



**SPECIAL PROVISIONS  
FOR  
WATER MAIN FOR INSTALLATION BY SLIP-LINING**

**Woodbury County  
IM-NHS-029-7(62)149--03-97**

**Effective Date  
November 18, 2014**

**THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

**120203.01 DESCRIPTION.**

**A. Summary.**

1. Water Main Piping, Fittings, and Accessories.
2. Testing for Water Main.

**B. References.**

1. **American Society for Testing and Materials (ASTM).**
  - a. D2152 - Test Method for Degree of Fusion of Extruded Poly(Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion
  - b. D2665 - Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
  - c. D2774 - 08 Standard Practice for Underground Installation of Thermoplastic Pressure Piping
  - d. D3035 - Standard Specifications for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
  - a. D3139 - Joints for Plastic Pressure Pipes Using Flexible Elastomer.
  - b. D3261 - 03 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
  - c. D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
  - d. F477 - Standard Specification for Elastomeric Seals (Gaskets for Joining Plastic Pipe).
  - e. F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings
  - f. ASTM F714 – Standard Specification for Polyethylene (PE) Plastic Pipe (S.D.R.-PR) Based on Outside Diameter
  - g. F1057 - Standard Practice for Estimating the Quality of Extruded Poly (Vinyl Chloride) (PVC) Pipe by the Heat Reversion Technique
  - h. F1483 - 05 Standard Specification for Oriented Poly(Vinyl Chloride), PVCO, Pressure

- Pipe
- i. F1674-05 - Standard Test Method for Joint Restraint Products for Use with PVC Pipe
- 2. American Waterworks Association (AWWA).**
  - a. C110/A21.10 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids
  - b. C111/A21.11 - American National Standard for Rubber Gasket Joints For Cast Iron and Ductile Iron Pressure Pipe and Fittings. (ANSI/AWWA C111/A21.11)
  - c. C550-05 - Protective Interior Coatings for Valves and Hydrants
  - d. C605-94 - Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
  - e. C905-97 - Standard for Polyvinyl Chloride (PVC Pressure Pipe and Fabricated Fittings, 14 in. through 48 in. (350mm-1200mm), for Water Distribution
  - f. C909-09, AWWA Standard for Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. Through 24 In. (100 mm Through 600 mm), for Water, Wastewater, and Reclaimed Water Service
  - g. M23 - Manual of Supply Practices PVC Pipe-Design and Installation, Second Edition
- 3. Uni-Bell Publications (UNI-PUB).**
  - UNI-PUB-08- Tapping Guide for PVC Pressure Pipe
- 4. National Science Foundation (NSF).**
  - a. NSF-14 - Plastics Piping System Components and Related Materials
  - b. NSF-61 - Drinking Water System Components--Health Effects
- 5. Plastics Pipe Institute (PPI).**
  - PPI TR-2 - PVC Range Composition Listing of Qualified Ingredients

## 120203.02 MATERIALS.

### A. Water Main Pipe Materials - Slip-Lining.

- 1. Fusible Polyvinyl Chloride (FPVC).**
  - a. Minimum Wall Thickness class of DR21.
  - b. Fusible polyvinyl chloride pipe shall conform to AWWA C900 or AWWA C905, ASTM D2241 or ASTM D1785. Testing shall be in accordance with AWWA standards for all pipe types.
  - c. Rework material shall be allowed per AWWA C905 standards.
  - d. Fusible polyvinyl chloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.
  - e. Fusible polyvinyl chloride pipe shall be manufactured in a standard 20', 30' or 40' nominal length.
  - f. Fusible polyvinyl chloride pipe shall be blue in color for potable water use.
  - g. Provide Ductile Iron Pipe Size (DIPS) outer diameter to connect to Ductile Iron fittings.
  - h. Pipe generally shall be marked and shall include as a minimum:
    - 1) Nominal pipe size.
    - 2) PVC.
    - 3) Dimension Ratio, Standard Dimension Ratio or Schedule.
    - 4) AWWA pressure class or standard pressure rating for non-AWWA pipe, as applicable.
    - 5) AWWA Standard designation number or pipe type for non-AWWA pipe as applicable.
    - 6) NSF-61 mark verifying suitability for potable water service.
    - 7) Extrusion production-record code.
    - 8) Trademark or trade name.

