**SECTION 2.6**

**TECHNICAL SPECIFICATION FOR SLIPLINING OF**

**WATER MAIN**

**NOVEMBER 2000**

**Part 1: General**

* 1. **Scope of Work**

Furnish all materials, labor, equipment, tools, and required incidentals for the replacement of water mains by Sliplining method. Sliplining is defined as the trenchless reconstruction of existing water mains by subsequently inserting pipe lengths, which are joined into a continuous tube, within the bore of the existing pipe and grouting the annual spacing between the new pipe and the existing pipe.

The scope includes standards for dimensionality, testing, quality, acceptable fusion practice, safe handling, storage and installation of the pipe by sliplining.

* 1. **Pipe Description**

Unless otherwise specified in the plans and/or specifications, the following pipes or approved equal can be considered for sliplining contingent upon approval by the Owner:

* Fusible Polyvinylchloride (PVC) Water Pipe as designated by C900 (DR 14) or C905 (DR 14) and manufactured by Underground Solutions, Inc. or approved equal.
* Restrained Joint Polyvinylchloride (PVC) Water Pipe as manufactured by CertainTeed Corporation.

The pipe to be used must be certified for use as a pressure-rated water delivery system and fire protection piping applications conforming to all standards and procedures, and meeting all testing and material properties as described in applicable pipe specifications.

* 1. **Related Work**
* Technical Specification for Fusible Polyvinylchloride (PVC) Water Pipe
* Technical Specification for Restrained Joint Polyvinylchloride (PVC) Water Pipe

**Part 2: Quality Assurance**

* 1. **Reference Standards**
     + - This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those other standards are included as references under this section as if referenced directly. In the event of a conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
       - Unless otherwise specified, references to documents shall mean the documents in effect at the time of design, bid, or construction, whichever is earliest. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued.
       - Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

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| ANSI/AWWA C110/A21.10 | American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids |
| ANSI/AWWA C111/A21.11 | American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings |
| ANSI/AWWA C153/A21.53 | AWWA Standard for Ductile-Iron Compact Fittings for Water Service |
| AWWA C605 | Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water |
| AWWA C651 | Standard for Disinfecting Water Mains |
| AWWA C900 | Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12 in. (100mm Through 300mm), for Water Distribution |
| AWWA C905 | Standard for Polyvinyl Chloride (PVC Pressure Pipe and Fabricated Fittings, 14 in. through 48 in. (350mm Through 1200mm), for Water Distribution and Transmission |

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| --- | --- |
| AWWA M23 | AWWA Manual of Supply Practices PVC Pipe—Design and Installation, Second Edition |
| UNI-PUB-08 | Tapping Guide for PVC Pressure Pipe |
| NSF-14 | Plastics Piping System Components and Related Materials |

* 1. **Qualification Requirements**
     1. Installer

All sliplining operations shall be performed by a qualified sliplining company who has at least three (3) years experience involving work of a similar nature. The company must have installed a minimum of 10,000 linear feet of pipe (6-inch diameter or greater) using sliplining and supply a list of project references, prior to job commencement.

* Schedule all work through the Owner. Notify the Owner a minimum of ten (10) working days in advance of the start of work.
* Perform all work in the presence of the Owner, or his representative.
* All applicable permits and applications must be in place prior to start of work.
  + 1. Fusion Technician Requirements
       - If applicable, fusion technician shall be fully qualified by the pipe supplier to install fusible polyvinylchloride pipe of the type(s) and size(s) being used. Qualification shall be current as of the actual date of fusion performance on the project.
  1. **Warranty**
* A one year warranty for the pipe shall be included from the Contractor, and shall cover the cost of replacement pipe and freight to project site, should the pipe have any defects in material or workmanship.
* In addition to the standard pipe warranty, the Sliplining contractor shall provide in writing a warranty for a period of one year for all the Sliplining work including material, installation, and pressure testing at no additional cost to the owner.
* Unless otherwise specified, the warranty periods shall begin after the Certificate of Acceptance is issued for the Contract.

