

SECTION 2100 – 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 600 – Project Testing Requirements
- B. Section 1100 – Temporary Facilities and Controls
- C. Section 1700 – Adjustment of Structures
- D. Section 1800 – Excavation and Embankment
- E. Section 2000 – Trench Excavation and Backfill

1.03 References

- A. American Water Works Association (AWWA):
 - 1. C104/A21.4 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
 - 2. C105/A21.5 – Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - 3. C110/A21.10 – Ductile Iron and Gray Iron Fittings, 3-inch through 48-inch for Water and Other Liquids.
 - 4. C111/A21.11 – Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
 - 5. C116/A21.16 – Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings.
 - 6. C151/A21.51 – Ductile-Iron Pipe, Centrifugally Cast.
 - 7. C153/A21.53 – Ductile-Iron Compact Fittings, 3-inch through 64-inch.
 - 8. C219 – Bolted, Sleeve-Type Couplings for Plain-End Pipe

9. C228 – Stainless Steel Pipe Flange Joints for Water Service – sizes 2 inch through 72 inch.
 10. C502 – Dry-Barrel Fire Hydrants.
 11. C504 – Rubber-Seated Butterfly Valves.
 12. C508 – Swing-Check Valves or Waterworks Service, 2-inch Through 48-inch.
 13. C515 – Reduced-Wall Resilient-Seated Gate Valves for Water Supply Service.
 14. C512 – Air Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service.
 15. C550 – Protective Interior Coatings for Valves and Hydrants.
 16. C600 – Installation of Ductile-Iron Mains and Their Appurtenances.
 17. C605 – Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
 18. C651 – Disinfecting Water Mains.
 19. C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4-inch Through 60-inch.
- B. American Society of Testing and Materials (ASTM):
1. A48 – Gray Iron Castings
 2. A126 – Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 3. B170 – Oxygen-Free Electrolytic Copper – Refinery Shapes
 4. B869 – Copper-Clad Steel Electrical Conductor for CATV Drop Wire
 5. C578 – Rigid, Cellular Polystyrene Thermal Insulation
 6. D1238 – Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
 7. D1784 – Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
 8. D3139 – Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

- 9. F477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- C. National Sanitation Foundation (NSF):
 - 1. 60 – Drinking Water Treatment Chemicals – Health Effects
 - 2. 61 – Drinking Water System Components – Health Effects
 - 3. All products (treatment chemicals and materials) that may come into contact with water intended for use in a public water system shall meet National Sanitation Foundation (NSF) International Standards / American National Standards Institute (ANSI) 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.

1.04 Sequencing and Scheduling

- A. Notify the City of Minot Public Works Department 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 Minot must open and close all valves under live city pressure. The Contractor shall coordinate all water main flushing with the Engineer and Public Works personnel at least 24 hours in advance of planned flushing.
 - 1. The Contractor is responsible for erosion control and restoration from flushing activities. Superchlorinated water shall be discharged in accordance with all applicable laws and regulations.

1.05 Submittals

- A. Submit all shop drawings and manufacturers' information in accordance with the Conditions of the Contract.

PART 2 – PRODUCTS

2.01 Polyvinyl Chloride Pipe (PVC)

- A. Pipe sizes 4 inch through 60 inch conform to AWWA C900 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 to cell classification 12454 as defined in ASTM D1784 and in accordance with the latest revision of AWWA C900.
- D. All pipes shall be DR-18, 235 psi pressure class.

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 revisions and shall be mechanical joint.
- 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 a minimum of 8 mil polyethylene pipe encasement material.
- E. All nuts and T-bolts 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 WB67-250 or American Darling B-62-B-5.
- 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. Nozzle threads shall conform to National Standard Threads (NST).

1. 2 ½" hose nozzles: Thread number 6038.
 2. 4 ½" pumper nozzle: Thread number 80430.
- E. Hydrant caps shall be 1-5/16-inch pentagon style.
 - F. Hydrant shall be 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: Hydrafinder 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 approved Mechanical Joint Restraints 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 valves under 18 inches in diameter shall be gate valves conforming to AWWA C515 manufactured by American Flow Control or Mueller Co.
- B. Stainless Steel or Bronze stemmed, 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. All Gate Valves shall open counterclockwise
- H. Mechanical joint ends conforming to AWWA C111/A21.11.
- I. Gate valves and valve boxes shall be wrapped in polyethylene pipe encasement material.
- J. Boxes shall be 3-piece cast iron, screw type.
- K. Adjustment for 8'-6" of cover.
- L. Each box shall include a 2" steel adjusting ring below the cover.
- M. Drop style covers, with "WATER" on the top.
- N. Gate Valve Adaptor by Adaptor, Inc. or approved equal.

