

# ADDENDUM NO. 1

MAY 20, 2026

TO

PROJECT MANUAL

FOR

**WILLISTON WATER RESOURCE RECOVERY FACILITY (WRRF) REUSE PIPELINE  
PROJECT**

FOR

**CITY OF WILLISTON**

**NORTH DAKOTA**

**MAY 2026**



This Addendum No. 1 forms a part of the Project Manual and modifies the original Bidding Documents as noted within this Addendum. All provisions of the Project Manual not in conflict with this Addendum shall remain in full force. Acknowledge receipt of this addendum on the outside of the bid envelope and in the space provided on the Bid Form. Failure to do so may result in rejection of bid.

This addendum consists of four (4) pages and two (2) attachments.

## **CLARIFICATIONS**

1. The 30"x30" hatch as shown in Detail 4/C515 is for the Pressure Sustaining Valve Vault only (Detail 2/C514) and not for the Pressure Reducing Valve Manhole (Detail 3/C509). The Pressure Reducing Valve Manhole will have standard adjusting rings and a Neenah Model R-1733 casting.
2. All gate valves are paid for as their own line item and are not included with any other installation pay item. The total quantity of gate valves shown on the bid form (24) should reflect the total number of gate valves to be installed on the project with the exception of the 6-inch gate valve which is included with the bid item for 6-inch Fire Hydrant as clarified below.
3. The cost for the line item of "6-inch Fire Hydrant" as described in Paragraph 1.8.K of Specification Section 01 22 00 shall include the cost of furnishing and installing the 8-inch x 6-inch reducer, the 6-inch hydrant lead piping, the 6-inch gate valve that is installed on the hydrant lead, the fire hydrant, and related appurtenances at Station 0+7.00 on Sheet C330.
4. The cost for furnishing and installing each 8-inch duckbill check valve that is installed on the end of the pipe in each drain manhole shall be included in the unit price for the line item of "Drain Manhole" as described in Paragraph 1.08.L of Specification Section 01 22 00.

5. The cost for the 8-inch duckbill check valve that is installed on the end of the pipe in the Effluent Aeration basin shall be included in the unit price for the line item of “Drain Pipe Connection to Effluent Aeration Basin” as described in Paragraph 1.08.W of Specification Section 01 22 00.
6. The Contractor is allowed to bore areas shown as open cut, however, those lengths of pipe installation will be paid for at the open cut installation bid price. Refer to Paragraph 3.04.C of Specification Section 33 05 07. Contractor shall submit an Installation Plan per Paragraph 1.03.D of Specification Section 33 05 07.
7. Contractor is to hire an independent testing laboratory to perform all testing. Refer to Paragraph 1.14.F of Section 01 45 00.
8. Seeding is not incidental to the pipe installation and will be paid for at the unit bid price for the “Restoration and Seeding” bid item.
9. Pipe bedding areas are to be backfilled using Class 3 pipe bedding to 6-inches above top of the pipe in all areas where pipe is installed by open cut methods. Above the pipe bedding area, the backfill shall be in accordance with the specifications (i.e. in-situ material up to the subgrade level for most areas except for under gravel, concrete, or asphalt roadways, driveways, sidewalks, or bike paths which would need to get Class 5 gravel as backfill up to the subgrade instead of in situ material). Refer to Paragraph 3.09 of Specification Section 31 23 23.
10. If any watermain is found to need to be offset as shown in Detail 2/C505, the cost for completing that work would be incidental to the pipeline installation cost as described in Section 01 22 00 – Measurement and Payment.

## **SPECIFICATIONS**

### **SECTION 1 22 00 – MEASUREMENT AND PAYMENT**

1. **ADD** the following Paragraph 1.04.D.
  - D. All costs, losses, and damages associated with surface restoration (excavation, grading, topsoil placement, gravel bedding placement, asphalt or concrete pavement replacement, compaction, testing, and other required restoration work) that is required as a result of a directional drilled pipeline installation such as but not limited to frac out pits; frac out containment, recycling, and disposal of drilling fluids; concrete or asphalt pavement removal and replacement (sidewalk, bike path, curb and gutter, driveway, street, parking lot, etc.) due to heaving, cracking, or settlement; landscape item restoration or replacement; tree damage or replacement; sign damage or replacement; or other damage to utilities, structures, or appurtenances shall be the responsibility of the Contractor and shall be considered incidental to the installation of the pipeline. No surface restoration work will be paid for as a separate line item for locations where the pipeline has been installed by directional boring. The surface restoration associated with bore pits and open cut installed pipe, in the locations as shown on the drawings, will be paid for at the unit prices indicated in the Bid Form for that line item (Class 5 Aggregate Base, Asphalt Paving, - Public Street, Asphalt Paving – Bike Path, Concrete Paving, Curb and Gutter, Restoration and Seeding, etc.).

### **SECTION 31 23 23 – FILL AND BACKFILL**

1. **REMOVE** and **REPLACE** Section 31 23 23 with Section 31 23 23R.

## SECTION 32 12 16 – BITUMINOUS PAVEMENT

1. **ADD** the following Paragraph 3.06.H.
  - H. Obtain samples of placed bituminous prior to bituminous being rolled at the rate of one (1) sample per 1000-ton of each mix placed per lift with a minimum of one (1) sample per mix per lift per day. Contractor shall cooperate with Engineer in obtaining the samples. Perform testing for gradation and binder content on each sample.

## SECTION 33 05 07 – TRENCHLESS INSTALLATION OF UTILITY PIPING

1. **ADD** the following Paragraph 3.08 RECORD KEEPING:
  - A. Maintain a daily project log of drilling operations and a guidance system log with a copy given to Engineer at completion of boring. DigiTrack or similar bore tracking and log generation software shall be used for bore log as-built completion. Record Drawings shall be certified by the Contractor, for accuracy, as required in Specification Section 01 33 00. HDD bore quantities requested for payment will not be approved without the accompanied bore log for each HDD bore.
  - B. Bore Logs shall contain the following information:
    1. Bore name or Station Start and Stop Locations.
    2. Date installed.
    3. Pipe size, type, and class.
    4. Length of staked bore and rod start and stop number based on staked length.
    5. Depth per rod from staked bore ends only.

## SECTION 33 10 00 – WATER UTILITIES

2. **REMOVE** and **REPLACE** Section 33 10 00 with Section 33 10 00R.

## SECTION 40 05 58 – PROCESS VALVES

1. **REMOVE** and **REPLACE** Paragraph 2.07.C.2 with the following:
  2. Body and Cover: Ductile Iron; 150 pound flanges.
2. **REMOVE** and **REPLACE** Paragraph 2.08.E.5.a with the following:
  - a. Valve body and cover: Ductile Iron.
3. **REMOVE** and **REPLACE** Paragraph 2.08.E.5.f with the following:
  - f. Trim (disc guide, seat, and cover bearing), diaphragm washer, disc retainer, stem, nut, and spring: Series 300 Stainless Steel.
4. **REMOVE** and **REPLACE** Paragraph 2.08.F.1 with the following:
  1. Control piping and all associated accessories shall be Series 300 Stainless Steel, not less than 0.375-inch in diameter.

## DRAWINGS

### SHEET G008

1. PIPELINE INSTALLATION NOTES: **REMOVE** and **REPLACE** Note No. 21 with the following:
  21. CONTRACTOR SHALL INSTALL ALL PIPE BEDDING AS INDICATED IN DETAIL 1/C505.

SHEET G302

2. **REMOVE** the words “12” DR11 HDPE CASING” and **REPLACE** with the words “8-INCH DR11 DIPS HDPE INSIDE A 12” STEEL CASING” in the profile view of the cased bore from Station 26+00 to Station 29+50.

**ATTACHMENTS TO THIS ADDENDUM**

1. Section 31 23 23R – Fill and Backfill
2. Section 33 10 00R – Water Utilities

**END OF ADDENDUM NO. 1**

# **Attachment No. 1**

**SECTION 31 23 23**  
**FILL AND BACKFILL**

**PART 1 GENERAL**

1.01 SUMMARY

A. Section includes:

1. Scarifying, compacting and shaping the earth subgrade below pavements and structures.
2. Backfilling and compaction for:
  - a. Pipeline trenches.
  - b. Pipeline bore pits or user connection pits.
  - c. Cast-in-place structures and manholes.
  - d. Hydrants, valve boxes, and other appurtenances.
  - e. Fill under landscaped areas.
  - f. Fill under paved areas.
  - g. Fill in cultivated areas.
  - h. Fill for over-excavation.

B. Related Sections include, but are not limited to:

1. Section 01 45 00 – Quality Control.
2. Section 01 50 00 – Temporary Facilities and Controls.
3. Section 31 05 13 – Soils for Earthwork.
4. Section 31 05 16 – Aggregates for Earthwork.
5. Section 31 11 00 – Clearing and Grubbing
6. Section 31 14 13 – Soil Stripping and Stockpiling.
7. Section 31 23 16 – Excavation.
8. Section 31 23 19 – Dewatering.
9. Section 31 25 00 – Erosion and Sedimentation Control.
10. Section 32 90 00 – Landscape Grading.
11. Section 32 97 00 – Restoration of Disturbed Areas.
12. Section 33 10 00 – Water Utilities.

