Designation: F2158 – 08

AnAmerican National Standard

Standard Specification for Residential Central-Vacuum Tube and Fittings[1]

This standard is issued under the fixed designation F2158; 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 the establishment of requirements and test methods for materials, dimensions and tolerances, flattening resistance and impact resistance of plastic tubing for use in central-vacuum systems for residential buildings.

1.2 All notes and footnotes shall be considered as nonmandatory requirements of the specification.

1.3 This specification does not apply to: inlet valve mounting plates of fittings directly connected to these plates, reducer fittings, mufflers exhaust vents, or flex tubing attached at the power unit location.

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 requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D618 Practice for Conditioning Plastics for Testing

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

D2444 Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)

D2564 Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems

D2749 Symbols for Dimensions of Plastic Pipe Fittings

D5033 Guide for Development of ASTM Standards Relating to Recycling and Use of Recycled Plastics (Withdrawn 2007)[3]

F402 Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings

F412 Terminology Relating to Plastic Piping Systems

3. Terminology

3.1 Definitions are in accordance with Terminology F412, abbreviations are in accordance with Terminology D1600, and dimension symbols are in accordance with Specification D2749.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *central-vacuum tubing, n*—piping used for central-vacuum systems, that is O.D. controlled.

3.2.2 *unaided eye, n*—observable without enhancement beyond correction for normal vision.

4. Significance and Use

4.1 The requirements of this specification are intended to provide tube and fittings for central-vacuum cleaning systems, used to convey debris from the vacuum inlets to the central-vacuum power units.

5. Materials

5.1 *Basic Materials*— The tube and fittings shall be made of virgin plastic having a cell classification of equivalent to or greater than that for poly (vinyl chloride) (PVC) 12454, 13354, and 12223, as defined in Specification D1784. Compounds that have different cell classifications, because one or more properties are superior to those of the specified compounds, are also acceptable.

[1] This specification is under the jurisdiction of ASTM Committee F11 on Vacuum Cleaners and is the direct responsibility of Subcommittee F11.50 on Special Vacuum Cleaner Types.

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[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.

5.2 *Recycled Material*—The use of recycled materials as defined in Guide D5033 is acceptable as long as the material meets the cell classification requirements in 5.1.

5.3 *Solvent Cement*— Where solvent cement is used to join PVC tube and fittings, it shall meet the requirements of Specification D2564.

6. Requirements

6.1 *General*—The tube and fittings shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other defects. They shall be as uniform as commercially practicable in color, opacity, density, and other physical properties.

6.1.1 *Tube and Fitting Flattening* —There shall be no evidence of splitting, cracking, or breaking when the tube and fittings are tested in accordance with 7.4.

6.1.2 *Tube and Fitting Impact Strength* —The impact strength of the tube and fittings at the time of manufacture shall not be less than 20ft·lbf (27 J), when tested in accordance with 7.5.

6.2 *Dimensions and Tolerances:*

6.2.1 *Tube Dimensions*— The tube dimensions shall meet the requirements given in Table 1, when measured in accordance with Test Method D2122.

6.2.1.1 *Tube Length*— The tolerance on the tube length shall be ±½ in. (±12.5 mm).

6.2.2 *Fitting and Tube Hub Dimensions* —The dimensions of fittings and tube hubs shall meet the requirements of Table 2 and Fig. 1, when measured in accordance with Test Method D2122.

6.2.3 *Belled Tube*—For belled tube fabricated from tube sections, the thickness of the belled section shall be considered satisfactory if the bell was formed from tube meeting the requirements of Table 1.

7. Test Methods

7.1 *Sampling*—The selection of tube samples shall be as agreed upon between the purchaser and seller. In case of no prior agreement, samples selected by a testing laboratory shall be deemed adequate.

7.2 *Tube Test Specimens*—For testing in accordance with 7.4 and 7.5, cut each test specimen from the selected tube to a minimum of 6 ± ⅛ in. (152 ± 3.175 mm) in length. Deburr the edges of each specimen on the inner and outer diameter.

7.3 *Conditioning*— For time-of-manufacture testing, conditioning shall be permitted at the ambient temperature and humidity of the manufacturer's facility. For referee purposes, conditioning shall be in accordance with Procedure A of Practice D618.

