Designation: ~~F2880 – 14~~ F2880 – 21

An American National Standard

Standard Specification for Lap-Joint Type Flange Adapters for Polyethylene Pressure Pipe in Nominal Pipe Sizes ¾ 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 ¾ 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~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

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[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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[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.

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

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

2.3 *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. 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).

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] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, ~~Three~~Two Park Ave., New York, NY 10016-5990, http://www.asme.org.
[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.

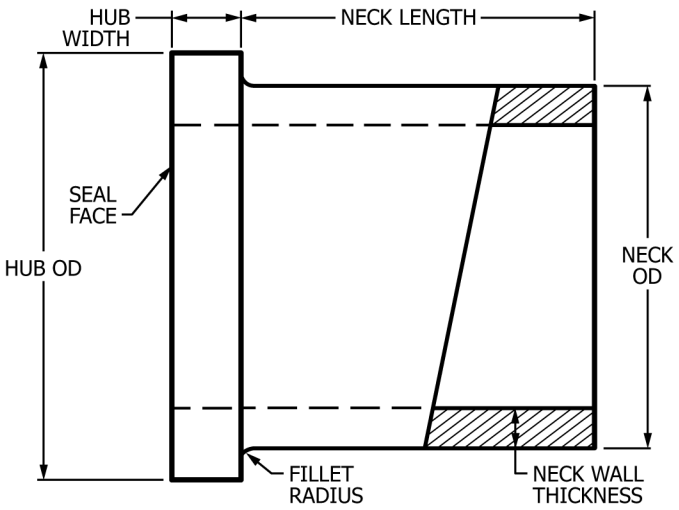

FIG. 1 Polyethylene Flange Adapter Geometry

3.1.6 *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.

3.1.10 *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.

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

where:

HDS = hydrostatic design stress for water at 73ºF, psi (kPa)
F_T = temperature factor (1.00 for 80ºF (27ºC) 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

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]
PE2606	PE2706	PE2708	PE3608	PE3708	PE3710	PE4608	PE4708	PE4710	
	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~~
HDB at 140 °F (60 °C) per ASTM D2837 and PPI TR-3, psi (MPa)	A	A	A	A	A	A	A	A	A
~~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)~~
HDS at 73 °F (23 °C) per ASTM D2837 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

[A] HDB at ~~140°F (60°C)~~140 °F (60 °C) per ASTM D2837 and PPI TR-3 at ~~140°F~~ 140 °F (60 °C) required; contact manufacturer for listed value.
[B] Specification 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.

compound shall have HDB ratings at ~~73°F (23°C)~~73 °F (23 °C) and at ~~140°F (60°C)~~140 °F (60 °C) and HDS ratings at ~~73°F (23°C)~~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.~~ in. through 65 in. (12 mm through ~~1 600~~ 1600 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 psig to 333 psig (276 kPa to ~~2 299~~ 2299 kPa) when conveying water at ~~80°F (27°C)~~80 °F (27 °C) and lower temperatures. Use at temperatures above ~~80°F (27°C)~~80 °F (27 °C) up to ~~140°F (60°C)~~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~~73 °F ± ~~3.6°F (23~~4 °F (23 °C ± ~~2°C)~~2 °C) shall conform to the applicable OD dimension requirements specified in the related polyethylene pipe standards : Specifications 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.~~4 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~~73 °F ± ~~3.6ºF (23~~3 °F (23 °C ± ~~2ºC)~~2 °C) shall conform to the applicable pipe standard's tabulated wall DR dimension, with a wall thickness tolerance of - zero, + ~~17%~~17 % × 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~~Hub width shall 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 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

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.

			Minimum Neck Length		
Nominal Pipe Size	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
~~16in.~~	~~X~~	~~X~~	~~8.44~~	~~8.00~~	~~8.00~~
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~~
1400 mm /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 × 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~~
1400 mm / 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 × 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

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 necessarily

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

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

	Hub Outside Diameter		
Nominal Pipe Size	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~~
1000 mm/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~~
1400 mm/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

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.