Designation: F1735 – 09 (Reapproved 2015)

Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Strip for PVC Liners for Rehabilitation of Existing Man-Entry Sewers and Conduits[1]

This standard is issued under the fixed designation F1735; 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, extrusion quality, and a form of marking for extruded poly (vinyl chloride) (PVC) profile strips used for field fabrication of PVC liners for existing man-entry (36 to 144 in. (900 to 3650 mm) in vertical dimension) sewer and conduit rehabilitation.

1.2 Profile strip produced to this specification is for use in field fabrication of PVC liners in non-pressure pipe and conduit rehabilitation where the liner is installed into the existing sewer or conduit and the annular space between the liner and the existing sewer or conduit is grouted with cementitious grout.

NOTE 1—The practice for the installation of PVC liner covered by this specification is Practice F1698.

1.3 This specification includes extruded profile strips made only from materials specified in 6.1.

1.4 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.

1.5 *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:*[2]

D618 Practice for Conditioning Plastics for Testing

D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

D883 Terminology Relating to Plastics

D1600 Terminology for Abbreviated Terms Relating to Plastics

D1784 Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

D2152 Test Method for Adequacy of Fusion of Extruded Poly(Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion

D2240 Test Method for Rubber Property—Durometer Hardness

F412 Terminology Relating to Plastic Piping Systems

F1698 Practice for Installation of Poly(Vinyl Chloride)(PVC) Profile Strip Liner and Cementitious Grout for Rehabilitation of Existing Man-Entry Sewers and Conduits

2.2 *Federal Standard:*

Federal Standard No. 123 Marking For Shipment (Civil Agencies)[3]

2.3 *Military Standard:*

MIL-STD-129 Marking for Shipment and Storage[3]

3. Terminology

3.1 *General*—Definitions are in accordance with Terminology D883 and Terminology F412. Abbreviations are in accordance with Terminology D1600, unless otherwise indicated.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 See Fig. 1 to clarify terminology.

3.2.2 *coextruded elastomer seal, n*—a elastomer coextruded in the joiner strip to provide compression sealing of the mechanical joint made when the joiner strip locks adjacent edges of former strip.

3.2.3 *extruded PVC joiner strip, n*—a companion product to the profile former strip of such configuration as to provide the locking mechanism at the edges of the former strips.

3.2.4 *extruded PVC profile former strip, n*—a product, available in various sizes, consisting of a smooth inner surface

[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.

Current edition approved March 1, 2015. Published April 2015. Originally approved in 1996. Last previous edition approved in 2009 as F1735 - 09. DOI: 10.1520/F1735-09R15.

[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] Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, http://quicksearch.dla.mil.

