



PIPELINE

ASME B16.5 Flange and Flanged Fittings Specification

General:

This Standard is limited to pipe flanges and flanged fittings, blind flanges, reducing flanges, and related flange bolts, flange gaskets, and flange joints. It covers flanges of pressure classes 150, 300, 400, 600, 900, 1500, and 2500. Sizes are given in metric and U.S. customary units from NPS 1/2 to NPS 24.

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ASME/ANSI B16.5 provides:

- Weld neck flange
- Slip-on flange
- Socket weld flange
- Blind flange
- Threaded flange
- Lap joint flange

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Size

In NPS, is designation for nominal flange or flange fittings size. NPS related to nominal diameter, DN in international standards, relations as below:

NPS	DN
1/2	15
3/4	20
1	25
1 1/4	32
1 1/2	40
2	50
2 1/2	65
3	80
4	100

NOTE: For $NPS \geq 4$, the related DN is $DN = 25 (NPS)$.

Markings

- Name: Manufacturer's name or trademark
- Material: Cast or Forged, material standard ASTM xxx.
- Pressure Ratings: (i.e., Class 150, 300, 400, 600, 900, 1500, or 2500)
- Conformance: ASME B16.5 or other B16 standard.
- Temperature: If a temperature is noted, indicate the corresponding pressure rating.
- Size: NPS
- Ring Joint Flanges: Shall be marked with letter R and ring groove number.
- Multiple Material Marking: In case multiple material used.

Materials

- ASTM A105 for forged carbon steel flange
- ASTM A350 for forged carbon steel, low alloy steel flange
- ASTM A182 for alloy steel flange and stainless steel flange
- ASTM A216 for casting carbon steel flanges
- ASTM A352, ASTM A217
- ASTM A515 Gr 70, 65 for plates flange
- ASTM A516 Gr 70, 65 for carbon and low alloy steel plates flange
- ASTM A203, A204
- ASTM A387 Gr 11, 22, 91 CL 2 for alloy steel plates flange
- ASTM A240 Grade 304/L, 316/L for stainless steel plate flange

DIMENSIONS

CLASS 150 PIPE FLANGES AND FLANGED FITTINGS

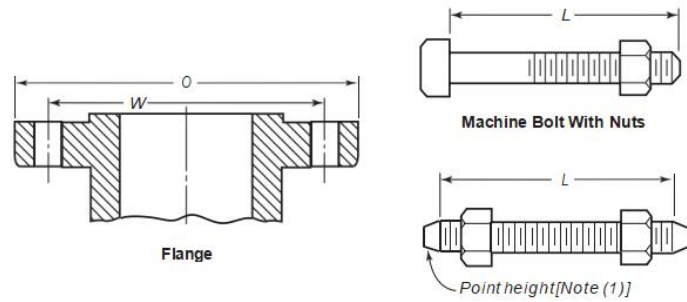


Table 1 Templates for Drilling Class 150 Flanges

1	2	3	4	5	6	7	8	9
Nominal Pipe Size, NPS	Outside Diameter of Flange, <i>O</i>	Drilling [Notes (2), (3)]				Length of Bolts, <i>L</i> [Notes (1), (4)]		
		Diameter of Bolt Circle, <i>W</i>	Diameter of Bolt Holes, in.	Number of Bolts	Diameter of Bolts, in.	Stud Bolts [Note (1)]		Machine Bolts
						2 mm Raised Face	Ring Joint	2 mm Raised Face
$\frac{1}{2}$	90	60.3	$\frac{5}{8}$	4	$\frac{1}{2}$	55	...	50
$\frac{3}{4}$	100	69.9	$\frac{5}{8}$	4	$\frac{1}{2}$	65	...	50
1	110	79.4	$\frac{5}{8}$	4	$\frac{1}{2}$	65	75	55
$1\frac{1}{4}$	115	88.9	$\frac{5}{8}$	4	$\frac{1}{2}$	70	85	55
$1\frac{1}{2}$	125	98.4	$\frac{5}{8}$	4	$\frac{1}{2}$	70	85	65
2	150	120.7	$\frac{3}{4}$	4	$\frac{5}{8}$	85	95	70
$2\frac{1}{2}$	180	139.7	$\frac{3}{4}$	4	$\frac{5}{8}$	90	100	75
3	190	152.4	$\frac{3}{4}$	4	$\frac{5}{8}$	90	100	75
$3\frac{1}{2}$	215	177.8	$\frac{3}{4}$	8	$\frac{5}{8}$	90	100	75
4	230	190.5	$\frac{3}{4}$	8	$\frac{5}{8}$	90	100	75
5	255	215.9	$\frac{7}{8}$	8	$\frac{3}{4}$	95	110	85
6	280	241.3	$\frac{7}{8}$	8	$\frac{3}{4}$	100	115	85
8	345	298.5	$\frac{7}{8}$	8	$\frac{3}{4}$	110	120	90
10	405	362.0	1	12	$\frac{7}{8}$	115	125	100
12	485	431.8	1	12	$\frac{7}{8}$	120	135	100
14	535	476.3	$1\frac{1}{8}$	12	1	135	145	115
16	595	539.8	$1\frac{1}{8}$	16	1	135	145	115
18	635	577.9	$1\frac{1}{4}$	16	$1\frac{1}{8}$	145	160	125
20	700	635.0	$1\frac{1}{4}$	20	$1\frac{1}{8}$	160	170	140
24	815	749.3	$1\frac{3}{8}$	20	$1\frac{1}{4}$	170	185	150

NOTES:

- (1) Length of stud bolt does not include the height of the points.
- (2) For flange bolt holes.
- (3) For spot facing.
- (4) Bolt lengths not shown in table may be determined in accordance with Annex D.

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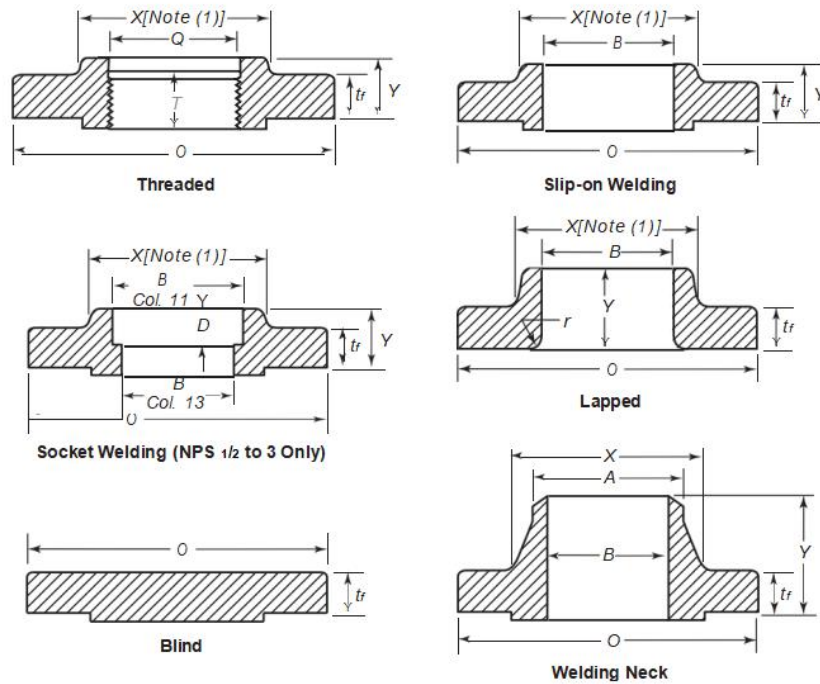


