

مجموعه تکرانهای ابعادی اقلام مصرفی در صنایع نفت ، گاز و پتروشیمی

(بر اساس استاندارد ۵۵۰۰۰)

با همکاری آموزشگا

ارائه شده در گر

ng.ir



بجودی

تی ، مشاوره و آموزش

عدی حتما در نظر گرفته شوند .

Mob: 09

تدوین و گردآوری

از ۱۰ سال سابقه در زمینه های طراحی

دوستان ،

نحال میشوم نظرات و پیشنهادات خود را با ایند

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Tolerances for Diameter and Out-of-Roundness Acc. To API 5L

Specified outside diameter D mm (in)	Diameter tolerances mm (in)				Out-of-roundness tolerances mm (in)	
	Pipe except the end ^a		Pipe end ^{a, b, c}		Pipe except the end ^a	Pipe end ^{a, b, c}
	SMLS pipe	Welded pipe	SMLS pipe	Welded pipe		
< 60,3 (2.375)	- 0,8 (0.031) to + 0,4 (0.016)				d	
≥ 60,3 (2.375) to ≤ 168,3 (6.625)	± 0,007 5 D		- 0,4 (0.016) to + 1,6 (0.063)		0,020 D	0,015 D
>168,3 (6.625) to ≤ 610 (24.000)	± 0,007 5 D	± 0,007 5 D but maximum of + 3,2 (0.125)	± 0,005 D, but maximum of ± 1,6 (0.063)			
> 610 (24.000) to ≤ 1 422 (56.000)	± 0,01 D	± 0,005 D, but maximum of + 4,0 (0.160)	± 2,0 (0.079)	±1,6 (0.063)	0,015 D but maximum of 15 (0.6), for d / t ≤ 75	0,01 D, but maximum of 13 (0.5). for d / t ≤ 75
> 1 422 (56 000)	as agreed					
<p>a The pipe end includes a length of 100 mm (4.0 in) at each of the pipe extremities.</p> <p>b For SMLS pipe, the tolerances apply for t ≤ 25.0 mm (0.984 in). and the tolerances for thicker pipe shall be as agreed.</p> <p>c For pipe with D ≥ 219,1 mm (8.625 in), the diameter tolerance and the out-of-roundness tolerance may be determined using the calculated inside diameter (the specified outside diameter minus two times the specified wall thickness) or measured inside diameter rather than the specified outside diameter.(see 10.2.8.3.)</p> <p>d Included in the diameter tolerance.</p>						

Tolerances for wall thickness Acc. To API 5L

Wall thickness t mm (in)	Tolerances ^a mm (in)
SMLS pipe ^b	
≤ 4,0 (0.157)	+ 0,6 (0.024) - 0,5 (0.020)
> 4,0 (0.157) to <25,0 (0.984)	+ 0,150 - 0,125
≥ 25,0 (0.984)	+3,7 (0.146) or + 0,1 t, whichever is the greater - 3,0 (0.120) or - 0,1 t, whichever is the greater
Welded pipe ^{c, d}	
≤ 5,0 (0.197)	± 0,5 (0.020)
> 5,0 (0.197) to <15,0 (0.591)	± 0,1 t
≥ 15,0 (0.591)	±1,5 (0.060)
<p>a if the purchase order specifies a minus tolerance for wall thickness smaller than the applicable value given in this table, the plus tolerance for wall thickness shall be increased by an amount sufficient to maintain the applicable tolerance range.</p> <p>b for pipe with D ≥ 355,6 mm (14.000 in) and t ≥ 25,0 mm (0.984 in) the wall-thickness tolerance locally may exceed the plus tolerance for wall thickness by an additional 0,05 t, provided that the plus tolerance for mass (see 9.14) is not exceeded.</p> <p style="text-align: center;">c The plus tolerance for wall thickness does not apply to the weld area.</p> <p style="text-align: center;">d See 9.13.2 for additional restrictions.</p>	

Tolerances for Diameter and Out-of-Roundness Acc. To API 5L

Table 3—Permissible Tolerances in Diameter and Thickness for Ferritic Pipe

ASTM Material Standard	Acceptable Diameter Tolerances ^a		Acceptable Thickness Tolerances ^b
	≤ NPS 1 1/2	> NPS 1 1/2	
A 53	+1/64 in. (0.4 mm)	-1/64 in. (0.4 mm)	
	±1 %		
A106	+1/64 in. (0.4 mm)	-1/64 in. (0.4 mm)	
	+1/32 in. (0.79 mm)	-1/32 in. (0.79 mm)	
A312	+1/16 in. (1.59 mm)	-1/32 in. (0.79 mm)	-12.5 %
A530	+3/32 in. (2.38 mm)	-1/32 in. (0.79 mm)	
A731	+1/8 in. (3.18 mm)	-1/32 in. (0.79 mm)	
A790	+5/32 in. (3.97 mm)	-1/32 in. (0.79 mm)	
	+3/16 in. (4.76 mm)	-1/32 in. (0.79 mm)	
A134	Circumference ±0.5 % of specified diameter		Acceptable tolerance of plate standard
A135	+1 % of nominal		-12.5 %
A358	±0.5 %		-0.01 in. (0.3 mm)
A409	Wall < 0.188 in. (4.8 mm) thickness ±0.20 %		-0.018 in. (0.46 mm)
	Wall ≥ 0.188 in. (4.8 mm) thickness ±0.40 %		
A451	—		+1/8 in. (3 mm); -0
A524	+1/64 in. (0.4 mm)	-1/32 in. (0.8 mm)	
	+1/32 in. (0.8 mm)	-1/32 in. (0.8 mm)	
A524	+1/16 in. (1.6 mm)	-1/32 in. (0.8 mm)	-12.5 %
	+3/32 in. (2.4 mm)	-1/32 in. (0.8 mm)	
A587	+1/8 in. (3.2 mm)	-1/32 in. (0.8 mm)	
	See ASTM A587, Table 4		
A660	—		10 % greater than the specified minimum wall thickness
A671	+0.5 % of specified diameter		Zero less than the specified minimum wall thickness
	±0.5 % of specified diameter		
A671, A691	+0.010 in. (0.25 mm)	-	0.01 in. (0.3 mm) less than the specified thickness
	+0.020 in. (0.5 mm)	-	
A813	+0.030 in. (0.75 mm)	-	±12 % for wall thickness < 0.188 in. (4.8 mm)
	+0.040 in. (1 mm)	-	
A814	+0.050 in. (1.25 mm)	-	±0.030 in. (0.8 mm) for wall thickness ≥ 0.188 in. (4.8 mm)
	See ASTM A814, Table 1		

