



Standard Specification for Lap-Joint Type Flange Adapters for Polyethylene Pressure Pipe in Nominal Pipe Sizes $\frac{3}{4}$ in. to 65 in.¹

This standard is issued under the fixed designation F2880; 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 polyethylene material and dimensions applicable to flange adapters (FAs) used to connect polyethylene pipes to other flanged pipe and components such as valves and flanged fittings. This standard describes outside diameter controlled polyethylene (PE) pipe flange adapters (FAs) in diameters ranging from $\frac{3}{4}$ in. through 65 in. (12 mm through 1600 mm). The flange adapters may be manufactured by various methods including injection molding, compression molding, and machining from billet or thick-wall polyethylene pipe.

1.2 The flange adapter (FA) is the principal component of the lap-joint flanged assembly widely used for several decades in low-pressure to high-pressure polyethylene pipe systems for all types of pressurized flow (gas and liquid) applications. The flange adapter's physical shape consists of the pipe-like Neck which is monolithic with its Hub. The Neck is intended to be butt-fused or fusion coupled to the pipe-line; while the Hub face is intended to affect the seal when subjected to the distributed load from the back up ring with its properly torqued bolt-studs and nuts.

NOTE 1—Polyethylene pipe flange adapters with slip on bolt rings are intended for use being bolted to each other or to be bolted to metal flanges having (primarily) Class 150 bolt hole patterns such as those presented in metal flange standards ASME B16.5, ASME B16.47 and AWWA C207.

1.3 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.

1.4 The use of gaskets and gasket selection are often an integral component of the flange adapter assembly. See the Plastic Pipe Institute Technical Note TN-38 for more information regarding HDPE flanged joints.

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

- D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
- D2513 Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings
- D2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
- D3035 Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
- D3261 Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
- D3350 Specification for Polyethylene Plastics Pipe and Fittings Materials
- F714 Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
- F2206 Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE)
- F3034 Specification for Billets made by Winding Molten Extruded Stress-Rated High Density Polyethylene (HDPE)

2.2 ASME Standards:³

- B16.5 "Pipe Flanges and Flanged Fittings"
- B16.47 "Large Diameter Steel Flanges: NPS 26 through NPS 60" Class #150 – Series A
- B36.10M Welded and Seamless Wrought Steel Pipe
- B36.19M Stainless Steel Pipe

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 American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

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

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

2.3 AWWA Standards:⁴

C207 “Standard for Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm) ; Class #150 /Series B, D & E.

C901 “Standard for Polyethylene (PE) pressure pipe and tubing, ½ ” through 3” for Water Service.”

C906 Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission

M55 Polyethylene Pipe - Design and Installation

2.4 NSF Standards:⁵

NSF/ANSI Standard No. 14 for Plastic Piping Components and Related Materials

NSF/ANSI Standard No. 61 for Drinking Water System Components—Health Effects

2.5 PPI Documents:⁶

TN-38 “Bolt Torque for Polyethylene Flanged Joints”

TR-3 “Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Pressure Design Basis (PDB), Strength Design Basis (SDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe

TR-4 “HDB/HDS/SDB/PDB/MRS Listed Materials”

PPI Handbook of Polyethylene Pipe and Fittings

3.1.2 *dimension ratio (DR)*—The ratio of a pipe’s specified nominal outside diameter to its specified minimum wall thickness. DR as applied to Flange Adapters is Neck OD ÷ neck minimum wall.

3.1.3 *DIPS*—Ductile-Iron Pipe Size; the outside diameter (OD) of plastic pipe that matches the nominal standard diameters of metal ductile iron, or, cast-iron pipes; also commonly referred to as DIOD, Ductile Iron Outside Diameter, previously known as CIOD or cast-iron OD.

3.1.4 *flange adapter*—One component of the two piece lap-joint flange assembly; It is a one piece polyethylene device whose geometry consists of two shapes: the wide, circular, seal-face disk, with central hole, which transitions along its length into pipe of smaller diameter and wall thickness, matched to the pipe-main to which it is to be joined. (Refer to Fig. 1).

3.1.5 *Hub*—The disk ring, or collar, extending radially outward from the pipe OD at the pipe termination.

3.1.6 *Hydrostatic design stress (HDS)*—The maximum allowable hoop stress in the pipe wall for pipe that is subjected to sustained long-term hydrostatic pressure. The hydrostatic design stress is determined by multiplying the hydrostatic design basis by the PPI recommended design factor for water service. HDS ratings for PE materials are published by PPI in TR-4.

