



Designation: F 1947 – 98

An American National Standard

Standard Practice for Installation of Folded Poly (Vinyl Chloride) (PVC) Pipe into Existing Sewers and Conduits¹

This standard is issued under the fixed designation F 1947; 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 rehabilitation of sewer lines and conduits (4 to 15 in. diameter) by the insertion of a folded PVC pipe, which is heated, pressurized, and expanded against the interior surface of an existing pipe with either a mechanical rounding device or steam pressure. The finished PVC pipe will be continuous and conform to the existing conduit. This rehabilitation process can be used in a variety of gravity applications, such as sanitary sewers, storm sewers and process piping.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are provided for information purposes only.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- D 790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials²
- D 1600 Terminology for Abbreviated Terms Relating to Plastics²
- D 1784 Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds²
- D 2122 Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings³
- F 412 Terminology Relating to Plastic Piping Systems³
- F 1417 Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air³

¹ This practice is under the jurisdiction of ASTM Committee F-17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.67 on Trenchless Plastic Pipeline Technology.

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² Annual Book of ASTM Standards, Vol 08.01.

³ Annual Book of ASTM Standards, Vol 08.04.

F 1504 Specification for Folded Poly (Vinyl Chloride) (PVC) Pipe for Existing Sewer and Conduit Rehabilitation³

2.2 NASSCO Standard:

Recommended Specifications for Sewer Collection System Rehabilitation⁴

3. Terminology

3.1 *Definitions*— Terminology used in this practice is in conformance with Terminology F 412 and abbreviations used in this practice are in accordance with Terminology D 1600, unless otherwise indicated.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *containment tube, n*—an optional elastomeric material placed between the folded pipe and the existing pipe to protect the folded pipe during insertion, for containment of steam during the installation process, and to provide a waterproof barrier against infiltration, inflow and standing water. This tube remains within the pipe but provides no structural support.

3.2.2 *dimples (dimpling), n*—Where a side connection meets the existing pipe, there is not existing pipe support for the PVC pipe during expansion causing a point of thermoplastic pipe expansion slightly beyond the existing pipe wall. This formation of an external departure from the formed pipe wall is termed dimpling.

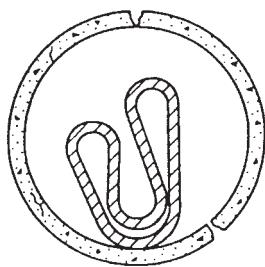
3.2.3 *folded pipe, n*—PVC pipe that has been manufactured in a folded shape for use in existing pipeline rehabilitation (see Fig. 1).

3.2.4 *formed pipe, n*—folded pipe that has been inserted into an existing sewer or conduit and expanded with heat, pressure, and, if applicable, a rounding device to conform to and take the shape of the existing pipe (see Fig. 1).

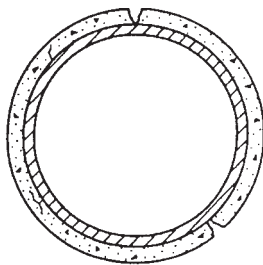
3.2.5 *insertion point, n*—an existing manhole, existing access shaft or an excavated pit that serves as the point of entrance for the folded pipe into the existing pipe.

3.2.6 *rounded field sample, n*—a rounded field sample is formed when the folded pipe has been inserted into a mold pipe and expanded with heat and pressure to conform to the mold pipe.

⁴ Available from NASSCO, 140 Circle Drive, Suite 103, Maitland, FL 32751.



Folded Pipe Section



Formed Pipe Section

NOTE 1—This figure is intended only for clarification of terms specific to this practice and shows a representative folded pipe shape. Other folded pipe shapes may meet the requirements of this practice.

FIG. 1 Folded Pipe and Formed Pipe, Clarification of Terms

3.2.7 *rounding device, n*—a flexible, bullet-shaped device, which may be used to unfold and expand the folded pipe tightly against the wall of the existing pipe.