1.02 REFERENCES

A. Reference Standards Include:

1. ASTM C136/C136M - Method for Sieve Analysis of Fine and Coarse Aggregates.
2. AASHTO T 180 - Test Methods for Moisture - Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
3. ASTM D698 Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>).

4. ASTM D1557 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>).
5. ASTM D6938 - Test Methods for In-Place Density and Water Content of Soil and Soil - Aggregate in Place by Nuclear Methods (Shallow Depth).
6. Standard Specifications for Road and Bridge Construction, Latest Edition, by North Dakota Department of Transportation.

### 1.03 QUALITY ASSURANCE

- A. Section 01 45 00 - Quality Control: Field Samples.
- B. Material Source: Submit name of imported material supplier(s). Provide materials from the same source throughout the Work. Change of source requires Engineer approval.

## **PART 2 PRODUCTS**

### 2.01 FILL MATERIALS

- A. Topsoil and Subsoil Fills: As specified in Sections 31 05 13.
- B. Aggregate Fills: As specified in Section 31 05 16.

### 2.02 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to approval of the Engineer.

## **PART 3 EXECUTION**

### 3.01 EXAMINATION

- A. Verify sub-drainage, damp proofing or waterproofing, and insulation installation has been inspected.
- B. Verify subgrade preparation consists of a firm and stable subgrade prior to placement of the surface or base course.
- C. Verify that below-grade cast-in-place concrete structures have cured to 75 percent of their design compressive strength before placing backfill against walls. Provide additional internal structural support to accommodate differential backfill placement per Engineer requirements.
- D. Verify valve blocking, required poly wrap, restraints, couplings, valve boxes, and thrust blocking are in-place, complete, and have been inspected and documented as to location and configuration for record drawing purposes.

### 3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Notify utility company to locate utilities.
- C. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- D. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Remove all subsoil lumps larger than 3-inches in any dimension and rocks larger than 2-inches in any dimension from pipe trench backfill pile and area. These subsoil conditions are not allowed for fill or backfill of the pipe trench.
- F. All subgrades below structures shall be cut to the final depth with a smooth-edged backhoe or other equipment that will minimize disturbance to the subgrades.
- G. Subgrade shall be prepared by scarifying the upper 12-inches of subgrade soil. Subgrade preparation shall extend deeper than 12-inches if the Engineer determines that additional subgrade preparation is necessary to support construction.
- H. Compact subgrade to density requirements for subsequent backfill materials, as specified in this Section.
  - 1. Identify soft spots and remove soft areas of subgrade not capable of compaction in-place. Backfill with Type S1 or Type S2 fill, as specified in Section 31 05 13, and compact to density equal to or greater than requirements for subsequent fill material.
  - 2. Contractor shall be responsible for drying the subgrade soil or applying water as may be necessary to obtain the required density. Contractor shall also be responsible for grading the Work area and providing drainage so that accumulating water will drain away from the subgrade.

### 3.03 STOCKPILING OF MATERIALS

- A. Stockpile according to Section 31 14 13.

### 3.04 BACKFILLING AND COMPACTION

- A. Backfill and compact areas to existing contours and elevations with unfrozen materials. Follow natural ground contours in cultivated areas, ditches, and landscaped areas. Make gradual grade changes. Blend slope into level areas.

- B. Systematically backfill and compact to allow maximum time for natural settlement. Do not backfill over loose, porous, wet, frozen, or spongy subgrade surfaces.
- C. Aggregate Fill: Place and compact materials in equal continuous layer not exceeding 6 inches compacted depth.
- D. Soil Fill: Place and compact material in equal continuous layers not exceeding two (2) feet compacted depth.
- E. Employ a backfill placement method that does not disturb or damage pipelines, appurtenances, or utilities in trenches, bore pits, or other excavations. This includes, but is not limited to, not burying rocks of 2-inches in any dimension in or on the pipe trench.
- F. When backfilling trenches, implement construction methods to prevent floatation of pipe and movement of appurtenances.
- G. Maintain optimum moisture content of backfill materials to attain required compaction density. Provide and utilize vibration or special compaction equipment when required.
- H. Repair and reestablish original grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations, vehicular traffic, or weather conditions. See Paragraph 3.04 of this Section and Section 01 45 00.
- I. Remove surplus backfill materials from site. Bear all costs associated with loading and hauling excess fill off site.
- J. Leave fill material stockpile areas free of excess fill materials. Contractor shall have the responsibility to load, haul, and spread all excess fill off-site. Scarify former stockpile locations grass areas, place top soil, and seed as required to return area to original or better condition.

### 3.05 TOLERANCES

- A. Finish subgrade or rough graded surfaces shall not deviate by more than +/- 0.20-foot from the required section and grade.
- B. Top Surface of Backfill in Ditches, Berms, Lawns, and Roadways: Plus or minus 1 inch from required elevations upon completion of settlement, but not to exceed 3 inches above finished grade prior to settlement.
- C. Top Surface of Roadways and Driveways: Plus or minus 1 inch from required elevations upon completion of settlement in roadways and driveways, but not to exceed 3 inches above finished grade prior to settlement.

- D. Top Surface of Backfill in Cultivated Areas: Plus or minus 3 inches from required elevations upon completion of settlement, but not to exceed 6 inches above finished grade prior to settlement.
- E. Trenches and bore pit areas shall be kept within settlement tolerances through the warranty period. Only top soil shall be used to raise settled trenches and bore pit areas.
- F. Finish subgrade or rough graded surfaces shall not deviate by more than 1 inch from the required section and grade.

### 3.06 FIELD QUALITY CONTROL

- A. Section 01 45 00 – Quality Control.
- B. Compaction testing will be performed in accordance with ASTM D698, ASTM D1557, and ASTM D6938.
- C. If compaction tests indicate Work does not meet specified requirements, remove Work, replace, and retest at no additional cost to Owner.
- D. Frequency of Compaction Tests:
  - 1. Tests shall be performed per the schedule included in Paragraph 3.9 of this Section at random locations as directed by the Engineer's on-site project representative.
- E. Testing to be paid for by Contractor.

### 3.07 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01 50 00.
- B. Reshape and re-compact fills subjected to vehicular or machine traffic.

### 3.08 SETTLEMENT

- A. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from the Engineer or Owner, or sooner if required by Engineer or Owner, depending on the critical nature of the settlement.

### 3.09 BACKFILLING AND COMPACTION SCHEDULE

- A. The following testing shall be conducted by the independent testing laboratory hired by the Contractor and accepted by the Engineer with results being reported to the Contractor and Engineer:

Item	Requirement	Test Method	Frequency
Building or Structure Sites Floor Slabs	100 percent of ASTM D698 maximum dry density +/- 3% for sands.	ASTM D6938	One (1) approved test per 2,500 sf with a minimum of two (2) density tests that indicate soil bearing capacity as required per 8-inch lift.
Footings / Foundation Subgrade	100 percent of ASTM D698 maximum dry density +/- 3% for sands.	ASTM D6938	One (1) approved test per 50 lf with a minimum of two (2) approved density tests indicating soil bearing capacity as required per 8-inch lift.
Exterior Slabs	98 percent of ASTM D698 maximum dry density & + 4% to 0% optimum moisture content for clays and +/- 3% for sands.	ASTM D6938	One (1) approved test per 2,500 sf of an area with a minimum of two (2) density tests that indicate soil bearing capacity as required per 8-inch lift.
Structural Backfill	98 percent of ASTM D698 maximum dry density & + 4% to 0% optimum moisture content for clays and +/- 3% for sands.	ASTM D6938	One (1) approved test per 50 lf with a minimum of two (2) approved density tests indicating soil bearing capacity as required per 8-inch lift.
Utility and Piping Trenches Beneath Roadways	98 percent of ASTM D698 maximum dry density.	ASTM D6938	One (1) approved test per 100 lf indicating soil bearing capacity as required per 24-inch lift.
Utility and Piping Trenches Not Beneath Roadways	95 percent of ASTM D698 maximum dry density.	ASTM D6938	One (1) approved test per 500 lf indicating soil bearing capacity as required per 24-inch lift.
Bedding Sand	95 percent of ASTM D698 maximum dry density.	ASTM D6938	One (1) approved test per 500 lf indicating soil bearing capacity as required per 24-inch lift.

B. Pipe encasement/bedding with ND Class 3 Modified Gravel per Section 31 05 16 as required or directed by Engineer, compacted to 95 percent of the Standard Proctor Density (ASTM D698).

C. Backfilling of Pipeline Trenches in Cultivated Areas:

1. Fill Type S1 or S2 per Section 31 05 13, from trench bottom to subgrade
2. Cover with Fill Type S4 (topsoil per Section 31 05 13).
3. Grade topsoil and prepare topsoil per Section 32 90 00.