- 9) Cell Classification 12454 and/or PVC material code 1120 may also be included.
  - i. Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.
  - j. Manufactured by  
Underground Solutions, Inc., Poway, CA, (858) 679-9551.
  - k. Connections:
    - 1) Connections: Restrained retainer gland product for PVC.
    - 2) Couplings: Sleeve-type mechanical couples for use with PVC pressure pipe, restrained and rated at the same or greater pressure carrying capacity than pipe.
- 2. High Density Polyethylene (HDPE) with butt-fused joints.**
- a. Minimum Class DR 7.
  - b. Conform to AWWA C906, ASTM D3035, and F714.
  - c. For use with potable water.
  - d. Provide DIPS to connect to Ductile Iron fittings.
- 3. Ductile Iron Restrained Joint Pipe.**
- 1. Per Section 2554 of the Standard Specifications.
  - 2. Nitrile gaskets not required.

**B. Fittings.**

Per Section 2554 of the Standard Specifications.

**C. Polyethylene Encasement of Ductile Iron Fittings and Pipe.**

Per Section 2554 of the Standard Specifications.

**E. Tracer Tape.**

3 inch wide detectable magnetic marking tape, imprinted with "Water Main", to be slip lined per manufacturer recommendation with water main at open pit installation locations. Acceptable products are Sentry Line Detectable Marking Tape by Terra Tape, Christy's Detectable Marking Tape by T. Christy Enterprises, Inc., or engineer approved equivalent.

**H. Thrust Restraint.**

Per Section 2554 of the Standard Specifications.

**120203.03 CONSTRUCTION.**

**A. Submittals.**

- 1. Product Data: Provide data indicating pipe and pipe accessories.
- 2. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- 3. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- 4. Project Record Documents
  - a. Record location of pipe runs, connections, air release manholes, and invert elevations.
  - b. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
- 5. Post-Construction fusion report for each fused FPVC joint performed on the project, including joints that were rejected. Reports shall include the following information:
  - a. Pipe size and thickness.

- b. Machine size.
  - c. Fusion Technician identification.
  - d. Job identification.
  - e. Fusion joint number
  - f. Fusion, heating, and drag pressure settings.
  - g. Heat plate temperature.
  - h. Time stamp.
  - i. Heating and cool down time of fusion.
  - j. Ambient temperature.
6. Submit the following items for approval:
  - a. Description of the proposed slip-lining construction methods.
  - b. Details of the equipment to be used including jacking or pulling system.
  - c. Detailed schedule of slip-lining work activities, which identifies interrelated work.
7. Hydrostatic pressure test results.

**B. Delivery, Storage, and Handling.**

1. Provide delivery, storage, and handling per pipe supplier's recommendations.
2. Arrange delivery of products in accordance with construction schedules and to allow inspection prior to installation.
3. Coordinate deliveries to avoid conflict with conditions at site.
4. Deliver products in undamaged condition in original containers or packaging, with identifying labels intact and legible.
5. Clearly mark to identify partial deliveries of component parts to facilitate assembly.
6. Store products immediately on delivery and protect until installed. Storage to be done according to manufacturer's instructions with seals and labels intact and legible.
7. Provide platforms, blocking or skids, or coverings required to protect products from deterioration or damage.
8. Arrange storage in a manner to provide easy access for inspection.
9. Maintain storage conditions to prevent deterioration or damage.
10. Protect products after installation to prevent damage from subsequent operations. Remove when no longer needed.
11. Provide equipment and personnel necessary to handle products by methods to prevent damage to products or packaging.
12. Handle products by methods to prevent bending or overstressing.

**C. Regulatory Requirements.**

Conform to applicable code for materials and installation of the Work of this section.

**D. Project Conditions.**

1. Coordinate the Work of shutting down and cutting into the water main with City. Provide temporary service to the existing commercial properties. See drawings for additional details.
2. Existing water main to receive slip-lining shall be cleaned prior to slip-lining.
3. Contractor shall provide a temporary cap on the pipe to prevent debris from entering the pipe while out of service. The cap shall be installed once the existing water main is cut into and shall remain in place until the slipline pipe is ready to be connected to the existing water main.

**E. Examination.**

1. Verify that trench cut and excavation base are ready to receive work and excavations, dimensions, and elevations are as indicated on plans.
2. Verify that piping system has been inspected and pressure tested.

