

33 1113 – WATER MAIN

WATER MAIN

PART 1 – GENERAL

1.01 Section Summary

- A. This section includes product and installation requirements for water main pipe, gate valves, hydrants, fittings, and miscellaneous items.

1.02 Related Sections

- A. Section 1700 – Adjustment of Structures.
- B. Section 1800 – Excavation and Embankment.
- C. Section 2000 – Trench Excavation and Backfill.

1.03 References

- A. American Water Works Association (AWWA):
 - 1. C104 – American National Standard for Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - 2. C105 – American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - 3. C111 – American National Standard for Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
 - 4. C116 – American National Standard for Protective Fusion Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service.
 - 5. C151 – American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
 - 6. C153 – American National Standard for Ductile-Iron Compact Fittings, 3 Inch Through 24 Inch, and 54 Inch Through 64 Inch, for Water Service.
 - 7. C219 – Standard for Bolted, Sleeve-Type Couplings for Plain-End Pipe.
 - 8. C502 – Standard for Dry-Barrel Fire Hydrants.
 - 9. C504 – AWWA Standard for Rubber-Seated Butterfly Valves.
 - 10. C508 – AWWA Swing Check Valves or Waterworks Service, 2 Inch Through 24 Inch.

11. C515 – AWWA Standard for Reduced Wall Resilient-Seated Gate Valves for Water Supply Service.
 12. C512 – AWWA Standard for Air Release, Air Vacuum, and Combination Air Valves.
 13. C550 – Protective Interior Coating for Valves and Hydrants.
 14. C600 – AWWA Standard for Installation of Ductile-Iron Water Main and Their Appurtenances.
 15. C651 – AWWA Standard for Disinfecting Water Mains.
 16. C900 – AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 Inch Through 12 Inch, for Water Distribution.
- B. American Society of Testing and Materials (ASTM):
1. A48 – Gray Iron Castings
 2. A126 – Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
- C. National Sanitation Foundation (NSF):
1. 60 – Drinking Water Treatment Chemicals
 2. 61 – Drinking Water System Components
 3. All products (treatment chemicals and materials) that may come into contact with water intended for use in a public water system shall meet American National Standards Institute (ANSI) / National Sanitation Foundation (NSF) International Standards 60 and 61, as appropriate. A product will be considered as meeting these standards if so certified by NSF, the Underwriters Laboratories, or other organizations accredited by ANSI to test and certify such products.
- D. North Dakota Department of Transportation “Standard Specification for Road and Bridge Construction” 2008 Edition, As Revised.
1. Section 744 – Insulation Board (Polystyrene)

1.04 Sequencing and Scheduling

- A. Notify the Water and Sewer Superintendent and City Engineer at least 48 hours before water service is interrupted.
- B. Notify all property owners effected by water service interruption 48 hours in advance.
- C. The City of New Town must open and close all existing valves. The Contractor is responsible for all water main flushing and shall contact the Engineer at least 24 hours in advance of flushing.

1. The Contractor is responsible for erosion control and restoration from flushing activities. Super Chlorinated water shall be discharged appropriately.

1.05 Submittals

- A. Submit all shop drawings and manufacturers information prior to construction.

PART 2 – PRODUCTS

2.01 Polyvinyl Chloride Pipe (PVC)

- A. Pipe sizes 4 inch through 12 inch conform to AWWA C900. Pipe sizes 14 inch through 48 inch conform to AWWA C905 or as specified by the Engineer.
 1. Minimum water main pipe size is 8 inch. All hydrant leads shall be 6 inch.
- B. All sizes are Cast Iron Pipe O.D.
- C. Pipe shall be manufactured in accordance with the latest revision of AWWA C900 or C905 depending on size.
- D. All pipes shall be DR-18, 235 psi.

2.02 Ductile Iron Pipe (DIP):

- A. All Ductile Iron Pipe shall conform to AWWA C151/A21.51.
- B. Cement-mortar lining shall conform to AWWA C104/A21.4.
- C. Pipe Class:
 1. Class 52: diameters less than 20 inches.
 2. Class 51: diameter greater than and equal to 20 inches.
- D. Wrap all pipe with pipe encasement material, minimum 8 mil thickness.
- E. Ductile Iron Pipe shall only be allowed if design conditions warrant or if approved by the Engineer.

2.03 Fittings

- A. All fittings shall conform to AWWA C153/A21.53 and AWWA C111/A21.11 latest revision, and shall be mechanical joint with mega-lug restraints.
- B. All fittings shall be Ductile Iron with 250 psi working pressure.
- C. All fittings shall be fusion bonded epoxy coated, 6-8 mil nominal thickness and shall conform to AWWA C550 and AWWA C116/A21.16.