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

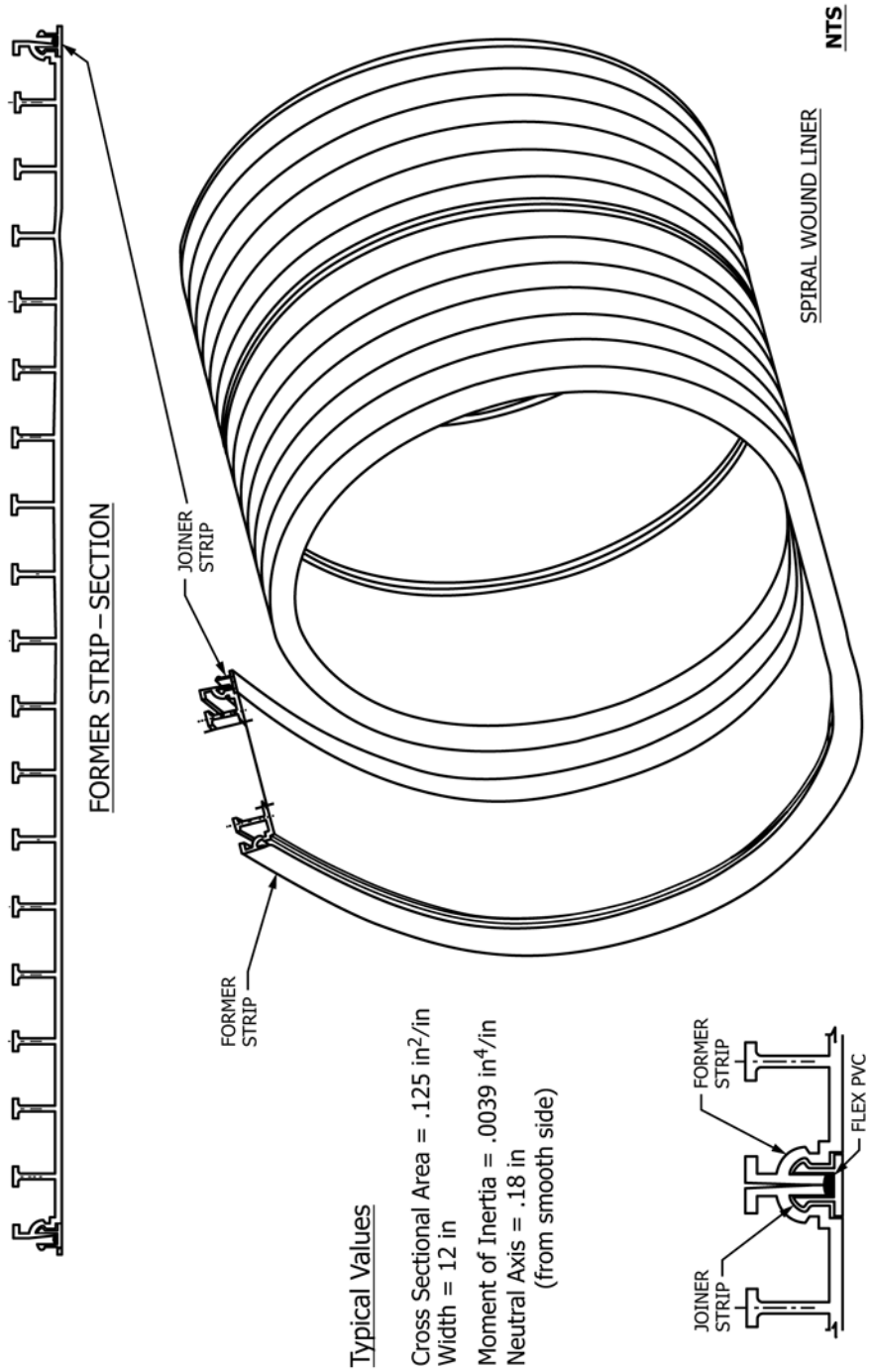

FIG. 1 An Example of A Profile PVC Strip

and a ribbed outer surface (profile) with edge configurations to allow mechanical locking of adjacent strips.

3.2.5 *production run, n*—a continuous extrusion of a given profile type.

3.2.6 *PVC liner, n*—a product field fabricated from extruded PVC profile strip into a shape which substantially conforms to the shape of the inner surface of the existing pipe or conduit over some portion or all of its inner circumference.

4. Significance and Use

4.1 The requirements of this specification are intended to provide extruded PVC profile suitable for the field fabrication of PVC liner 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 shall be installed only with 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.

5. Application of Materials

5.1 The profile strip specified herein can be used for a range of existing sewer and conduit diameters. The selection of the annulus between the PVC liner and the host structure shall be determined based on analysis of installation conditions.

6. Materials and Manufacture

6.1 The extruded profile former and joiner strips shall be made from PVC compound meeting all the minimum requirements for cell classification 12344 or higher as defined in Specification D1784.

6.2 The elastomer seal shall be made from extrusion grade elastomer with Shore A durometer of 65 (+5 to –5), when measured in accordance with Test Method D2240.

6.3 *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.

7. Other Requirements

7.1 *Acetone Immersion*—The profile strip shall not flake or disintegrate when tested in accordance with 11.3.

NOTE 3—This is intended only for use as a quality control test and not for use as a simulated service test.