- D. Backfilling of Pipeline Trenches in Ditches and Landscaped Areas:
1. Fill Type S1 or S2 per Section 31 05 13, from trench bottom to subgrade.
  2. Cover with Fill Type S4 (topsoil per Section 31 05 13).
  3. Grade topsoil and prepare topsoil per Section 32 90 00.
- E. Backfilling Under Cast-In-Place and Precast Structures:
1. Fill Type A3 per Section 31 05 16, to 12 inches thick.
- F. Backfilling for Exterior Side of Cast-In-Place and Precast Structures:
1. Fill Type S1 or S2 per Section 31 05 13, to subgrade elevation.
  2. Cover with Fill Type S4 (topsoil per Section 31 05 13).
  3. Grade topsoil and prepare topsoil per Section 32 90 00.
- G. Backfilling of Hydrants, Valve Boxes, and Other Appurtenances:
1. Fill Type S1 or S2 per Section 31 05 13, from excavation bottom to subgrade.
  2. Cover with Fill Type S4 (topsoil per Section 31 05 13).
  3. Grade topsoil and prepare topsoil per Section 32 90 00.
- H. Backfilling Under Gravel, Concrete, or Asphalt Roadways, Driveways, Sidewalks, and Bikepaths:
1. Fill Type A3 per Section 31 05 16 to 0.1 ft. below finished paving elevation.
  2. If pipeline trench settlement occurs, Contractor shall correct settlement to tolerances referenced in Paragraph 3.04 of this Section.

**END OF SECTION**

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# **Attachment No. 2**

**SECTION 33 10 00**  
**WATER UTILITIES**

**PART 1 GENERAL**

1.01 SUMMARY

A. Section includes:

1. Polyethylene (HDPE) and Polyvinyl chloride (PVC) pipe and fittings for water lines.
2. Ductile Iron Pipe and Fittings
3. Gate valves, service saddles, couplers, flush valves, curb stops, ball valves, and appurtenances.
4. Connections to existing pipes.
5. Connections to new pipes.
6. Pipe Casing Requirements.
7. Fire Hydrants.
8. Modular precast concrete manhole sections
9. Underground wastewater piping systems, including manholes, fittings and miscellaneous accessories.
10. Bedding materials.
11. Accessories.

B. Related Sections include, but are not limited to:

1. Section 01 22 00 – Unit Price Measurement and Payment.
2. Section 01 25 00 – Substitution Procedures.
3. Section 01 31 13 – Project Coordination.
4. Section 01 31 19 – Project Meetings.
5. Section 01 33 00 – Submittal Procedures.
6. Section 01 45 00 – Quality Control.
7. Section 01 61 00 – Common Product Requirements.
8. Section 01 77 00 – Closeout Procedures.
9. Section 31 05 13 – Soils for Earthwork.
10. Section 31 05 16 – Aggregates for Earthwork.
11. Section 31 23 16 – Excavation.
12. Section 31 23 23 – Fill and Backfill.
13. Section 31 25 00 – Erosion and Sedimentation Control.
14. Section 32 39 14 – Singage and Bollards.
15. Section 32 90 00 – Landscape Grading.
16. Section 32 97 00 – Restoration of Disturbed Areas.
17. Section 33 13 00 – Disinfection of Water Systems.

## 1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
1. ASTM A536 – Ductile Iron Castings.
  2. ASTM D1248 – Polyethylene Plastics Extrusion Materials for Wire and Cable.
  3. ASTM B584 – Standard Specification for Copper Alloy Sand Castings for General Applications
  4. ASTM D1599 – Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings.
  5. ASTM D1784 – Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated PVC Compounds.
  6. ASTM D1785 – HDPE(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
  7. ASTM D2000 – Rubber Products in Automotive Applications.
  8. ASTM D2239 – Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameters.
  9. ASTM D2241 – Polyvinyl Chloride (PVC) Pressure-Rated Plastic Pipe (SDR Series).
  10. ASTM D2513 – Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings.
  11. ASTM D2855 – Two-Step Method of Joining Poly Vinyl Chloride (PVC) or Chlorinated Poly Vinyl Chloride (CPVC) Pipe and Piping Components with Tapered Sockets.
  12. ASTM D3035 – Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
  13. ASTM D3139 – Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
  14. ASTM D3350 – Polyethylene (PE) Plastic Pipe and Fitting Materials.
  15. ASTM F477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
  16. ASTM F714 – Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.
  17. ASTM F1055 – Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing.
  18. AWWA C104/A21.4 – Cement-Mortar Lining for Ductile Iron Pipe and Fittings.
  19. AWWA C105/A21.5 – Polyethylene Encasement for Ductile-Iron Pipe Systems.
  20. AWWA C111/A21.11 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  21. AWWA C151/A21.51 – Ductile-Iron Pipe, Centrifugally Cast.

22. AWWA C153/A21.53 – Ductile-Iron Compact Fittings.
23. AWWA C502 – Dry Barrel Fire Hydrants.
24. AWWA C509 – Resilient Seated Gate Valves for Water Supply Service.
25. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
26. AWWA C700 – Cold-Water Meters - Displacement Type, Metal Alloy Main Case.
27. AWWA C710 – Cold-Water Meters - Displacement Type, Plastic Main Case.
28. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 60 in.
29. AWWA C901 – Polyethylene (PE) Pressure Pipe and Tubing, 3/4 In. (19 mm) through 3 In. (76 mm), for Water Service.
30. AWWA C905 – Polyvinyl Chloride (PVC) Pressure Pipe, 14 in. through 48 in., for Water Transmission and Distribution.
31. AWWA C906 – Polyethylene (PE) Pressure Pipe and Fittings, 4 in. through 63 in., for Waterworks.

### 1.03 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
- B. Before any materials or equipment are purchased, the Contractor shall submit a complete list of materials and equipment to the Engineer for approval. This information shall include the manufacturer's name and the type, size, rating and catalog number for each of the following items:
  1. Ductile iron pipe and fittings.
  2. Gate valves and boxes.
  3. Corporation stops.
  4. Flush hydrants.
  5. Saddles.
  6. Pipe and fittings.
  7. Stop boxes.
  8. Curb stops.
- C. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories.
- D. Product Test Reports: The manufacturer of the PVC or HDPE piping shall furnish an affidavit that all delivered materials comply with the requirements of ASTM D2241.

- E. Installation Plan: Submit description of proposed construction plan, plan to establish and maintain vertical and horizontal alignment within specified tolerances, as applicable to open cut and boring method.
- F. Submit for Engineer's approval prior to construction, information on Contractor proposed grade control equipment including, but not limited to, equipment operation, accuracy, and capabilities to record and verify final grade.
- G. Pipeline Installation Plan: The Contractor shall submit a proposed Pipeline Installation Plan as a shop drawing a minimum of seven (7) days before any work begins for the Project. The Pipeline Installation Plan shall indicate all portions of the proposed pipeline that the Contractor intends to install by: either open-cut methods, directional drillings methods, by bore-and-push methods, or by other means. The location of proposed bore pits shall be shown on the proposed Pipeline Installation Plan.
  - 1. Open-cut methods
  - 2. Directional drillings methods
  - 3. Bore-and-push methods
  - 4. Other installation means
- H. The location of proposed bore pits shall be shown on the proposed Pipeline Installation Plan.

#### 1.04 SUBMITTALS AT PROJECT CLOSEOUT

- A. Per Section 01 77 00.
- B. Record actual locations of piping mains, valves, connections, and thrust restraints.

#### 1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with Section 01 45 00.
- B. Perform Work in accordance with grade tolerances as indicated in Sections 01 33 00, 01 45 00, 31 23 16, and 33 05 07.
- C. Valves: Manufacturer's name and pressure rating marked on valve body.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01 61 00.
- B. Deliver and store valves in shipping containers with labeling in place.

## **PART 2      PRODUCTS**

### **2.01    WATER PRESSURE PIPE AND FITTINGS**

#### **A.      Polyethylene (HDPE) Water Pipe:**

1.      ASTM F714, AWWA C901, AWWA C906, PE4710 polyethylene compound with a cell classification of ASTM D3350-PE445574C.
2.      Pressure Classes (unless indicated otherwise on Plan Sheets):
  - a.      Open Cut, Plow, or Trencher Installation:
    - 1)      Size 2-inch through 12-inch: DR-11, Class 200, DIPS
  - b.      Directional Bores, and Cased Bore Carrier Pipe:
    - c.      Size 8-inch through 16-inch: DR-11, Class 200, DIPS
      - a)      Carrier Pipeline Exterior Fusion Welds shall be deburred.
      - b)      Casing Pipeline Interior Fusion Welds shall be deburred.
  - d.      Miscellaneous 1-inch Air Release/vacuum valve assembly lead pipe:
    - 1)      Rated for a minimum working pressure of 250 psi, IPS, SDR-7, PE3330.
3.      Provide with rigid, high-quality, stainless steel liners or stiffeners for insertion in the ends of HDPE pipe for all connections to appurtenances with the use of compression fittings.
4.      Pipe shall be marked with identifications indicating the size, type, and class rating.
5.      Pipe shall be manufactured in the United States.
6.      Pipeline shall have a purple line indicating that this pipeline is supply reclamation water.
7.      Approved Manufacturers:
  - a.      CP Chem Polyethylene (Plexco).
  - b.      Sclair Pipe.
  - c.      ISCO.
  - d.      WL Plastics.
  - e.      Centennial Plastics, Inc.
  - f.      Approved Equivalent.