2.06 Butterfly Valve

- A. All valves 18 inches in diameter and larger shall be butterfly valves conforming to AWWA C504 manufactured by American Flow Control or Mueller Co.
- B. Conform to AWWA C504, Class 150B valve shaft diameter, resilient seated.
- C. All surfaces shall be fusion-bonded epoxy coated conforming to AWWA C550.
- D. Valve Body: Class 150B valve bodies shall be ASTM A126, Class B gray cast iron or ASTM A536 Grade 65-45-12 ductile iron.
 - 1. Minimum working pressure of 250 psi.
- E. Valve Disk: Shall be constructed of ductile iron ASTM A536 with 316 stainless steel disc edge, seated to provide 360° continuous uninterrupted seating surface.
- F. Operator: Shall be traveling nut type sealed, gasketed, and lubricated for underground service.
- G. All hardware shall be stainless steel.
- H. Test plug shall be brass.
- I. Standard 2-inch operating nut.
- J. Mechanical joint ends conforming to AWWA C111/A21.11.
- K. Butterfly valves shall not be direct-bury, but shall be installed inside a concrete manhole..

- L. Manhole casting per Section 2300 – Sanitary Sewer except lid shall be marked “WATER”.

2.07 Joint Restraint

A. Mechanical Joint Restraints:

1. All mechanical joint fittings shall have joint restraints, except where joining to cast iron pipe.
2. All restraints shall be epoxy-coated ductile iron, EBAA Iron MEGALUG, ROMAC GripRing, or approved equal.
3. Working pressure must be at least 250 psi.
4. All mechanical joint restraints must be wrapped with polyethylene pipe encasement materials.

B. Tie Rods: Shall be stainless steel.

2.08 Polyethylene Pipe Encasement

- A. Shall conform to AWWA C105/A21.5, Black in color, 8 mil thick, tube form.

2.09 Insulation

A. Conform to ASTM C578 Type X.

1. Minimum total thickness shall be 4 inches, with no individual insulation board less than 2 inches thick.

2.10 Tracer Wire

A. Wire shall be blue in color and conform to the following:

1. Direct bury: Solid 12 awg fully annealed carbon-steel conductor, copper-clad, with minimum 450 lb. break load rating, insulated with minimum 30 mil thick HDPE insulation.
2. Boring/Directional Drilling: Solid 12 awg hard drawn high carbon-steel conductor, copper-clad, with minimum 1,150 lb. break load rating, insulated with minimum 45 mil thick HDPE insulation.
3. Pipe Bursting/Slip-Lining: 7 x 7 stranded hard drawn high carbon-steel conductor, copper-clad, with minimum 4,700 lb. break load rating, insulated with minimum 50 mil thick HDPE insulation.

B. Wire shall be identified by markings on its surface indicating manufacturer’s identification, conductor size, and other appropriate information.

- C. In-line splices shall be made with DryConn Direct Bury Lug Aqua, Copperhead SnakeBite Locking Connector, or approved equal. Wire nut splices are not allowed.
- D. Access points shall be blue in color, be manufactured by Copperhead Industries, and conform to the following:
 - 1. Terminations at hydrants: Cobra T3 Test Station access point with Hydrant Flange, part # T3-*FLPKG-5/8 for hydrants with 5/8-inch bolts or T3-*FLPKG-3/4 for hydrants with 3/4-inch bolts (where * equals B for BLUE) with 3/4-inch schedule 40 PVC conduit below the test station to protect the wire from weed whips, mowers, etc.
 - 2. Terminations in non-paved areas: At-grade SnakePit Lite Duty Adjustable Access Point with Two-Terminal Switchable Lid, part # LD14*2T-ADJ-SW where * equals B for BLUE.
- E. Ground Rods
 - 1. Drive in Magnesium Ground Rod: Part # ANO-12 (1.5 lb) or approved equal.
- F. Marker Posts
 - 1. TriView Plus by Rhino Markers and Protection Systems, blue in color, 66 inches long, with custom decal reading "City of Minot Public Works Utility Locating Station".

2.11 Marking Tape

- A. Non-detectable or detectable polyethylene, min. 4.5 mil thickness.
- B. Blue in color, marked continuously "CAUTION BURIED WATER LINE BELOW".

2.12 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 adapter outlet for new branch connection. Adapter gasket shall be type Buna N per ASTM D2000. Include sleeve matching size and type of pipe material being tapped and with recessed flange in accordance with AWWA C228 for branch valve. Sleeve assembly shall be equipped with a standard square head $\frac{3}{4}$ " stainless steel test plug for pressure testing. Entire assembly shall be stainless steel.

