGE

- A. Pipe Marking: Mark each pipe section in accordance with AWWA C303. In addition, mark each pipe section as follows:
 - 1. Special pipe sections and fittings shall be marked at each end with notation "TOP FIELD CENTERLINE".
 - 2. Mark "TOP MATCH POINT" for compound bends per AWWA C208 so end rotations can be easily oriented in field.
 - 3. Legibly mark installation sequence number on pipe, fittings, and specials in accordance with piping layout.
 - 4. The word "TOP" shall be painted or marked on outside top spigot of each pipe section.
 - 5. Pipes shall be marked with the outside diameter, welder's name, wall thickness, and pressure rating.
 - 6. Markings on the interior of the pipe shall be a minimum of one foot away from test plug or pipe joint.

7. Any markings that are obscured during pipe installation are to be reestablished on another location on the pipe.
8. No piping shall be shipped to the project without proper markings.
9. All pipe markings shall be stenciled.
10. This information shall be submitted with the Certificate of Compliance.

B. Delivery:

1. Securely bulkhead or otherwise seal ends of pipe, specials, and fittings prior to loading.
2. Pipe ends shall remain sealed until installation.
3. Damage to pipe, fittings, or specials, including linings and coatings, found upon delivery to Site shall be repaired to Engineer's satisfaction or removed from Site and replaced.

C. Handling and Storage:

1. The pipe shall be handled as recommended by the pipe manufacturer for handling and placement.
2. Support pipe securely to prevent accidental rolling and to avoid contact with mud, water, or other deleterious materials.
3. Support on sand or earth berms free of rock exceeding 2 inches in diameter.

- D. All pipe handling equipment and materials must be acceptable to the Owner. The recommended methods of handling and placement of the pipe shall be submitted to the Owner as a record copy prior to transporting of any pipe to the Project site. The use of chains, hooks, or other equipment which might damage the pipe exterior will not be permitted.

1.07 SEQUENCING AND SCHEDULING

A. Notify Engineer in writing of the following:

1. Pipe Manufacturing: Not less than 14 days prior to starting.
2. Not less than 5 days prior to start of each of the following:
 - a. Welding.
 - b. Coating application.
 - c. Lining application.
 - d. Shop hydrostatic testing.

PART 2 PRODUCTS

2.01 GENERAL

- A. Pipe shall conform to requirements of AWWA C303, except as modified herein.
- B. Either bar-wrapped concrete cylinder pipe, as specified, may be utilized for the 30-inch water line. Contractor shall indicate the selected material in his bid.
- C. Pipe shall be manufactured and inspected specifically for this Project, and shall not be taken from manufacturer's inventory.
- D. Pipe:
 - 1. Manufacturing of bar wrapped concrete cylinder pipe, fittings, and specials shall be under direction of one pipe supplier.
 - 2. Responsibility shall include, at minimum, coordinating work of other suppliers for fittings and specials; ensuring all pipe, fittings, and specials are being manufactured in full accordance with the Drawings and Specifications; preparing and submitting all submittal information and shop drawings; making any corrections that may be required to the submittal information and shop drawings; and certifying that the pipe and specials have been manufactured in accordance with the Drawings and Specifications.
- E. Joints:
 - 1. Joint rings for push-on joints shall be manufactured from Carnegie type shapes, suitable for the pressures applied. Single gaskets shall be provided. Joints shall have the same or higher pressure rating as the abutting pipe. Unless indicated otherwise, steel joint rings with double gasket Carnegie joints shall be the standard field joint for non-restrained pipe.
 - 2. Restrained joints shall be restrained with welded joints or with an approved manufactured proprietary restraint system that mechanically restrains pipe to adjoining pipe. Welded joints shall be provided where indicated. Double-welded butt-strap or welded joints shall be required for closures or where restrained joints are indicated and per manufacturer requirements. The joints furnished shall have the same or higher pressure rating as the abutting pipe. The clearance between faying surfaces shall be less than 1/8 inch.

