Designation: F 2158 – 01

An American National Standard

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

This standard is issued under the fixed designation F 2158; 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 establishes 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 non-mandatory requirements of the specification.

1.3 *Units*—The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units, which are provided for information only and are not considered standard.

1.4 *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:*

D 618 Practice for Conditioning Plastics for Testing[2]

D 1600 Terminology for Abbreviated Terms Relating to Plastics[2]

D 1784 Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds[2]

D 2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings[3]

D 2444 Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)[3]

D 2564 Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems[3]

D 2749 Specification for Dimensions of Plastic Pipe Fittings[3]

D 5033 Guide for Development of ASTM Standards Relating to Recycling and Use of Recycled Plastic[4]

F 402 Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings[3]

F 412 Terminology Relating to Plastic Piping Systems[3]

3. Terminology

3.1 Definitions are in accordance with Terminology F 412, abbreviations are in accordance with Terminology D 1600, and dimension symbols are in accordance with Specification D 2749.

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 D 1784. Compounds that have different cell classifications, because one or more properties are superior to those of the specified compounds, are also acceptable.

5.2 *Recycled Material*—The use of recycled materials as defined in Guide D 5033 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 D 2564.

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.

[1] This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.25 on Vinyl-Based Pipe.

Current edition approved Dec. 10, 2001. Published February 2002.

[2] *Annual Book of ASTM Standards*, Vol 08.01.

[3] *Annual Book of ASTM Standards*, Vol 08.04.

[4] *Annual Book of ASTM Standards*, Vol 08.03.

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

6.1.2 *Tube Impact Strength*—The impact strength of the tube 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 D 2122.

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

6.2.2 *Fitting Dimensions*—The dimensions of fittings shall meet the requirements of Table 2, when measured in accordance with Test Method D 2122.

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 *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 D 618.

7.4 *Tube 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. 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 in accordance with Appendix X3.5 "Procedure–Specification Requirement" of D 2444. Use either a 6lb (2.7kg) 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 joules). 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.

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 Dimensions

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.

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 F 2158."

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 F 2158.

9.3.3 Nominal tube size.

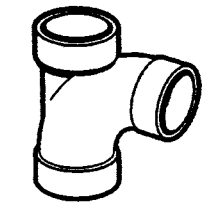
9.3.4 The material identification symbol, for example, PVC.

10. Quality Assurance

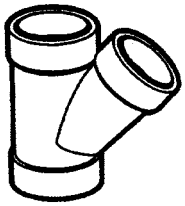
10.1 When the product is marked with this designation, ASTM D 2158, the manufacturer affirms that the product was manufactured, inspected, sampled, and tested in accordance with this standard and has been found to meet the requirements of this specification.

11. Keywords

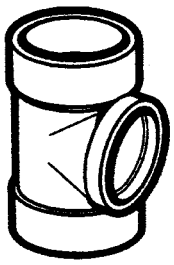
11.1 central vacuum; fittings; PVC; tube



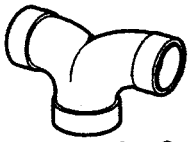
90° Tee S x S x S 2"



45° Wye S x S x S 2"

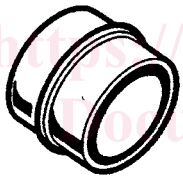


Short Socket Short Tee S x S X S 2"

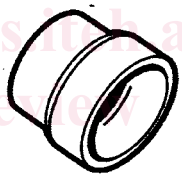


3- Way 90° Ell S x S x S 2"

Coupling S x S 2" (Grey)



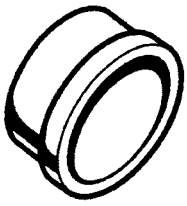
Spigot Adapter S x S 2"



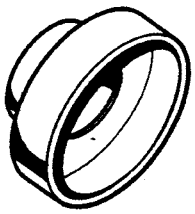
Reducer Coupling S x S 2" x 1.630"

Slip Coupling S x S 2"

FIG. 1 Typical Fitting Configurations

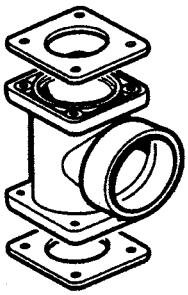


Reducer Coupling S x S 2" x 1.660"



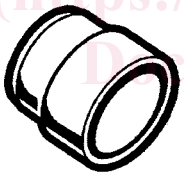
Adapter S x S 3" x 2"

Reducer Coupling S x S 2" x 1.825

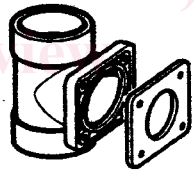


Double Flanged Tee FLG x FLG x S 2"

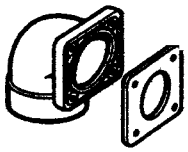
Reducer Bushing SPG x S 2" x 1.660"



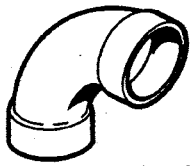
Inlet Valve Extension S x SPG 2"



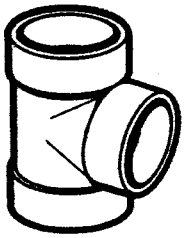
Flanged 90° Tee with Gasket S x S x FLG 2"



Flanged 90° Short Ell with Gasket S x FLG 2"



90° Sweep Ell S x S 2"



Short Tee S x S x S 2"

FIG. 1 Typical Fitting Configurations *(continued)*