B. Approved Manufacturers:

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

C. Tapping Gate Valves:

1. Conform to 2.05 – Gate Valve and Box of this Specification Section.

2.13 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.

2.14 Water Meters and Meter Pits

- A. All meters shall be manufactured by Sensus and installed with a check valve.
- B. All meters shall be installed in pits having solid concrete floors and deep enough to provide at least 8.5 feet of cover over the water line.
 1. Meters on lines up to 4 inches in diameter shall be installed inside a standard 84-inch diameter precast concrete manhole.
 2. Meters on larger lines shall be installed inside meter pits designed for the application by a licensed engineer.

2.15 Transition Couplings

- A. Conform to AWWA C219.
- B. Manufacturers
 - 1. Hymax Grip by Krausz, Macro HP or Alpha by Romac.

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 manufacturer's instructions.
 - 3. Pipe shall be lowered in place by appropriate rigging and in a manner 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. Lay pipe in accordance with manufacturer's recommendations. 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'-6" of cover.
 - 3. The Contractor must protect its work at all times; no damage to the pipe is acceptable and no groundwater or debris shall be allowed to enter the pipe.
 - 4. Install polyethylene pipe encasement material on all ductile iron pipe per AWWA C-105, Method A.

E. Underground Piping for Fire Protection

1. Contact the Minot Fire Department (701-857-4740) with any questions or to witness installation, testing, or flushing of the fire protection system.

3.02 Fittings

- A. Fittings shall be secured to pipe using restrained mechanical joints 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.
- C. Encase all fittings in polyethylene pipe encasement, overlapping the polyethylene pipe encasement on adjacent pipes by at least 12 inches.

3.03 Hydrants

- A. Set on 15-inch square solid concrete blocks stacked at least 8-inches thick.
- B. Use mechanical joint restraints or stainless-steel rods on all joints to secure hydrant lead back to the main. If using rods, the hydrant shall be restrained to the valve and the valve shall be separately restrained to the tee.
- 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 8 mil, or separation fabric, over the rock to prevent the voids from filling with sediment.
- D. Encase hydrant barrel and base in polyethylene 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.
- H. Install tracer wire per Section 2100-3.06 Tracer Wire.

3.04 Valves and Boxes

- A. Set each valve up to 12-inches in diameter on 15-inch square solid concrete blocks stacked at least 8-inches thick. Set each larger valve on a concrete slab designed for the application by a licensed engineer.

- B. Valves and boxes shall be set plumb. Using approved valve box adaptor, the operating nut must be in the center of the box.
- C. Top of boxes shall be set, including the 2" steel adjusting ring, 1/4 to 3/8 inch below finish grade. Valve boxes shall be installed so as to have 1 foot of adjustment remaining.
- D. Valves shall be restrained with mechanical joint restraints.
- E. Encase valves and boxes in polyethylene pipe encasement.

3.05 Joint Restraint

- A. All valves and hydrants shall be restrained per this Section 2100-3.
- B. All dead-end lines shall be secured back at least 2 joints including the plug with steel tie rods or mechanical joint restraints. The number of tie rods required depends on water main size as follows:

Pipe Size	Number of 3/4 Inch Rods
6 Inch	2 each
8 Inch	2 each
12 Inch	4 each
16 Inch	6 each
18 Inch	6 each
20 Inch	8 each
24 Inch	10 each

3.06 Tracer Wire

- A. Install along the top of the pipe between the 10 o'clock and 2 o'clock positions.
- B. Fasten to the main every five to eight feet with tape.
- C. Splices shall not occur more frequently than one per 800 LF of pipe and shall be made using approved splice kits.
- D. Tracer wire shall be terminated at each hydrant. The tracer wire shall be routed along the hydrant lead, up the side of the hydrant, through the protective conduit, and securely fastened to the test station attached to the breakoff flange. The length of protective conduit shall be sufficient to extend at least 6 inches below finished grade. Ground wire shall be connected to the center terminal.

- E. Where indicated on the plans, tracer wire access point boxes shall be installed per manufacturer's recommendations, in no case more than 1,000 feet between access points. Access point boxes shall not be placed in roadways and may only be placed in sidewalks/driveways with permission from the City Engineer.

Mark each at-grade tracer wire access point with a Marker Post placed within 6 inches of the access point on the side farthest away from the right-of-way or easement centerline.

- F. Tracer wire must be properly grounded at all terminations.

Grounding of tracer wire shall be achieved by driving in the magnesium grounding rod at the same elevation as the pipe.

When grounding the tracer wire at an access point, the grounding rod shall be installed in a direction 180 degrees opposite of the vertical tracer wire to create the maximum possible distance between the wire termination and the end of the grounding rod.