Table 2 Dimensions of Class 150 Flanges

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nominal Pipe Size NPS	Outside Diameter of Flange, O	Thickness of Flange, t_r Min., [Notes (2)-(4)]	Thickness Lap Joint Min., t_r	Diameter of Hub, X	Hub Diameter Beginning of Chamfer Welding Neck, A [Note (5)]	Length Through Hub			Thread Length Threaded Min., T [Note (6)]	Bore			Corner Radius of Bore of Lapped Flange and Pipe, r	Depth of Socket, D
						Threaded/ Slip-on/ Socket Welding, Y	Lapped, Y	Welding Neck, Y		Slip-on/ Socket Welding, Min., B	Lapped Min., B	Welding Neck/ Socket Welding, B [Note (7)]		
1/2	90	9.6	11.2	30	21.3	14	16	46	16	22.2	22.9	15.8	3	10
3/4	100	11.2	12.7	38	26.7	14	16	51	16	27.7	28.2	20.9	3	11
1	110	12.7	14.3	49	33.4	16	17	54	17	34.5	34.9	26.6	3	13
1 1/4	115	14.3	15.9	59	42.2	19	21	56	21	43.2	43.7	35.1	5	14
1 1/2	125	15.9	17.5	65	48.3	21	22	60	22	49.5	50.0	40.9	6	16
2	150	17.5	19.1	78	60.3	24	25	62	25	61.9	62.5	52.5	8	17
2 1/2	180	20.7	22.3	90	73.0	27	29	68	29	74.6	75.4	62.7	8	19
3	190	22.3	23.9	108	88.9	29	30	68	30	90.7	91.4	77.9	10	21
3 1/2	215	22.3	23.9	122	101.6	30	32	70	32	103.4	104.1	90.1	10	...
4	230	22.3	23.9	135	114.3	32	33	75	33	116.1	116.8	102.3	11	...
5	255	22.3	23.9	164	141.3	35	36	87	36	143.8	144.4	128.2	11	...
6	280	23.9	25.4	192	168.3	38	40	87	40	170.7	171.4	154.1	13	...
8	345	27.0	28.6	246	219.1	43	44	100	44	221.5	222.2	202.7	13	...
10	405	28.6	30.2	305	273.0	48	49	100	49	276.2	277.4	254.6	13	...
12	485	30.2	31.8	365	323.8	54	56	113	56	327.0	328.2	304.8	13	...
14	535	33.4	35.0	400	355.6	56	79	125	57	359.2	360.2	To be Specified by Pur- chaser	13	...
16	595	35.0	36.6	457	406.4	62	87	125	64	410.5	411.2		13	...
18	635	38.1	39.7	505	457.0	67	97	138	68	461.8	462.3		13	...
20	700	41.3	42.9	559	508.0	71	103	143	73	513.1	514.4		13	...
24	815	46.1	47.7	663	610.0	81	111	151	83	616.0	616.0		13	...

NOTES:

- (1) This dimension is for large end of hub, which may be straight or tapered.
- (2) The minimum thickness of these loose flanges, in sizes NPS 3 1/2 and smaller, is slightly greater than the thickness of flanges on fittings, Table 9, which are reinforced by being cast integral with the body of the fitting.
- (3) These flanges may be supplied with a flat face. The flat face may be either the full t_r dimension of thickness plus 2 mm, or the t_r dimension

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thickness without the raised face height.

- (4) The flange dimensions illustrated are for regularly furnished 2 mm raised face (except lapped); for requirements of other facings, see Fig. 7.
- (5) For welding end bevel
- (6) For thread of threaded flanges
- (7) Dimensions in Column 13 correspond to the inside diameters of pipe as given in ASME B36.10M for Standard Wall pipe. Thickness of Standard Wall is the same as Schedule 40 in sizes NPS 10 and smaller. These bore sizes are furnished unless otherwise specified by the purchaser.

CLASS 300 PIPE FLANGES, AND FLANGED FITTINGS

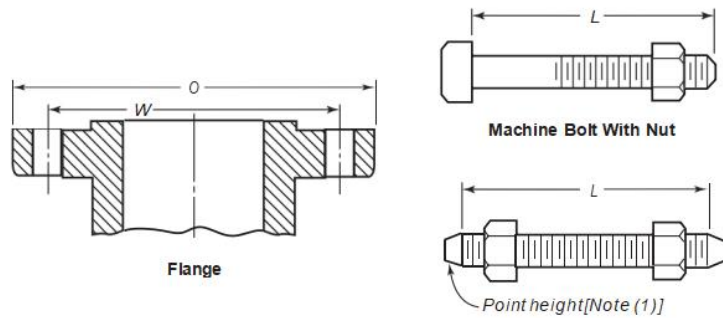


Table 3 Templates for Drilling Class 300 Flanges

1	2	3	4	5	6	7	8	9
Nominal Pipe Size, NPS	Outside Diameter of Flange, O	Drilling [Notes (2), (3)]				Length of Bolts, L [Notes (1), (4)]		
		Diameter of Bolt Circle, W	Diameter of Bolt Holes, in.	Number of Bolts	Diameter of Bolts, in.	Stud Bolts [Note (1)]		Machine Bolts
						2 mm Raised Face	Ring Joint	
1/2	95	66.7	5/8	4	1/2	65	75	55
3/4	115	82.6	3/4	4	5/8	75	90	65
1	125	88.9	3/4	4	5/8	75	90	65
1 1/4	135	98.4	3/4	4	5/8	85	95	70
1 1/2	155	114.3	7/8	4	3/4	90	100	75
2	165	127.0	3/4	8	5/8	90	100	75
2 1/2	190	149.2	7/8	8	3/4	100	115	85
3	210	168.3	7/8	8	3/4	110	120	90
3 1/2	230	184.2	7/8	8	3/4	110	125	95
4	255	200.0	7/8	8	3/4	115	125	95
5	280	235.0	7/8	8	3/4	120	135	110
6	320	269.9	7/8	12	3/4	120	140	110
8	380	330.2	1	12	7/8	140	150	120
10	445	387.4	1 1/8	16	1	160	170	140
12	520	450.8	1 1/4	16	1 1/8	170	185	145
14	585	514.4	1 1/4	20	1 1/8	180	190	160
16	650	571.5	1 3/8	20	1 1/4	190	205	165
18	710	628.6	1 3/8	24	1 1/4	195	210	170
20	775	685.8	1 3/8	24	1 1/4	205	220	185
24	915	812.8	1 5/8	24	1 1/2	230	255	205

NOTES:

- (1) Length of stud bolt does not include the height of the points.
- (2) For flange bolt holes.
- (3) For spot facing.
- (4) Bolt lengths not shown in table may be determined in accordance with Annex D.