7.2 *Flexural (Bending) Properties*—The flexural rigidity (stiffness factor) shall be determined in accordance with Test Methods D790, Section on Tangent Modulus of Elasticity, Procedure B, where the equation for E_B is replaced by $EI = L^3m/48\ h$. Procedure B of Test Methods D790 shall be used in these tests. This is a qualification test that shall be performed on each distinct profile product; separate tests shall be performed for each PVC compound used in each distinct profile product. The test specimens shall be made from a flat sample profile former strip at least 12 in. (300 mm) long, split as near the middle of its width as possible without cutting through a rib and the outer edges joined in a joint (approximately in the center of the width of the specimen and running lengthwise) with the joiner strip installed in the joint. The load shall be applied to the profiled (ribbed) side of the specimens. See Fig. 2. The minimum flexural rigidity (stiffness factor) shall be 1600; higher values are available by special order from the manufacturer of the product. If required by the buyer or designated in the contract documents or purchase order, or combination thereof, this test shall be run as a quality control test on each production run supplying materials to the order.

7.3 *Joint Leakage*—A 10 in. (250 mm) sample joint (consisting of a joiner strip joining two full width panels of former strip) shall be pressure tested with water at 15 psig (103.5 kPa) for a maximum 25-h period to simulated ground water leakage into the lined pipe. The maximum leakage through the joint shall be 0.00125 gal (4.7 mL) measured over a 1-h period. The test shall be terminated at the end of any 1-h period during which this requirement is satisfied. This test shall be conducted on each production run of extruded PVC joiner strip with samples from the extruded PVC former strip intended for use with that production run of joiner strip. If higher hydrostatic testing pressures are required by the buyer, additional testing, as agreed between the buyer and seller shall be performed. The test fixture used for this test shall provide for the pressurized water to interface with the joint on the ribbed side of the PVC panels such that the leakage flow is from the ribbed side to the smooth (inner) side of the PVC panels, that is, simulates ground water into liner. Means shall be provided to continuously measure and regulate the water pressure to within 1 psig (6.9 kPa) of the specified 15 psig (103.5 kPa) during the test period.

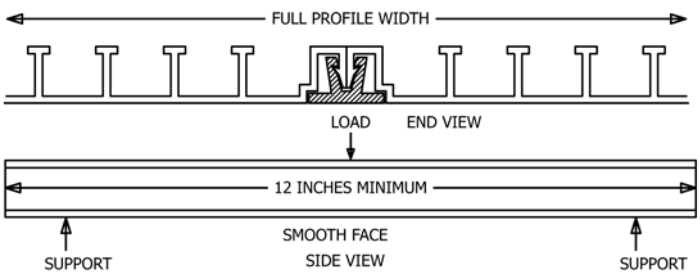

FIG. 2 Stiffness Factor (EI) Test Specimen

8. Dimensions, Mass, and Permissible Variation

8.1 *Height of Profile Former Strip*—The minimum height of the former strip shall be 0.488 in. (12.4 mm) when measured in accordance with 11.2.1

8.2 *Wall Thickness of Profile Former Strip*—The minimum average (arithmetic mean) wall thickness (between ribs) of each extruded former strip sample shall be 0.060 in. (1.5 mm) and no individual measurement being less than 0.055 in. (1.4 mm) when measured in accordance with 11.2.2.

8.3 *Width Tolerance of Former Strip*—The former strips may be produced in various widths as distinct products, for example, produced in nominal 8 in. (200 mm) and nominal 12 in. (300 mm) widths, which are not intended for mixed use in the same application. Tolerances on the nominal width shall be ±2.5 % when measured in accordance with 11.2.3.

8.4 *Thickness of Coextruded Elastomer Seal*—The thickness of the coextruded seal, when measured in accordance with 11.2.4, shall be 0.040 ± 0.015 in. (1.02 ± 0.38 mm).

9. Workmanship, Finish, and Appearance

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

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 by 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 D618, unless otherwise specified in the test methods or in this specification.

11.2 *Extruded Profile Dimensions:*

11.2.1 *Height of Profile Former Strip*—Measure the height of the profile strip in accordance with Section 6 of Test Method D2122 for determining wall thickness. Measurements shall be made from the smooth surface to the outer surface of the ribs.

11.2.2 *Wall Thickness of Profile Former Strip*—Measure the average wall thickness of the cross section in the gaps between ribs in accordance with Section 6 of Test Method D2122.