#### **B.      HDPE Water Main Fittings:**

1.      All fittings shall be supported by concrete blocks placed under the fitting and directly on top of virgin compacted earth.
2.      Tees, Bends, and Reducers: Polyethylene, Molded Fittings, ASTM F714, PE4710, DIPS, polyethylene compound with a cell classification of ASTM D3350-PE445574C. Pressure rating and SDR to match that of pipeline. Pressure rating and SDR to match that of pipeline. May only be placed directly on to adjacent HDPE pipe with butt fusion or electrofusion. Fabricated fittings may only be utilized with Engineer's approval.
  - a.      Approved Manufacturers:

- 1) CP Chem Polyethylene (Plexco).
- 2) Sclair Pipe.
- 3) ISCO.
- 4) WL Plastics.
- 5) Approved Equivalent.

C. Polyvinyl Chloride (PVC) Pipe:

1. PVC pipe of 12 inches in diameter and smaller
  - a. PVC Pressure Pipe manufactured of PVC resin conforming to ASTM D1784, Type 1, Grade 1 (Class 12454-B). ASTM D2241 with Standard Thermoplastic Dimension Ratio (SDR). All pipe must bear the NSF 61 seal of approval for potable water.
  - b. 6-inch through 12-inch: SDR-18, C900
  - c. Pressure classes pertain to open cut, plow, or trencher installation.
  - d. Pipe shall be supplied of consistent length with a minimum length of 20 feet.
  - e. The manufacturer's recommended minimum pipe bending radius shall be at least 600 times the outside diameter of the pipe.
  - f. The manufacturer of each shipment of pipe is required to supply a statement certifying that each lot or load of pipe has been subjected to the appropriate testing for PVC pipe meeting the requirements of ASTM D2241 or ASTM D1599, as applicable.
  - g. Joints: ASTM D3139, push-on bell and spigot utilizing gasket sealing system meeting ASTM F477. Gasket sealing system shall be Locked-In Rieber Gasket type joint. Restrain pipe as required.
  - h. Install pipe in compliance with manufacturer's recommendations and in accordance with ASTM D2241.
  - i. Approved Manufacturers:
    - 1) Northern Pipe Products
    - 2) J-M Manufacturing Company, Inc.
    - 3) Diamond Plastics Corporation
    - 4) CertainTeed Pipe
    - 5) Approved Equivalent

D. Fittings for Polyvinyl Chloride (PVC) Fittings

1. Fittings for PVC pipe shall be ductile iron. See Paragraph E below.

E. Ductile Iron Pipe (DIP) and Fittings

1. The pipe and fittings furnished shall be of the Ductile Iron type as specified for each particular use or installation and shall be minimum Pressure Class 350 for pipe 4-12 inches and minimum Pressure Class 250 for pipe 14 inches and greater, unless otherwise noted.
2. Materials:
  - a. Ductile iron pipe shall conform to the requirements of AWWA C151/ANSI A21.51 with mechanical joints.
  - b. Mechanical or push-on joints shall conform to the requirements of AWWA C111/ANSI A21.11.
  - c. The weight, class, or nominal thickness and casing period shall be shown on each pipe. The manufacturer's mark, year produced, and letters "DI" or "Ductile" shall be cast or stamped on the pipe.
  - d. Mechanical joint fittings shall conform to the requirements of AWWA C110/ANSI 21.10 or AWWA C153/ANSI 21.53 rated at 250 psi or 350 psi for piping larger than 16-inches in diameter, and AWWA C110/ANSI 21.10 or AWWA C153/ANSI 21.53 rated at 350 psi for sizes up to and including 16-inches in diameter. No plain end fittings shall be allowed.
  - e. Rubber gaskets shall conform to the requirements of AWWA C111. Gaskets used for air piping shall be EPDM.
  - f. All pipe joints and fittings shall have conductive gaskets with copper inserts or copper strap welded to the pipe and connected with "Cor-Blue" bolts by NSS industries, or equal. The conductors shall be rated at 600 amps sustained current.
  - g. The nuts and bolts shall be constructed of corrosion resistant, high-strength, low-alloy steel with a ceramic filled, baked on fluorocarbon resin. The nuts and bolts shall be in compliance with ANSI/AWWA C111/A21.11 and shall be "Cor-Blue" bolts by NSS industries, or equal.
  - h. All ductile iron pipe and fittings shall be lined with cement mortar in accordance with AWWA C104/ANSI A21.4, unless otherwise noted. Ductile iron pipe and fittings used for air piping shall not be cement lined.
  - i. All watermain materials furnished and installed under this contract shall be furnished by a manufacturer having notable reputation within the industry.
  - j. All ductile iron pipe and fittings shall be encased with enhanced V-BIO polyethylene encasement in accordance with AWWA C105.
3. All exterior surfaces of pipe and fittings shall have a tar or bituminous seal coating at least one (1) mil thick conforming to AWWA C151. Spotty or thin seal coating, or poor coating adhesion, shall be cause for rejection of the materials.
4. Retainer glands for restrained joints shall be American, US Pipe, or EBAA Iron, Inc. Mega Lug type, ductile iron, and be designed to meet or exceed the pressure classification of the corresponding pipe. Restraint glands for mechanical joint pipe shall be EBAA Iron, Inc. Megalug, Series 1100, or equal. Push joint pipe shall be restrained using restraint harnesses EBAA Iron, Inc. Megalug, Series 1700, or equal. Joint restraint systems shall be

rated for at a minimum the design pressure of the pipe with a 2 to 1 safety factor.

5. Restrained joint pipe may be used in lieu of joint restraint systems for push on and mechanical joint pipe. Restrained joint pipe shall be US Pipe TR Flex or American Flex Ring pipe, or equal.
6. Nuts, bolts, and tie rod restraints shall be 304 stainless steel. Tee bolts for mechanical joints and fittings shall be "Cor-Blue" by NSS industries, or equal.

## 2.02 PIPE TO PIPE CONNECTIONS

### A. PVC pipe to HDPE or PVC to Fitting:

1. 2.0 inch and smaller
  - a. Connections shall be made of brass construction with pack joint type connections.
2. 3.0-inch
  - a. Connections shall be made using ductile iron mechanical joint fittings, long sleeve type, and restraint glands.
3. 4.0 inch to 12.0 inch
  - a. Transition coupling casting and grippers to be made with restrained joint ductile iron meeting the requirements of ASTM A536, grade 65-45-12, rated at minimum 250 psi. Gaskets shall conform to the requirements of ASTM D2000. Fittings shall be wrapped in polyethylene wrap conforming to ANSI/AWWA C105/A21.5 AWWA C105/A21.5.
  - b. Approved Manufacturers:
    - 1) Romac Alpha Couplers
    - 2) Hymax High Pressure Grip Coupling
    - 3) Approved Equivalent
4. 12.0 inch and larger
  - a. Connections shall be made using ductile iron mechanical joint fittings, long sleeve type, and restraint glands.

### B. HDPE to HDPE pipe or HDPE to Fitting

1. 2.0-inch and Smaller
  - a. Method 1: Butt fusion of HDPE pipe to HDPE pipe of fitting
  - b. Method 2: Connections shall be made of brass construction with pack joint type connections. Stainless steel stiffeners to be used on all connections.
  - c. Method 3: Connection by mechanical joint long body ductile iron fittings made with butt fusion mechanical joint adaptor kit and restraint glands.
2. 3.0-inch and Larger
  - a. Method 1: Butt fusion of HDPE pipe to HDPE pipe of fitting
  - b. Method 2 & 3: at Owner/Engineers discretion

- 1) Method 2: Connection by mechanical joint long body ductile iron fittings made with butt fusion mechanical joint adaptor kit and restraint glands.
- 2) Method 3: Connection by coupling casting and grippers to be made with restrained joint ductile iron meeting the requirements of ASTM A536, grade 65-45-12, rated at minimum 250 psi. Gaskets shall conform to the requirements of ASTM D2000. Fittings shall be wrapped in polyethylene wrap conforming to ANSI/AWWA C105/A21.5.
- 3) Approved Manufacturers:
  - a) Romac Alpha Couplers
  - b) Hymax High Pressure Grip Coupling
  - c) Approved Equivalent

C. End Connections for Capped Pipe:

1. Restrained Caps (Romac Alpha End Caps or approved equivalent) shall be used for the ends of each connection location:
  - a. Hillside Memory Gardens Cemetery
  - b. Drain Pond 5 (DP5)

2.03 GATE VALVES - RESTRAINED

A. Sizes 6-inch and Larger:

1. End Connections: Alpha design by American Flow Control and shall only require the use of one Type 304 Stainless Steel Fastener with all accessories being factory installed.
2. Working Pressure: 250 psi, AWWA C515.
3. Operating Nut: 2-inch square.
4. Materials:
  - a. Body, Bonnet, and Single Wedge: Ductile iron (ASTM A53/A53M).
  - b. Resilient seat.
  - c. Stem: Stainless steel, non-rising.
  - d. Exterior and Interior Coating: Fusion bonded epoxy; AWWA C550.
  - e. Hardware: Interior and Exterior type 316 stainless steel bolts, nuts, and washers; Bronze trim.