^a Tolerance on DN unless otherwise specified.

^b Tolerance on nominal wall thickness unless otherwise specified.

Dimensional Tolerances for Seamless and Welded Pipes ASTM A530

Nominal pipe size		
up to 4 = ± 0.79 mm 5 thru 8 = + 1.58 mm / - 0.79 mm		
10 thru 18 = + 2.37 mm / - 0.79 mm 20 thru 24 = + 3.18 mm / - 0.79 mm		
Wall Thickness	Length	Weight
All Diameters = - 12.5%	+ 6.40 mm / - 0 mm	Weight = + 10% / - 1.5%
+ tolerance not specified		

TABLE 1 Permissible Variations in Wall Thickness

NPS Designator	Tolerance, % from Nominal	
	Over	Under
	1/8 to 2 1/2, incl., all $t/D^{A,B}$ ratios	20.0
3 to 18 incl., t/D up to 5 % incl.	22.5	12.5
3 to 18 incl., $t/D > 5$ %	15.0	12.5
20 and larger, welded, all t/D ratios	17.5	12.5
20 and larger, seamless, t/D up to 5 % incl.	22.5	12.5
20 and larger, seamless, $t/D > 5$ %	15.0	12.5

^A t = Nominal wall thickness.

^B D = Ordered diameter.

TABLE 2 Permissible Variations in Outside Diameter

NPS Designator	Permissible Variations In Outside Diameter			
	Over		Under	
	in.	mm	in.	mm
1/8 to 1 1/2, incl	1/64 (0.015)	0.4	1/32 (0.031)	0.8
Over 1 1/2 to 4, incl	1/32 (0.031)	0.8	1/32 (0.031)	0.8
Over 4 to 8, incl	1/16 (0.062)	1.6	1/32 (0.031)	0.8
Over 8 to 18, incl	3/32 (0.093)	2.4	1/32 (0.031)	0.8
Over 18 to 26, incl	1/8 (0.125)	3.2	1/32 (0.031)	0.8
Over 26 to 34, incl	5/32 (0.156)	4.0	1/32 (0.031)	0.8
Over 34	3/16 (0.187)	4.8	1/32 (0.031)	0.8

TABLE X1.1 Minimum Wall Thicknesses on Inspection for Nominal (Average) Pipe Wall Thicknesses

NOTE 1—The following equation, upon which this table is based, may be applied to calculate minimum wall thickness from nominal (average) wall thickness:

$$t_n \times 0.875 = t_m$$

where:

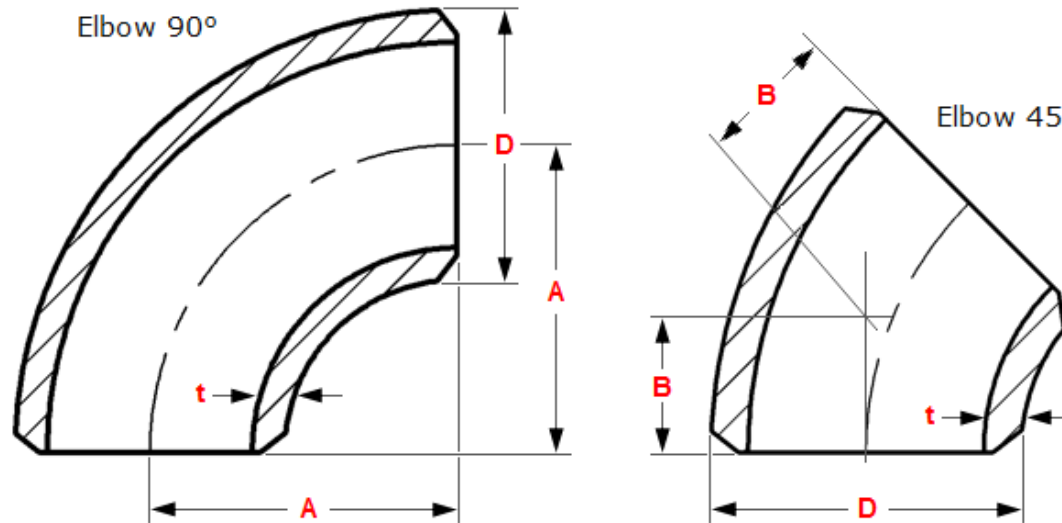
t_n = nominal (average) wall thickness, in. [mm], and

t_m = minimum wall thickness, in. [mm].

The wall thickness is expressed to three decimal places, the fourth decimal place being carried forward or dropped, in accordance with the Practice E 29.

NOTE 2—This table is a master table covering wall thicknesses available in the purchase of different classifications of pipe, but it is not meant to imply that all of the walls listed therein are obtainable under this specification.

