Designation: F 1697 – 07

An American National Standard

Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Strip for Machine Spiral-Wound Liner Pipe Rehabilitation of Existing Sewers and Conduit[1, 2]

This standard is issued under the fixed designation F 1697; 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 specification covers requirements and test methods for materials, dimensions, workmanship, stiffness factor, extrusion quality, and a form of marking for extruded poly(vinyl chloride) (PVC) profile strips used for machinemade field fabrication of spirally wound pipe liners in the rehabilitation of a variety of gravity applications such as sanitary sewers, storm sewers, and process piping in diameters of 6 to 180 in. and for similar sizes of non-circular pipelines such as arched or oval shapes and rectangular shapes.

1.2 Profile strip produced to this specification is for use in field fabrication of spirally wound liner pipes in nonpressure sewer and conduit rehabilitation, where the spirally wound liner pipe is expanded until it presses against the interior surface of the existing sewer or conduit, or, alternatively, where the spirally wound liner pipe is inserted as a fixed diameter into the existing sewer or conduit and the annular space between the liner pipe and the existing sewer or conduit is grouted.

1.3 This specification includes extruded profile strips made only from materials specified in 5.1.

1.4 The values in parentheses are provided for information only.

1.5 The following precautionary caveat pertains only to the test method portion, Section 11, of this specification: *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:* [3]

A 167 Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

A 176 Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip

A 653/A 653M Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

A 879/A 879M Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface

A 924/A 924M Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

D 618 Practice for Conditioning Plastics for Testing

D 790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

D 883 Terminology Relating to Plastics

D 1600 Terminology for Abbreviated Terms Relating to Plastics

D 1784 Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

D 2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

D 2152 Test Method for Adequacy of Fusion of Extruded Poly(Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion

F 412 Terminology Relating to Plastic Piping Systems

F 1741 Practice for Installation of Machine Spiral Wound Poly (Vinyl Chloride) (PVC) Liner Pipe for Rehabilitation of Existing Sewers and Conduits

2.2 *Federal Standard:*

Federal Standard No. 123 Marking for Shipment (Civil Agencies)[4]

[1] This specification 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] The rehabilitation of existing pipelines and conduits by the insertion of a spiral wound liner pipe is covered by patents. (RibLoc Group Limited, Dry Creek, South Australia, Australia and Danby of North America, Inc., Cary, NC, USA). Interested parties are invited to submit information regarding the identification of acceptable alternatives to this patented item to the Committee on Standards, ASTM Headquarters, 100 Barr Harbor Drive, West Conshohocken, PA 19428-29590. Your comments will receive careful consideration at a meeting of the responsible technical committee which you may attend.

[3] 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.

[4] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

2.3 *Military Standard:*
MIL-STD-129 Marking for Shipment and Storage[4]

3. Terminology

3.1 *General*—Definitions are in accordance with Terminologies D 883 and F 412. Abbreviations are in accordance with Terminology D 1600, unless otherwise indicated.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *extruded PVC profile strips*—a product, available in various widths, consisting of a smooth inside surface and a ribbed outer surface with mechanically locked male and female edges which are self interlocking, or separate locking strips which serve the same purpose. Type A and Type B are different profiles and are installed by different installation methods. (See Fig. 1 and Table 1 for Type A and Fig. 2 and Table 2 for Type B.)

3.2.2 *non-circular pipe*—arched, oval or rectangular, or a combination thereof, shaped pipes.

3.2.3 *production run*—a continuous extrusion of a given profile type.

3.2.4 *spirally wound liner pipe*—a product field fabricated from extruded PVC profile strip into a round , or non-circular shape such as arched or oval or rectangular pipe (see Fig. 3).

3.2.5 *steel reinforcement*—a shaped steel strip or clip inserted into the inside of the PVC profile to provide additional reinforcement and stiffening (See Fig. 4 and Fig. 5.)

4. Application of Materials

4.1 The profile strip designations specified in Table 1 may be used for a range of existing sewer and conduit diameters. The selection of the profile designation to be used should be determined based on analysis of installation conditions.

4.2 The steel reinforcing strips shall be used to reinforce the extruded PVC profile strip where required by the design conditions, such as for pipes under high soil, surcharge or live loads throughout the design life. The steel reinforcing strips shall be used to maintain the profile position during grouting of non-circular pipes.