- B. Provide three-piece cast iron valve box with 5 ¼ inch diameter. Cover shall have "Water" cast on top. Box when installed shall provide for a minimum of 12 inches of adjustment. Adjustment shall be screw type. Provide gate valve adaptor for each valve box. Adapter material shall be 0.25" steel with UV polyurethane protective coating. 0.75" rubber gasket w/poly-coated wire ties as manufactured by Adaptor Inc., or approved equal.

- C. Encase buried metallic valves with High Density Cross-Laminated (HDCL) polyethylene encasement conforming to AWWA C105/A21.5 as specified in this section.
- D. Install permanent gate valve nut 5-foot extension stems on all Project gate valve unless indicated otherwise by Engineer or Owner.
- E. Provide two (2) short operating wrenches for use with gate valve nut extensions
- F. Approved Manufacturers:
  - 1. American Flow Control Series 2500-1 Resilient Wedge Gate Valves with Alpha Ends.
  - 2. Approved Equivalent.

## 2.04 CONNECTIONS TO EXISTING PIPE

- A. Connections to Existing HDPE Pipe:
  - 1. Saddle for pipeline sizes from 1-inch through 16-inch:
    - a. Stainless Steel Saddles
      - 1) Must be a full wrap saddle. Saddles may not be used in lieu of tees on all new pipelines unless specified in the drawings. Pressure rating and SDR to match that of connecting pipeline with a minimum allowable pressure rating and SDR of SDR 11 & Class 200 psi.
      - 2) All Stainless Steel Band Clamps, rated to be saddled and connected on to existing HDPE pipe with spring washers, Heavy gauge 18-8 Type 304 stainless steel construction, double bolt type with minimum band width of 4", and rubber gasket meeting ASTM D2000.
      - 3) Saddle outlet shall be of female AWWA/CC threading.
      - 4) May only be used where indicated on the Drawings or as directed by Engineer.
      - 5) Manufacturers:
        - a) Ford Meter Box Company.
        - b) Cascade Waterworks Mfg. Company.
        - c) Mueller Valve Company.
        - d) Powerseal Pipeline Products Corporation.
        - e) A.Y. McDonald Mfg. Company.
        - f) Romac Industries, Inc.
        - g) Approved Equivalent.
  - 2. Tapping Tee
    - a. All tapping tees shall have a pressure rating and SDR to match that of connecting pipeline with a minimum allowable pressure rating and SDR of SDR 11 & Class 200 psi.
    - b. Manufacturers:
      - 1) ISCO Industries.

- 2) Approved Equivalent.
- c. Must be a full wrap tapping tee.
- d. Tapping Tees may only be used where indicated on the Drawings or as directed by Engineer.
- e. Tapping Tee outlet shall be of poly fusion or female AWWA/CC threading.
- 3. Tee: Install per Paragraph 2.01.B
- B. Connections to Existing Ductile Iron Pipe:
  - 1. Saddle for existing 24-inch effluent pipeline:
    - a. All tapping tees shall have a pressure rating and SDR to match that of connecting pipeline with a minimum allowable pressure rating and SDR of SDR 11 & Class 200 psi.
    - b. Stainless Steel Tap Sleeve w/mechanical joint outlet.
    - c. Must be a full wrap tapping tee.
    - d. Tapping Tees may only be used where indicated on the Drawings or as directed by Engineer.
    - e. Manufacturers:
      - 1) Powerseal 3480MJ.
      - 2) Approved Equivalent.

## 2.05 CONNECTIONS TO NEW PIPE

- A. Connections to New HDPE Pipe:
  - 1. 1-inch through 16-inch:
    - a. Use HDPE fittings with minimum 5-foot stick poly spools and butted end fusion.
    - b. Use of saddles is not permitted in lieu of tees for new pipe without prior engineer approval.

## 2.06 PIPE CASING REQUIREMENTS

- A. Polyethylene Casing Pipe
  - 1. Highway Crossings
    - a. Polyethylene Casing Pipe is required when crossing North Dakota State Highways; based on the requirements stated on the crossing's issued permit by the North Dakota Department of Transportation. Install as indicated on Drawings or as directed by Engineer.
    - b. Casing pipe shall meet the requirements to support the highway and live loads imposed on the highway and be at least two nominal sizes larger than the carrier pipe. Casing pipe shall be a minimum of DR11.
    - c. Carrier Pipeline Exterior Fusion Welds shall be deburred.
    - d. Casing Pipeline Interior Fusion Welds shall be deburred.

- e. Casing pipe shall be manufactured to meet the requirements as indicated on the Drawings.

B. Steel Casing Pipe

- 1. All railroad crossing must be steel encased.
- 2. Must be rated as having a minimum yield strength of 35,000 psi.
- 3. A minimum wall thickness of 0.188-inches for casing pipe of 12-inches.
- 4. Casing pipe shall meet E-80 loading requirements.
- 5. Casing pipe shall be provided with cathodic protection or adequate BNSF-approved coating.
- 6. Be designed for effective corrosion control.

C. Casing Spacers

- 1. Casing spacers shall be non-metallic spacers constructed of preformed sections of high-density polyethylene. Spacers should be ISO 9001:2000 certified for strength and quality.
- 2. Casing spacers should be projection type with the minimum number of projections around the circumference that total the number diameter.
- 3. Casing spacers shall be centered in a restrained position configuration within the casing pipe.
- 4. Spacer should also have a minimum height that clears the pipe bell or as otherwise indicated on the plans.
- 5. Casing Spacers are not required when the carrier pipeline and casing pipeline are both Poly.
- 6. Manufacturer
  - a. Raci Casing Spacers.
  - b. Approved Equivalent.
- 7. Spacing
  - a. As Detailed on the Drawings.

D. Casing End Seals

- 1. Once the carrier pipe has been installed inside of the casing pipe with all properly installed casing spacers, the annular space between the carrier pipe and the casing pipe shall be sealed by the installation of Modular Mechanical Seal at each end of the casing pipe and a rubber boot seal with stainless steel clamps.
- 2. Modular Mechanical Seal
  - a. Seal shall be modular, mechanical type, consisting of inter-locking synthetic rubber links shaped to continuously fill the annular space between the carrier pipe and casing pipe.
  - b. The elastomeric element shall be sized and selected per manufacturer's recommendations and have the following properties as designated by ASTM.
    - 1) -40 to +250°F (-40 to +120°C)

- 2) EPDM: ATSM D2000 M3 BA510
- c. Color: Black
- d. Manufacturer
  - 1) PSI Pipeline Seal & Insulator, Inc.
  - 2) Cascade.
  - 3) Maloney.
  - 4) Approved Equivalent.
- 3. Boot Seals
  - a. Approved Manufacturers:
    - 1) PSI Pipeline Seal & Insulator, Inc.
    - 2) Cascade.
    - 3) Maloney.
    - 4) Approved Equivalent.

## 2.07 FIRE HYDRANTS

- A. All hydrants shall conform to the City of Williston's standard detail shown on 1/C503.
- B. Hydrants shall be non-jacket types meeting the latest revision of AWWA C-502.
- C. Hydrants shall be be dry-barrel construction closing with and opening against the inlet pressure.
- D. Rated for minimum working pressure of 250 psig.
- E. All hydrants shall be equipped with a break-off traffic flange and shall be capable of being extended in 6" increments.
- F. Main Valve opening: 5-1/4" minimum.
- G. Hydrant Barrel: 7 1/4" minimum inside diameter.
- H. Type of shut-off: Compression.
- I. Inlet connection: 6" size - mechanical joint type.
- J. Nozzles: 2-2 1/2" hose nozzles; 1-4" pumper nozzle.
- K. Nozzle threads: National Standard threads.
- L. Bury depth: 8 feet 6 inches.

