Designation: F 845 – 96

An American National Standard

Standard Specification for Plastic Insert Fittings for Polybutylene (PB) Tubing[1]

This standard is issued under the fixed designation F 845; 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 plastic insert fittings for polybutylene (PB) plastic tubing. These fittings are intended for use in 100-psi (6.9-MPa) cold- and hot-water distribution systems operating at temperatures up to and including 180°F (82°C). Included are the requirements for materials, workmanship, burst pressure, sustained pressure, temperature cycling tests, and markings to be used on the fittings.

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

1.3 The following safety hazards caveat pertains only to the test method portion, Section 7, 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:*

D 618 Practice for Conditioning Plastics for Testing[2]

D 1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure[3]

D 1599 Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings[3]

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 3309 Specification for Polybutylene (PB) Plastic Hot-Water Distribution Systems[3]

D 4181 Specification for Acetal (POM) Molding and Extrusion Materials[4]

F 412 Terminology Relating to Plastic Piping Systems[3]

F 1498 Specification for Taper Pipe Threads 60° for Thermoplastic Pipe and Fittings[3]

2.2 *Federal Standard:*

Fed. Std. No. 123 Marking for Shipments (Civil Agencies)[5]

2.3 *Military Standard:*

MIL-STD-129 Marking for Shipment and Storage[5]

2.4 *National Sanitation Foundation Standard:*

Standard No. 14 for Plastic Piping Components and Related Materials[6]

Standard No. 61 for Drinking Water System Components—Health Effects[6]

3. Terminology

3.1 Definitions are in accordance with Terminology F 412 and abbreviations are in accordance with Terminology D 1600, unless otherwise specified.

4. Classification

4.1 This specification covers one class of fittings suitable for use with PB tubing that meet the requirements of applicable ASTM specifications. At the present time, this is Specification D 3309.

5. Materials

5.1 The fittings shall be made from one of the following plastics:

5.1.1 *Acetal Plastics*, meeting the requirements of Class 1, Grade 1 or 2 in Table POM of Specification D 4181.

5.1.2 *Chlorinated Poly(Vinyl Chloride) (CPVC)*, meeting the requirements of cell classification 23447-B in Specification D 1784.

5.2 *Rework Material*—Clean reworked material generated from the fitting manufacturer's own production may be used by the same manufacturer provided that the types specified in 5.1

[1] This specification is under the jurisdiction of ASTM Committee F-17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.10 on Fittings.

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[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 08.02.

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

[6] Available from the National Sanitation Foundation, P.O. Box 1468, Ann Arbor, MI 48106.

are not mixed with one another and that the fittings produced meet all the requirements of this specification.

6. Requirements

6.1 *Workmanship*—The fittings shall be made from compounds that are homogeneous throughout and essentially uniform in color, opacity, density, and other properties. The inside and outside surfaces shall be semi-matte or glossy in appearance (depending on the type of plastic) and free of chalking, sticky, or tacky material. The fitting walls shall be free of cracks, holes, blisters, voids, foreign inclusion, or other defects that are visible to the naked eye and that may affect the wall integrity.

6.2 *Dimensions and Tolerances*—The dimensions and tolerances shall be as shown in Table 1 and Table 2 when measured in accordance with 7.4.

6.2.1 Alignment of all openings of fittings shall be within ¼ in. (6.4 mm)/ft (30 cm).

6.2.2 *Fittings Not Illustrated*—All fittings not illustrated in Table 1 shall have insert ends in accordance with Table 1 or threaded ends in accordance with Table 2.

6.2.3 *Threads*—For all fittings having taper pipe threads, threads shall conform to Specification F 1498 and be gaged in accordance with 7.9.