3.1.7 *IPS*—Iron Pipe Size (steel pipe) outside diameters; replaced with nominal pipe sizes (NPS) per as listed with the plastic pipe standards and B36.10M and B36.19M.

3.1.8 *lap-joint flange ring*—the loose metal ring that transfers the load from the bolts through the hub to the seal face.

3.1.9 *neck*—The long barrel of the flange adapter with OD and wall thickness matched to the pipeline dimensions. The neck length must be sufficient for fusion joining in the fusion machine used.

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *billet, n*—a mass formed from a single polyethylene compound in the approximate shape of a thick-walled cylindrical shell (see Specification F3034).

⁴ Available from American Water Works Association (AWWA), 6666 W. Quincy Ave., Denver, CO 80235, <http://www.awwa.org>.

⁵ Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140, <http://www.nsf.org>.

⁶ Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, <http://www.plasticpipe.org>.

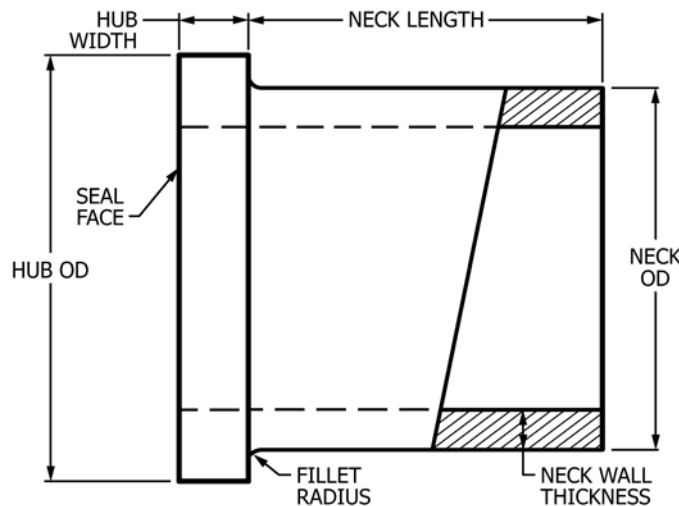


FIG. 1 Polyethylene Flange Adapter Geometry

3.1.10 *seal face*—The front of the Hub, which contacts the mating flange, which radially confines fluid pressure by compressive stress when subjected to distributed load from torqued bolts.

3.1.11 *residual sealing stress*—The long-term compressive stress intensity from the load distributed over the seal face area which is in contact with a mating flange.

3.1.12 *pressure rating (PR)*—maximum sustained internal water pressure at 80°F (27°C) and lower service temperature with specified maximum allowances for pressure surges.

$$PR = \frac{2 \times HDS \times F_T}{(DR - 1)} \quad (1)$$

where:

HDS = hydrostatic design stress for water at 73°F, psi (kPa)

F_T = temperature factor (1.00 for 80°F (27°C) and lower water service temperature)

DR = dimension ratio. Surge pressure allowances are applied above the sustained internal pressure and are integral to the working pressure rating.

4. Polyethylene Materials for Flange

4.1 *General*—Table 1 contains the list of polyethylene materials that are acceptable for use in manufacture of the flange adapters. Usually, the flange adapter material has the same material designation as the specified polyethylene pipeline material, for the purpose of chemical resistance and heat-fusion joining. Commercial virgin PE material compounds shall meet Table 1 physical properties, Specification D3350 requirements and shall be classified per Specification D3350 as shown in Table 1. The PE material compound shall have HDB ratings at 73°F (23°C) and at 140°F (60°C) and HDS ratings at 73°F (23°C) determined in accordance with Test Method D2837 and PPI TR-3.

4.2 *Color*—The PE material in the pipe shall contain color and ultraviolet (UV) stabilizer meeting the requirements of Code C or E per Specification D3350. Code C material shall contain between 2 to 3 percent carbon black by weight.

4.3 *Rework*—Clean rework pipe-grade polyethylene material derived from pipe and or fittings production by the same manufacturer are acceptable as part of a blend with virgin material for the production of flange adapters provided that (a) the cell classification or materials designation code of the rework material is the same as the virgin material compound to which it is added, and (b) the rework materials complied with applicable requirements as virgin materials.