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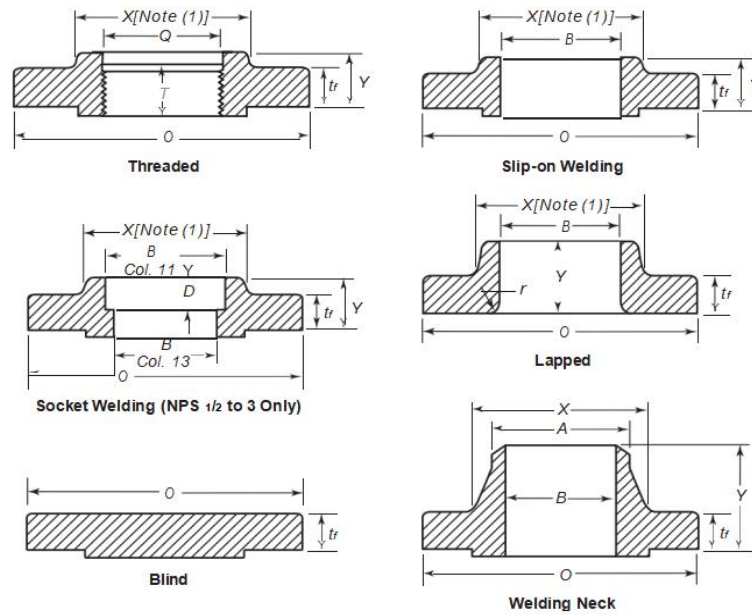


Table 4 Dimensions of Class 300 Flanges

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nominal Pipe Size NPS	Outside Diameter of Flange, O	Thickness of Flange Min., tr [Notes (2), (3)]	Thickness Lap Joint, Min., tr	Diameter of Hub, X	Hub Diameter Beginning of Chamfer Welding, Neck, A [Note (4)]	Length Through Hub			Thread Length Threaded Min., T [Note (5)]	Bore			Corner Radius of Bore of Lapped Flange and Pipe, r	Counter- bore Threaded Flange, Min., Q	Depth of Socket, D
						Threaded/ Slip-on/ Socket Welding, Y	Lapped, Y	Welding Neck, Y		Slip-on/ Socket Welding Min., B	Lapped Min., B	Welding Neck/ Socket Welding, B [Note (6)]			
1/2	95	12.7	14.3	38	21.3	21	22	51	16	22.2	22.9	15.8	3	23.6	10
3/4	115	14.3	15.9	48	26.7	24	25	56	16	27.7	28.2	20.9	3	29.0	11
1	125	15.9	17.5	54	33.4	25	27	60	18	34.5	34.9	26.6	3	35.8	13
1 1/4	135	17.5	19.1	64	42.2	25	27	64	21	43.2	43.7	35.1	5	44.4	14
1 1/2	155	19.1	20.7	70	48.3	29	30	67	23	49.5	50.0	40.9	6	50.3	16
2	165	20.7	22.3	84	60.3	32	33	68	29	61.9	62.5	52.5	8	63.5	17
2 1/2	190	23.9	25.4	100	73.0	37	38	75	32	74.6	75.4	62.7	8	76.2	19
3	210	27.0	28.6	117	88.9	41	43	78	32	90.7	91.4	77.9	10	92.2	21
3 1/2	230	28.6	30.2	133	101.6	43	44	79	37	103.4	104.1	90.1	10	104.9	22
4	255	30.2	31.8	146	114.3	46	48	84	37	116.1	116.8	102.3	11	117.6	23
5	280	33.4	35.0	178	141.3	49	51	97	43	143.8	144.4	128.2	11	144.4	24
6	320	35.0	36.6	206	168.3	51	52	97	47	170.7	171.4	154.1	13	171.4	25
8	380	39.7	41.3	260	219.1	60	62	110	51	221.5	222.2	202.7	13	222.2	26
10	445	46.1	47.7	321	273.0	65	95	116	56	276.2	277.4	254.6	13	276.2	27
12	520	49.3	50.8	375	323.8	71	102	129	61	327.0	328.2	304.8	13	328.6	28
14	585	52.4	54.0	425	355.6	75	111	141	64	359.2	360.2	To	13	360.4	29
16	650	55.6	57.2	483	406.4	81	121	144	69	410.5	411.2	be	13	411.2	30
18	710	58.8	60.4	533	457.0	87	130	157	70	461.8	462.3	specified	13	462.0	31
20	775	62.0	63.5	587	508.0	94	140	160	74	513.1	514.4	by	13	512.8	32
24	915	68.3	69.9	702	610.0	105	152	167	83	616.0	616.0	Pur- chaser	13	614.4	33

NOTES:

- (1) This dimension is for large end of hub, which may be straight or tapered.
- (2) These flanges may be supplied with a flat face. The flat face may be either the full tr dimension thickness plus 2 mm or the tr dimension thickness without the raised face height.
- (3) The flange dimensions illustrated are for regularly furnished 2 mm raised face (except lapped); for requirements of other facings, see Fig. 7.
- (4) For welding end bevel.
- (5) For thread of threaded flanges.
- (6) Dimensions in Column 12 correspond to the inside diameters of pipe as given in ASME B36.10M for Standard Wall pipe. Standard Wall dimensions are the same as Schedule 40 in sizes NPS 10 and smaller. These bore sizes are furnished unless otherwise specified by the purchaser.