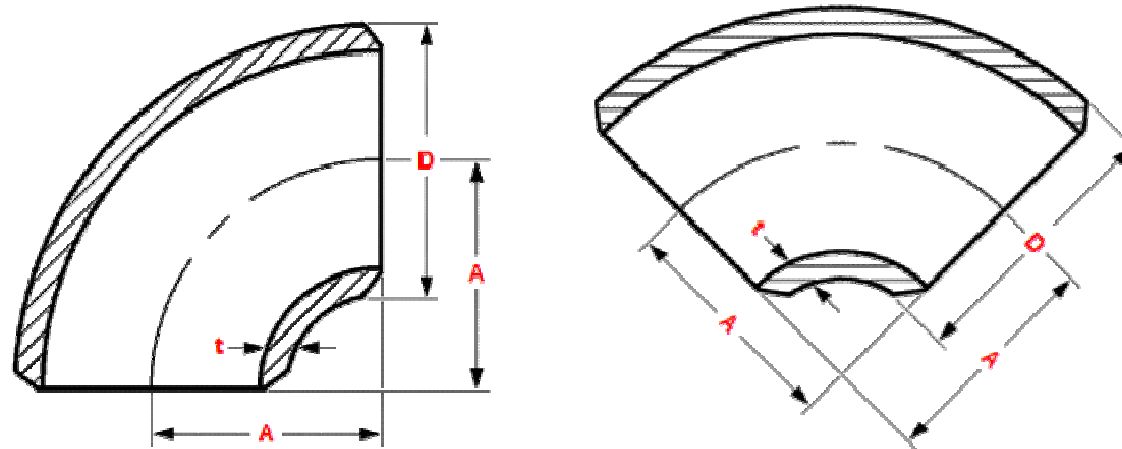
Dimensional Tolerances of Butt Weld Elbows - 45° and 90° - LR - ASME B16.9



Nominal Pipe Size	1/2 to 2½	3 to 3½	4	5 to 8
Outside Diameter at Bevel (D)	+ 1.6 - 0.8	1.6	1.6	+ 2.4 - 1.6
Inside Diameter at End	0.8	1.6	1.6	1.6
Center to End LR (A/B)	2	2	2	2
Center to End 3D (A/B)	3	3	3	3
Nominal Pipe Size	10 to 18	20 to 24	26 to 30	32 to 48
Outside Diameter at Bevel (D)	+ 4 - 3.2	+ 6.4 - 4.8	+ 6.4 - 4.8	+ 6.4 - 4.8
Inside Diameter at End	3.2	4.8	+ 6.4 - 4.8	+ 6.4 - 4.8
Center to End LR (A/B)	2	2	3	5
Center to End 3D (A/B)	3	3	6	6
Wall Thickness (t)	Not less than 87.5% of Nominal Wall Thickness			

Dimensional tolerances are in millimeters unless otherwise indicated and are equal \pm except as noted.

Dimensional Tolerances of Butt Weld Elbows Short Radius 90° ASME B16.9

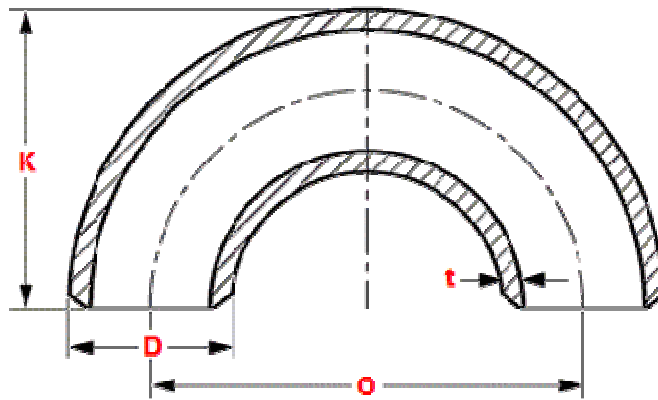


Nominal Pipe Size	1/2 to 2½	3 to 3½	4	5 to 8
Outside Diameter at Bevel (D)	+ 1.6 - 0.8	1.6	1.6	+ 2.4 - 1.6
Inside Diameter at End	0.8	1.6	1.6	1.6
Center to End (A)	2	2	2	2
Nominal Pipe Size	10 to 18	20 to 24	26 to 30	32 to 48
Outside Diameter at Bevel (D)	+ 4 - 3.2	+ 6.4 - 4.8	+ 6.4 - 4.8	+ 6.4 - 4.8
Inside Diameter at End	3.2	4.8	+ 6.4 - 4.8	+ 6.4 - 4.8
Center to End (A)	2	2	3	5
Wall Thickness (t)	Not less than 87.5% of Nominal Wall Thickness			

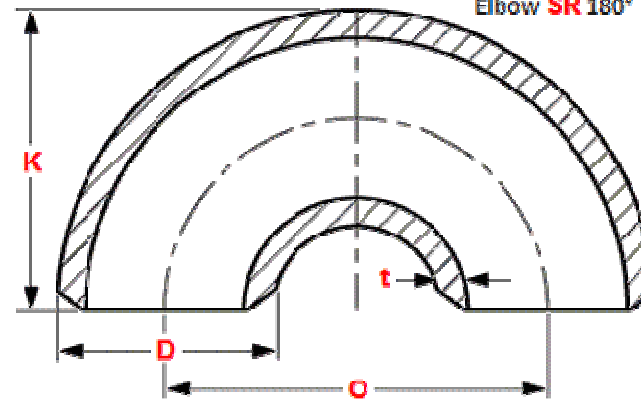
Dimensional tolerances are in millimeters unless otherwise indicated and are equal \pm except as noted.