4.4 *Potable Water*—Materials used for products intended for use in the transport of potable water shall be evaluated and certified as safe for this purpose by a testing agency acceptable to the local health authority. The evaluation shall be in accordance with requirements for chemical extraction, taste, and odor that are no less restrictive than those included in NSF/ANSI Standard No. 14 or NSF/ANSI Standard No. 61. The seal or mark of the laboratory making the evaluation should be included on the piping per 7.1.3.7.

5. Flange Adaptor Dimensions and Working Pressure Ratings

5.1 *General*—This standard describes 10 dimension ratios (DR’s) for nominal flange adapter sizes ranging from ¾ in. through 65 in. (12 mm through 1 600 mm). Flange adapter outside diameters (ODs) conform to the outside diameter dimensions of iron pipe sizes (IPS), or to equivalent outside diameters for ductile-iron (DI) pipe (DIPS). Polyethylene flange adapters are classified by dimension ratios (DR’s) ranging from 7.0 to 32.5. The resultant combinations of PE material designations and DR’s define flange adapters with pressure ratings ranging from 40 to 333 psig (276 to 2 299 kPa) when conveying water at 80°F (27°C) and lower temperatures. Use at temperatures above 80°F (27°C) up to 140°F (60°C) is acceptable at pressure ratings that are appropriately reduced for the service temperature.

5.2 *Outside diameters*—The neck Outside Diameter (OD) of the flange adapter measured at 73.4 ± 3.6°F (23 ± 2°C) shall conform to the applicable OD dimension requirements specified in the related polyethylene pipe standards : Specifications

TABLE 1 Property Values and Specification D3350 Cell Classification for Materials

Property	Materials Designation Code								
	PE2606	PE2706	PE2708 ^A	PE3608 ^A	PE3708	PE3710	PE4608	PE4708	PE4710 ^A
	Property Values								
HDB at 140°F (60°C) per ASTM D 2837 and PPI TR-3, psi (MPa)	C	C	C	C	C	C	C	C	C
HDS at 73°F (23°C) per ASTM D 2837 and PPI TR-3, psi (MPa)	630 (4.6)	630 (4.6)	800 (5.5)	800 (5.5)	800 (5.5)	1000 (6.9)	800 (5.5)	800 (5.5)	1000 (6.9)
	Specification D3350 Cell Classification ^B Values								
Density (natural base resin)	2	2	2	3	3	3	4	4	4
Melt Index	3-4	3-4	3-4	4	4	4	4	4	4
Flexural Modulus	3-4	3-4	3-4	≥4	≥4	≥4	≥4	≥4	≥5
Tensile Strength at Yield	≥3	≥3	≥3	≥4	≥4	≥4	≥4	≥4	≥4
SCG Resistance	6	7	7	6	7	7	6	7	7
Hydrostatic Strength Classification	3	3	3	4	4	4	4	4	4
Color and UV Stabilizer	C or E	C or E	C or E	C or E	C or E	C or E	C or E	C or E	C or E

^AHDB at 140°F (60°C) per ASTM D2837 and PPI TR-3 at 140°F required; contact manufacturer for listed value.

^BSpecification D3350 cell classification values reflect typical property values for numerous lots of the material and do not include variability in testing or manufacturing tolerances. Values for individual material lots can vary from typical values. Contact the manufacturer for information about variability in testing and material manufacturing tolerances.

F714, D2513, D3035, and AWWA C901 and C906. Measurements shall be made according to the methods specified in Test Method **D2122**. The tolerance on outside diameter shall not exceed ± 0.45 percent of the average outside diameter, as presented in the tables for NPS 4-in. and larger.

5.2.1 *Special Sizes*—Where existing system conditions or special local requirement make other diameters or dimension ratios necessary, other sizes or dimension ratios, or both, shall be acceptable for engineered applications when mutually agreed upon by the customer and the manufacturer, if the flange adapter is manufactured from plastic compounds meeting the material requirements of this specification, and the strength and design requirements are calculated on the same basis as those use in this specification. For diameters not shown in **Table 2, Table 3** or **Table 4**, the tolerance shall be the same percentage as that shown in the corresponding tables for the next smaller listed size.