* 1. **Submittals**
     1. Product Data

The following product data is required from the pipe supplier and/or fusion provider:

* + - * Pipe Size
      * Dimensionality
      * Pressure Class per applicable standard and as shown on plans
      * Color
      * Recommended Minimum Bending Radius
      * Recommended Maximum Safe Pull Force
      * Fusion technician qualification indicating conformance with this specification
    1. Work Plan

The following work plan and information is required from the contractor and/or slipline installer. This work plan and information shall also be supplied to the pipe supplier, should it be requested:

* + - * Work plan shall include for each sliplining installation all excavation locations, interfering utilities, excavation dimensions, temporary water and traffic control schematics.
      * At least 2 weeks prior to the start of work, the Contractor shall submit its sliplining schedule identifying daily work hours and working dates for each installation.
      * Grout design mixes, installation plan, and contingency plan for the annular space grout to be used, if grout is to be used for annular space fill.

**Part 3: Product**

* 1. **Pipe**

As specified in Section 1.2 of this specification.

* 1. **Grout**
     + Grout for use as a filler of the annular space between the new pipe and the host pipe shall be a low-density, highly flowable mix. Grout shall meet the compressive strength requirements for the installation per the contract documents.
     + Testing requirements shall be in accordance with the contract documents. Contractor may incorporate grout additives to improve its flow properties, provided that strength property requirements are met.

**3.3 Pipe Pull Heads**

* + - Pipe pull heads, if utilized, shall employ a positive through-bolt design assuring a smooth walled bolt against the pipe cross-section at all times.
    - Pipe pull heads shall be specifically designed for use with the new pipe, and shall be as recommended by the pipe supplier.

**3.4 Pipe Rollers**

* + - 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.

**Part 4: Execution**

* 1. **Delivery and Off-Loading**
     + All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the Owner or Engineer.
     + Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify Owner or Engineer immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color, and type.
     + Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all of the pipe supplier’s guidelines shall be followed.
     + Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.
     + During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.
     + If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to insure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.
  2. **Handling and Storage**
     + Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the

suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the Owner or Engineer.

* + - Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the Owner or Engineer.
    - Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.
    - Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.
    - If pipe is to be stored for periods of 1 year or longer, the pipe should be shaded or otherwise shielded from direct sunlight. Covering of the pipe, which allows for temperature build-up, is strictly prohibited. Pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.
    - Pipe shall be stored and stacked per the pipe supplier’s guidelines.
  1. **Pipe Cleaning** 
     + 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.
     + Hazardous materials shall be removed and disposed of per all applicable regulations.
     + All pipelines 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. Any potentially deleterious areas of the host pipe should be removed or secured in place, prior to the insertion of the new pipe.
  2. **TV Inspection**
     + The host pipe shall be inspected by TV after and possibly during the cleaning process in accordance with these specifications.
       - TV inspection after host pipe cleaning shall indicate condition of host pipe and suitability of host pipe for new pipe insertion.
       - Obstructions such as corporation taps, valves and valve bodies, and collapsed piping shall be remedied prior to insertion. Spot repairs shall be made in accordance with the drawings and these specifications.
  3. **Pipe Insertion and Installation** 
     1. Excavation and Access Pits
        + Location of the excavation pits shall be submitted to the Engineer prior to construction.
        + Access pit length shall be such that the minimum bending radius for the new pipe, per the pipe supplier is maintained. Sheeting, shoring and bracing requirements shall be in accordance with these specifications and applicable jurisdictional standards.
        + Access pit excavations shall be performed at all points where the new pipe will be inserted into the existing pipeline. When possible, access pit excavations shall coincide with host pipe lateral connection points or other appurtenance installations.
     2. Pulling Equipment
        + The pulling mechanism shall be properly connected to the end of the new pipe via a pulling head or arrangement approved by the pipe supplier.
        + The maximum pulling tension on the new pipe shall not exceed the pipe supplier’s safe pulling force as submitted for this project.
        + Immediately following the completion of an installation by sliplining, 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 insertion pit on the other side of the installation from the pulling equipment.
     3. Pipe Care
        + The pipe shall be handled with care to minimize the possibility of it being cut, kinked, gouged, or otherwise damaged. The use of cables or hooks will not be permitted.
        + Sections of the pipe damaged, cut, or gouged shall be repaired by cutting out the section of damaged pipe and rejoining.
  4. **Annular Space Grouting**
     + If required, the annular space between the outside of the new pipe and the inside of the existing host pipe shall be filled with a flowable grout in accordance with the contract documents.
     + Samples of grout shall be obtained in accordance with ASTM C495. One set of four standard cylinders shall be cast for each batch. Special handling and sampling procedures shall be followed if indicated by the grout manufacturer. The samples must meet the design compressive strength of the grout as outlined

in this specification and per the grout manufacturer. Samples shall be tested in accordance with ASTM C495.