Dimensional Tolerances of Butt Weld Elbows 180° LR and SR ASME B16.9

Elbow LR 180°



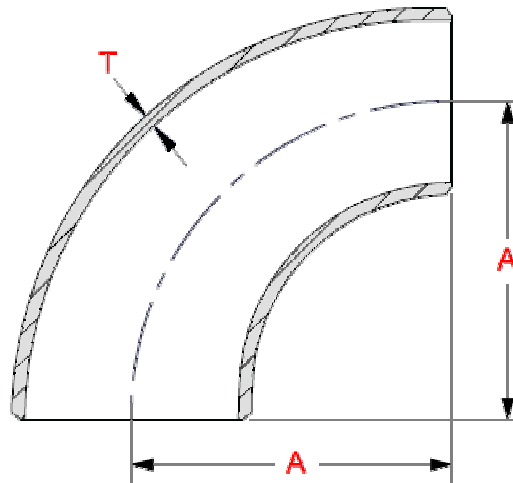
Elbow SR 180°



Nominal Pipe Size	1/2 to 2½	3 to 3½	4
Outside Diameter at Bevel (D)	+ 1.6 - 0.8	1.6	1.6
Inside Diameter at End	0.8	1.6	1.6
Center to Center (O)	6	6	6
Back to Face (K)	6	6	6
Nominal Pipe Size	5 to 8	10 to 18	20 to 24
Outside Diameter at Bevel (D)	+ 2.4 - 1.6	+ 4 - 3.2	+ 6.4 - 4.8
Inside Diameter at End	1.6	3.2	4.8
Center to Center (O)	6	10	10
Back to Face (K)	6	6	6
Wall Thickness (t)	Not less than 87.5% of Nominal Wall Thickness		

Dimensional tolerances are in millimeters unless otherwise indicated and are equal \pm except as noted.

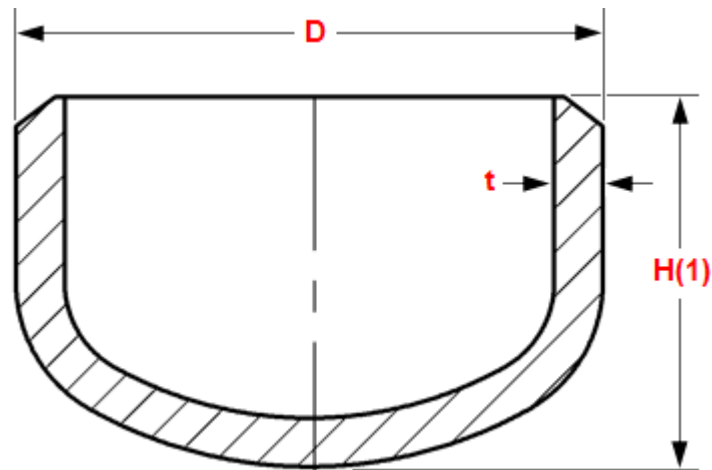
Dimensional Tolerances of Butt Weld Red Elbows 90° LR ASME B16.9



Nominal Pipe Size	1/2 to 2½	3 to 3½	4
Outside Diameter at Bevel	+ 1.6 - 0.8	1.6	1.6
Inside Diameter at End	0.8	1.6	1.6
Center to End LR (A)	2	2	2
Nominal Pipe Size	5 to 8	10 to 18	20 to 24
Outside Diameter at Bevel	+ 2.4 - 1.6	+ 4 - 3.2	+ 6.4 - 4.8
Inside Diameter at End	1.6	3.2	4.8
Center to End LR (A)	2	2	2
Wall Thickness (t)	Not less than 87.5% of Nominal Wall Thickness		

Dimensional tolerances are in millimeters unless otherwise indicated and are equal \pm except as noted.

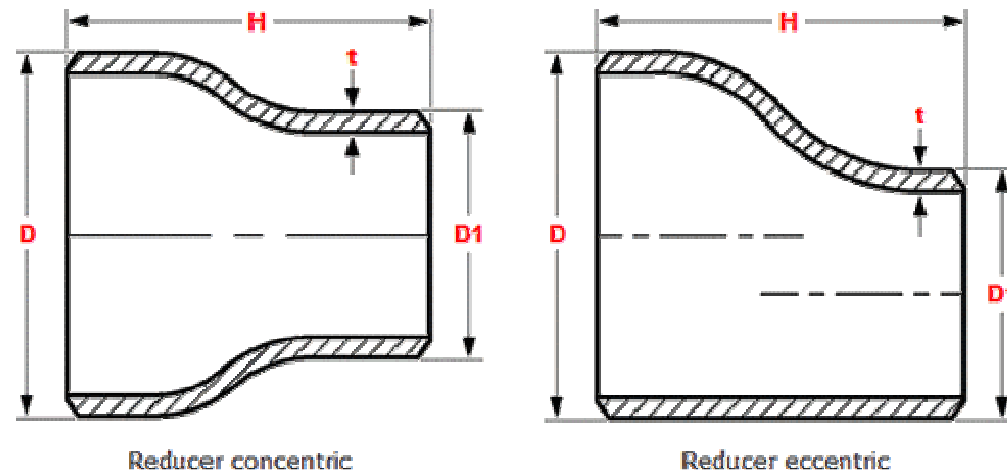
Dimensional Tolerances of End Caps ASME B16.9



Nominal Pipe Size	1/2 to 2½	3 to 3½	4	5 to 8
Outside Diameter at Bevel (D)	+ 1.6 - 0.8	1.6	1.6	+ 2.4 - 1.6
Inside Diameter at End	0.8	1.6	1.6	1.6
Overall Length (H)	3	3	3	6
Nominal Pipe Size	10 to 18	20 to 24	26 to 30	32 to 48
Outside Diameter at Bevel (D)	+ 4 - 3.2	+ 6.4 - 4.8	+ 6.4 - 4.8	+ 6.4 - 4.8
Inside Diameter at End	3.2	4.8	+ 6.4 - 4.8	+ 6.4 - 4.8
Overall Length (H)	6	6	10	10
Wall Thickness (t)	Not less than 87.5% of Nominal Wall Thickness			

Dimensional tolerances are in millimeters unless otherwise indicated and are equal \pm except as noted.