- D. Wrap all fittings with pipe encasement material.
- E. Every other nut and T-bolt for mechanical joint fittings shall be 304 Stainless Steel suited for underground use.

2.04 Hydrants

- A. Hydrants shall conform to AWWA C502
- B. Waterous Pacer, WB-67-250; or American Darling B-62-B.
- C. Two 2-1/2 inch hose nozzles and One 4-1/2 inch pumper nozzle. Nozzle caps shall be attached with metal chains. Pumper nozzle shall face the street.
- D. Hose and pumper threads shall conform to Standard NTS threads.
- E. Hydrant caps shall be 1-5/16 inch pentagon style.
- F. Hydrant shall have 8 foot – 6 inch cover or 9 foot bury. Upper standpipe section shall be 22 inches, nozzles must be at least 31 inches from ground level.
- G. Minimum opening of 5-1/4 inches for 6 inch water lines, 6 inch mechanical joint pipe connection.
- H. Working pressure of 250 psi and tested up to 500 psi.
- I. Fiberglass Flag: Hydrfinder Hydrant Marker, or approved equal.
 - 1. White fiberglass rod, with 4 red reflective bands without a bulb end. Attached to top bolt.
 - 2. 54 inches long, 3/8 inch diameter.
- J. Break-off flange with breakable rod.
- K. All bolts, nuts, and hardware shall be stainless steel.
- L. Hydrants shall be restrained with thrust blocks and mega-lugs or tie rods.
- M. Standpipe above traffic flange shall be painted traffic yellow, the bonnet and caps shall be painted red.
- N. Maximum fire hydrant spacing shall be 400 feet.

2.05 Gate Valve and Box

- A. All gate valves shall conform to AWWA C515.
- B. Bronze mounted, ductile iron body valves.

- 1. Minimum working pressure of 250 psi.
- C. O-ring seals.
- D. All surfaces shall be fusion-bonded epoxy coated conforming to AWWA C550.
- E. Stainless steel hardware.
- F. Standard 2 inch operating nut.
- G. Mechanical joint ends conforming to AWWA C111/A21.11.
- H. Gate valves and valve boxes shall be wrapped in pipe encasement material.
- I. Boxes shall be 3 piece cast iron, screw type.
- J. Adjustment for 8 foot – 6 inch cover.
- K. Drop style covers, with “WATER” on the top.
- L. Maximum valve spacing shall be 400 feet.

2.06 Butterfly Valve and Box

- A. All butterfly valves shall conform to AWWA C504.
- B. Conform to AWWA C504, Class 150B valve shaft diameter.
- C. Valve Body: Class 150B valve bodies shall be ASTM A126, Class B gray iron or ASTM A536 Grade 65-45-12 ductile iron.
 - 1. Minimum working pressure of 250 psi.
- D. Valve Disk: Shall be seated to provide 360° continuous uninterrupted seating surface.
- E. Operator: Shall be traveling nut type sealed, gasketed, and lubricated for underground service.
- F. All hardware shall be stainless steel.
- G. Test plug shall be brass.
- H. Standard 2 inch operating nut.
- I. Mechanical joint ends conforming to AWWA C111/A21.11.
- J. Butterfly valves and valve boxes shall be wrapped in pipe encasement material.
- K. Boxes shall be 3 piece cast iron, screw type.

- L. Adjustment for 8 foot – 6 inch cover.
- M. Drop style covers, with “WATER” on the top.
- N. Maximum valve spacing shall be 400 feet.

2.07 Joint Restraint

- A. Mechanical Joint Restraint (mega-lug):
 - 1. All restraints shall be ductile iron.
 - 2. Working pressure must be at least 250 psi.
 - 3. Mega-lug and retainer glands are not allowed on cast iron pipe.
 - 4. All mechanical joint restraints must be wrapped with pipe encasement materials.
- B. Tie Rods: Shall be stainless steel.

2.08 Pipe Encasement

- A. Shall be polyethylene and conform to AWWA C105/A21.5, Class C (Black), 8 mil, tube form. Material shall conform to ASTM A674.

2.09 Insulation

- A. Conform to NDDOT Spec 868.
 - 1. Minimum thickness shall be 3 inches.

2.10 Tracer Wire

- A. Conform to the applicable requirements of NEMA W70.
- B. Attach to bolt on break off flange of the hydrant.
- C. Use #8 copper insulated and rated for underground service.
- D. Shall be connected to all valves and fire hydrants.
- E. All directional bore tracer wire shall be woven stainless steel.