CLASS 400 PIPE FLANGES

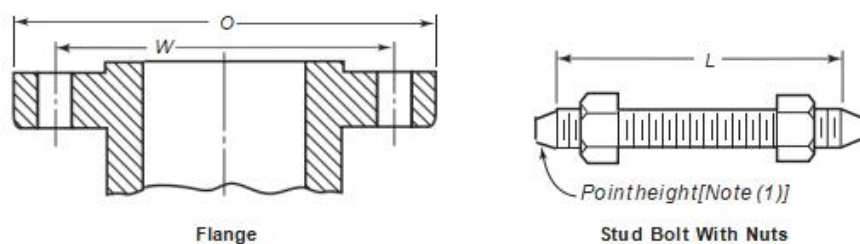


Table 5 Templates for Drilling Class 400 Flanges

1	2	3	4	5	6	7	8	9
Nominal Pipe Size NPS	Outside Diameter of Flange, O	Diameter of Bolt Circle, W	Drilling [Notes (2), (3)]		Diameter of Bolts in.	Length of Bolts, L [Notes (1), (4)]		Ring Joint
			Diameter of Bolt Holes in.	Number of Bolts		7 mm Raised Face	Male and Female/ Tongue and Groove	
1/2								
3/4								
1								
1 1/4								
1 1/2								
Use Class 600 Dimensions in these sizes								
2								
2 1/2								
3								
3 1/2								
4	255	200.0	1	8	7/8	140	135	140
5	280	235.0	1	8	7/8	145	135	145
6	320	269.9	1	12	7/8	150	145	150
8	380	330.0	1 1/8	12	1	170	165	170
10	445	387.4	1 1/4	16	1 1/8	190	185	190
12	520	450.8	1 3/8	16	1 1/4	205	195	205
14	585	514.4	1 3/8	20	1 1/4	210	205	210
16	650	571.5	1 1/2	20	1 3/8	220	215	220
18	710	628.6	1 1/2	24	1 3/8	230	220	230
20	775	685.8	1 5/8	24	1 1/2	240	235	250
24	915	812.8	1 7/8	24	1 3/4	265	260	280

NOTES:

- (1) Length of stud bolt does not include the height of the points.
- (2) For flange bolt holes.
- (3) For spot facing.
- (4) Bolt lengths not shown in table may be determined in accordance with Annex D.

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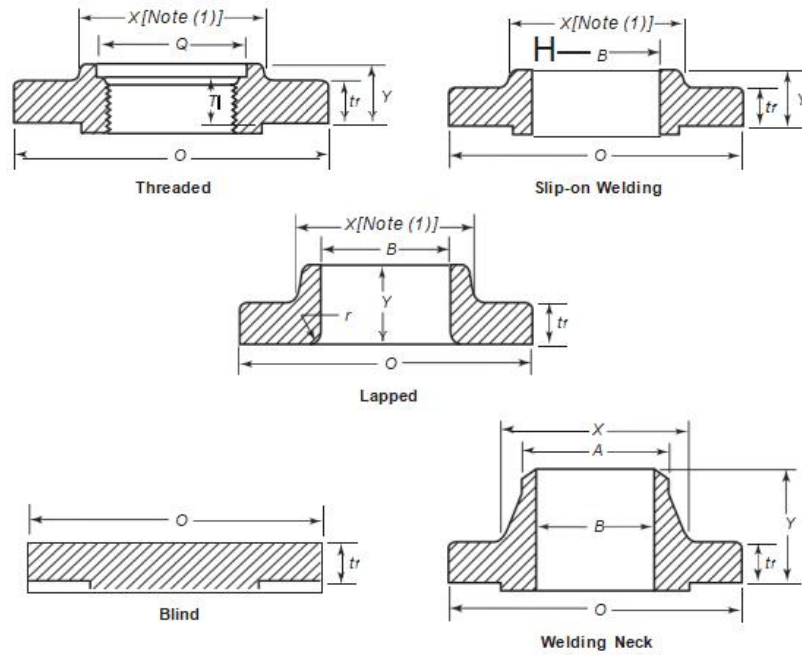


Table 6 Dimensions of Class 400 Flanges

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nominal Pipe Size NPS	Outside Diameter of Flange, O	Thickness of Flange Min., tr	Diameter of Hub, X	Hub Diameter Beginning of Chamfer Welding Neck, A [Note (2)]	Length Through Hub			Thread Length Threaded Flange Min., T [Note (3)]	Bore			Corner Radius of Bore of Lapped Flange and Pipe, r	Counterbore Threaded Flange Min., Q
					Threaded/ Slip-on, Y	Lapped, Y	Welding Neck, Y		Slip-on Min., B	Lapped Min., B	Welding Neck, B		
1/2													
3/4													
1					Use Class 600 Dimensions in these sizes [Note (4)].								
1 1/4													
1 1/2													
2													
2 1/2					Use Class 600 Dimensions in these sizes [Note (4)].								
3													
3 1/2													
4	255	35.0	146	114.3	51	51	89	37	116.1	116.8	To be specified by purchaser	11	117.6
5	280	38.1	178	141.3	54	54	102	43	143.8	144.5		11	144.4
6	320	41.3	206	168.3	57	57	103	46	170.7	171.4		13	171.4
8	380	47.7	260	219.1	68	68	117	51	221.5	222.2		13	222.2
10	445	54.0	321	273.0	73	102	124	56	276.2	277.4		13	276.2
12	520	57.2	375	323.8	79	108	137	61	327.0	328.2		13	328.6
14	585	60.4	425	355.6	84	117	149	64	359.2	360.2		13	360.4
16	650	63.5	483	406.4	94	127	152	69	410.5	411.2		13	411.2
18	710	66.7	533	457.0	98	137	165	70	461.8	462.3		13	462.0
20	775	69.9	587	508.0	102	146	168	74	513.1	514.4		13	512.8
24	915	76.2	702	610.0	114	159	175	83	616.0	616.0		13	614.4

NOTES:

- (1) This dimension is for large end of hub, which may be straight or tapered. Taper shall not exceed 7 deg on threaded, slip-on, socket-welding, and lapped flanges. This dimension is defined as the diameter at the intersection between the hub taper and the back face of the flange.
- (2) For welding end bevel.
- (3) For thread of threaded flanges.
- (4) Socket welding flanges may be provided in NPS 1/2 through NPS 2 1/2, using Class 600 dimensions.