3. Mechanically coupled, field welded, or flanged joints shall be provided where indicated.
 4. Shop-applied interior linings and exterior coatings shall be held back from the ends of the pipe as indicated or as otherwise acceptable to the Owner. All holdback areas for welded joints, all butt straps, and all bell and spigot joints rings for rubber gasketed joints shall be thoroughly cleaned and given a shop coat of rust inhibitive primer.
- F. The inside diameter shall not be less than the nominal diameter shown or specified.
- G. Fittings and specials shall be manufactured, tested, inspected, and marked to comply with AWWA C303.
- H. Cement Mortar Lining:
1. Cement Mortar Lining for Shop Application: Unless otherwise indicated, interior surfaces of all pipe, fittings, and specials shall be cleaned and lined in the shop with cement-mortar lining applied in conformity with AWWA C303. During the lining operation and thereafter, the pipe shall be maintained in a round condition by suitable bracing or strutting. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found faulty at the site or after installation, the damaged or unsatisfactory portions shall be replaced with lining conforming to these Specifications.
 2. The minimum lining thickness and tolerances shall be in accordance with AWWA C303.
 3. The ends of pipe shall be left bare where field joints occur as indicated. Ends of the linings shall be left square and uniform. Feathered or uneven edges will not be permitted.
 4. The pipe shall have smooth, dense interior surfaces and shall be free from fractures, excessive interior surface crazing, and roughness. Cracks shall be subject to repair within the guidelines of AWWA C303.
 5. Defective linings shall be removed from the pipe wall and shall be replaced to the full thickness required. Defective linings shall be cut back to a square shoulder in order to avoid feather edged joints.
 6. The progress of the application of mortar lining shall be regulated in order that all hand work, including the repair of defective areas, is cured in accordance with the provisions of AWWA C303. Cement mortar for patching shall be the same materials as the mortar for machine lining,

except that a finer grading of sand and mortar richer in cement shall be used when field inspection indicates that such mix will improve the finished lining of the pipe.

- I. Cement-Mortar Coating: Exterior cement-mortar coating shall be in accordance with AWWA C303.
- J. Color: All AWWA C303 pipe shall be lavender in color, Pantone 522. The coloring agent used in shading the pipe must be resistant to the effects of sunlight and must allow the pipe color to be stable for a period of at least nine months in full sunlight.

2.02 CEMENT

- A. Cement: Type II, per ASTM C150.
- B. Cement for mortar lining and coating shall not originate from kilns which burn metal-rich hazardous waste fuel, nor shall a flyash or pozzolan be used as a cement replacement. Admixtures shall contain no calcium chloride.

2.03 STEEL FOR CYLINDER AND FITTINGS

- A. Steel for Cylinders and Fittings: Conform to the requirements of AWWA C303.

2.04 SPECIALS AND FITTINGS

- A. Specials and fittings shall conform to dimensions of AWWA C208.

2.05 PIPE WITH RESTRAINED JOINTS

- A. Where transmission of load from one pipe to the next via field weld or otherwise restrained joint is anticipated, the load-path shall be adequately designed for structural transmission of load as follows:
 - 1. Cylinder Thickness:
 - a. Constant throughout each section of restrained joint pipe.
 - 2. Axial load for cylinder design shall be the greater of the following load combinations:
 - a. Full test pressure times area ($Pt \cdot A$) plus soil drag.
 - b. Temperature change plus effect of Poisson's ratio plus soil drag.
 - 3. Located where indicated and required, restrained joints shall be double welded butt strap joints. Butt straps shall be full circumference, field welded, with a minimum of two passes as indicated.

4. For field welded joints, design stresses shall not exceed 18,000 psi.
5. The first non-restrained joint on both sides of a restrained joint section shall be a deep joint. The pipe manufacturer shall determine joint depth requirement based on anticipated temperature change. The joint shall be epoxy coated. The pipe shall be homed to midway of the joint to allow either expansion or contraction to occur first.

2.06 GASKETED JOINTS

- A. Joint rings shall include grooves for two gaskets with provisions for air testing the space between the gaskets. For double gasket Carnegie joint, the clearance between the bells and spigots shall be such that, when combined with the gasket groove configuration and the gasket itself, will provide watertight joints under all operating conditions when properly installed. The pipe manufacturer shall submit details complete with significant dimensions and tolerances and also submit performance data indicating that the proposed joint has performed satisfactorily under similar conditions. In the absence of a history of field performance, the results of a test program shall be submitted. No process will be permitted in which the bell is formed by rolling the pipe cylinder.
- B. Rubber gaskets shall be rated to withstand water temperatures up to 110 degrees F without exceeding the leakage tolerance and must conform to the listed standards.