TABLE 1 Outside Diameters and Tolerances for Vacuum Tubing, in. (mm)

Nominal Tube Size	Wall Thickness			
	max	min	min	max
2	2.005 (50.93)	1.995 (50.67)	0.060 (1.52)	0.070 (1.78)

TABLE 2 Fitting and Tube Hub Dimensions, in. (mm)

Nominal Size	Socket Entrance-Diameter			Socket Bottom-Diameter			Socket Depth, min	Wall Thickness, min[A]
	min[A]	max[A]	OOR	min[A]	max[A]	OOR		
2	2.005 (50.93)	2.015 (51.18)	+0.015 (0.38)	1.990 (50.54)	2.000 (50.8)	+0.015 (0.38)	0.730 (18.54)	0.085 (2.16)

[A] The wall thickness is a minimum value except that a ±10 % variation resulting from core shift is allowed. In such case, the average of the two opposite wall thicknesses shall equal or exceed the value shown in the table.

7.4 *Tube and Fitting Flattening* —Flatten three test specimens between parallel plates in a press until the distance between the plates is 40 % of the outside diameter of the tube or fitting. The rate of loading shall be uniform and such that the flattening is completed within 2 to 5 min. On the removal of the load, the specimen shall pass if no splitting, cracking, or breaking is observed under normal light with the unaided eye.

7.5 *Impact Resistance*—Determine the impact resistance of the tube or fitting in accordance with Appendix X3.5, "Procedure–Specification Requirement," of D2444. Use either a 6-lb (2.7-kg) or a 20-lb (9.1-kg) B tup and the flat plate (holder B). Test six specimens at an impact of 20 ft·lbf (27 J). If all six specimens pass, accept the lot. If one specimen fails, test another six specimens. If eleven of twelve specimens pass, accept the lot. If two or more specimens fail, reject the lot.

8. Retest and Rejection

8.1 If the results of any test(s) do not meet the requirements of this specification, the tests shall be conducted again in accordance with an agreement between the purchase and the seller. There shall be no agreement to lower the minimum requirements of this specification by such means as omitting tests that are a part of this 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.

9. Product Marking

9.1 *Tube Marking*— The markings shall be applied to the tube in such a manner that they remain legible after installation.

9.2 *Content of Marking*—The tube shall be marked at least every 5 ft (1.5 m) in letters not less than 3⁄16 in. (5 mm) high, in a contrasting color, with the following information.