11.2.3 *Width of Profile Former Strip*—Measure the width of the profile former strip (or panel) in accordance with Section 11 of Test Method D2122.

11.2.4 *Thickness of Coextruded Elastomer Seal*—Measure the thickness of the coextruded elstomer seal with a good quality micrometer using standard machine shop practice.

NOTE 4—Any micrometer of equivalent accuracy to the tubing micrometer specified may be used in these measurements.

11.3 *Acetone Immersion*—Test shall be run in accordance with Test Method D2152 on full width profile strip samples (both former and joiner strips). This procedure is used for determining the extrusion quality of extruded PVC profile strip as indicated by reaction to immersion in anhydrous acetone. It is applicable only for distinguishing between unfused and properly fused PVC.

12. Retest and Rejection

12.1 If the results of any test(s) do not meet the requirements of this specification, the test(s) may be conducted again in accordance with an agreement between the purchaser and the seller. There shall be no agreement to lower the minimum requirement of the specification by such means as omitting tests that are a part of the specification, substituting or modifying a test method, or by changing the specification limits. In retesting, the product requirements of this specification shall be met, and the test methods designated in the specification shall be followed. If, upon retest, failure occurs, the quantity of product represented by the test(s) does not meet the requirements of this specification.

13. Inspection

13.1 Inspection of the material shall be made as agreed upon by the purchaser and the seller as part of the purchase contract.

14. Certification

14.1 When specified in the purchase order or contract, a manufacturer's certification shall be furnished to the purchaser that the material was manufactured, sampled, tested and inspected in accordance with this specification, and has been found to meet the requirements. Each certification so furnished shall be signed by an authorized agent of the manufacturer.

15. Product Marking

15.1 Extruded profile strip in compliance with this specification shall be clearly marked at intervals of 5 ft (1.5 m) or less as follows:

15.1.1 Manufacturer's name or trademark and production code from which plant location, machine and date of manufacture can be identified.

15.1.2 Profile type or manufacturer's product name (if definitive),

15.1.3 The PVC cell classification, for example "12344," and

15.1.4 This designation "Specification F1735."

16. Packaging and Package Marking

16.1 The extruded PVC profile former and joiner strips are normally coiled in a continuous length for storage and shipping. The former strip may also be provided as flat panels cut to custom lengths.

17. Quality Assurance

17.1 When the product is marked with this ASTM designation, F1735, the manufacturer affirms that the product

was manufactured, inspected, sampled, and tested in accordance with this specification and has been found to meet the requirements of the specification.

18. Keywords

18.1 PVC liners; PVC profile strip; sewers

SUPPLEMENTARY REQUIREMENTS

GOVERNMENT/MILITARY PROCUREMENT

These requirements apply only to Federal/Military procurement, not domestic sales or transfers.

S1. *Responsibility for Inspection*—Unless otherwise specified in the contract or purchase order, the producer is responsible for all inspection and test requirements specified herein. The producer may use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless the purchaser disapproves. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections are deemed necessary to ensure that material conforms to prescribed requirements.

NOTE S1.1—In U.S. federal contracts, the contractor is responsible for inspection.

S2. *Packaging and Marking for U.S. Government Procurement:*

S2.1 *Packaging*—Unless otherwise specified in the contract, the materials shall be packaged in accordance with the supplier's standard practice in a manner ensuring arrival at destination in satisfactory condition and which will be acceptable to the carrier at lowest rates. Containers and packing shall comply with Uniform Freight Classification rules or National Motor Freight Classification rules.

S2.2 *Marking*—Marking for shipment shall be in accordance with Fed. Std. No. 123 for civil agencies and MIL-STD-129 for military agencies.

NOTE S2.1—The inclusion of the U.S. Government procurement requirements should not be construed as an indication that the U.S. Government uses or endorses the products described in this specification.

SUMMARY OF CHANGES

Committee F17 has identified the location of selected changes to this standard since the last issue (F1735–02(2008)) that may impact the use of this standard.

(1) 3.2.2, 6.2, 7.2, 7.3, and 8.4 were revised.