5.3 *Neck Wall thickness*—The flange adapter manufacturer may provide extra wall thickness to compensate for PE pipe toe-in, out of round, and pipe over-wall. Wall thickness tolerance above minimum wall as measured and calculated according to Test Method **D2122** in any diametrical cross section of the pipe shall not exceed 17 percent. The flange adapter’s minimum neck wall thickness measured at $73.4 \pm 3.6^\circ\text{F}$ ($23 \pm 2^\circ\text{C}$) shall conform to the applicable pipe standard’s tabulated wall DR dimension, with a wall thickness tolerance of - zero, + 17% \times min. wall. The minimum wall

thickness by pipe OD and sizing system (IPS & DIPS) are tabulated in : Specifications **F714, D2513, D3035**, and AWWA C901, C906.

5.4 *Neck Length*—The neck length shall be a minimum length so as to enable holding in the jaws of a heat-fusion machine, or, to enable joining by socket fusion or electro-fusion coupler. (See **Table 2**.)

5.5 *Hub Width and Hub OD*—The hub width must be sufficiently stiff to resist shear, to resist fluid pressure bending moment flexing, to resist pipe beam bending, and to distribute concentrated back up ring load across the seal-face. The hub minimum width shall be at least 1.10 times the nominal neck wall thickness for a specified neck DR. The ratio of the hub width to neck wall thickness may exceed 1.5 when a lower DR flange adapter is machined into a thinner wall, higher DR flange adapter. Hub width may be the minimum or thicker, as specified by the Target Hub Width in **Table 3** and **Table 4**. **Table 5** specifies the nominal Hub outside diameters.

5.5.1 *Custom Flange Adapter Hub Width*—Custom designed flange adapter hub widths are allowable. Specifically butterfly flange adapters shall have the hub width extended and chamfered or tapered as needed to clear the rotation of the butterfly disk by adding to the minimum hub width of the flange adapter. Chamfering or tapering the ID of the minimum hub width for a given flange adapter DR is not acceptable. At the butterfly flange adapter seal face, the tapered Hub OD and

TABLE 2 Minimum Neck Length, in. for IPS and DIPS Flange Adapters

NOTE 1—Minimum Neck Length = Nominal Fusion Machine Clamp width + stop-protursion + 1 in. + Back Up Ring Neck Length may be longer; consult Flange Adapter manufacturer.

Nominal Pipe Size	Minimum Neck Length				
	IPS	DIPS	DR 7	DR 9	DR 11 -DR 32.5
¾ in.	X		2.88	2.88	2.88
1 in.	X		3.75	3.75	3.75
1 ¼ in.	X		3.88	3.88	3.88
1 ½ in.	X		4.00	4.00	4.00
2 in.	X		4.25	4.25	4.25
3 in.	X		4.50	4.50	4.50
4 in.	X	X	5.38	5.38	6.00
5 in.	X		6.50	6.50	6.50
6 in.	X	X	6.75	6.75	6.75
8 in.	X	X	6.50	6.13	6.13
10 in.	X	X	6.50	6.13	6.13
12 in.	X	X	7.38	7.38	7.75
14 in.	X	X	8.13	7.75	7.75
16 in.	X	X	8.44	8.00	8.00
18 in.	X	X	8.50	8.13	8.13
20 in.	X	X	8.94	8.38	8.38
22 in.	X		9.03	8.63	8.63
24 in.	X	X	9.50	8.69	8.69
26 in.	X		10.38	10.13	10.13
28 in.	X		10.63	10.25	10.13
30 in.	X	X	10.88	10.38	10.25
32 in.	X		11.13	10.88	10.75
34 in.	X		12.13	11.50	10.88
36 in.	X	X	13.13	12.19	11.31
1000mm / 40 in.	X		*	*	12.63
42 in.	X	X	*	*	12.63
48 in.	X	X	*	*	12.88
54 in.	X		*	*	20.13
1400mm /55 in.			*	*	20.50
63 in.	X		*	*	20.50
65 in.	X		*	*	21.50

TABLE 3 Target Hub Width, in. for IPS Outside Diameter Flange Adapters

NOTE 1—Minimum Hub Width is $1.10 \times$ Neck min. wall, to handles shear and tensile loads. Standardized Width is the target width grouped by DR's, for standard bolt lengths.