Where the grounding rod wire will be connected to a tracer wire access point, a minimum of 2 ft. of excess/slack wire is required after meeting final elevation.

- G. The Contractor shall periodically ensure tracer wire conductivity during construction. Upon completion of the project, the Contractor shall perform an acceptance test of all tracer wire in accordance with Section 1000 and the requirements herein.

3.07 Insulation

- A. Insulation shall be installed where shown on the Plans or as directed by the Engineer such that butt-joints of insulation layers are staggered by at least 18 inches.
- B. Insulation shall have a 6-inch sand cushion above and below the board.

3.08 Marking Tape

- A. Tape shall be installed 18 to 24 inches above, and along the centerline of all water mains.

3.09 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 horizontally. When it is impossible to achieve such 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.
 - 3. Where water mains cross storm sewers with less than 2.5 feet of vertical separation from edge to edge, a minimum of 4 inches of insulation shall be used along with the requirements for sewer crossings.

3.10 Protection

- A. Existing hydrants, existing valves, and new valves tapping into existing mains 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.

3.11 Disinfection and Testing

- A. General
 - 1. Contractor must perform all testing and disinfection.
 - 2. All new water mains, dead ends, hydrant leads, fittings and valves shall be disinfected and included in tests.
 - 3. Potable water must be used to fill pipe for testing and service tapping.
 - 4. Engineer must visually inspect and verify all acceptance tests. A 48-hour notice must be given to the Engineer.

B. Hydrostatic Pressure Test

1. Minimum test pressure: 150 psi.
2. Test duration: 2 hours
3. Criteria: No drop in pressure is allowed. If this test requirement cannot be met, the Contractor shall investigate the cause, make corrections, and retest until the pressure drop requirement can be met.

Only if several consecutive tests indicate a consistent pressure drop and only after the Contractor has made numerous attempts to resolve the problem, acceptable to the City Engineer, may the Contractor request in writing and the City Engineer consider the use of a leakage test. When allowed, the leakage test and pipeline acceptance shall be in accordance with AWWA C-600 or AWWA C-605, as applicable.

The leakage test may be performed by the Contractor to determine the magnitude of the leak, however, meeting the leakage allowance shall not automatically be considered acceptance, in lieu of the pressure test, for the section being tested. Final acceptance shall be at the discretion of the City Engineer.

4. Gauge shall be liquid filled, labeled in 1 lb. or 2 lb. increments. The dial shall register from 0 - 200 psi and have a dial size of four- and one-half inches (4 ½").
5. The Contractor shall coordinate with the Engineer and the Fire Department for testing on all fire service lines.
6. Contractor and Engineer shall visually verify water services are not leaking after the mainline pressure test has passed.

C. Disinfection and Bacteria Testing

1. Prior to disinfection, all lines shall be flushed with high velocity water through fire hydrant nozzles.
2. All lines shall be sterilized with an injected chlorine solution conforming to AWWA B301. Granular calcium hypochlorite shall not be used.
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 set of samples shall be collected every 1,200 ft of new water main, plus one set from the end of the line and at least one from each branch greater than one pipe length. Each test group shall contain 2 bacteria tests taken a minimum of 16 hours apart or 15 minutes apart following a 16-hour rest period. If the tests show positive total coliform, the section being tested shall have failed and shall be retested.
8. Test all samples at a North Dakota-certified laboratory.

D. Tracer Wire Test

1. The Contractor shall, within one week after completion of pressure testing and prior to aggregate base installation, use low frequency (512 Hz or similar) line locating equipment to perform a test of all tracer wire to ensure continuous and sufficient conductivity for the purpose of tracing water main for utility location.
2. Connections at all hydrants and all access points shall be tested.

PART 4 – MEASUREMENT AND PAYMENT

- A. Water Main Pipe: Shall be paid for by the linear foot (LF) for each size and type specified on the Plans. Pay quantity will be determined by measuring horizontally along the axis of the pipe the actual quantity installed. Price shall include all materials and labor for installing and testing the pipe complete and in place as specified, including all excavation, bedding, joints, joint restraints, pipe encasement, tracer wire systems (wire, splices, terminations, ground rods, etc.), marking tape, backfilling, and compaction.
- 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 Hydrant: 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 cubic foot (CF) 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 Meter Pit: 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. 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.
- I. Water Main Flushing and Testing: Shall be considered incidental to the installation of water main.
- J. Disinfection and Testing: Shall be considered incidental to the installation of water main.
- K. All costs to properly complete the work specified herein and/or shown on the Plans shall be included in the prices bid for these or other items unless applicable bid items are included on the Bid Form.

END OF SECTION