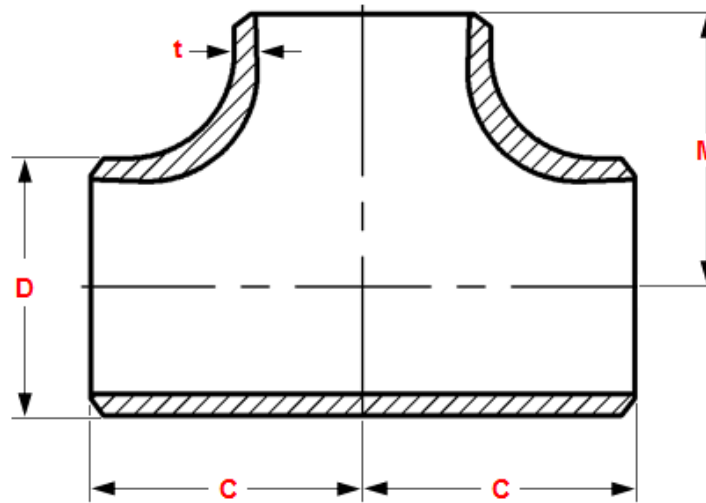
Dimensional Tolerances of Concentric and Eccentric Reducers ASME B16.9



Nominal Pipe Size	1/2 to 2½	3 to 3½	4	5 to 8
Outside Diameter at Bevel (D)	+ 1.6 - 0.8	1.6	1.6	+ 2.4 - 1.6
Inside Diameter at End	0.8	1.6	1.6	1.6
Overall Length (H)	2	2	2	2
Nominal Pipe Size	10 to 18	20 to 24	26 to 30	32 to 48
Outside Diameter at Bevel (D)	+ 4 - 3.2	+ 6.4 - 4.8	+ 6.4 - 4.8	+ 6.4 - 4.8
Inside Diameter at End	3.2	4.8	+ 6.4 - 4.8	+ 6.4 - 4.8
Overall Length (H)	2	2	5	5
Wall Thickness (t)	Not less than 87.5% of Nominal Wall Thickness			

Dimensional tolerances are in millimeters unless otherwise indicated and are equal \pm except as noted.

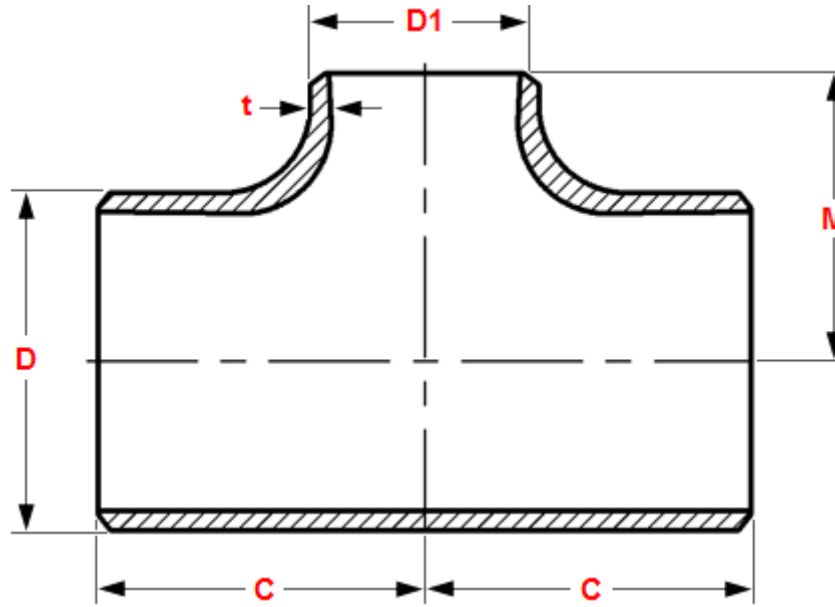
Dimensional Tolerances Straight Tees ASME B16.9



Nominal Pipe Size	1/2 to 2½	3 to 3½	4	5 to 8	10 to 18	20 to 24	26 to 30	32 to 48
Outside Dia at Bevel (D)	+1.6 -0.8	1.6	1.6	+2.4 -1.6	+4 -3.2	+6.4 -4.8	+6.4 -4.8	+6.4 -4.8
Inside Dia at End	0.8	1.6	1.6	1.6	3.2	4.8	+6.4 -4.8	+6.4 -4.8
Center to End (C / M)	2	2	2	2	2	2	3	5
Wall Thk (t)	Not less than 87.5% of Nominal Wall Thickness							

Dimensional tolerances are in millimeters unless otherwise indicated and are equal \pm except as noted.