6.2.4 *Crimp Joints*—Insert fittings shall be jointed to the PB tubing by metallic crimp rings. The crimp ring dimensions and tolerances shall be in accordance with Table 3. The crimp rings shall be copper with a minimum hardness of 35 and maximum hardness of 45 on the Rockwell 15T scale or aluminum with a minimum hardness of 20 and a maximum hardness of 54 on the Rockwell 15T scale (see Note 2). The crimp rings shall be free of burrs and sharp edges. Crimping tool and gage, supplied by the manufacturer, shall be used in crimping the ring to affix the insert fitting. The tool shall be adjusted in accordance with the manufacturer's instructions (see Note 2). The tolerances for dimensions and out-of-roundness on the ring after it has been crimped shall be in accordance with Table 4. These tolerances are required to have an adequate seal and pull-out strength and not over-stress the tubing or fitting.

TABLE 2 Dimensions of Insert Adapters with Pipe Thread Ends, in. (mm)

Nominal Tube Size, Insert End and Pipe Thread	Length of Thread, min, in. (mm)	
	Male S	Female T
⅜	0.53 (13.46)	0.475 (12.07)
½	0.53 (13.46)	0.64 (16.16)
¾	0.55 (13.97)	0.65 (16.51)

NOTE 1—The choice between copper or aluminum for the crimp ring should be made with consideration of the environmental conditions of the application. The fittings manufacturer may be consulted for recommendations.

NOTE 2—In the crimping operation, the fittings manufacturer's instructions shall be followed. The crimping tool shall be adjusted before starting the job, at the start of each day, and when recommended by the manufacturer. The crimping procedure shall be as follows: slide the ring onto the tubing, insert the fitting tightly onto the tubing and position the ring ⅛ in. (3.2 mm) to ¼ in. (6.4 mm) from fitting shoulder and parallel to the tubing. The crimping tool's jaws shall be centered over the ring. The crimp tool shall be closed completely so as to make a crimp while the tool is at 90° to the tubing. The rings shall not be double crimped. Each crimp shall be checked with the caliper gage provided by the manufacturer.

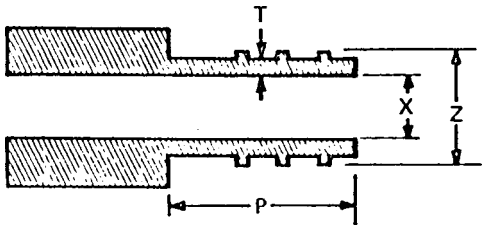
6.3 *Hydrostatic Burst*—Fittings with the dimensions and tolerances noted in Table 1 and Table 2 and tubing manufactured in accordance with Specification D 3309 will be tested as an assembly and shall meet the minimum hydrostatic burst requirements shown in Table 5 when tested in accordance with 7.5.

6.4 *Hydrostatic Sustained Pressure Strength*—Tubing and fittings (tested as assemblies) shall meet the hydrostatic sustained pressure strength requirements shown in Table 6 when tested in accordance with 7.6.

6.5 *Thermocycling*—Fittings and tubing assembled using the manufacturer's recommended procedure shall not leak or separate when thermocycled 1000 times between the temperatures of 60°F (16°C) and 180°F (82°C) when tested in accordance with 7.7.

6.6 *Excessive Temperature and Pressure Capability*—In the event of a heating system malfunction, polybutylene tubing

TABLE 1 Dimensions of Insert End, in. (mm)



Nominal Tube Size	Insert Length, P, min	Outside Diameter Z		Circumferential Parallel Ridges, min[A,B]	Thickness, T, min	Inside Diameter, X, min
		max	min			
⅜	0.625 (15.88)	0.385 (9.78)	0.370 (9.40)	3	0.049 (1.24)	0.232 (5.89)
½	0.720 (18.29)	0.505 (12.83)	0.495 (12.57)	3	0.049 (1.24)	0.355 (9.02)
¾	0.720 (18.29)	0.725 (18.42)	0.710 (18.03)	3	0.070 (1.78)	0.535 (13.59)

[A] Minimum circumferential ridge height is 0.008 in. (0.20 mm).

[B] The number and spacing of the ridges on the insert shall be located to ensure that the crimp ring will be crimped over at least one ridge when installed as stated in Note 3.