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Class 600 PIPE FLANGES AND FLANGED FITTINGS

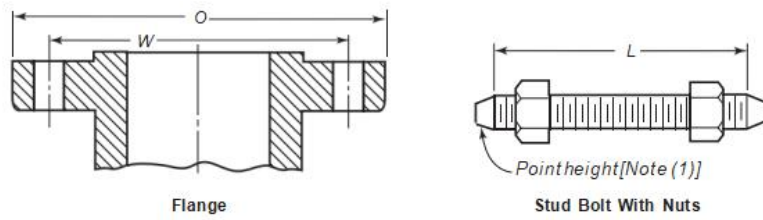


Table 7 Templates for Drilling Class 600 Flanges

1	2	3	4	5	6	7	8	9
						Length of Bolts, <i>L</i> [Notes (1), (4)]		
		Drilling [Notes(2), (3)]						
	Outside	Diameter	Diameter				Male and	
Nominal	Diameter	of Bolt	of Bolt	Number	Diameter	7 mm	Female/	
Pipe Size	of Flange,	Circle,	Holes	of	of Bolts	Raised	Tongue	Ring
NPS	O	W	in.	Bolts	in.	Face	and Groove	Joint
1/2	95	66.7	5/8	4	1/2	75	70	75
3/4	115	82.6	3/4	4	5/8	90	85	90
1	125	88.9	3/4	4	5/8	90	85	90
1 1/4	135	98.4	3/4	4	5/8	95	90	95
1 1/2	155	114.3	7/8	4	3/4	110	100	110
2	165	127.0	3/4	8	5/8	110	100	110
2 1/2	190	149.2	7/8	8	3/4	120	115	120
3	210	168.3	7/8	8	3/4	125	120	125
3 1/2	230	184.2	1	8	7/8	140	135	140
4	275	215.9	1	8	7/8	145	140	145
5	330	266.7	1 1/8	8	1	165	160	165
6	355	292.1	1 1/8	12	1	170	165	170
8	420	349.2	1 1/4	12	1 1/8	190	185	195
10	510	431.8	1 3/8	16	1 1/4	215	210	215
12	560	489.0	1 3/8	20	1 1/4	220	215	220
14	605	527.0	1 1/2	20	1 3/8	235	230	235
16	685	603.2	1 5/8	20	1 1/2	255	250	255
18	745	654.0	1 3/4	20	1 5/8	275	265	275
20	815	723.9	1 3/4	24	1 5/8	285	280	290
24	940	838.2	2	24	1 7/8	330	325	335

NOTES:

- (1) Length of stud bolt does not include the height of the points.
- (2) For flange bolt holes
- (3) For spot facing
- (4) Bolt lengths not shown in table may be in accordance with Annex D.

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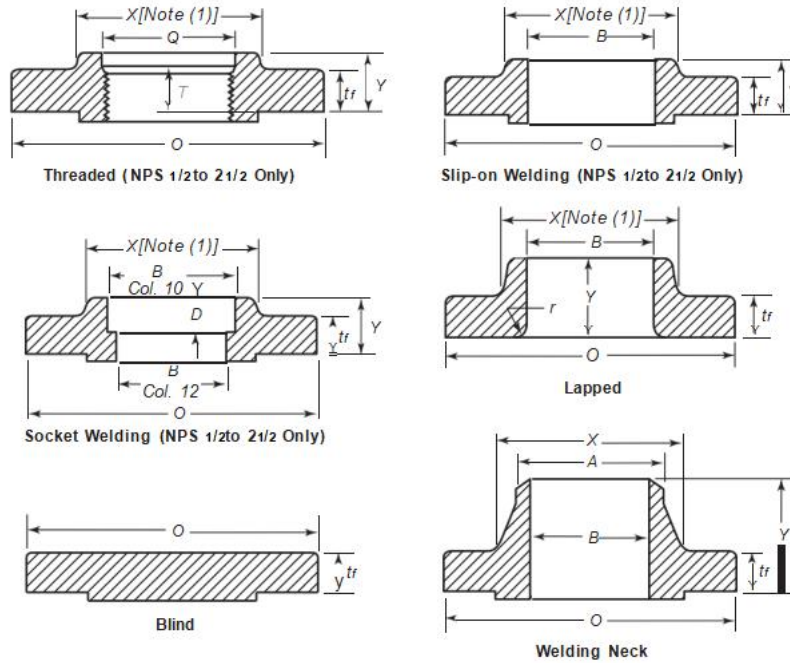


Table 8 Dimensions of Class 600 Flanges

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nominal Pipe Size NPS	Outside Diameter of Flange, O	Thickness of Flange, Min., tr	Diameter of Hub, X	Length Through Hub				Thread Length Threaded Flange Min., T [Note (3)]	Bore			Corner Radius of Bore of Lapped Flange and Pipe, r	Counter bore Threaded Flange Min., Q	Depth of Socket, D
				Hub Diameter Beginning of Chamfer Welding Neck, A [Note (2)]	Threaded/ Slip-on/ Socket Welding, Y	Lapped, Y	Welding Neck, Y		Slip-on/ Socket Welding, Min., B	Lapped Min., B	Welding Neck/ Socket Welding, B			
1/2	95	14.3	38	21.3	22	22	52	16	22.2	22.9	To be specified by Purchaser	3	23.6	10
3/4	115	15.9	48	26.7	25	25	57	16	27.7	28.2		3	29.0	11
1	125	17.5	54	33.4	27	27	62	18	34.5	34.9		3	35.8	13
1 1/4	135	20.7	64	42.2	29	29	67	21	43.2	43.7		5	44.4	14
1 1/2	155	22.3	70	48.3	32	32	70	23	49.5	50.0		6	50.6	16
2	165	25.4	84	60.3	37	37	73	29	61.9	62.5		8	63.5	17
2 1/2	190	28.6	100	73.0	41	41	79	32	74.6	75.4		8	76.2	19
3	210	31.8	117	88.9	46	46	83	35	90.7	91.4		10	92.2	21
3 1/2	230	35.0	133	101.6	49	49	86	40	103.4	104.1		10	104.9	...
4	275	38.1	152	114.3	54	54	102	42	116.1	116.8		11	117.6	...
5	330	44.5	189	141.3	60	60	114	48	143.8	144.4		11	144.4	...
6	355	47.7	222	168.3	67	67	117	51	170.7	171.4		13	171.4	...
8	420	55.6	273	219.1	76	76	133	58	221.5	222.2		13	222.2	...
10	510	63.5	343	273.0	86	111	152	66	276.2	277.4		13	276.2	...
12	560	66.7	400	323.8	92	117	156	70	327.0	328.2		13	328.6	...
14	605	69.9	432	355.6	94	127	165	74	359.2	360.2		13	360.4	...
16	685	76.2	495	406.4	106	140	178	78	410.5	411.2		13	411.2	...
18	745	82.6	546	457.0	117	152	184	80	461.8	462.3		13	462.0	...
20	815	88.9	610	508.0	127	165	190	83	513.1	514.4		13	512.8	...
24	940	101.6	718	610.0	140	184	203	93	616.0	616.0		13	614.4	...

NOTES:

- (1) This dimension is for large end of hub, which may be straight or tapered. Taper shall not exceed 7 deg on threaded, slip-on, socket-welding, and lapped flanges. This dimension is defined as the diameter at the intersection between the hub taper and the back face of the flange.
- (2) For welding end bevel.
- (3) For thread of threaded flanges.