2.07 FABRICATION OF FITTINGS AND SPECIALS

- A. Fabrication:
 1. Shop fabricate only, no field fabrication will be allowed, unless approved by Engineer.
 2. Fabricate from materials of straight pipe in full conformance with requirements of these Contract Documents and dimensions of AWWA C208, unless otherwise indicated.
- B. Lining and Coating: Cement mortar in accordance with AWWA C303.

2.08 FLANGES AND GASKETS

- A. Conform to AWWA C207.

2.09 WELD LEAD OUTLETS

- A. Outlets for weld leads shall conform to Drawings.

2.10 SOURCE QUALITY CONTROL

- A. Owner inspection of pipe fabrication: Contractor shall provide all expenses paid for up to two Owner representatives to inspect pipe manufacturer facilities for a three days plant visit. All expenses shall include but not limited to lodging, meals, and travel (ground and air). A two week notification shall be provided to Owner representatives before the schedule plant visit.
- B. Materials Testing: Test concrete, mortar, rubber for gaskets, and welds in accordance with AWWA C303. Steel testing shall conform to the requirements of AWWA C200.
- C. Hydrostatic test steel cylinders in accordance with AWWA C303.
- D. Shop Nondestructive Testing: NDT shall be performed for various weld categories in accordance with the requirements of AWWA C303 and as specified below. Testing shall include submitted written documentation of procedures per Section V, and acceptable criteria shall be in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code.
 - 1. All Welds: Contractor's certified welding inspector shall 100 percent visually examine all welds.
 - 2. Butt Joint Welds: Spot radiographically examine pipe in accordance with ASME BPVC Section VIII, Div. 1, paragraph UW-52. If, in opinion of Owner, welds cannot readily be radiographed, they shall be 100 percent ultrasonically examined.
 - 3. Fillet Welds: Examine 100 percent of fillet welds using magnetic particle inspection method.
 - 4. Groove Welds: Ultrasonically examine 100 percent of groove welds that cannot be readily radiographically spot examined.
 - 5. Air test doubler pads in accordance with AWWA C206.
- E. Repair of Defects: Patching inserts, overlays, or pounding out of dents will not be permitted. Repair of notches or laminations on second ends will not be permitted. Damaged ends shall be removed as a cylinder and the end properly prepared. Distorted or flattened lengths shall be rejected. A buckled section shall be replaced as a cylinder.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect each pipe and verify size, condition, and class prior to placement.
- B. Clean each pipe and inspect for damage prior to placement. Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance which may have collected thereon and shall be kept clean at all times thereafter. For this purpose, the openings of all pipes and fittings in the trench shall be closed during any interruptions in the work.
- C. Repair any damage to the coating and lining system prior to installation.
- D. Remove any pipes from the Project with damage to the barrel or joint rings, and replace with undamaged pipe meeting this Specification.
- E. Handling and Storage: All pipe, fittings, and specials shall be carefully handled and protected against damage to lining and coating/interior and exterior surfaces, impact shocks and free fall. All pipe handling equipment must be acceptable to the Owner. Pipe shall not be placed directly on rough ground but shall be supported in a manner which will protect the pipe against injury whenever stored at the Site or elsewhere. Pipe shall be handled and stored at the Site in accordance with the manufacturer's recommendations. No pipe shall be installed where the lining or coating/interior or exterior surfaces show cracks that may be harmful as determined by the Owner. Such damaged lining and coating/interior and exterior surfaces shall be repaired, or a new undamaged pipe shall be provided.

3.02 INSTALLATION

- A. Handle and install pipe sections in accordance with manufacturer's recommendations and AWWA Manual M9.
- B. Immediately notify Engineer if pipe is damaged during installation process. Any damaged pipe shall be repaired or replaced.
- C. Pipe to be laid directly on prepared and shaped imported bedding, excavation for bell holes required. No blocking will be permitted, and the bedding shall be such that it forms a continuous, solid bearing for the full length of the pipe. Excavations shall be made as needed to facilitate removal of handling devices after the pipe is laid. Bell holes shall be formed at the ends of the pipe to prevent point loading at the bells of couplings and to facilitate placement of grout bands. Excavation shall be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coatings on field joints.
- D. Lay pipe in the order shown on supplier's approved Shop Drawings.