* + - Grouting of the annular space shall be done in such a manner as to prevent damage, floating, or collapse of the new pipe. Grouting operations shall be properly vented. If the distance between grout points exceeds the Contractor's pumping capability additional grouting points shall be excavated. The new pipe at access pits, service connections, and grouting points shall not be grouted above the springline of the existing host pipe.
    - The new pipe shall be filled with water prior to the grouting procedure. This shall aid in keeping the new pipe from floating or collapsing during grouting operation and also aid in dissipating the heat of hydration and its effects on the new pipe as the grout cures. This can be done in coordination with the testing performed on the new pipe.
  1. **Preparation Prior to Making Connections Into Existing Piping Systems**

Approximate locations for existing piping systems are shown in the construction documents. Prior to making connections into existing piping systems, the contractor shall:

* + - * Field verify location, size, piping material, and piping system of the existing pipe.
      * Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents.
      * Have installed all temporary pumps and/or pipes in accordance with established connection plans.
    - Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.
  1. **Pipe System Connections**

Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer’s guidelines and as indicated in the construction documents.

* 1. **Tapping for Potable Water Applications**
* Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C605. Tapping shall be performed only with use of tap saddles or sleeves. NO DIRECT TAPPING WILL BE PERMITTED. Tapping shall be performed in accordance with the applicable sections for Saddle Tapping per Uni-Pub-8.
* All connections requiring a larger diameter than that recommended by the pipe supplier, shall be made with a pipe connection as specified and indicated on the drawings.
* Equipment used for tapping shall be made specifically for tapping PVC pipe:
  + - * + 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.
        + Manually operated or power operated drilling machines may be used.
        + Taps may be performed while the pipeline is filled with water and under pressure (‘wet’ tap,) or when the pipeline is not filled with water and not under pressure (‘dry’ tap).
  1. **Testing**

Testing shall comply with all applicable jurisdictional building codes, statutes, standards, regulations, and laws.

* + 1. Hydrostatic Testing and Leakage Testing for Pressure Piping

All hydrostatic and leakage testing shall be in accordance to Sec 506.5 COD (Hydrostatic Test) as specified in City of Dallas Addendum to the North Central Texas Council of Governments (NCTCOG) Public Works Construction Standards, Latest Edition.

* + - * In preparation for pressure testing the following parameters must be followed:
        + All air must be vented from the pipeline prior to pressurization. This may be accomplished with the use of the air relief valves or corporation stop valves, vent piping in the testing hardware or end caps, or any other method which adequately allows air to escape the pipeline at all high points. Venting may also be accomplished by ‘flushing’ the pipeline in accordance with the parameters and procedures as described in AWWA C605.
        + The pipeline must be fully restrained prior to pressurization. This includes complete installation of all mechanical restraints per the restraint manufacturer’s guidelines, whether permanent or temporary to the final installation. This also includes the installation and curing of any and all required thrust blocking. All appurtenances included in the pressure test, including valves, blow-offs, and air-relief valves shall be checked for proper installation and restraint prior to beginning the test.
        + Temporary pipeline alignments that are being tested, such as those that are partially installed in their permanent location shall be configured to minimize the amount of potentially trapped air in the pipeline.
    1. Disinfection of the Pipeline for Potable Water Piping

Once all pipe work is completed to the satisfaction of the Construction Manager, Dallas Water Utilities shall perform, as required, chlorine disinfection, sampling and analysis of the newly installed liner in accordance with the specifications and/or as ordered by the Engineer.

* + 1. Partial Testing

Segments of the pipe may be tested separately in accordance with standard testing procedure, as approved by the owner and engineer.

**Part 5: Method of Measurement and Payment**

Method of Measurement and Payment for the work included in this section will be in accordance with the payment schedule in the Bid Proposal.

**\*\*END OF SECTION\*\***