**F. Pipe Installation – Slip-Lining.****1. Cleaning.**

- a. Prevent debris from collecting in the water main access pits.
- b. Host pipe shall be cleaned in accordance with all applicable standards and guidelines. Unless otherwise specified, all interior pipe surfaces shall be cleaned per AWWA M28.
- c. If cleaning of the entire section cannot be successfully performed from either excavation pit, the equipment will be set up on the opposite excavation pit to complete cleaning. If successful cleaning again cannot be performed or the equipment fails to traverse the entire pipe segment, it will be assumed that a major blockage exists. Contractor shall notify City and Engineer of this condition immediately. The Contractor shall be paid for the portion of the line cleaned satisfactorily.
- d. For cleaning where entry must be made onto private property, notice must be given and permission must be obtained to enter property. Easement information will be provided to the Contractor by the City.
- e. All water main segments shall be cleaned with as many passes as necessary to create a uniform interior host pipe surface free of all loose material and sharp edges.
- f. Use potable water for cleaning. Cost will be the responsibility of the Contractor.
- g. The Contractor shall be responsible for the removal of debris from the pipeline, disposing of it, cleaning, and re-cleaning of the pipe to the Engineer's satisfaction.
- h. All debris, dirt, sand, rock, cobbles, roots, grease and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream excavation pit of the section being cleaned.

**2. Debris Disposal.**

- a. Liquids may be disposed at City's Wastewater Treatment Plant. Debris shall not be disposed in the existing sanitary sewer collection system. All debris will be removed from the work site at the end of each workday. Under no circumstances will the Contractor be allowed to accumulate debris beyond a single workday.
- b. The Contractor shall make all disposal arrangements.
- c. All debris hauling and disposal activities shall conform to all state, local, and Federal regulations.

**3. Spills, Leaks or Drainage.**

- a. Spillage, leakage, and draining of liquids onto the ground, into buildings, and/or into a body of water is prohibited.

- b. In case of a spill, Contractor shall notify all affected parties. Contractor shall immediately contact City, Engineer, and Local Police and notify them of the address (location), time, and date of the spill, material spilled, quantity, reason and cleanup measures to be taken.
  - c. The Contractor shall issue a report to the City on the address (location), date and time of the incident, the estimated amount of spillage, the cause of the incident, the action taken including both the corrective action and the cleanup activities. Attach any police reports, if applicable.
- 4. Installation shall be completed per the manufacturer's specifications.
- 5. Fused FPVC shall be by qualified fusion technicians, as documented by the pipe supplier. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion of thermoplastic pipe. The software shall register and/or record the parameters required by the pipe supplier and these specifications. Data not logged by the data logger shall be logged manually and be included in the Fusion Technicians joint report. All reports are to be submitted to the engineer at the completion of each complete segment of slip-lining pipe.

During cold weather fusion (when FPVC pipe temperatures are below 40°F), Contractor shall follow FPVC supplier's recommendations for fusing PVC pipe during cold weather. Cold weather fusion recommendations include but are not limited to prior day temperature preparation of PVC pipe, construction of a weatherproof enclosure around the fusing machine, and use of heaters.

**6. Fusion Joints.**

Unless otherwise specified, fusible polyvinyl chloride pipe lengths shall be assembled in the field with butt-fused joints. The Contractor shall follow the pipe supplier's written guidelines for the procedure. All fusion joints shall be completed as described in this specification.

- 7. Pipe rollers, if required, shall be of sufficient size to fully support the weight of the pipe during handling and pullback operations. A sufficient quantity of rollers and spacing, per the pipe supplier's guidelines shall be used to assure adequate support and resist excessive sagging of the product pipe.
- 8. Install the pipe in the location designated on the drawings with the pipe joints neatly fused together.
- 9. The pipe pulling system shall be designed to ensure that the forces are evenly distributed over the pipe section. The Contractor shall submit temporary facility drawings showing details of the equipment and construction method in sufficient detail for the Engineer to determine the adequacy of the proposed system.
  - a. The maximum pulling tension on the FPVC pipe shall not exceed the pipe supplier's safe pulling force.
  - b. Immediately following the completion of an installation by slip-lining, if possible, the pipe should be pushed back into the location of the insertion, at the pulling head, until a small amount of movement is realized at the excavation pit on the other side of the installation from the pulling equipment.
- 10. Site preparation, grading, excavation, fill and backfill, trenching, and vegetation removal shall be done in accordance with the Plans and Specifications. Strip topsoil from excavated areas and stockpile for future use with the limits of the project.