9.2.1 The manufacturer's name (or trademark).

9.2.2 The designation "ASTM F2158."

9.2.3 Nominal Pipe Size (for example, 2 in. (50 mm).

9.2.4 The material identification for example "PVC Vacuum Tubing."

9.3 *Fitting Markings:*

9.3.1 Manufacturer's name (or trademark).

9.3.2 The designation ASTM F2158.

9.3.3 Nominal tube size.

9.3.4 The material identification symbol, for example, PVC.

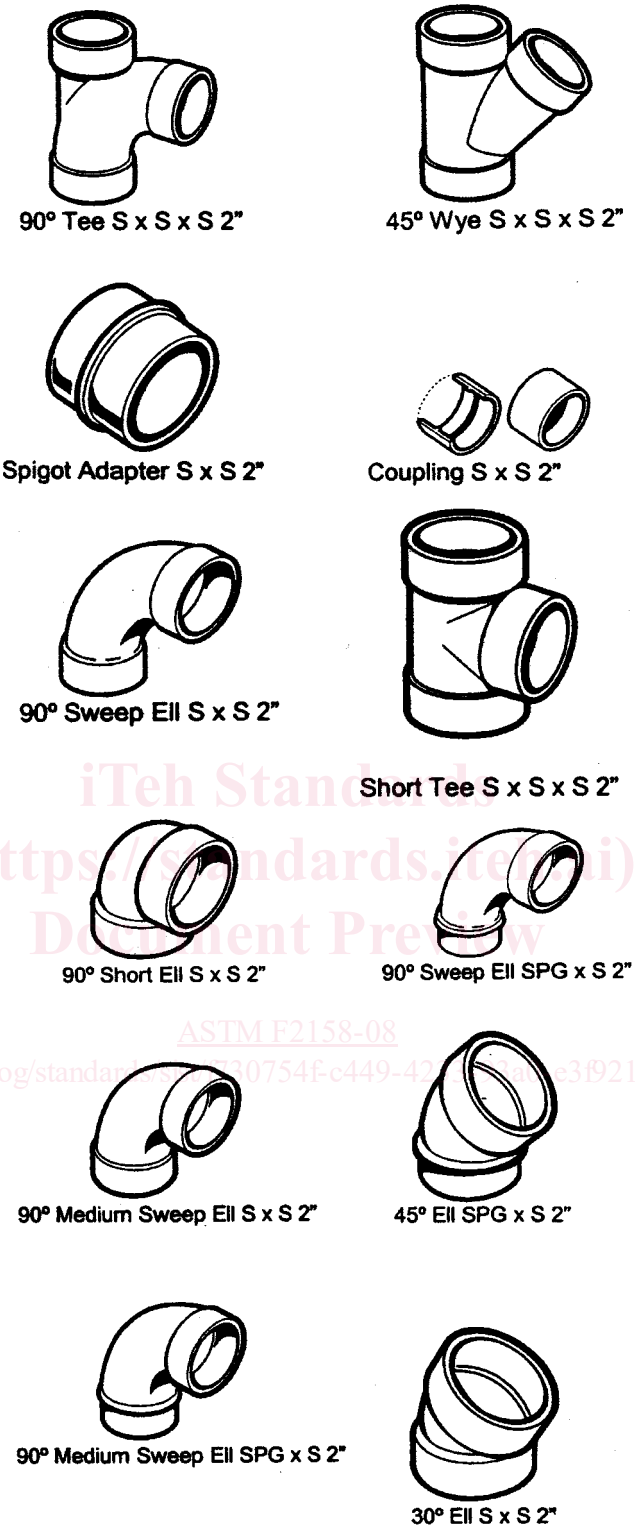

FIG. 1 Typical Fitting Configurations

10. Quality Assurance

10.1 When the product is marked with this designation, ASTM F2158, the manufacturer affirms that the product was manufactured, inspected, sampled, and tested in accordance with and has been found to meet the requirements of this specification.

11. Keywords

11.1 central vacuum; fittings; PVC; tube

APPENDIXES

(Nonmandatory Information)

X1. STORAGE

X1.1 *Outside Storage*—Plastic tube should be stored on a flat surface or supported in a manner that will prevent sagging or bending. Do not store tube in direct sunlight for long periods. To prevent damage, fittings should not be stored where the temperature exceeds 100°F (38°C).

X1.2 Inventories of plastic tube should be used on a first-in, first-out basis.

X2. JOINTS AND CONNECTIONS

X2.1 PVC tubing and fittings shall be joined by the solvent-cement method.

X2.2 When connecting to metal tubing systems, metal tubing and fitting shall be joined in accordance with Appendix X4.

X3. SOLVENT CEMENT JOINTS

X3.1 *Tube Cutting* —Cut the tube square with the axis, using a fine-tooth handsaw and a miter box. A rotary cutter may be used if the cutting blades are specifically designed for cutting plastic tube in such a way as not to raise a burr or ridge (flare) at the cut end (see Fig. X3.1). Remove all burrs with a deburring tool, knife, file, or abrasive paper.

X3.2 *Dry Fit Test*—The solvent cement joint is designed so that there will generally be interference of the tube wall with the fitting socket before the tube is fully inserted. Insert the tube into the fitting and check that the interference occurs about ⅓ to ⅔ of the socket depth (see Fig. X3.2).

X3.3 *Cleaning* —Surfaces to be joined must be cleaned and be free of dirt, moisture, oil, and other foreign material. If this cannot be accomplished by wiping with a clean, dry cloth, a chemical or mechanical cleaner must be used. If a chemical cleaner is used, apply with an applicator. (**Warning—** Skin contact with chemical cleaners should be avoided.)

X3.4 Application Procedure

X3.4.1 *Handling Cement*— Keep the cement can closed and in a shady place when not actually in use. Discard the cement when an appreciable change in viscosity takes place or at the first sign of gelation. The cement should not be thinned. Keep the applicator immersed in cement between applications.

X3.4.2 *Application of Cement*—PVC solvent cement is fast drying, and, therefore, the cement shall be applied as quickly as possible, consistent with good workmanship (see Fig. X3.3). The surface temperature of the mating surfaces should not exceed 110°F (43°C) at the time of assembly.

X3.4.3 Apply cement lightly but uniformly to the outside of the tubing, taking care to keep the use of cement to a minimum. (**Warning—** Application of cement to fitting socket is not recommended and can cause drippings or an excess amount of cement to be pushed to the inside diameter of the connection that can possibly snag debris and eventually create a clog.)

X3.4.4 *Low-Temperature Applications* —At temperatures below freezing, 32°F (0°C), solvents penetrate and soften the PVC surfaces more slowly than in warmer weather. For this reason, it is recommended that testing be done on a piece of scrap tube to determine if satisfactory penetration of the surfaces can be achieved.

X3.4.5 *Assembly of Joint*—Immediately after applying a coat of cement to the tube, forcibly insert the tube into the socket. To distribute the cement evenly, turn the tube or fitting a ¼ turn during the process (see Fig. X3.4).

X3.4.6 Assembly should be completed within 20 s after the application of cement. (**Warning—**Until the cement is set in the joint, the tube may back out of the fitting socket, if not held