IPS SIZE	Neck OD	Standard	DR 7	DR9	DR11	DR13.5	DR15.5	DR17	DR19	DR21	DR26	DR32.5
¾ in.	1.05	Std	0.406	0.406	0.406	0.406	0.406	0.406	*	*	*	*
1 in.	1.315	Std	0.406	0.406	0.406	0.406	0.406	0.406	*	*	*	*
1 ¼ in.	1.66	St	0.406	0.406	0.406	0.406	0.406	0.406	*	*	*	*
1 ½ in.	1.9	Std	0.406	0.406	0.406	0.406	0.406	0.406	*	*	*	*
2in.	2.375	Std	0.437	0.390	0.390	0.390	0.390	0.390	0.390	0.390	*	*
3in.	3.5	Std	0.625	0.500	0.406	0.390	0.390	0.390	0.390	0.390	0.390	0.375
4 in.	4.5	Std	0.875	0.625	0.500	0.500	0.500	0.500	0.500	0.390	0.390	0.375
5 in.	5.563	Std	0.875	0.875	0.625	0.625	0.500	0.500	0.500	0.390	0.390	0.375
6 in.	6.625	Std	1.188	1.000	0.781	0.781	0.781	0.781	0.781	0.500	0.500	0.500
8 in.	8.625	Std	1.625	1.250	1.000	1.000	1.000	1.000	1.000	0.750	0.750	0.750
10 in.	10.75	Std	2.000	1.500	1.280	1.280	1.280	1.280	1.280	0.750	0.750	0.750
12 in.	12.75	Std	2.281	1.875	1.540	1.540	1.540	1.540	1.540	0.875	0.875	0.875
14 in.	14	Std	2.500	2.000	1.625	1.625	1.625	1.625	1.625	1.000	1.000	1.000
16 in.	16	Std	2.875	2.250	1.875	1.875	1.875	1.875	1.875	1.125	1.125	1.125
18 in.	18	Std	3.250	2.500	2.000	2.000	2.000	2.000	2.000	1.250	1.250	1.250
20 in.	20	Std	3.625	2.875	2.270	2.270	2.270	2.270	2.270	1.375	1.375	1.375
22 in.	22	Std	3.938	3.125	2.500	2.500	2.500	2.500	2.500	1.500	1.500	1.500
24 in.	24	Std	4.281	3.360	2.750	2.750	2.750	2.750	2.750	1.625	1.625	1.625
26 in.	26	Std	4.625	3.625	3.000	2.500	2.500	2.500	2.500	1.750	1.750	1.750
28 in.	28	Std	5.000	3.875	3.250	2.625	2.625	2.625	2.625	1.750	1.750	1.750
30 in.	30	Std	5.375	4.188	3.500	2.750	2.750	2.750	2.750	1.875	1.875	1.875
32 in.	32	Std	5.750	4.500	3.625	3.000	3.000	3.000	3.000	2.000	2.000	2.000
34 in.	34	Std	6.125	4.750	3.875	3.250	3.000	3.000	3.000	2.125	2.125	2.125
36 in.	36	Std	6.500	5.000	4.125	3.500	3.000	3.000	3.000	2.125	2.125	2.125
1000mm / 40 in.	39.37	Std	*	5.500	4.500	3.750	3.250	3.000	3.000	2.375	2.375	2.375
42 in.	42	Std	*	5.875	5.000	4.000	3.500	3.125	3.000	2.500	2.500	2.500
48 in.	48	Std	*	6.750	5.500	4.500	3.875	3.625	3.250	3.000	3.000	3.000
54 in.	54	Std	*	*	6.125	5.000	4.500	4.000	3.625	3.250	3.250	3.250
1400mm / 55 in.	55.12	Std	*	*	6.375	5.250	4.500	4.250	3.750	3.500	3.250	3.250
63 in.	63	Std	*	*	*	5.875	5.125	4.625	4.250	3.750	3.750	3.750
65 in.	65	Std	*	*	*	6.125	5.250	4.875	4.375	3.875	3.875	3.875

TABLE 4 Target Hub Width (Inches) for Ductile-Iron OD Flange Adapters

NOTE 1—Minimum Hub Width is $1.10 \times$ Neck min. wall, to handles shear and tensile loads. Standardized Width is the target hub width grouped by DR's, for standard bolt lengths.