- M. Stand Pipe: Ductile Iron.
- N. Base: Shall be mechanical joint as shown on the Drawings and shall have an outlet to adequately restrain 6-inch pipeline. Use of Alpha Base by Romac Industries would be acceptable.
- O. Bolts: All bolts below ground shall be type 304 stainless steel.
- P. Equipped with a main valve, which opens against water system pressure. Main valve shall be bronze seated and valve seat shall have a minimum 5-inch diameter opening and thread into a non-clog bronze drain ring.
- Q. Removeable internal hydrant parts through the hydrant barrel without need for excavation.
- R. Counterclockwise opening rotation; hydrant operating nut for main hydrant valve.
- S. Provide hydrant operating wrench for each hydrant.
- T. Finish: Epoxy primer and two coats of two-part polyurethane topcoat. Base to be coated with fusion-bonded epoxy. Repair finish damaged in shipping or handling.
  - 1. The topcoat color of any fire hydrant **connected to the finished water distribution system** shall be the City of Williston standard color (Red).
  - 2. The topcoat color of any fire hydrant **connected to the reuse water pipeline** shall be painted Barney Purple (non-potable water use).
- U. All hydrant connected to a non-potable water main shall have "Out of Service" tags installed on them.
- V. Encase buried metallic components. with High Density Cross-Laminated (HDCL) polyethylene encasement conforming to AWWA C105/A21.5 as specified in this section.
- W. Approved hydrants
  - 1. Waterous Pacer WB67-250.
  - 2. Approved equivalent.

## 2.08 CORPORATIONS STOPS

- A. Corporation Valve
  - 1. Brass Construction.
  - 2. Pressure Rating: Meeting or exceeding pressure rating of adjacent pipe.
  - 3. Threading shall be of AWWA/CC threading.
  - 4. Inlet and outlet openings same size as the valve.
  - 5. Connect to watermain by use of tapped saddle fittings.

6. Must be of quarter turn operation with off/on indication, and must NOT have the ability to rotate 360 degrees.
7. Manufacturers:
  - a. A.Y. McDonald Mfg. Company.
  - b. Ford Meter Box Company.
  - c. Mueller Valve Company.
  - d. Approved Equivalent.

## 2.09 AIR RELEASE/VACUUM VALVE ASSEMBLY

### A. Manhole and Lid:

1. Shall be of an 18-inch diameter PVC shell with a minimum wall thickness of 0.366-inches.
2. Lid shall be 18-inch Flat Lid with a center mounted pentagon nut lock as shown on Drawings.
3. Lid shall meet AIS criteria.

### B. Interior Rigid Piping and Vent Piping: ASTM D1785, Schedule 80 PVC pipe, shall be sized to fit valve.

1. Vent piping shall extend at least one foot above grade and provided with a screened, downward-facing elbow unless an inflow preventer is utilized.
2. Inflow preventer:
  - a. Certified Lead-Free in accordance with NSF 61.
  - b. Conforming to AWWA C514.
  - c. Approved Manufacturer and Model:
    - 1) Floodsafe Inflow Preventer.
    - 2) Approved Equivalent.

### C. Interior Flexible Piping: Polybutylene water service tubing conforming to requirements of ASTM D-2581. Rated for a minimum working pressure of 250 psi, with standard thermoplastic dimension ration (SDR) not to exceed 9. Any coupling of service lead piping shall be made with copper couplers.

### D. Approved Valves:

1. Air Release Valve: 1-inch Combination air valve, Model 143C manufactured by Apco, or Model 201C manufactured by Val-Matic, or Approved Equal with inflow preventor or vent piping as specified.
2. Ball Valves as specified in in Section 40 05 58.

### E. Insulation:

1. Install three (3) 4-inch rigid insulation barriers to the interior of the SDR 35 PVC pipe as shown on the Drawings.

2. The insulation shall be applied to the exterior side of the SDR 35 PVC pipe as indicated on the Drawing details.
3. The SDR 35 PVC pipe shall be covered with insulation to prevent freezing of the air release valves.
4. Product shall be rated for buried installation.
5. Rigid Interior Insulation:
  - a. Thickness: 2 inches minimum.
  - b. R-Value: 5 per inch of insulation.
6. External Insulation:
  - a. Spray on or rigid polyurethane foam insulation.

## 2.10 STORM MANHOLE

### A. Manhole Sections, bases, and top sections

1. All structures shall be designed and stamped by a Registered Engineer in the state of North Dakota.
2. Reinforced precast concrete as outlined in ASTM C478 able to withstand H25 loading and backfill requirements; including knockouts for wall pipes as shown on Drawings. Concrete shall be Type 5 Portland cement per ASTM C150 with minimum 28-day compressive strength of 4,000 psi.
3. Reinforcement: Reinforce with deformed billet-steel conforming to ASTM A615 or deformed welded wire fabric conforming to ASTM A496 and ASTM A497 for the anticipated loading conditions.
4. Welded Wire Fabric: Conforming to ASTM A185.
5. Prestressing Strand: Uncoated, 7-wire, stress relieved strand conforming to ASTM A416 (including supplement) - Grade 270K, low relaxation type.
6. Connecting and Supporting Devices: Plates, angles, items cast into concrete, insets, bolts and accessories, conforming to ASTM A36. All items cast into precast concrete to be prime painted.
7. Welded Studs: Conform to AWS D1.1.
8. Admixtures:
  - a. Air entraining admixtures: ASTM C260.
  - b. Water reducing, retarding, accelerating, high range water reducing admixtures: ASTM C494.

### B. Precast Concrete Vaults for Pressure Sustaining Valve Manhole and Pressure Reducing Valve Manhole

1. Manholes Sections: Reinforced precast concrete as outlined in ASTM C478 able to withstand water loading requirements; including knockouts for wall pipes as shown on Drawings.
2. Circular Sections: Reinforced precast concrete outlined in ASTM C76 Class IV, double cage steel reinforcement, including knockouts for wall pipes and tie bolts.

3. Box Sections: Reinforced precast concrete as outlined in ASTM C858, C890, and C913, double cage steel reinforcement, including knockouts for wall pipes and tie bolts.
4. Manholes shall be sized as shown on the Construction Drawings or if size is not noted, as appropriately for piping size, type, and locations in accordance with manufacturer's recommendations.

C. Joints

1. Precast concrete unit riser section joints shall be tongue and groove with rubber "O" ring joint gaskets. Profile joint gaskets may be used if reviewed and approved by Engineer.
2. Precast concrete unit joints shall be formed entirely of concrete employing a circular cross section gasket, Press Seal, or equal. When assembled, the joint shall be self-centering and make a uniform watertight joint conforming to the requirements of ASTM C443.
3. Joints shall also be sealed with a bituminous mastic joint sealing compound, Kent Seal No. 2, by Hamilton Kent Manufacturing Co., or approved equivalent.
4. Provide external joint seal on all manhole section joints. External joint seal shall be a 12 inch wide heavy bitumastic coating, Infi-Shield Seal Wrap, by Sealing Systems Inc., or equal.

D. Bottom Slab Sections

1. Bottom slab sections shall be precast concrete conforming to ASTM C478. Bottom slabs shall be suitable for depth and groundwater conditions encountered.
2. Inverts shall be formed as an integral part of the precast bottom and constructed as shown on the Drawings and shall have a smooth commercial finish.
3. Preformed bases shall have spaces filled with the appropriate sealer.
4. Where there are changes in the direction of the flow or entering branches into the unit, the centerline of the invert shall have a true curve of as large a radius as the size of the manhole will permit. A minimum fall of 0.10 foot shall be provided through all manholes.
5. The inside bottom of each unit shall be shaped with concrete to form a free flow channel through invert troughs.

E. Top Slab Sections

1. Top slab sections shall be precast concrete conforming to ASTM C478. Top slabs shall be suitable for H25 wheel loading.
2. Commercial finish formed surfaces and broom finish top surface.
3. Provide tapered handling hooks as required.
4. Provide access hatch as specified in Paragraph F.

F. Access Hatches

1. Valve Vault Access Fram and Cover:
  - a. 30" x 30" clear opening.
  - b. 1/4" thick 6061-T6 aluminum alloy, ASTM GSI1A, diamond pattern plate access cover.
  - c. Doors shall open to 90° and automatically lock with stainless steel hold-open arms with aluminum release handles. The arms shall incorporate enclosed stainless steel compression spring assists.
  - d. Unit shall lock with a stainless steel slam lock with removable key and non-corrosive handle.
  - e. 1/4" thick one-piece, mill finish, extruded aluminum frame, incorporating a continuous concrete anchor.
  - f. Doors shall close flush with the frame and rest on a built-in neoprene cushion/gasket.
  - g. Hinges and fastening hardware shall be stainless steel.
  - h. Unit shall be guaranteed against defects in material and workmanship for 10 years.
  - i. Size and quantity as indicated on the Drawings.
  - j. Acceptable Manufacturers:
    - 1) Halliday Products.
    - 2) Bilco.
    - 3) Or equal.

G. Manhole Steps

1. Where called for on the Drawings, provide plastic steps placed at 12" spacing. Steps shall comply with ASTM C-478 and OSHA.
2. Whenever possible, steps shall not be placed directly above the manhole flow channel. Steps should be located above the largest bench area in the manhole base. Steps shall be equally spaced, 12-inches on center maximum, for the entire depth of the manhole.