**11. Excavation and Access Pits.**

- a. Excavation pit length shall be such that the minimum bending radius for the pipe, per the pipe supplier is maintained. Sheeting, shoring, and bracing requirements shall be in accordance with applicable jurisdictional standards.
  - b. Pit excavations shall be performed at all points where the pipe will be inserted into the existing force main. When possible, pit excavations shall coincide with host pipe lateral connection points or other appurtenance installations.
12. Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the Engineer.
13. Inspect the leading end (three feet minimum) of the pipe for excessive bruises or gouges. If gouges exceed 10% of wall thickness, pipe shall be repaired per manufacturer's recommendations at Contractor's expense.
14. Equipment used for tapping shall be made specifically for tapping the pipe material used.
- a. Tapping bits shall be slotted "shell" style cutters, specifically made for PVC pipe. "Hole saws" made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.
  - b. Follow manufacturer's recommendations for tapping fusible PVC pipe.

**G. Hydrostatic Testing.**

1. Test all pressure lines for leakage. After the pipe is laid, the joints completed, and the trench backfilled.
2. All sections of pipe installed by slip-lining shall be pressure tested prior to connecting to existing force main.
3. The Contractor is to provide all equipment, water for hydrostatic pressure testing, caps, fittings, valves, gauges, cocks, labor and appurtenances necessary to complete the Hydrostatic Pressure Test.
4. Pressure tests conducted on individual piping sections between valves in order to test the integrity of the valves as well as the piping.
5. Test pressure to 150 psi, or as directed by the Engineer. The test pressure not be less than 1.25 times the working pressure at the highest point along the test section and not less than 1.5 times the working pressure at the point of testing.
6. Pressure shall be maintained for a minimum of 2 hours.
7. Before applying the pressure, completely expel air from the system being tested.
8. Install, at no expense to Contracting Authority, corporation cocks as required at all high points in the system.
9. After all the air has been expelled, remove corporation cocks and plug or close prior to testing. Engineer shall determine whether the corporation cocks are removed or left in place.
10. Determine the amount of leakage by adding water to the system by means of a pump whereby the pressure within the system is maintained within 5 psi of the test pressure.
11. Allowable leakage shall not exceed 11.65 gallons per mile per inch diameter per 24 hours for pipe in 18 foot lengths, 10.5 gallons for pipe in 20 foot lengths, and proportionally varied for other lengths at a test pressure of 150 psi.

12. PVC Pipe: Per Section 2554 of the Standard Specifications.
13. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gallons per hour per inch of nominal valve size is allowed.
14. Acceptance determined on the basis of allowable leakage.
15. If any test of pipe laid discloses leakage greater than that specified above, locate and repair the defective material until the leakage is within the specified allowance.
16. All visible leaks are to be repaired regardless of the amount of leakage.
17. Replace damaged or defective pipe, fittings, or valves, hydrants, or joints discovered in the pressure test and repeat test until the test results are satisfactory.

**120203.04 METHOD OF MEASUREMENT.**

- A. Pre-Installation Cleaning of 16 Inch Water Main will be measured per linear foot of existing water main jet cleaned.
- B. Water Main Installation by Sliplining will be measured per linear foot.
- C. Fill Annular Space will be measured per cubic yard of flowable mortar or sand required between the existing water main and the new slipline pipe.

**120203.05 BASIS OF PAYMENT.**

- A. The payment for Pre-Installation Cleaning of 16 Inch Water Main will be per linear foot and shall include furnishing all labor, equipment, and materials necessary for jet cleaning of the existing water main to remove any buildup on the existing pipe to allow the slipline pipe to fit inside, disposal of debris generated from cleaning.
- B. The payment for Water Main Installation by Sliplining will be per linear foot of pipe installed and shall include furnishing all labor, equipment, and materials necessary for the water main installation including freight, unloading pipe, pipe storage, pipe handling during fusion, construction of enclosures needed for cold-weather pipe fusion, pre-heating pipe for cold-weather pipe fusion, fusing of pipe, pipe support, slip-lining access pit excavation and backfill, pipe connections (adaptors/end seals) to existing water main, testing, and related subsidiary and incidental work in accordance with plans and special provisions.
- C. The payment for Fill Annular Space will be per cubic yard and shall include all labor, equipment, and materials necessary for filling the annular space.