NOMINAL DIPS SIZE	Neck OD/ Inches	Standard	DR 7	DR 9	DR 11	DR 13.5	DR 15.5	DR 17	DR 19	DR 21	DR 26	DR 32.5
2 in.	2.5	Std	0.5	0.406	0.406	0.406	0.406	0.407	*	*	*	*
3 in.	3.96	Std	0.75	0.625	0.5	0.406	0.406	0.406	0.406	0.406	*	*
4 in.	4.8	Std	0.875	0.688	0.563	0.5	0.5	0.5	0.5	0.406	0.406	0.406
6 in.	6.9	Std	1.25	1	0.783	0.75	0.75	0.75	0.75	0.406	0.406	0.406
8 in.	9.05	Std	1.625	1.25	1.063	1	1	1	1	0.563	0.563	0.563
10 in.	11.1	Std	2	1.625	1.25	1.25	1.25	1.25	1.25	0.75	0.75	0.75
12 in.	13.2	Std	2.375	1.875	1.5	1.5	1.5	1.5	1.5	0.781	0.781	0.781
14 in.	15.3	Std	2.75	2.125	1.75	1.75	1.75	1.75	1.75	1	1	1
16 in.	17.4	Std	3.125	2.5	2	2	2	2	2	1.063	1.063	1.063
18 in.	19.5	Std	3.5	2.75	2.25	2.25	2.25	2.25	2.25	1.188	1.188	1.188
20 in.	21.6	Std	4	3	2.5	2.5	2.5	2.5	2.5	1.312	1.312	1.312
24 in.	25.8	Std	4.625	3.625	3	3	3	3	3	1.563	1.563	1.563
30 in.	32	Std	5.75	4.5	3.625	3.625	3.625	3.625	3.625	2	2	2
36 in.	38.3	Std	7	5.5	4.5	4.5	4.5	4.5	4.5	2.281	2.281	2.281
42 in.	44.5	Std	*	*	5	4.5	4	3.5	3	2.75	2.75	2.75
48 in.	50.8	Std	*	*	*	5	4	3.75	3.5	3	3	3
54 in.	57.56	Std	*	*	*	5.5	4.75	4.5	4	3.5	3.5	3.5
60 in.	61.61	Std	*	*	*	6	5	4.5	4	3.75	3.75	3.75
64 in.	65.67	Std	*	*	*	6	5.5	5	4.5	4	4	4

Hub Wall shall be sufficiently dimensioned to provide a DR pressure rating at least equal to that of the pipe DR to which the butterfly flange adapter will be joined by heat fusion. If the tapered Hub Wall at the seal face is not sufficiently thick to match the pipe pressure rating, then a sufficiently thick corrosion resistant metal collar shall be snug-fit over the hub's taper transition section to reinforce the taper portion of the Hub

so as to provide full pressure rating. Butterfly flange adapters are unique for each brand of butterfly valve.

5.6 *Fillet Radius*—Table 6 specifies the target minimum radius and tolerance for IPS and DIPS flange adapters.

5.7 *Seal Face Finish and Flatness*—The seal face may be smooth or serrated. Although PE flange adapters do not

TABLE 5 Hub Outside Diameter, in. for Class 150 Bolt Pattern Flanges

NOTE 1—For both IPS and DIPS pipe sizes, as available.

Nominal Pipe Size	Hub Outside Diameter			
	Maximum	Nominal	Minimum	
0.75	2.125	2	1.99	
1	2.5	2.375	2.325	
1.25	2.875	2.75	2.7	
1.5	3.25	3.125	3.075	
2	4	3.875	3.625	
3	5.25	5	4.5	
4	6.75	6.625	5.812	
5	7.625	7.5	7.313	
6	8.625	8.5	7.937	
7	10.875	10.625	10.375	
8	10.875	10.625	10.375	
10	13.25	12.75	12.5	
12	16	15.75	14.937	
14	17.625	17.375	16.75	
16	20.125	19.75	19.217	
18	21.5	21.125	19.875	
20	23.75	23.375	22.875	
22	25.875	25.5	25	
24	28.125	27.75	27.25	
26	30.375	30	29.5	
28	32.625	32.25	31.28	
30	34.625	34.25	33.75	
32	36.875	36.75	35.875	
34	38.875	38.5	37.875	
36	41.125	40.75	39.063	
1000MM/40 in.	45.625	45.125	42.83	
42	47.875	47.375	46.875	
48	54.375	53.75	51.628	
54	60.875	60	59.375	
1400MM/55 in.	60.875	60	59.375	
63 in.	70.25	66.75	66.25	
63 - (66)	73.75	72	71.5	
65 - (66)	73.75	72	71.5	

necessarily require gaskets, serrations may be provided on the seal face to assist in gasket retention. Sealing face serrations also accommodate surface irregularities and promote sealing if a gasket is not used. Alternately, the seal face may be smooth from molding processes, or, have a sufficiently flat surface marked with the finish from lathe machining. The seal face should be sufficiently flat so that it provides essentially uniform sealing pressure on the hub face when subjected to the flattening, compressive load from the metal lap-joint flange ring. The flatness tolerance will be as agreed between the manufacturer and the purchaser.