- E. The Contractor shall submit any required alignment adjustments to the Owner for approval. The Contractor shall make any required field alignment adjustments approved by the Owner to allow proper fit up of pipe.
- F. Test Sections: At the beginning of pipe laying operations, the Contractor shall perform a test section to demonstrate that the methods and materials to be utilized will satisfy the pipe zone backfill compaction and pipe deflection criteria. The minimum length of the test section shall be 500 feet. The Contractor shall not proceed with production pipe laying beyond the test section without the Owner's acceptance. The entire test section length that does not comply with the Contract Document shall be reworked as necessary to comply. The Owner will observe construction of the test section. The Owner will take measurements and keep records for quality assurance purposes. Any change in means, methods, and trench conditions, including excavation, bedding, and pipe zone materials, in situ soils, water conditions and backfill and compaction methods will require another successful test section before additional production pipe installation.
- G. Adequately lubricate each gasketed pipe joint as defined in AWWA Manual M9 prior to joining.
- H. Equalize the volume of the gasket by moving a metal rod around the pipe, between gasket and spigot ring.
- I. Align bell and spigot squarely before insertion, tilting of the pipe will not be allowed.
- J. Check installed gaskets for displacement using a feeler gauge around the full circumference of the pipe, as approved by Engineer. If gasket is not centered around the joint, disassemble and relubricate, install new gasket (if gasket was damaged) and reassemble, then recheck the gasket location.
- K. Welded Joints:
 - 1. General: Field welded joints shall be in accordance with AWWA C206 – Field Welding of Steel Water Pipe.
 - 2. Where exterior welds are performed, adequate space shall be provided for welding and inspection of the joints.
 - 3. When fitting up the ends of pipe to be welded or fitting butt strap pieces, minor jacking or clamping will be allowed. Cold working the metal with sledges or localized application of heat and working the metal with sledges will not be allowed. If field displacement of joint, where butt strap joints are indicated, does not allow proper fit up with the tolerances indicated, special closure butt straps or mitered pieces shall be shop fabricated and installed.

4. After the pipe and pipe joint are properly positioned in the trench, the length of pipe between joints shall be backfilled to at least one foot above the top of the pipe. Care shall be exercised during the initial backfilling to prevent movement of the pipe and to prevent any backfill material from being deposited at the joint.
 5. See Paragraph 3.04 of this specification for requirements of Thermal Control Joints.
 6. Prior to the beginning of the welding procedure, any tack welds or joint stops used to position the pipe during laying shall be removed. The weld shall then be made in accordance with AWWA C206.
 7. Joints: The pipe ends shall be cut straight on joints where butt straps are used for realignment, adjustment, or deflection and fillet welds shall be made as indicated.
 8. Field Closures: Contractor shall provide special closure pieces with butt strap connections as required to complete the installation and facilitate the pipe laying sequence.
- L. The interior joint recesses shall be thoroughly wiped clean and all water, loose scale, dirt and other foreign material shall be removed from the inside surface of the pipe. The interior exposed surfaces of the joints shall be protected by pointing with cement mortar in accordance with the recommendations and procedures in AWWA Manual M9. Metalizing of the surfaces with zinc or other products is not an acceptable alternative. Grout shall be tightly packed in the joint recess and troweled flush with the interior surface. All excess shall be removed.
- M. Grout exterior joint space in accordance with the recommendations and procedures in AWWA Manual M9. The outside annular space between pipe sections shall be completely filled with grout formed by the use of polyethylene foam-lined fabric bands. The grout space shall be flushed with water prior to filling so that the surface of the joint to be in contact with the grout will be thoroughly moistened when the grout is poured. The joint shall be filled with grout by pouring from one side only, and shall be rodded with a wire or other flexible rod or vibrated so that the grout completely fills the joint recess by moving down one side of the pipe, around the bottom of the pipe and up the opposite side. Care shall be taken to leave no unfilled space. Grouting of the outside joint spaces shall be kept as close behind the laying of the pipe as possible except that in no case shall grouting be closer than three joints of the pipe being laid.
- N. Grout Bands (Diapers): The grout bands or heavy-duty diapers shall be 12-ounce duck fabric with steel strapping of sufficient strength to hold the fresh grout, resist rodding of the grout, and allow excess water to escape. The grout bands shall be

