



Designation: F1743 – 22

Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled- in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)¹

This standard is issued under the fixed designation F1743; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This practice describes the procedures for the reconstruction of pipelines and conduits (2 in. to 96 in. (5 cm to 244 cm) diameter) by the pulled-in-place installation of a resin-impregnated, flexible fabric tube into an existing conduit and secondarily inflated through the inversion of a calibration hose by the use of a hydrostatic head or air pressure (see Fig. 1). The resin is cured by circulating hot water, by the introduction of controlled steam into the tube, or by photoinitiated reaction. When cured, the finished cured-in-place pipe will be continuous and tight fitting. This reconstruction process may be used in a variety of gravity and pressure applications such as sanitary sewers, storm sewers, process piping, electrical conduits, and ventilation systems.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

NOTE 1—There are no ISO standards covering the primary subject matter of this practice.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This practice is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.67 on Trenchless Plastic Pipeline Technology.

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2. Referenced Documents

2.1 ASTM Standards:²

- C1920 Practice for Cleaning of Vitrified Clay Sanitary Sewer Pipelines
- D543 Practices for Evaluating the Resistance of Plastics to Chemical Reagents
- D638 Test Method for Tensile Properties of Plastics
- D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- D903 Test Method for Peel or Stripping Strength of Adhesive Bonds
- D1600 Terminology for Abbreviated Terms Relating to Plastics
- D1682 Test Method for Breaking Load and Elongation of Textile Fabric (Withdrawn 1992)³
- D3039/D3039M Test Method for Tensile Properties of Polymer Matrix Composite Materials
- D3567 Practice for Determining Dimensions of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings
- D4814 Specification for Automotive Spark-Ignition Engine Fuel
- D5813 Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems
- E797 Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method
- F412 Terminology Relating to Plastic Piping Systems
- F1216 Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube

2.2 AWWA Standard:⁴

- M28 Manual on Cleaning and Lining Water Mains⁴

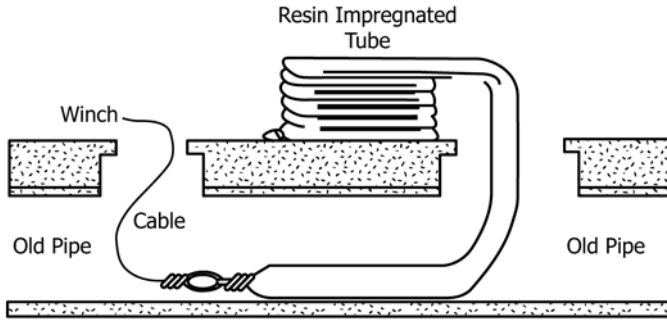
² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American Water Works Association (AWWA), 6666 W. Quincy Ave., Denver, CO 80235, <http://www.awwa.org>.

*A Summary of Changes section appears at the end of this standard

Step 1 – Pull resin-impregnated tube into existing pipe.



Step 2 – Calibration hose inversion

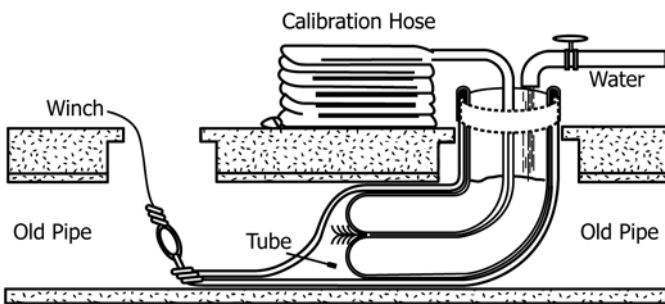


FIG. 1 Cured-in-Place Pipe Installation Methods

2.3 NASSCO Standard:⁵

Recommended Specifications for Sewer Collection System Rehabilitation

3. Terminology

3.1 *General*—Definitions are in accordance with Terminology F412. Abbreviations are in accordance with Terminology D1600, unless otherwise indicated.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *calibration hose*—an impermeable bladder which is inverted within the resin-impregnated fabric tube by hydrostatic head or air pressure and may optionally be removed or remain in place as a permanent part of the installed cured-in-place pipe as described in 5.2.2.

3.2.2 *cured-in-place pipe (CIPP)*—a hollow cylinder consisting of a fabric tube with cured (cross-linked) thermosetting resin. Interior or exterior plastic coatings, or both, may be included. The CIPP is formed within an existing pipe and takes the shape of and fits tightly to the pipe.

3.2.3 *delamination*—separation of layers of the CIPP.

3.2.4 *dry spot*—an area of fabric of the finished CIPP which is deficient or devoid of resin.

3.2.5 *fabric tube*—flexible needled felt, or equivalent, woven or nonwoven material(s), or both, formed into a tubular shape which during the installation process is saturated with resin and holds the resin in place during the installation and curing process.

3.2.6 *inversion*—the process of turning the calibration hose inside out by the use of water pressure or air pressure.

3.2.7 *lift*—a portion of the CIPP that is a departure from the existing conduit wall forming a section of reverse curvature in the CIPP.

3.2.8 *photoinitiated reaction*—The polymerization of a resin system initiated by light or other electromagnetic radiation.

4. Significance and Use

4.1 This practice is for use by designers and specifiers, regulatory agencies, owners, and inspection organizations who are involved in the rehabilitation of conduits through the use of a resin-impregnated fabric tube pulled-in-place through an existing conduit and secondarily inflated through the inversion of a calibration hose. Modifications may be required for specific job conditions.

5. Recommended Materials and Manufacture

5.1 *General*—The resins, fabric tube, tube coatings, or other materials, such as the permanent calibration hose when combined as a composite structure, shall produce CIPP that meets the requirements of this specification.

5.2 *CIPP Wall Composition*—The wall shall consist of a plastic coated fabric tube filled with a thermosetting (cross-linked) resin, and if used, a filler.

5.2.1 *Fabric Tube*—The fabric tube should consist of one or more layers of flexible needled felt, or equivalent, woven or nonwoven material(s), or both, capable of carrying resin, withstanding installation pressures, and curing temperatures. The material(s) of construction should be able to stretch to fit irregular pipe sections and negotiate bends. Longitudinal and circumferential joints between multiple layers of fabric should be staggered so as not to overlap. The outside layer of the fabric tube should have an impermeable flexible coating(s) whose function is to contain the resin during and after fabric tube impregnation. The outer coating(s) must facilitate monitoring of resin saturation of the material(s) of construction of the fabric tube. The fabric tube should be fabricated to a size that, when installed, will tightly fit the internal circumference and the length of the original conduit. Allowance should be made for circumferential and longitudinal stretching of the fabric tube during installation. As required, the fabric tube should meet minimum tensile strength requirements in the longitudinal and transverse directions as specified in 7.1. All the material(s) of construction for the fabric tube should be compatible with the resin system used.

5.2.2 Calibration Hose:

5.2.2.1 *Removable Calibration Hose*—The removable calibration hose should consist of an impermeable plastic, or impermeable plastic coating(s) on flexible woven or nonwoven

⁵ Available from the National Association of Sewer Service Companies, NASSCO 11521 Cronridge Drive, Suite J Owings Mills, MD 21117, <http://www.nassco.org>.