5.8 Pressure Rating—Refer to [Table 7](#) which presents flange adapter PR values by DR. PR represents the design capacity to resist working pressure at the anticipated operating temperature with sufficient inherent instant strength to endure the repetitive, actual, anticipated, instant positive pressure surges above the working pressure, for the lifetime of the pipeline. (For a detailed discussion, including hydraulic surge pressure, hydraulic surge pressure allowance, pressure rating (PR), water flow rates and flow velocities, refer to the PPI Handbook of Polyethylene Pipe, or, AWWA Polyethylene Pipe Manual, M55.)

5.9 Physical Requirements—Polyethylene flange adapters shall meet the requirements of this standard and the test requirements of Specification [D3261](#). For sizes greater than 48 in., the same test requirements of 14 in. through 48 in. shall apply.

5.10 Workmanship—Polyethylene flange adapters shall be homogeneous throughout, free from voids, cracks, inclusions and other defects; and as uniform as commercially practical in color, opacity, density, and other physical properties. Surfaces shall be free from scratches, voids, blisters, and other imperfections that may affect wall integrity or joining.

6. Assurance Program

6.1 General—The manufacturer shall take sufficient measures to check incoming materials and to produce flange adapters that comply with the requirements of this standard. The actual tests and frequency at which each of these tests are conducted should be determined in the manufacturer’s quality control program, which shall be designed to ensure compliance with the requirements of this standard.

6.2 Quality control records—The manufacturer shall maintain records of all quality control tests for a period of not less than two years and, if requested, shall submit the pertinent quality control test information to the purchaser.

7. Marking

7.1 General:

7.1.1 Marking the product with the designations to which the flange adapter is in compliance (that is, AWWA C906, Specification [D3261](#), Specification [F2206](#), etc.) affirms that the

TABLE 6 Fillet Radius for IPS and DIPS Flange Adapters

 NOTE 1—The manufacturing radius tolerance is ± 0.032 in.

IPS		DIPS	
Nominal Diameter	Minimum Fillet Radius (inches)	Nominal Diameter	Minimum Fillet Radius (inches)
¾ in.	0.125		
1 in.	0.125		
1¼ in.	0.125		
1 ½ in.	0.188		
2 in.	0.25	2 in.	0.44
3 in.	0.25	3 in.	0.44
4 in.	0.38	4 in.	0.44
5 in.	0.38		
6 in.	0.38	6 in.	0.44
8 in.	0.38	8 in.	0.44
10 in.	0.38	10 in.	0.44
12 in.	0.38	12 in.	0.44
14 in.	0.5	14 in.	0.44
16 in.	0.5	16 in.	0.44
18 in.	0.5	18 in.	0.44
20 in.	0.5	20 in.	0.44
22 in.	0.5		
24 in.	0.5	24 in.	0.5
26 in.	0.5		
28 in.	0.5		
30 in.	0.5	30 in.	0.5
32 in.	0.5		
34 in.	0.5		
36 in.	0.5	36 in.	0.5
1000MM /	0.5		
40 in.			
42 in.	0.5	42 in.	0.5
48 in.	0.75	48 in.	0.75
54 in.	0.75		
1400MM /	0.75		
55 in.			
63 in.	0.75		
65 in.	0.75		

product has been manufactured, inspected, sampled, and tested in accordance with those standards and has been found to meet their requirements.