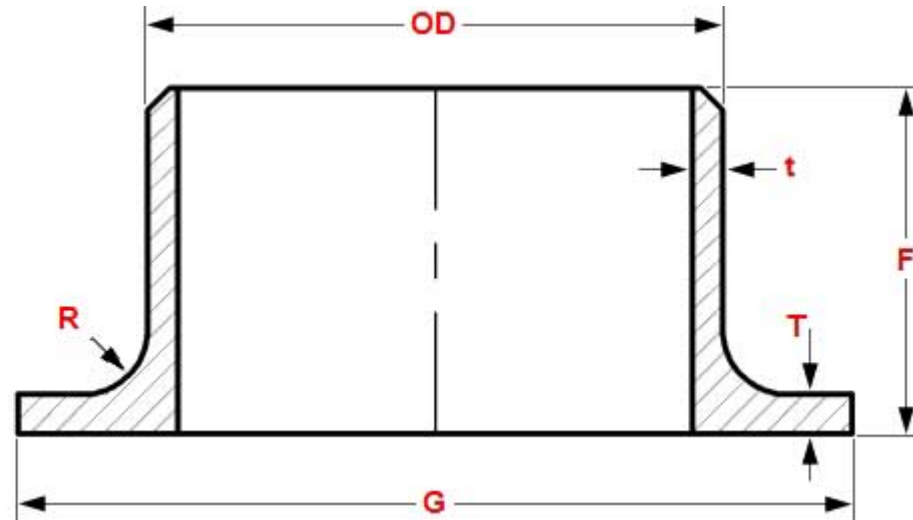
Dimensional Tolerances Reducing Tees ASME B16.9



Nominal Pipe Size	1/2 to 2½	3 to 3½	4	5 to 8	10 to 18	20 to 24	26 to 30	32 to 48
Outside Dia at Bevel (D)	+1.6 -0.8	1.6	1.6	+2.4 -1.6	+4 -3.2	+6.4 -4.8	+6.4 -4.8	+6.4 -4.8
Inside Dia at End	0.8	1.6	1.6	1.6	3.2	4.8	+6.4 -4.8	+6.4 -4.8
Center to End (C / M)	2	2	2	2	2	2	3	5
Wall Thk (t)	Not less than 87.5% of Nominal Wall Thickness							

Dimensional tolerances are in millimeters unless otherwise indicated and are equal ± except as noted.

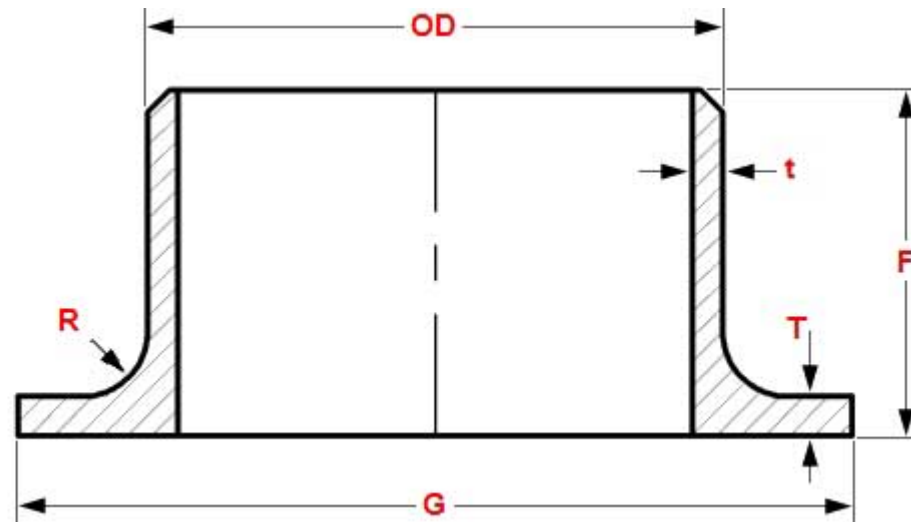
Dimensional Tolerances of Stub Ends MSS SP-43



Nominal Pipe Size	1/2 up to 2½	3 to 3½	4	5 to 8	10 to 18	20 to 24
Outside Diameter at Welding End (OD)	0.8	0.8	0.8	+ 1.6 - 0.8	+ 2.29 - 0.76	+ 3.05 - 0.76
Overall Length (F)	1.6	1.6	1.6	1.6	2	2
Outside Diameter of Lap (G)	+ 0 - 0.76	+ 0 - 0.76	+ 0 - 0.76	+ 0 - 0.76	+ 0 - 1.6	+ 0 - 1.6
Thickness of Lap (T)	+ 1.52 - 0	+ 1.52 - 0	+ 1.52 - 0	+ 1.52 - 0	+ 1.52 - 0	+ 1.52 - 0
Fillet Radius of Lap (R)	+ 0 - 0.76	+ 0 - 0.76	+ 0 - 1.6	+ 0 - 1.6	+ 0 - 1.6	+ 0 - 1.6
Wall Thickness (t)	Not less than 87.5% of Nominal Wall Thickness					

Dimensional tolerances are in millimeters unless otherwise indicated and are equal \pm except as noted.

Dimensional Tolerances of Stub Ends ASME B16.9



Nominal Pipe Size	1/2 up to 2½	3 to 3½	4	5 to 8	10 to 18	20 to 24
Outside Diameter at Welding End (OD)	+ 1.6 - 0.8	1.6	1.6	+ 2.29 - 1.6	+ 4.06 - 3.05	+ 6.35 - 4.83
Overall Length (F)	1.6	1.6	1.6	1.6	2	2
Outside Diameter of Lap (G)	+ 0 - 0.76	+ 0 - 0.76	+ 0 - 0.76	+ 0 - 0.76	+ 0 - 1.6	+ 0 - 1.6
Thickness of Lap (T)	+ 1.52 - 0	+ 1.52 - 0	+ 1.52 - 0	+ 1.52 - 0	+ 1.52 - 0	+ 1.52 - 0
Fillet Radius of Lap (R)	+ 0 - 0.76	+ 0 - 0.76	+ 0 - 1.6	+ 0 - 1.6	+ 0 - 1.6	+ 0 - 1.6
Wall Thickness (t)	Not less than 87.5% of Nominal Wall Thickness					

Dimensional tolerances are in millimeters unless otherwise indicated and are equal \pm except as noted.