5. Materials and Manufacture

5.1 *PVC Materials*—The extruded profile strip shall be made from PVC compound meeting all the minimum requirements for Cell Classifications 12344 or 13454 or higher, as defined in Specification D 1784.

5.2 *Steel Materials*—The steel reinforcing strip shall be made of zinc-galvanized coated steel or stainless steel as defined in Specifications A 879/A 879M, A 167, A 176, A 924/A 924M or A 653/A 653M.

5.3 *Rework Material*—Clean rework material generated from the manufacturer's own extruded PVC strip production may be used by the same manufacturer provided extruded profile strip produced meets all the requirements of this specification.

6. Other Requirements

6.1 *Stiffness Factor*—Stiffness factor values for the extruded profile strip shall comply with Table 1 when tested in accordance with 11.3.

6.2 *Acetone Immersion*—The profile strip shall not flake or disintegrate when tested in accordance with 11.4.

NOTE 1—This is intended only for use as a quality control test and not for use as a simulated service test.

7. Dimensions and Permissible Variation

7.1 *Width of Profile Strip*—The width of the profile strip shall meet the requirements given in Table 1 when measured in accordance with 11.2.1.

7.2 *Height of Profile Strip*—The height of the profile strip shall meet the requirements given in Table 1 when measured in accordance with 11.2.2.

7.3 *Waterway Wall Thickness*—The waterway wall thickness of the profile strip shall meet the requirements given in Table 1 when measured in accordance with 11.2.3.

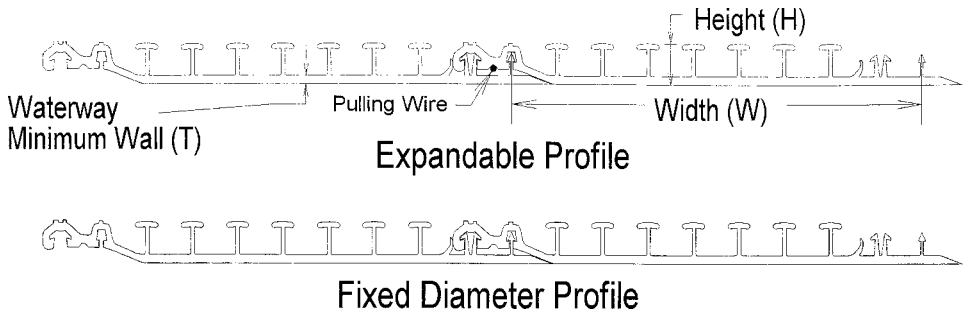
8. Workmanship, Finish, and Appearance

8.1 The extruded profile strip shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. The extruded profile strip shall be as uniform as commercially practical in color, opacity, density, and other physical properties.

9. Significance and Use

9.1 The requirements of this specification are intended to provide extruded PVC profile strip suitable for the field fabrication of spirally wound liner pipe for the rehabilitation of existing pipelines and conduits conveying sewage, process flow, and storm water under gravity flow conditions.

NOTE 2—Industrial waste disposal lines should be installed only with



NOTE 1—For values of width, height, and waterway minimum wall, see Table 1.

FIG. 1 Type A-Typical PVC Profile Strip

TABLE 1 Type A-Typical Profile Strip Dimensions and Stiffness Factors

Profile Type	Minimum Width, W		Minimum Height, H		Waterway Minimum Wall, T		Minimum Stiffness Factor, (EI)[B]	
	in.	(mm)	in.	(mm)	in.	(mm)	$in.^3$-lbf/$in.^2$	(MPa-mm^3)
1	2.00	(51.0)	0.216	(5.5)	0.063	(1.60)	188.0	(21.2 × 10^3)
2	3.14	(80.0)	0.314	(8.0)	0.063	(1.60)	561	(63.4 × 10^3)
3	4.76	(121.0)	0.511	(13.0)	0.083	(2.10)	2148	(242.7 × 10^3)
4	4.33	(110.0)	0.480	(12.2)	0.040	(1.00)	1600.0	(180.8 × 10^3)
5	8.00	(203.2)	0.488	(12.4)	0.060	(1.50)	1600.0	(180.8 × 10^3)
6	12.00	(304.8)	0.488	(12.4)	0.060	(1.50)	1600.0	(180.8 × 10^3)

[B]Stiffness factor listed is the minimum value that will be provided by the manufacturer for the given profile type.