H. Grade Adjustment Rings

1. Grade adjustments of manhole frame and cover assemblies shall be completed utilizing HDPE adjusting rings, standard two-inches thick. Each new manhole shall have a total height of adjustment between four (4) and six (6) inches, unless otherwise directed by ENGINEER.
2. Precast reinforced concrete grade adjustment rings shall conform to ASTM C378 and shall be free from cracks, voids, and other defects.
3. The diameter or rectangular dimension of rings shall conform to the type of casting on the structure.
4. Provide grout or mortar between the rings.
5. Wrap adjusting rings, edge of casting frame, and upper barrel section (where applicable) with Infishield, or Cretex™ External Manhole

Chimney Seal, approved flexible sealing product per manufacturers specs.

I. Mortar

1. Mortar shall conform to ASTM C270. The cement shall be Type S masonry cement.
2. Water shall be added for proper consistency. The entrained air content of the mortar shall range between seven (7) to ten (10) percent.
3. Mortar sand volume shall equal 2.25 to 3.00 times the total volume of cement and lime.

J. Pipe Connections to Manholes

1. Grouted Connections (knock-outs)
  - a. Non-shrink masonry cement.
  - b. For larger knock-out openings, Contractor shall use bricks on the interior to provide a stable, hard surface for the non-shrink masonry cement.
2. Boot Connections
  - a. Pipe to manhole connections on all pipes shall be flexible and watertight. Pipe shall be sealed in the manhole section pipe openings with a resilient connector meeting the requirements of ASTM C923. The connection may be of the following types:
    - 1) Rubber sleeve with stainless steel banding type, Press Seal PSX, A-Lok G3, or equal. Install by mechanical means in openings cut into manhole wall per ASTM C923.
    - 2) Cast in place rubber gasket with stainless steel banding type, Press Seal Cast A Seal, or equal. Resilient connector shall be cast integrally into the wall of the manhole section at time of manufacture.
    - 3) Core drilled connections shall utilize link seal where indicated on the drawings.
3. Pipe to manhole connections shall utilize link seal where indicated on the drawings.

2.11 STORM MANHOLES (FOR DRAIN MANHOLES)

A. Barrel and cone sections:

1. Precast concrete sections per ASTM C-478, 48" or 60" inside diameter as referenced in the drawings.
2. Tongue and groove ends with pre-formed flexible joint sealer.
3. Eccentric type cone sections per standard details.

B. Steps:

1. Verify that manhole steps are required by the governing authority and Engineer prior to ordering manholes.
2. When steps are required, the following requirement pertains:
  - a. Meet FS RR-F-6216 and ASTM C-581.
  - b. 12" wide, 16" vertical spacing.
  - c. Aluminum, Neenah R-1982-W, or fiberglass, Permastep Model 112-P, or rubber coated ductile iron or steel.
3. 12" wide, 16" vertical spacing.
4. Aluminum, Neenah R-1982-W, or fiberglass, Permastep Model 112-P, or rubber coated ductile iron or steel.
5. Meet FS RR-F-6216 and ASTM C-581.

C. Access Frames and Covers:

1. Standard Casting: ASTM A48, Class 35B Gray (cast) Iron construction machined flat bearing surface, removable lid.
2. Standard Manhole: Neenah Model R-1733 or approved equivalent.
3. Components
  - a. Strap Anchors: Bent shape, 304 stainless steel, 2 inches wide x 1/4 inch thick x required length.
  - b. Pipe Connectors: Cast-in resilient type (Ferncos) with stainless steel straps.

D. Lids and Base Slabs:

1. Lids (where required or specified) and bottom slab sections shall be precast concrete conforming to ASTM C478 and of thickness, diameter, and reinforcement as shown on the Construction Drawings and manhole schedule. Bottom slabs shall be suitable for depth and groundwater conditions encountered.
2. Inverts shall be formed as an integral part of the precast bottom and constructed as shown on the Drawings and shall have a smooth commercial finish.
3. Bases shall be monolithic with joints extending past pipe openings.
4. Where there are changes in the direction of the flow or entering branches into the unit, the centerline of the invert shall have a true curve of as large a radius as the size of the manhole will permit. A minimum fall of 0.10 foot shall be provided through all manholes.
5. The inside bottom of each unit shall be shaped with concrete to form a free flow channel through invert troughs.
6. Reinforcement: Reinforce with deformed billet-steel conforming to ASTM A615 or deformed welded wire fabric conforming to ASTM A496 and ASTM A497 for the anticipated loading conditions.

E. Joints:

1. Precast concrete unit riser section joints shall be tongue and groove with rubber "O" ring joint gaskets. Profile joint gaskets may be used if reviewed and approved by Engineer.
2. Precast concrete unit joints shall be formed entirely of concrete employing a circular cross section gasket, Press Seal, or equal. When assembled, the joint shall be self-centering and make a uniform watertight joint conforming to the requirements of ASTM C443.
3. Joints shall also be sealed with a bituminous mastic joint sealing compound, Kent Seal No. 2, by Hamilton Kent Manufacturing Co., or equal.
4. Provide external joint seal on all manhole section joints. External joint seal shall be a 12 inch wide heavy bitumastic coating, Infi-Shield Seal Wrap, by Sealing Systems Inc., or equal.

F. Resilient Pipe Seals:

1. Resilient connector cast integrally into the manhole wall.
2. Compression seal type, mechanical fasteners, if used, shall be stainless steel.
3. Conform to ASTM C-923.

G. Adjusting Rings: Reinforced concrete, 1" to 4" vertical adjusting increments:

1. Conform to ASTM C-923.
2. The outside diameter of the adjusting rings shall be equal to or greater than the diameter of the casting base.

## 2.12 BEDDING AND BACKFILL MATERIALS

- A. Bedding: Fill Type S1 and Type S2, as specified in Section 31 05 13
- B. Backfill: Fill Type S1 and Type S2, as specified in Section 31 05 13.

## 2.13 ACCESSORIES

- A. Concrete for Thrust Restraints and Splash Pads: Premixed bagged concrete consisting of aggregate and Type I Portland Cement. Form and pour thrust restraints for pipe, fittings, and plugs as shown on the Drawings.
- B. Bolts and Related Hardware: Stainless steel underground bolts, including all bolts on fittings, valves, hydrants, and transition couplers. Properly lubricate bolts to prevent seizing.
- C. Storm Manholes
  1. Manhole Access Frames and Covers:
    - a. Standard Casting: ASTM A48, Class 35B Gray (cast) Iron construction machined flat bearing surface, removable lid.

- b. Manufacturer and Products
  - c. Standard Manhole: Neenah Model R-1733 or approved equivalent.
2. Components
- a. Strap Anchors: Bent shape, 304 stainless steel, 2 inches wide x 1/4 inch thick x required length.
  - b. Pipe Connectors: Cast-in resilient type (Ferncos) with stainless steel straps.

## 2.14 POLYETHYLENE ENCASEMENT

- A. Conform to ANSI/ASTM D1248 and install per AWWA C105/A21.5.
- B. High Density Cross-Laminated; 4 mil minimum thickness.
- C. Install on all underground metallic items, including but not limited to: ductile iron pipe, ductile iron fittings, gate valves, other metal pipe and fittings, fire hydrants, stainless steel couplings, transition couplings, and service and testing tapping saddles.

## **PART 3 EXECUTION**

### 3.01 EXAMINATION

- A. Verify existing conditions under provisions of Section 01 31 19.

### 3.02 PREPARATION AND STORAGE

- A. Store pipe on-site on flat surface so barrel is evenly supported. Do not stack higher than 6 feet. Cover pipe with opaque material for extended storage.
- B. Remove scale and dirt on inside and outside before assembly. Inspect for damage to pipe and other materials before installation.
- C. Store all valves and appurtenances according to manufacturer's recommendations.
- D. Storm Manholes - Coordinate placement of inlet and outlet pipe or duct sleeves required by other Sections.

### 3.03 INSTALLATION - PIPE AND APPURTENANCES

- A. Install all pipe and appurtenances in strict accordance with manufacturer's recommendations.
- B. Install potable water mains at a minimum cover depth of 90 inches (7.5 feet) below finished grade to top of pipe, unless noted elsewhere. In areas of graveled or compacted driveways and parking lots, pipe depths shall be increased to a minimum cover of 96 inches (8 feet). Construct to lines, grade, and dimensions as detailed on construction Drawings.