CLASS 900 PIPE FLANGES AND FLANGED FITTINGS

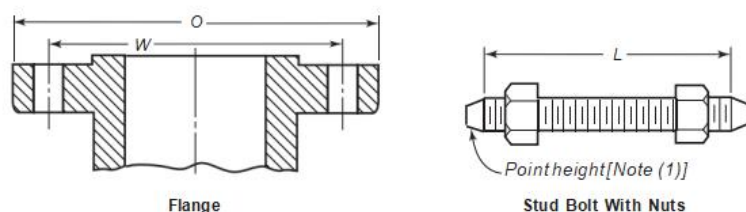


Table 9 Templates for Drilling Class 900 Flanges

1	2	3	4	5	6	7	8	9
Nominal Pipe Size NPS	Outside Diameter of Flange, O	Drilling [Notes (2), (3)]			Diameter of Bolts, in.	7 mm Raised Face	Length of Bolts, L [Notes (1), (4)]	Male and Female/ Tongue and Groove Ring Joint
		Diameter of Bolt Circle, W	Diameter of Bolt Holes, in.	Number of Bolts				
1/2								
3/4								
1								
1 1/4								
1 1/2								
2								
2 1/2								
Use Class 1500 dimensions in these sizes.								
3	240	190.5	1	8	7/8	145	140	145
4	290	235.0	1 1/4	8	1 1/8	170	165	170
5	350	279.4	1 3/8	8	1 1/4	190	185	190
6	380	317.5	1 1/4	12	1 1/8	190	185	195
8	470	393.7	1 1/2	12	1 3/8	220	215	220
10	545	469.9	1 1/2	16	1 3/8	235	230	235
12	610	533.4	1 1/2	20	1 3/8	255	250	255
14	640	558.8	1 5/8	20	1 1/2	275	265	280
16	705	616.0	1 3/4	20	1 5/8	285	280	290
18	785	685.8	2	20	1 7/8	325	320	335
20	855	749.3	2 1/8	20	2	350	345	360
24	1,040	901.7	2 5/8	20	2 1/2	440	430	455

NOTES:

- (1) Length of stud bolt does not include the height of the points.
- (2) For flange bolt holes.
- (3) For spot facing.
- (4) Bolt lengths not shown in Table may be determined in accordance with Annex D.

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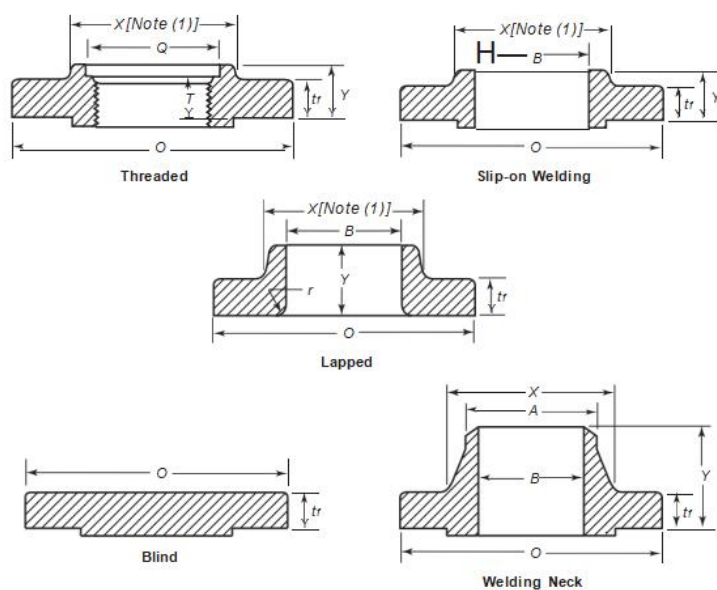


Table 10 Dimensions of Class 900 Flanges

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nominal Pipe Size, NPS	Outside Diameter of Flange, O	Thickness of Flange Min., tr	Diameter of Hub, X	Hub Diameter Beginning of Chamfer Welding Neck, A [Note (2)]	Length Through Hub			Thread Length Threaded Flange Min., T [Note (3)]	Bore			Corner Radius of Bore of Lapped Flange and Pipe, r	Counterbore Threaded Flange Min., Q
					Threaded/ Slip-on, Y	Lapped, Y	Welding Neck, Y		Slip-on Min., B	Lapped Min., B	Welding Neck, B		
1/2													
3/4													
1													
1 1/4													
1 1/2													
2													
2 1/2													
Use Class 1500 Dimensions in these sizes [Note (4)].													
3	240	38.1	127	88.9	54	54	102	42	90.7	91.4	To be specified by Purchaser	10	92.2
4	290	44.5	159	114.3	70	70	114	48	116.1	116.8		11	117.6
5	350	50.8	190	141.3	79	79	127	54	143.8	144.4		11	144.4
6	380	55.6	235	168.3	86	86	140	58	170.7	171.4		13	171.4
8	470	63.5	298	219.1	102	114	162	64	221.5	222.2		13	222.2
10	545	69.9	368	273.0	108	127	184	72	276.2	277.4		13	276.2
12	610	79.4	419	323.8	117	143	200	77	327.0	328.2		13	328.6
14	640	85.8	451	355.6	130	156	213	83	359.2	360.2		13	360.4
16	705	88.9	508	406.4	133	165	216	86	410.5	411.2		13	411.2
18	785	101.6	565	457.0	152	190	229	89	461.8	462.3		13	462.0
20	855	108.0	622	508.0	159	210	248	93	513.1	514.4		13	512.8
24	1,040	139.7	749	610.0	203	267	292	102	616.0	616.0		13	614.4

NOTES:

- (1) This dimension is for large end of hub, which may be straight or tapered. Taper shall not exceed 7 deg on threaded, slip-on, socket-welding, and lapped flanges. This dimension is defined as the diameter at the intersection between the hub taper and the back face of the flange.
- (2) For welding end bevel.
- (3) For thread of threaded flanges.
- (4) Socket welding flanges may be provided in NPS 1/2 through NPS 2 1/2, using Class 1500 dimensions.