2.11 Tapping Gate Valve & Sleeve

- A. Tapping Sleeve Assembly:
 - 1. Comply with MSS SP-60.
 - 2. Include sleeve and valve compatible with drilling machine.

3. Stainless steel, two-piece bolted sleeve with mechanical joint outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.

B. Manufacturers:

1. Romac Industries
2. Power Seal – Pipeline Products Corp.
3. Ford.

C. Tapping Gate Valves:

1. Conform to Section 2100, 2.05. Valve must have flange for connection.

2.12 Check Valves

- A. Conform to AWWA C508.
- B. American Flow Control Series 2100 or approved equal.
 1. Minimum working pressure of 250 psi.
- C. Resilient seated with optional back-flushing actuator.
- D. Conform to AWWA C116 and C550 for fusion-bonded epoxy coatings.
- E. All hardware shall be stainless steel.
- F. All valves shall have a mechanical indicator.

2.13 Water Meters

- A. Meters shall have meter pits with a minimum of 8 foot 6 inch cover to protect against frost and must have a concrete floor.
- B. All meters shall be installed with a check valve.
- C. Manhole shall follow 2.13C-D of this Section.
- D. Exact meter to be used shall be determined by City Water Department Superintendent.

2.14 Transition Couplings

- A. Conform to AWWA C219.
- B. Manufacturers
 1. Hymax.

PART 3 – EXECUTION

3.01 Pipe Installation

A. Pipe Handling

1. All pipe shall be new, unused, and clean.
2. All pipe cutting shall be according to manufactures instructions.
3. Pipe shall be lowered in place in a manor not to damage the pipe.

B. Trench Excavation and Backfill

1. Conform to Section 2000 – Trench Excavation and Backfill.

C. Granular Pipe Bedding

1. Granular pipe bedding must be used and shall be in accordance with Section 2000 – Trench Excavation and Backfill.

D. Pipe Laying

1. No pipe shall be laid in water or unstable trench conditions.
2. Pipe shall be laid true to location, line, and grade. No deviation is allowed unless specifically approved by the Engineer. All water main shall have a minimum of 8 foot – 6 inch cover.
3. The Contractor must protect their work at all times, no damage to the pipe is acceptable, no groundwater or debris shall be allowed to enter the pipe.

3.02 Fittings

- A. Fittings shall be secured to pipe using restrained mechanical joints (megalugs) conforming to AWWA C600.
- B. All fittings shall be installed with the appropriate restrained joints and with the appropriate thrust blocks which are poured or set against undisturbed earth.

3.03 Hydrants

- A. Set on an 8 inch solid concrete block.
- B. Use mega-lugs or steel rods on all joints to secure hydrant lead back to the main.
- C. Encase hydrant base with no less than one cubic yard of 3/4 inch to 1-1/2 inch washed rock. Ensure weep holes are surrounded by rock. Place 2 layers of polyethylene, minimum of 4 mil, or separation fabric, over the rock to prevent filling the voids with sediment.

- D. Encase hydrant barrel and base in pipe encasement.
- E. Hydrant must be installed plumb, no deviation is allowed.
- F. Attached fiberglass flag to the top of the hydrant using a flange bolt.
- G. Deliver to the Superintendent of Water and Sewer an extra hydrant flag for each new hydrant installed.

3.04 Valves

- A. Set on 8 inch solid concrete block.
- B. Valves and boxes shall be set vertically plumb with no bends. Operating nut must be in the center of the box.
- C. Top of valve box shall be set 1/4 to 1/8 inch below finish grade. Valve box shall have 1 foot of adjustment remaining.
- D. Valves shall be restrained with mega-lugs.
- E. Valves not set in roads shall be marked with steel fence post.
- F. Valves installed deeper than 9 feet shall have an extension rod.
 - 1. If a stem extension is specified, it shall be fastened to the operating nut with a set screw. The operating nut shall be drilled or otherwise indented to accept the set screw and provide a secure connection that will prevent an extension from coming loose during operation.

3.05 Joint Restraint

- A. All joints from hydrant back to the main must have joint restraints, either mega-lugs or tie rods.
- B. All dead end lines shall be secured back at least 2 joints including the plug with steel tie rods. The number of tie rods required depends on water main size as follows:

Pipe Size	Number of ¾ Inch Rods
6 Inch	2
8 Inch	2
12 Inch	4
16 Inch	6
18 Inch	6

20 Inch	8
24 Inch	10

3.06 Insulation

- A. Insulation shall be installed as shown on the Plans or as directed by the Engineer.
- B. Insulation shall have a 6 inch sand cushion above and below the board.