- as manufactured by Mar-Mac Company, or equal. The fabric backing shall be cut and sewn into 9-inch wide strips with slots for the steel strapping on the outer edges. Splices to provide continuity of the material will be permitted. The grout band shall be centered over the joint space with approximately equal widths extending over each pipe end and securely attached to the pipe with the steel straps. After filling the exterior joint space with grout, the flaps shall be closed and overlapped in a manner that fully encloses the grout. The grout band shall remain in position on the pipe joint.
- O. Joints and related work for field assembly of fittings and specials shall conform to requirements for straight pipe, unless otherwise shown.
 - P. Pipe alignment or grade may be changed slightly by Engineer to avoid obstructions. Make minor field adjustments by pulling standard joints.
 - 1. Maximum Allowable Deflection Angle: 75 percent of manufacturer's recommended, or angle that results from 3/4-inch pull out from normal joint closure, whichever is less.
 - 2. Maximum Allowable Gap for Welded Joints: 1/8 inch between bell and spigot at weld location.
 - 3. No joint shall be misfit any amount which will be detrimental to the strength and water tightness of the finished joint.
 - Q. Horizontal deflections or fabricated angles shall fall on alignment, as shown.
 - R. Vertical deflections shall fall on alignment and pipe angle point locations shall match those indicated on Drawings.
 - S. Lay pipelines uphill on slopes greater than 10 percent. Block or hold pipe in place until backfilled, if placement is down hill (any grade). Lay pipe so that no high or low points other than those on the laying diagram are introduced. To prevent high points or low points along the pipeline, the general slope of the pipeline shall not be changed between vertical angle points.
 - T. Do not place pipe on frozen ground, or ground that has frost penetration. Ensure backfill is in place before frost or ice can form during cold weather installations.
 - U. Take all necessary precautions to prevent the pipe from floating due to water entering the trench from any source. The Contractor shall assume all responsibility for any damage due to this cause, and shall at its own expense replace the pipe to its specified condition and grade if it is displaced due to floating. Maintain the inside of the pipe free from foreign materials and in a clean and sanitary condition until its acceptance by the Owner.

V. Pipe 30 Inches in Diameter and Larger with Welded Joints:

1. Ensure that maximum allowed penetration of spigot end into bell end is achieved.
2. Remove welded metal tabs prior to welding inside of joint.

W. Pipe Struts:

1. Any pipe damaged during handling, hauling, storage, or installation due to improper strutting shall be repaired or replaced.
2. Left in place until backfilling operations have been completed.
3. A laboratory selected and paid by the Owner may monitor pipe deflection by measuring pipe inside diameter before struts are removed and 24 hours after struts are removed.
4. Pipe deflection shall not exceed 50 percent of the amount allowed in AWWA Manual M9 24 hours after the struts are removed.
5. After the backfill has been placed, struts shall be removed without damage to any coating and linings.
6. Stulls and wedges shall be installed and removed without damage to any coatings and linings.
7. Struts welded to steel cylinder shall not be removed with a torch or any other method that may damage pipe lining or coating.
8. The parent pipe material shall not be nicked, gouged, or damaged during strut removal.
9. Tack welds, stull metal, weld splatter, slag, and burrs that remain attached to the parent metal surface after cutting shall be ground to within 1/32 inch of the parent metal.
 - a. Grinding shall not penetrate the parent metal.
 - b. Notify Engineer prior to grinding.
10. Following grinding, pipe surfaces at tack weld shall be visually inspected for defects.
 - a. Defects deeper than 1/16 inch shall be repaired by welding in accordance with AWS D1.1/D1.1M and AWWA C206.
 - b. Inspection work shall be performed by a certified welding inspector.

X. Installation of Pipe Appurtenances:

1. Protection of Appurtenances: Where the joining pipe is concrete or coated with cement mortar, buried appurtenances shall be coated with a minimum thickness of one inch of cement mortar, in accordance with the specifications.
2. Installation of Valves: Valves shall be handled in a manner to prevent any injury or damage to any part of the valve. Joints shall be thoroughly cleaned and prepared prior to installation. The Contractor shall adjust stem packing and operate each valve prior to installation to insure proper operation. Valves (body and seat) shall not be subjected to test pressures greater than manufacturer's recommendation.
3. Valves shall be installed so that the valve stems are plumb and in the location indicated.
4. Buried valves and flanges shall be coated and protected with cement mortar and polyethylene encased, as specified.
5. Installation of Flanged Joints: Before the joint is assembled, the flange faces shall be thoroughly cleaned of all foreign material with a power wire brush. The gasket shall be centered and the connecting flanges drawn up watertight without unnecessarily stressing the flanges. Bolts shall be tightened in a progressive diametrically opposite sequence and torque with a suitable, approved and calibrated torque wrench. Clamping torque shall be applied to the nuts only. Full face reinforced rubber gaskets shall be applied to the inside faces of blind flanges with adhesive. Where insulating flanges are indicated, flange holes shall be oversized. All buried flanges shall be coated and protected with cement mortar, as specified.
6. Insulated Joints: Insulated joints and appurtenance features shall be made by the Contractor as indicated. The Contractor shall exercise special care when installing these joints to prevent electrical conductivity across the joint. After the insulated joint is completed, an electrical resistance test shall be performed by the Contractor. Should the resistance test indicate a short circuit, the Contractor shall remove the insulating units to inspect for damages, replace all damaged portions, and reassemble the insulating joint. The insulated joint shall then be retested to assure proper insulation. The Owner shall observe all electrical resistance tests.
7. Flexible Coupled Joints: When installing flexible couplings, care shall be taken that the connecting pipe ends, couplings and gaskets are clean and free of all dirt and foreign matter with special attention being given to the contact surfaces of the pipe, gaskets and couplings. The couplings shall be assembled