- C. Install non-potable water mains as shown on Drawings or as approved by the Engineer/Owner.
- D. Set buried fittings on concrete blocks and pads that rest on solid bearing soils.
- E. Do not gouge or mar pipe in any fashion.
- F. Take up and relay any pipe disturbed from its required grade or alignment.
- G. Keep trenches free from water until pipe jointing is complete.
- H. Securely close open ends of pipe and fittings when Work is not in progress.
- I. Cut pipe in a neat and workmanlike manner by an approved mechanical cutting machine.
- J. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- K. Connect new water supply to existing water supply where shown on Drawings. Notify Engineer at least 7 days in advance of the time connections are to be made and coordinate connection operations with the Owner in effort to minimize interference with existing water system service.
- L. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main per Drawing details.
- M. Grade water main to avoid high spots and air pockets.
- N. Install water main and appurtenances to avoid existing utilities.
- O. Install pipe such that maximum deflections from straight line or grade do not exceed manufactures specifications. Install bend fittings where maximum deflections are exceeded.
- P. Install pipelines within the vertical alignment shown on the Drawings with a tolerance not to exceed +/- 0.20'. The Contractor shall correct any deviation in the vertical alignment at no additional cost to the Owner. Corrective measures shall involve boring or open cut placement of a new pipe length in a new location as directed by Engineer. The Contractor must obtain approval from the Owner and Engineer prior to implementation of any corrective measures.
- Q. Pipelines shall be installed to the horizontal alignment shown on the Drawings or staked in the field with a tolerance of +/- 2.00'. The Contractor shall correct any deviation in the horizontal alignment that results in the bore(s) colliding with utilities that parallel the proposed pipeline route at no additional cost to the Owner. Corrective measures may include boring a new pipe length in a new location and abandonment and filling of bore hole placed in error. The Contractor

must obtain approval from the Owner and Engineer prior to implementation of any corrective measures.

- R. **Provide adequate adapters and couplers for connections of different pipe types and sizes.**
- S. **Where and as directed by Engineer, pipelines shall be installed by the trenchless installation methods to avoid disturbance of surface features. Refer to Specification 33 05 07. All boring pits shall be sheathed and braced, as necessary, to provide a safe place for workmen. The Contractor shall comply with all applicable OSHA safety requirements relating to this type of construction. Separate Bid items are provided for water main installed by non-cased bore methods, and payment will be made only where specifically requested by Engineer. Contractor may install additional pipe by this method for his convenience in crossing utilities or surface items that would require restoration; however, this pipe shall be paid for at the unit bid price for watermain installed by open cut methods.**
- T. Excavate and backfill trench in accordance with Section 31 23 16 and Section 31 23 23, respectively.

#### 3.04 INSTALLATION – VALVES, FLUSH CLEANOUTS, CURB STOPS, AND CORPORATION STOPS

- A. Locate curb stops, gate valves, air release valves, pressure reducing valve, etc. as directed by Engineer.
- B. Set buried valves on concrete blocks and pads that shall rest on solid bearing soils per Drawing details.
- C. Center and plumb valve box over valve or curb stop. Set valve box cover flush with finished grade or as shown on Drawings.
- D. Locate valves outside road or street areas.
- E. Provide down-stream side of curb stop with polyethylene pipe to the surface. Provide suitable cap to prevent entrance of dirt and other foreign materials.
- F. Set cleanouts to existing grade or as shown on Drawings.
- G. Locate control valve a minimum of 2 feet away from discharge.
- H. Provide a drainage pit for cleanouts, consisting of not less than 5 cubic feet washed gravel.
- I. Provide suitable cap to prevent entrance of dirt and other foreign materials on ends of pipe until final connections are completed.

- J. Install flush cleanout curb stops plumb, on a concrete pad, and to existing grade or as shown on Drawings.
- K. Encase all ductile pipe valves, gate valves, transition couplings, and fittings in polyethylene encasement.
- L. Install service lead curb stops plumb and per details contained in Drawings.
- M. Excavate and backfill trenches in accordance with Sections 31 23 16 and 31 23 23, respectively.

### 3.05 PLACING MANHOLE SECTIONS

- A. Place base pad, trowel top surface level.
- B. Place manhole sections plumb and level, trim to correct elevations, anchor to base-pad, and seal section joints as noted on the Construction Drawings.
- C. Provide openings for existing pipe connections and new pipe that conform to the required pipe connection types
- D. Grouted pipe openings shall be sealed with non-shrink masonry cement.
- E. Boot-sealed pipe openings shall be sealed as noted on the Construction Drawings and specifications.
- F. Grout lifting holes neatly to the curvature of the barrel with non-shrink masonry cement. Trowel smooth. Contour as required.
- G. Install preformed plastic sealing compound or water stop as required between joints of manhole sections to insure leak proof manhole.
- H. Adjusting rings should be set in place and grouted with mortar or non-shrink masonry cement to provide a smooth appearance, and connections shall be watertight.
- I. Set cover frames and covers level without tipping, to correct elevations.
- J. Coordinate with other sections of work to provide correct size, shape, and location.
- K. Construct concrete bench and channel.
- L. Manhole and casting final rim surface elevations shall be one-half inch below pavement elevation when set in pavement, or at grade when set in turf.
- M. Manhole Steps

1. Manholes shall be placed at a spacing as noted on the Construction Drawings. If no spacing is noted, steps on 12-inch centers shall be provided.
2. Steps in all sections shall be aligned in each section so as to form a continuous ladder with rungs.
3. Steps shall project a minimum of 4 inches from the manhole wall.
4. Whenever possible, steps shall not be placed directly above the manhole obstructions. Steps should be located above the clear area in the manhole base.

### 3.06 FLUSHING OF SYSTEM WATER LINES

- A. Water will not be readily available during this project. Contractor shall flush system water lines after water become available from the Williston Water Resource Recovery Facility.
- B. Flush water lines thoroughly before water system is placed into operation.
- C. Pipelines three (3) inches and Larger: Fill water main to expel all air from main. "Pig" all newly installed pipelines using potable water source. Contractor shall prepare a proposed "pigging" plan and review with Engineer and Owner prior to implementation.

### 3.07 FIELD QUALITY CONTROL

- A. Per Section 01 45 00 - Quality Control.
- B. Hydrostatic Testing for HDPE Pipeline
  1. Submit suggested plan/procedure to Owner and Engineer for Approval.
  2. Subject newly laid pipe to a leakage and hydrostatic pressure test for a period of two hours at a minimum pressure of 200 psi.
  3. Fill water main with water a minimum of 24 hours before the test. Ensure thermal equilibrium and allow any dissolved air to be expelled from the main prior to pressure testing.
  4. Avoid development of waterhammer in pipeline.
  5. Begin initial expansion phase by gradually pressurizing the watermain, adding any make up water as necessary to reach and maintain testing pressure for four (4) hours. The initial expansion phase does not require monitoring amount of water added.
  6. Upon maintaining testing pressure for four (4) hours, immediately begin test phase by reducing test pressure by 10 psi, cease adding water, and monitor pressure for one (1) hour.
  7. If during/after completion of test phase, the test pressure remains steady (within 5% of the target value) and no visual leakage is observed, no leakage is indicated and water main passes hydrostatic pressure testing.

8. Complete, execute, and submit to Engineer the Pressure Test Report for each pressure test after pressure test completion and Engineer examination.
9. Depressurize the main at a controlled rate to avoid water hammer.
10. If during/after completion of test phase, the test pressure does **not** remain steady (within 5% of the target value) and/or visual leakage is observed, no leakage is indicated water main fails the pressure test.
11. Locate and repair any defective areas if test fails.
12. Retest after completion of repairs.
13. Repeat procedure until tests pass.
14. Complete, execute, and submit to Engineer the Pressure Test Report for each pressure test after pressure test completion and Engineer examination.
15. Depressurize the main at a controlled rate to avoid water hammer.

### 3.08 RAILROAD, TOWNSHIP, COUNTY, STATE ROAD, AND WETLAND CROSSINGS

- A. See Section 33 05 07 for requirements.

### 3.09 UTILITY CROSSING REQUIREMENTS

- A. Install water mains no closer than a horizontal distance of 10 feet from the sewer, except when crown of the sewer is at least 18 inches below invert of the water main and the sewer pipe is laid in a separate trench or water main is laid to one side of common trench on a bench of undisturbed soil, separation shall be 6 feet horizontally.
- B. Where new water main crosses an existing sewer:
  1. Center full length of water main over sewer if crossing is within 3 feet above or below sewer.
  2. No additional protection required if water main is at least 3 feet above sewer.
- C. Where new water main crosses an existing utility, including but not limited to fiber, telephone, petroleum, and natural gas pipes:
  1. A minimum vertical distance of 2' from bottom of utility to top of water main shall be maintained, unless otherwise approved.
  2. All requirement with corresponding utility easements must be met.
- D. Provide thoroughly compacted backfill between pipes where a new pipe crosses a new or existing pipe for adequate support.
- E. Utility Crossings may be installed via trenchless installation methods if requested by Engineer, see Section 33 05 07. The length of the bores is shown on plans or

will be determined by the Engineer's Field Representative as outlined in Section 01 22 00.

### 3.10 DATA FOR AS-BUILT RECORDS

- A. Record location of all alignment changes, fittings, couplings, valves, and other underground appurtenances installed on sheets provided for such purposes by the Engineer.

**END OF SECTION**