7.1.2 Markings shall remain legible during normal handling, storage and installation. The markings shall be applied in a manner that will not reduce the strength or otherwise damage the flange adapter or detrimentally affect joining with devices that seal to the outside surface of the product. Molded print, scribing on the hub OD, paint or ink, or adhesive labels are all acceptable methods of marking

7.1.3 Required marking for fittings. Unless otherwise specified, each fitting shall be marked or labeled to include the following information:

7.1.3.1 Nominal size and OD “basis” (such as 18-in. IPS, or, 12-in. DIPS)

7.1.3.2 Dimension ratio (such as DR 17) or custom wall thickness or DR.

7.1.3.3 Manufacturer’s name or trademark.

7.1.3.4 Standard materials designation code (such as PE3608, or, PE4710).

7.1.3.5 Pressure Rating, in psi. at 73°F

7.1.3.6 Manufacturer’s production code, including the date of manufacture. The manufacturer’s production code shall be a coded marking that will allow the manufacturer to determine the location of manufacture, resin lots, pipe or fitting production lot, and the date of manufacture. The date of manufacture may be a numeric code or a combination of text and numerals, but shall be readily recognizable as a date. Upon request, the manufacturer shall provide decoding information to the purchaser.

7.1.3.7 The mark of the certifying agency for fittings intended for potable water service.

7.1.3.8 The mark of ASTM-F2880, which is this specification.

8. Shipping

8.1 Pipe, billet, and fittings, unless otherwise specified by the purchaser, shall be prepared for standard commercial shipment. Care shall be taken during shipment to prevent cuts, scratches, and other damage.

9. Affidavit of Compliance

9.1 The manufacturer shall, if so required by the purchaser, provide an affidavit that materials delivered comply with the requirements of this standard.

10. Keywords

10.1 back-up rings; bolt rings; flanges; flange adapters; flange joints; HDPE flanges; HDPE; lap-joint flanges; plastic flanges; polyethylene; polyethylene flanges; polyethylene pipe flanges; raised face flanges; stub ends; weld neck flanges

TABLE 7 Flange Adaptor PR Conveying Water at 80°F (27°C) and Lower Service Temperature^A

Materials designation code Specification	PE2606, PE2706	PE2708, PE3608, PE3708, PE4608, PE4708	PE3710, PE4710
D3350			
Hydrostatic Design Stress, psi (kPa) per Table 1	630 (4345)	800 (5517)	1000 (6897)
Dimension Ratio	Pressure Rating, psi (kPa)		
32.5	40 (276)	51 (350)	63 (438)
26.0	50 (348)	64 (441)	80 (552)
21.0	63 (435)	80 (552)	100 (690)
19.0	70 (483)	89 (613)	111 (766)
17.0	79 (543)	100 (690)	125 (862)
15.5	87 (599)	110 (761)	138 (951)
13.5	101 (695)	128 (883)	160 (1104)
11.0	126 (869)	160 (1103)	200 (1379)
9.3	152 (1047)	193 (1329)	241 (1662)
9.0	158 (1086)	200 (1379)	250 (1724)
7.3	200 (1379)	254 (1751)	317 (2190)
7.0	210 (1448)	267 (1839)	333 (2299)

^AFor water at 80°F (27°C) and lower, PR is determined in accordance with:

$$PR = \frac{2 \times HDS \times F_T}{(DR - 1)}$$

where:

- PR* = Pressure Rating, psi (kPa)
HDS = hydrostatic design stress, psi (kPa)
DR = dimension ratio
F_T = temperature factor = 1.0 for 80°F (27°C) and lower service temperature.

APPENDIX

(Nonmandatory Information)

X1. CLARIFICATION AND PRECAUTIONS

X1.1 Stub Ends are a different design than flange adaptors and do not meet the requirements of this standard. Stud-Ends are not included in this standard.

X1.2 Some flange adaptors may not have sufficient neck length to fit larger size-range butt-fusion machines, which have wider clamps. All flange adaptors have sufficient neck length to

extend sufficiently through the jaws of at least one size-range of butt-fusion machine, from every manufacturer. For each pipeline project, check with the supplier of the field fusion equipment regarding jaw width and the capacity of the specific equipment to fuse the flange adaptor having the neck length supplied.

SUMMARY OF CHANGES

Committee F17 has identified the location of selected changes to this standard since the last issue (F2880–11a) that may impact the use of this standard.

- (1) Revision of Scope, Section 1, to add billet to the list of materials acceptable for machining into flange adaptors.
 (2) Revision of Referenced Documents to add Specification **F3034**.
 (3) Revision of Terminology, Section 3, to provide the same definition for billet that appears in Specification **F3034** and renumber definitions that follow the addition sequentially.

- (4) Revision of Shipping, Section 8, to add billet to the list of materials acceptable for shipment.
 (5) Addition of Summary of Changes.

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