3.07 Tracer Wire

- A. Wire shall be installed according to detail plate.
- B. To be installed on all pipes, fittings and valves.

3.08 Pipe Crossings and Conflicts

- A. Water mains crossing sanitary sewer mains and services or storm sewers shall have a minimum of 18 inch vertical separation, and 10 foot separation from edge to edge with water main and sanitary sewer. When circumstances prevent 18 inch separation, the following construction methods must be followed:
 - 1. Sewers passing over or under water main must be constructed to water main standards. A full length of water main pipe must be centered on a full sewer pipe when crossing.
 - 2. The bedding and soil surrounding the crossing must be compacted to 100 Percent Standard Proctor.
- B. Water mains crossing storm sewers shall have a minimum of 2.5 feet of clearance. When circumstances prevent 2.5 feet of clearance, a minimum of 3 inches of insulation shall be used along with the requirements for sewer crossings.

3.09 Protection

- A. Existing hydrants and valves shall only be operated by Public Works Staff; Contractor must contact the Water and Sewer Superintendent.
- B. Securely plug all water main openings to prevent debris and other substances from entering the water main.
- C. Protect all water main structures from damage during construction.

3.10 Disinfection and Testing

- A. General
 - 1. Contractor must perform all hydrostatic testing and disinfection.

2. Engineer must visually inspect and verify all tests. A 48 hour notice must be given to the Engineer.
3. Potable water must be used to fill pipe for testing and service tapping.

B. Hydrostatic Pressure Test

1. Minimum test pressure: 150 psi.
2. Test duration: 2 hours
3. Criteria: No drop in pressure is allowed.
4. Gauge shall be liquid filled, labeled in 1 lb or 2 lb increments.
5. All water mains, services, dead ends, and hydrant leads shall be included in the test.
6. Test will be monitored by representative of City Engineer or City Water Department.

C. Disinfection of Lines

1. Prior to disinfection, all lines shall be flushed with high velocity water through fire hydrants.
2. All lines shall be sterilized with an injected chlorine solution. Granular calcium hypochlorite shall not be used. Conform to AWWA B301A or B300.
3. A minimum of 50 ppm chlorine residual shall be maintained during disinfection.
4. Chlorine solution shall remain in the system for a minimum of 24 hours and a maximum of 36 hours.
5. Extreme care shall be taken during disinfection to ensure that super chlorinated water does not enter existing water mains or water supply.
6. After disinfection, the lines shall be flushed until chlorine concentrations are within normal operating levels (1 to 2 ppm).
7. A minimum of 1 test group per section with each section being a maximum of 1200 feet in length shall be taken. Each test group shall contain 2 bacteria tests taken 24 hours apart. If the tests show positive total coliform, the section being tested shall have failed and shall be retested.

3.11 Measurement and Payment

- A. Water Main Pipe: Shall be paid for by the lineal foot (LF) for each size and type specified on the Plans. Costs shall include all materials and labor for installing the pipe complete and in place as specified, including all joint restraints, pipe encasement, tracer wire, and granular bedding.

- B. Fittings: Shall be paid for by each (EA) for the size and type specified on the Plans or shall be paid for by the pound (LB) as stated by the manufacturer for each fitting. Fittings shall include all materials and labor for the complete installation as specified.
- C. Valve and Box: Shall be paid for by each (EA) for the size and type specified on the Plans and shall include all materials and labor for the complete installation as specified.
- D. Fire Hydrants: Shall be paid for by each (EA) and shall include all materials and labor costs for the complete installation as specified.
- E. Insulation: Shall be paid for by board foot (BD FT) and shall include all materials and labor for the complete installation as specified including granular bedding.
- F. Tapping Gate Valve and Sleeve: Shall be paid for by each (EA) for the size and type specified on the Plan and shall include all materials and labor for the complete installation as specified including the Valve Box.
- G. Water Meter and Manhole: Shall be paid for by each (EA) for the size and type specified on the Plan and shall include all materials and labor for the complete installation as specified.
- H. Transition Coupling: Shall be paid for by each (EA) for the size and type specified on the Plan and shall include all materials and labor for the complete installation as specified.
- I. Connect to Existing Water Main: Shall be paid for by each (EA) and shall include all materials and labor for the complete connection including all fittings.
- J. Water Main Flushing and Testing: Shall be considered incidental to the installation of water main.
- K. All other work and costs of this Section shall be incidental to the Project.

END OF SECTION