CLASS 1500 PIPE FLANGES

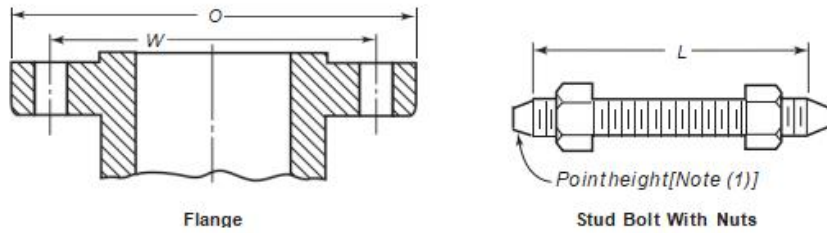


Table 11 Templates for Drilling Class 1500 Flanges

1	2	3	4	5	6	7	8	9
Drilling [Notes (2), (3)]					Length of Bolts, L [Notes (1), (4)]			
Nominal Pipe Size, NPS	Outside Diameter of Flange, O	Diameter of Bolt Circle, W	Diameter of Bolt Holes, in.	Number of Bolts	Diameter of Bolts, in.	7 mm Raised Face	Male and Female/ Tongue and Groove Ring Joint	
1/2	120	82.6	7/8	4	3/4	110	100	110
3/4	130	88.9	7/8	4	3/4	115	110	115
1	150	101.6	1	4	7/8	125	120	125
1 1/4	160	111.1	1	4	7/8	125	120	125
1 1/2	180	123.8	1 1/8	4	1	140	135	140
2	215	165.1	1	8	7/8	145	140	145
2 1/2	245	190.5	1 1/8	8	1	160	150	160
3	265	203.2	1 1/4	8	1 1/8	180	170	180
4	310	241.3	1 3/8	8	1 1/4	195	190	195
5	375	292.1	1 5/8	8	1 1/2	250	240	250
6	395	317.5	1 1/2	12	1 3/8	260	255	265
8	485	393.7	1 3/4	12	1 5/8	290	285	325
10	585	482.6	2	12	1 7/8	335	330	345
12	675	571.5	2 1/8	16	2	375	370	385
14	750	635.0	2 3/8	16	2 1/4	405	400	425
16	825	704.8	2 5/8	16	2 1/2	445	440	470
18	915	774.7	2 7/8	16	2 3/4	495	490	525
20	985	831.8	3 1/8	16	3	540	535	565
24	1170	990.6	3 5/8	16	3 1/2	615	610	650

NOTES:

- (1) Length of stud bolt does not include the height of the points.
- (2) For flange bolt holes
- (3) For spot facing
- (4) Bolt lengths not shown in table may be determined in accordance with Annex D.

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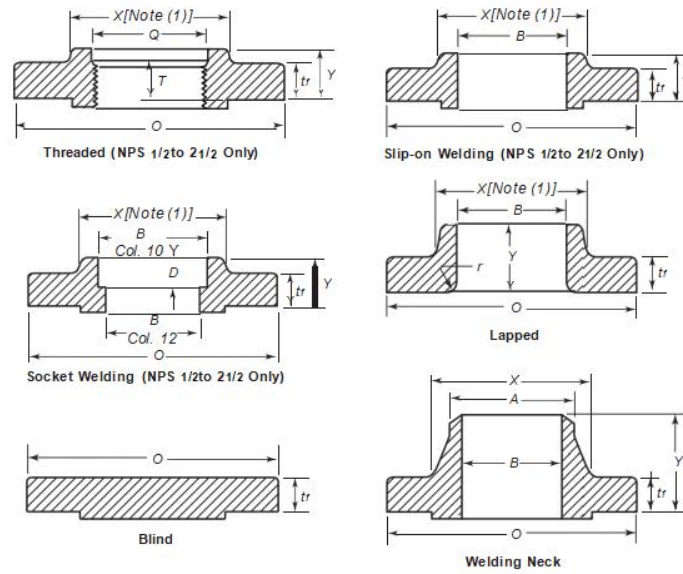


Table 12 Dimensions of Class 1500 Flanges

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nominal Pipe Size, NPS	Outside Diameter of Flange, O	Thickness of Flange Min., tr	Diameter of Hub, X	Hub Diameter Beginning of Chamfer Welding Neck, A [Note (2)]	Length Through Hub			Thread Length Threaded Flange Min., T [Note (3)]	Bore			Corner Radius of Bore of Lapped Flange and Pipe, r	Counter bore Threaded Flange Min., Q	Depth of Socket, D
					Threaded/ Slip-on/ Socket Welding, Y	Lapped, Y	Welding Neck, Y		Slip-on/ Socket Welding Min., B	Lapped Min., B	Welding Neck/ Socket Welding, B			
1/2	120	22.3	38	21.3	32	32	60	23	22.2	22.9	To be specified by Purchaser	3	23.6	10
3/4	130	25.4	44	26.7	35	35	70	26	27.7	28.2		3	29.0	11
1	150	28.6	52	33.4	41	41	73	29	34.5	34.9		3	35.8	13
1 1/4	160	28.6	64	42.2	41	41	73	31	43.2	43.7		5	44.4	14
1 1/2	180	31.8	70	48.3	44	44	83	32	49.5	50.0		6	50.6	16
2	215	38.1	105	60.3	57	57	102	39	61.9	62.5		8	63.5	17
2 1/2	245	41.3	124	73.0	64	64	105	48	74.6	75.4		8	76.2	19
3	265	47.7	133	88.9	...	73	117	...	...	91.4		10	...	...
4	310	54.0	162	114.3	...	90	124	...	...	116.8		11	...	...
5	375	73.1	197	141.3	...	105	156	...	...	144.4		11	...	...
6	395	82.6	229	168.3	...	119	171	...	...	171.4		13	...	...
8	485	92.1	292	219.1	...	143	213	...	...	222.2		13	...	...
10	585	108.0	368	273.0	...	178	254	...	...	277.4		13	...	...
12	675	123.9	451	323.8	...	219	283	...	...	328.2		13	...	...
14	750	133.4	495	355.6	...	241	298	...	...	360.2		13	...	...
16	825	146.1	552	406.4	...	260	311	...	...	411.2		13	...	...
18	915	162.0	597	457.0	...	276	327	...	...	462.3		13	...	...
20	985	177.8	641	508.0	...	292	356	...	...	514.4		13	...	...
24	1170	203.2	762	610.0	...	330	406	...	...	616.0		13	...	...

NOTES:

- (1) This dimension is for large end of hub, which may be straight or tapered. Taper shall not exceed 7 deg on threaded, slip-on, socket-welding, and lapped flanges. This dimension is defined as the diameter at the intersection between the hub taper and the back face of the flange.
- (2) For welding end bevel.
- (3) For thread of threaded flanges.