3.2.8 *termination point, n*—an existing manhole, existing access shaft or an excavated pit that serves as the point of exit of the folded pipe from the existing pipe.

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 nonpressure sewers and conduits.

5. Materials

5.1 The folded poly (vinyl chloride) (PVC) pipe shall be in accordance with Specification F 1504.

5.2 The folded pipe shall be spooled in a continuous length for storage and shipping to the job site. Handling and storing shall be in accordance with the manufacturer's published recommendations.

5.3 The optional containment tube should be an elastomeric material capable of containing the steam required to process the folded pipe and serve as a protective waterproofing barrier. The containment tube shall be compatible with the PVC compound, the folded pipe installation process, and the existing pipe so as not to effect the properties of the finished pipe.

6. Installation Recommendations

6.1 Cleaning and Inspection:

6.1.1 Prior to entering access areas such as manholes, and performing inspection or cleaning operations, an evaluation of the atmosphere to determine the presence of toxic or flammable vapors or lack of oxygen must be undertaken in accordance with local, state, or federal safety regulations.

6.1.2 *Cleaning of Pipeline*—Internal debris shall be removed from the existing pipeline. The pipeline should be cleaned with hydraulically-powered equipment, high-velocity jet cleaners, or mechanically-powered equipment in accordance with NASSCO Recommended Specifications for Sewer Collection System Rehabilitation.

6.1.3 *Inspection of Pipelines*—Inspection of pipelines shall be performed by experienced personnel trained in locating

breaks, obstacles, and service connections by closed circuit television. The interior of the pipeline shall be inspected carefully to determine the location of any conditions that may prevent proper installation of the folded pipe, such as protruding service taps, collapsed or crushed pipe, out-of-roundness, significant line sags, and deflected joints. These conditions should be noted and corrected prior to installation.

6.1.4 *Line Obstructions*—The existing pipeline shall be clear of obstructions that will prevent the proper insertion and full expansion of the folded pipe such as offset joints of more than 12.5 % of inside pipe diameter, service connections that protrude into the pipe more than 12.5 % of the inside pipe diameter or 1 in. (25 mm), whichever is less; and, other reductions in cross-sectional area of more than 16 % based on the inside diameter of the existing pipe. If inspection reveals an obstruction that cannot be removed by conventional equipment, then a point repair excavation shall be made to uncover and remove or repair the obstruction. Typically, bends along the pipe length in excess of 30° and changes in pipe size cannot be accommodated along an insertion length of the folded pipe. Such conditions require access at these points for termination and start of a new insertion.

NOTE 1—Some processes may accommodate larger obstructions. Consult the product manufacturer for applications which exceed these typical limitations.

6.2 *Bypassing*—If flow can not be interrupted for the necessary duration, bypassing of the flow is required around the sections of the existing pipe designated for rehabilitation. The bypass should be made by plugging the line at a point upstream of the pipe to be reconstructed and pumping the flow to a downstream point or adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle any extreme flows expected during the installation period. Services within the rehabilitation area will be out of service temporarily.

NOTE 2—Public advisory services will be required to notify all parties whose service laterals will be out of commission and to advise against water usage until the mainline is back in service.

6.3 Insertion:

6.3.1 The spool of folded shall be positioned near the insertion point and contained in a heating chamber. A temperature, as recommended by the manufacturer shall be maintained in the heating chamber for a minimum of 1 h to fully heat the length of folded pipe to be inserted. Shorter insertion lengths may be fully heated over a shorter time period as recommended by the manufacturer.

6.3.2 A containment tube then may be pulled through the existing conduit, secured at both ends, and inflated with air at low pressure.

NOTE 3—The containment tube allows for thorough and even heating of the folded pipe by providing a barrier between the folded pipe and infiltration or standing water in the existing pipeline.

6.3.3 A cable shall be strung through the existing conduit (and containment tube, if applicable) and attached to the folded pipe. The folded pipe shall be heated along the entire length and pulled, with a power winch unit and the cable, directly from the spool, through the insertion point, through the