and installed in conformity with the recommendations and instructions of the coupling manufacturer.

8. Wrenches used in bolting couplings shall be of a type and size recommended by the coupling manufacturer. Coupling bolts shall be tightened so as to secure a uniform annular space between the follower rings and the body of the pipe with all bolts tightened approximately the same amount. Diametrically opposite bolts shall be tightened progressively and evenly. Final tightening shall be done with a suitable, approved and calibrated torque wrench set for the torque recommended by the coupling manufacturer. All clamping torque shall be applied to the nut only. Upon completion of the coupled joint, the coupling and bare metal of the pipe shall be cleaned, coated and protected in accordance with cement mortar and polyethylene encased, as specified.

- Y. Pipe and Specials Protection: The openings of all pipe and specials where the pipe and specials have been cement mortar lined in the shop shall be protected with suitable bulkheads to maintain a moist atmosphere and to prevent unauthorized access by persons, animals, water, or any undesirable substance. The bulkheads shall be so designed to prevent drying out of the interior of the pipe. The Contractor shall introduce water into the pipe to keep the mortar moist where moisture has been lost due to damaged bulkheads. At all time, means shall be provided to prevent the pipe from floating due to water in the trench from any source. Pipe which has floated shall be replaced.

- Z. Pipe Cleanup: As pipe laying progresses, the Contractor shall keep the pipe interior free of all debris. The Contractor shall completely clean the interior of the pipe of all sand, dirt, mortar splatter and any other debris following completion of pipe laying, pointing of joints and any necessary interior repairs prior to testing the completed pipeline.

3.03 WELDING

- A. Conform to AWS D1.1/D1.1M, AWWA C206, approved welding procedures, and referenced welding codes. In case of conflict AWS D1.1/D1.1M shall govern.

- B. Preheat and interpass temperature requirements for unlisted base metals shall be determined according to AWS D1.1/D1.1M, Annex XI Guideline on Alternative Methods for Determining Preheat.

- C. Rejected weld defects shall be repaired or removed and replaced, and retested until sound weld metal has been deposited in accordance with appropriate welding codes.

3.04 GROUNDING PROTECTION

- A. Apply to pipe as shown and as specified in Section 13210, Zinc Anode Grounding.
- B. Install joint bonds and test stations as shown and as specified in Section 13210, Zinc Anode Grounding. Provide welded plates at pipe joints to facilitate wire connections associated with joint bonding, test stations, and galvanic anodes, in accordance with the details.
- C. Install insulating flanges as shown and as specified in Section 13210, Zinc Anode Grounding.

3.05 FIELD QUALITY CONTROL

- A. Air test for single gasketed joints:
 - 1. Pressurize connection between the gaskets following the procedure in AWWA C206.
 - 2. Apply air or other Engineer-approved gas into connection between the two gaskets.
 - 3. If joint fails air test, repair the joint, and re-test.
 - 4. After acceptance of the joint air test, close threaded openings with flush pipe plugs or by welding them.
- B. Field Welding:
 - 1. Welds (100 percent inspection) shall be VT inspected by Contractor's CWI and marked to indicate acceptance or rejection.
 - 2. Test butt-strap or double-welded lap joint welds by pressurizing connection between the two fillet welds in accordance with AWWA C206.
 - a. Apply air or other Engineer-approved gas into connection between the two fillet welds.
 - b. If joint fails air test, paint welds with soap solution.
 - c. Mark leaks indicated by escaping gas bubbles and repair or remove and replace the weld, as noted above.
 - d. After acceptance of the joint air test, close threaded openings with flush pipe plugs or by welding them.
 - 3. Inspect 100 percent of butt joint welds with full circumference RT.
 - 4. Inspect 100 percent of lap joint welds PT or MT.
 - 5. Weld Acceptance:

- a. If, in the opinion of Engineer, inspections indicate inadequate quality of welds, percentage of welds inspected shall be increased.
 - b. Welds to be inspected, if less than 100 percent rate, shall be selected at random by Engineer.
 - c. VT: Perform VT per AWS D1.1/D1.1M Paragraph 6.9.
 - d. UT: Perform UT of CJP groove welds in accordance with AWS D1.1/D1.1M, Paragraph 6.13.1.
 - e. RT: Perform RT of CJP butt joint welds in accordance with AWS D1.1/D1.1M, Paragraph 6.12.1.
 - f. PT or MT:
 - 1) Perform on fillet and PJP groove welds in accordance with AWS D1.1/D1.1M, Paragraph 6.10.
 - 2) Acceptance shall be in accordance with VT standards specified above.
 - g. Remove in manner that permits proper and complete repair by welding.
 - h. Caulking or peening of defective welds is not permitted.
 - i. Repair or remove and replace and retest rejected welds.
6. Submit test results to Engineer.
7. Owner may conduct random nondestructive inspections of field-welded joints. Inspections will be of an appropriate type for weld being evaluated. Possible types of inspection include, but are not limited to, radiographs, magnetic particle, and ultrasonic. Testing will be performed and evaluated per AWS D1.1/D1.1M. Provide access to the Work.

3.07 HYDROSTATIC TESTING

A. Pipeline Hydrostatic Test:

- 1. General:
 - a. Notify Engineer in writing 5 days in advance of testing. Perform testing in presence of Engineer.
 - b. Test newly installed pipelines. Using water as test medium, pipes shall successfully pass a leakage test prior to acceptance.
 - c. Furnish testing equipment and perform tests in manner satisfactory to Engineer. Testing equipment shall provide observable and accurate measurements of leakage under specified conditions.
 - d. Isolate new pipelines that are connected to existing pipelines.
 - e. Conduct field hydrostatic test on buried piping after trench has been completely backfilled. Testing may, as approved by Engineer, be done prior to placement of asphaltic concrete or roadway structural section.
 - f. Contractor may, if field conditions permit and as determined by Engineer, partially backfill trench and leave joints open for inspection and conduct an initial service leak test. Final field hydrostatic test shall not be conducted until backfilling has been completed as specified above.

- g. Supply of temporary water shall be as stated in Section 01500, Construction Facilities and Temporary Controls.
 - h. Dispose of water used in testing.
2. Preparation:
- a. Install temporary thrust blocking or other restraint as necessary to prevent movement of pipe and protect adjacent piping or equipment. Make necessary taps in piping prior to testing.
 - b. Prior to test, remove or suitably isolate appurtenant instruments or devices that could be damaged by pressure testing.
 - c. New Piping Connected to Existing Piping: Isolate new piping with grooved-end pipe caps, blind flanges, or other means acceptable to Engineer.
 - d. Fill test section with water and allow to stand under low pressure prior to testing.
3. Procedure:
- a. Maximum filling velocity shall not exceed 0.25 foot per second, calculated based on the full area of pipe.
 - b. Expel air from pipe system during filling.
 - c. Test pressure shall be 250 psi as measured at low point of pipeline.
 - d. Apply and maintain specified test pressure with hydraulic force pump. Valve off piping system when test pressure is reached.
 - e. Maintain hydrostatic test pressure continuously for 4 hours minimum, adding additional make-up water only as necessary to restore test pressure.
 - f. Determine actual leakage by measuring quantity of water necessary to maintain specified test pressure for duration of test.
 - g. If measured leakage exceeds allowable leakage or if leaks are visible, repair defective pipe section and repeat hydrostatic test.
4. Allowable Leakage: Maximum allowable leakage for pipe with rubber gasket (non-restrained) joints shall not exceed 10 gallons per inch of diameter per mile of pipe per 24 hours. No leakage is allowed for welded joints.

3.08 MANUFACTURER'S SERVICES

- A. Provide manufacturer's representative at Site in accordance with Section 01430, Manufacturers' Field Services, for installation assistance, inspection and certification of proper installation, testing.

END OF SECTION