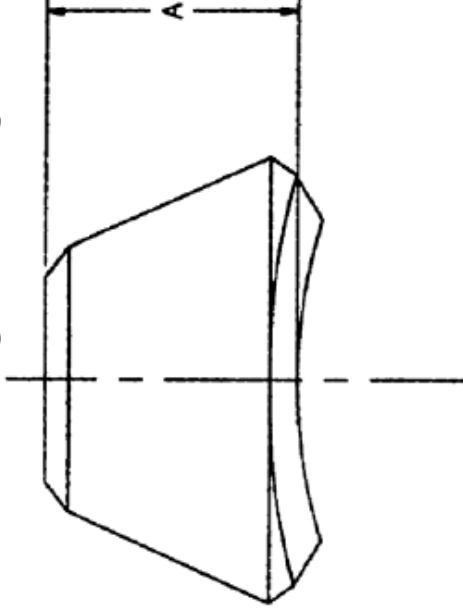
Dimensional Tolerances of ButtWelding Olets – MSS SP-97

MSS

STANDARD PRACTICE

SP-97

TABLE 2 Branch Outlet Height – ButtWelding, Customary Units



OUTLET NPS	"A" (FACE OF FITTING TO CROUCH)					
	STANDARD		EXTRA STRONG		SCHEDULE 160	
	Reducing	Full	Reducing	Full	Reducing	Full
1/8	.62	-	.62	-	-	-
1/4	.62	-	.62	-	-	-
3/8	.75	-	.75	-	-	-
1/2	.75	.75	.75	.75	1.12	1.12
3/4	.88	.88	.88	.88	1.25	1.25
1	1.06	1.06	1.06	1.06	1.50	1.50
1-1/4	1.25	1.25	1.25	1.25	1.75	1.75
1-1/2	1.31	1.31	1.31	1.31	2.00	2.00
2	1.50	1.50	1.50	1.50	2.18	2.18
2-1/2	1.62	1.62	1.62	1.62	2.44	2.44
3	1.75	1.75	1.75	1.75	2.88	2.88
3-1/2	1.88	2.00	1.88	2.00	-	-
4	2.00	2.00	2.00	2.00	3.31	3.31
5	2.25	2.25	2.25	2.25	3.69	3.69
6	2.38	2.38	3.06	3.06	4.12	4.12
8	2.75	2.75	3.88	3.88	-	-
10	3.06	3.06	3.69	3.50	-	-
12	3.38	3.38	4.06	3.94	-	-
14	3.50	3.50	3.94	4.12	-	-
16	3.69	3.69	4.18	4.44	-	-
18	3.81	4.06	4.38	4.69	-	-
20	4.00	4.62	4.69	5.00	-	-
24	4.56	5.38	5.50	5.50	-	-

Dimensions are in Inches
Tolerances: 1/8 – 3/4 ± .03 in.
1 – 4 ± .06 in.
5 – 12 ± .12 in.
14 – 24 ± .19 in.

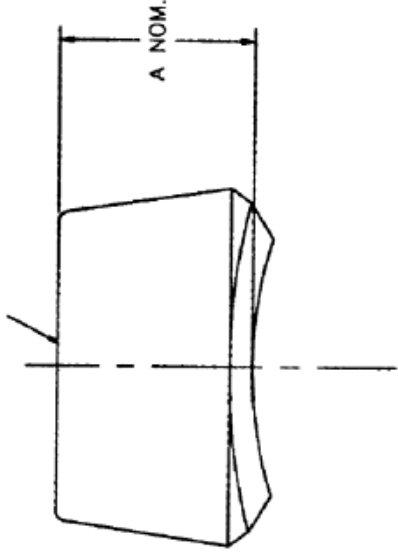
Dimensional Tolerances of Thread Olets – MSS SP-97

MSS

STANDARD PRACTICE

SP-97

TABLE 3 Branch Outlet Height – Threaded, Customary Units
NPT THREADS PER B1.20.1



OUTLET NPS	"A" (FACE OF FITTING TO CROUCH)	
	3000	THREADED 6000
1/8	.75	-
1/4	.75	-
3/8	.81	-
1/2	1.00	1.25
3/4	1.06	1.44
1	1.31	1.56
1-1/4	1.31	1.62
1-1/2	1.38	1.69
2	1.50	2.06
2-1/2	1.81	-
3	2.00	-
4	2.25	-

Dimensions are in Inches

Tolerances: 1/8 – 1/4 ± .03 in.

1 – 4 ± .06 in.

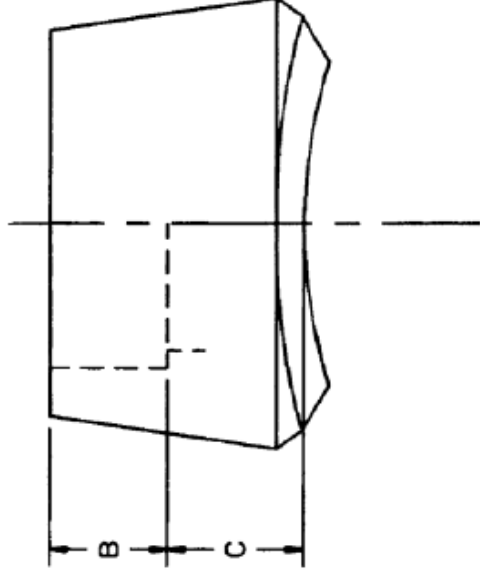
Dimensional Tolerances of Socket Weld Olets – MSS SP-97