CLASS 2500 PIPE FLANGES

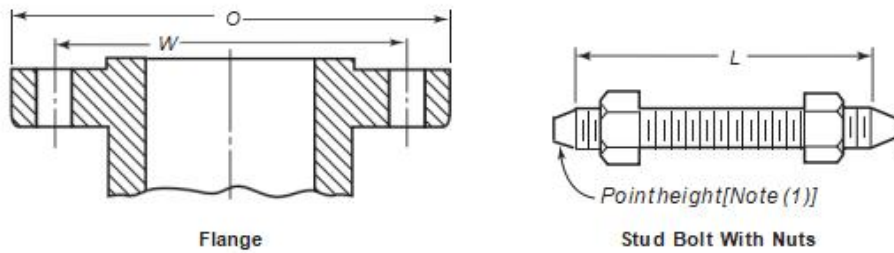


Table 13 Templates for Drilling Class 2500 Flanges

1	2	3	4	5	6	7	8	9
Drilling [Notes (2), (3)]					Length of Bolts, L [Notes (1), (4)]			
Nominal Pipe Size, NPS	Outside Diameter of Flange, O	Diameter of Bolt Circle, W	Diameter of Bolt Holes, in.	Number of Bolts	Diameter of Bolts, in.	7 mm Raised Face	Male and Female/Tongue and Groove	Ring Joint
1/2	135	88.9	7/8	4	3/4	120	115	120
3/4	140	95.2	7/8	4	3/4	125	120	125
1	160	108.0	1	4	7/8	140	135	140
1 1/4	185	130.2	1 1/8	4	1	150	145	150
1 1/2	205	146.0	1 1/4	4	1 1/8	170	165	170
2	235	171.4	1 1/8	8	1	180	170	180
2 1/2	265	196.8	1 1/4	8	1 1/8	195	190	205
3	305	228.6	1 3/8	8	1 1/4	220	215	230
4	355	273.0	1 5/8	8	1 1/2	255	250	260
5	420	323.8	1 7/8	8	1 3/4	300	290	310
6	485	368.3	2 1/8	8	2	345	335	355
8	550	438.2	2 1/8	12	2	380	375	395
10	675	539.8	2 5/8	12	2 1/2	490	485	510
12	760	619.1	2 7/8	12	2 3/4	540	535	560

NOTES:

- (1) Length of stud bolt does not include the height of the points.
- (2) For flange bolt holes
- (3) For spot facing
- (4) Bolt lengths not shown in table may be determined with Annex

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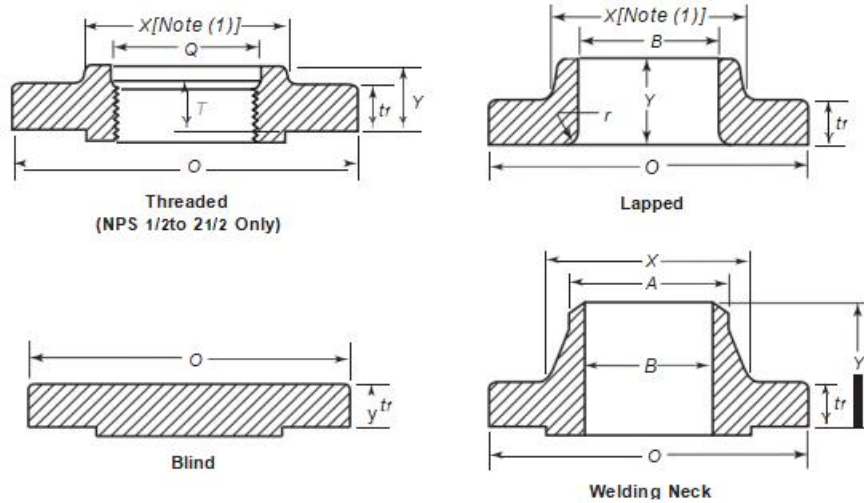


Table 14 Dimensions of Class 2500 Flanges

1	2	3	4	5	6	7	8	9	10	11	12	13
Nominal Pipe Size, NPS	Outside Diameter of Flange, O	Thickness of Flange Min., tr	Diameter of Hub, X	Hub Diameter Beginning of Chamfer Welding Neck, A [Note (2)]	Length Through Hub			Thread Length Threaded Flange Min., T [Note (3)]	Bore		Corner Radius of Bore of Lapped Flange and Pipe, r	Counterbore Threaded Flange Min., Q
					Threaded, Y	Lapped, Y	Welding Neck, Y		Lapped Min., B	Welding Neck, B		
1/2	135	30.2	43	21.3	40	40	73	29	22.9	To be specified by Purchaser	3	23.6
3/4	140	31.8	51	26.7	43	43	79	32	28.2		3	29.0
1	160	35.0	57	33.4	48	48	89	35	34.9		3	35.8
1 1/4	185	38.1	73	42.2	52	52	95	39	43.7		5	44.4
1 1/2	205	44.5	79	48.3	60	60	111	45	50.0		6	50.6
2	235	50.9	95	60.3	70	70	127	51	62.5		8	63.5
2 1/2	265	57.2	114	73.0	79	79	143	58	75.4		8	76.2
3	305	66.7	133	88.9	...	92	168	...	91.4		10	...
4	355	76.2	165	114.3	...	108	190	...	116.8		11	...
5	420	92.1	203	141.3	...	130	229	...	144.4		11	...
6	485	108.0	235	168.3	...	152	273	...	171.4		13	...
8	550	127.0	305	219.1	...	178	318	...	222.2		13	...
10	675	165.1	375	273.0	...	229	419	...	277.4		13	...
12	760	184.2	441	323.8	...	254	464	...	328.2		13	...

NOTES:

- (1) This dimension is for large end of hub, which may be straight or tapered. Taper shall not exceed 7 deg on threaded, slip-on, socket-welding, and lapped flanges. This dimension is defined as the diameter at the intersection between the hub taper and the back face of the flange.
- (2) For welding end bevel.
- (3) For thread of threaded flanges.

TOLERANCES

Center-to-Contact Surfaces and Center-to-End Tolerances

(a) *Center-to-Contact Surfaces Other Than Ring Joint:*

NPS $\leq$ 10 ± 1.0 mm (± 0.03 in.)

NPS $\geq$ 12 ± 1.5 mm (± 0.06 in.)

(b) *Center-to-End (Ring Joint):*

NPS $\leq$ 10 ± 1.0 mm (± 0.03 in.)

NPS $\geq$ 12 ± 1.5 mm (± 0.06 in.)

(c) *Contact Surface-to-Contact Surface Other Than Ring Joint:*

NPS $\leq$ 10 ± 2.0 mm (± 0.06 in.)

NPS $\geq$ 12 ± 3.0 mm (± 0.12 in.)

(d) *End-to-End (Ring Joint):*

NPS $\leq$ 10 ± 2.0 mm (± 0.06 in.)

NPS $\geq$ 12 ± 3.0 mm (± 0.12 in.)

Pressure Testing

Flanges are not required to be pressure tested

Flanged Fitting Test

Shell Pressure Test: The shell pressure test pressure for flanged fittings shall be no less than 1.5 times the pressure rating at 38 ° C (100 ° F), rounded up to the next higher 1 bar (25 psi) increment.

Test Fluid:

Water (with the addition of corrosion inhibitors) or kerosene shall be used as the test fluid. The test fluid temperature shall not exceed 50 ° C (125 ° F).

Test Duration:

Flanged Fittings Size	Duration, Sec
NPS $\leq$ 2	60
2 1/2 $\leq$ NPS $\leq$ 8	120
NPS $\geq$ 10	180