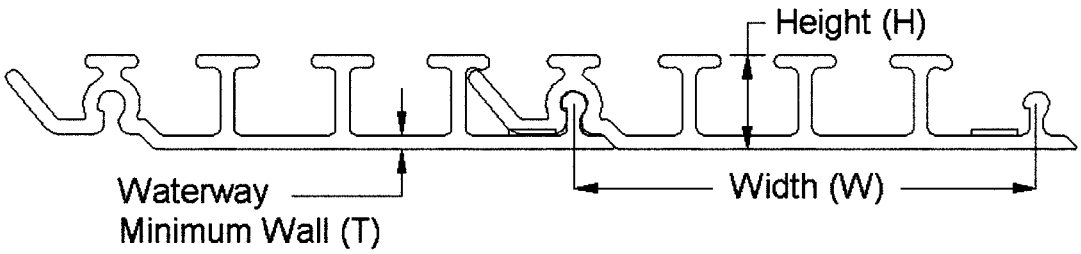


FIG. 2 Type B-Typical PVC Profile Strip

TABLE 2 Type B-Typical Profile Strip Dimensions and Stiffness Factors

Profile Type	Minimum Width, W		Minimum Height, H		Waterway Minimum Wall, T		Minimum Stiffness Factor, (EI)[B]	
	in.	(mm)	in.	(mm)	in.	(mm)	$in.^3$-lbf/$in.^2$	(MPa-mm^3)
1	3.19	(81.0)	0.32	(8.10)	0.05	(1.44)	362.5	40955
2	3.08	(78.3)	0.42	(10.71)	0.06	(1.62)	745.0	84127
3	2.83	(72.0)	0.58	(14.67)	0.09	(2.34)	1946.3	219900
4	2.80	(71.1)	0.76	(19.35)	0.012	(3.06)	3971.0	448656
5	2.81	(71.28)	1.12	(28.53)	0.015	(3.69)	14116.0	1594900
6	3.60	(91.44)	0.56	(14.22)	0.06	(1.440)	1513.8	171042

[B]Stiffness factor listed is the minimum value that will be provided by the manufacturer for the given profile type.

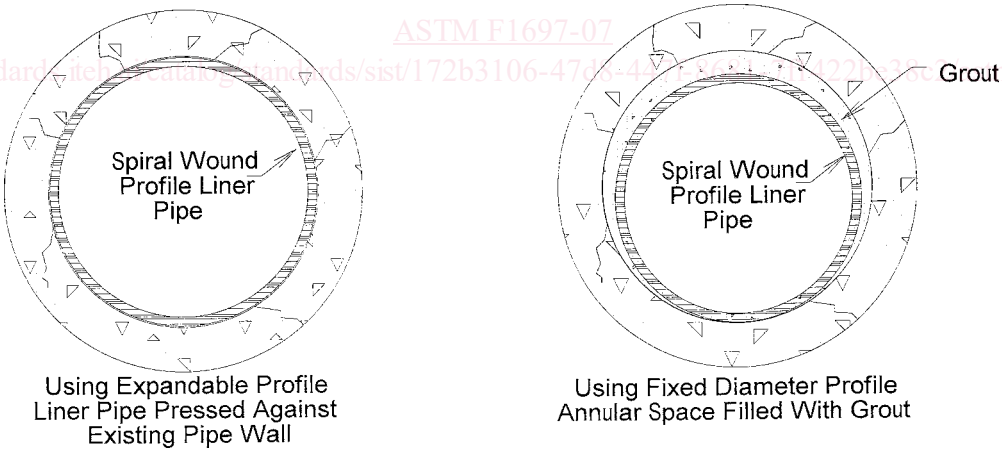


FIG. 3 Typical Spiral-Wound Liner Pipe

the specific approval of the cognizant code authority since chemicals not commonly found in drains and sewers and temperatures in excess of 140°F (60°C) may be encountered.

10. Sampling

10.1 Samples of extruded profile strip of sufficient length to conduct the necessary quality control tests shall be cut from each extrusion production run of a given profile designation.

10.2 The frequency of sampling shall be as agreed upon between the purchaser and the seller.

10.3 Initial and retest samples shall be drawn from the same production run.

11. Test Methods

11.1 *Test Conditions*—Conduct tests in the standard laboratory atmosphere of 73.4 ± 3.6°F (23 ± 2°C) and 50 ± 5 % relative humidity, with test specimens conditioned in accordance with Procedure A of Practice D 618, unless otherwise specified in the test methods or in this specification.