MSS

STANDARD PRACTICE

SP-97

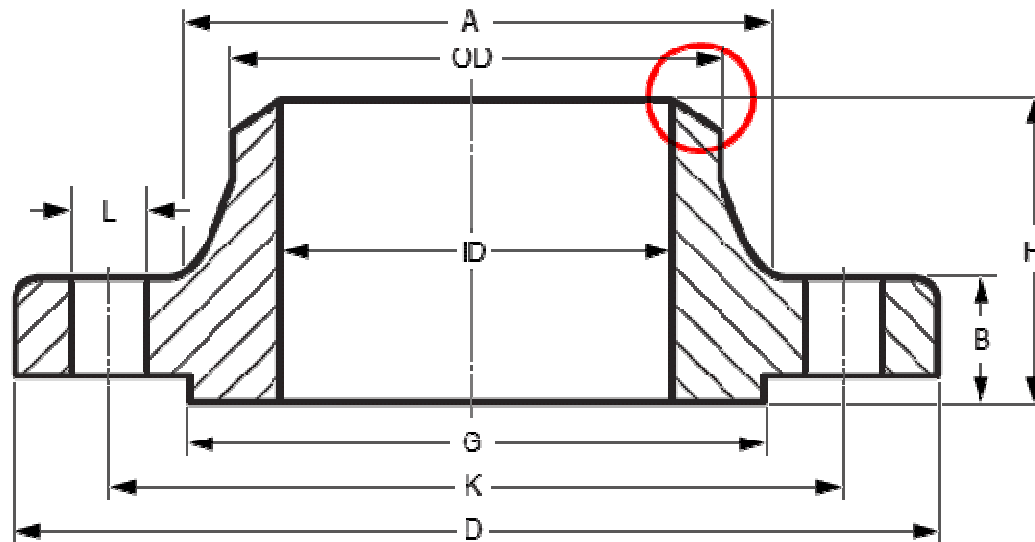
TABLE 4 Branch Outlets – Socket Welding Customary Units



OUTLET NPS	"B" MIN. ^(a)	"C" MAX.	
		3000	6000
1/8	0.38	0.41	-
1/4	0.38	0.41	-
3/8	0.38	0.50	-
1/2	0.38	0.63	0.94
3/4	0.50	0.63	1.00
1	0.50	0.88	1.13
1-1/4	0.50	0.88	1.19
1-1/2	0.50	0.94	1.25
2	0.62	0.94	1.44
2-1/2	0.62	1.00	-
3	0.62	1.19	-
4	0.75	1.19	-

(a) Note: "B" Minimum Socket Depth per ASME B16.11
Dimensions are in inches

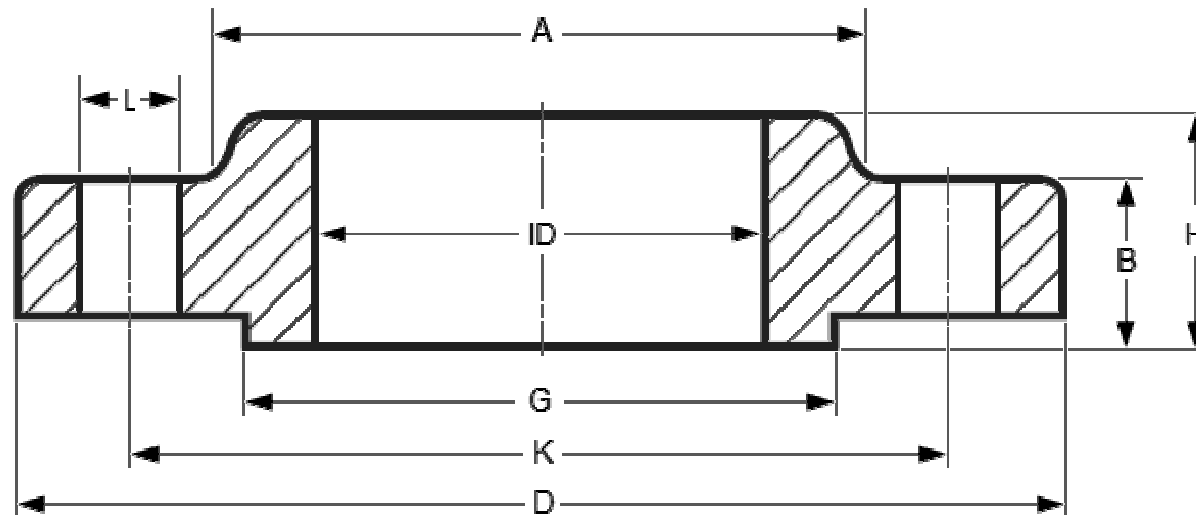
Dimensional Tolerances of Weld Neck Flanges ASME B16.5



DIMENSIONAL TOLERANCES OF WELD NECK FLANGES ASME B16.5

OUTSIDE DIAMETER (NOTE 1) ≤ 24 1.6 mm (0.06 in) > 24 ± 3.2 mm (± 0.12 in)	DIAMETER HUB AT BASE ≤ 24 1.6 mm (0.06 in) > 24 ± 3.2 mm (± 0.12 in)	INSIDE DIAMETER ≤ 10 ± 0.8 mm (± 0.03 in) 12 thru 18 1.6 mm (0.06 in) ≥ 20 $+3.2$ mm / -1.6 mm (± 0.12 in / -0.06 in)	DIAMETER HUB AT POINT OF WELDING ≤ 5 $+2.4$ mm / -0.8 mm (± 0.09 in / -0.03 in) ≥ 6 $+4.0$ mm / -0.8 mm ($+0.15$ in / -0.03 in)	DRILLING Bolt Circle 1.6 mm (0.06 in) Bolt Hole Spacing ± 0.8 mm (± 0.03 in)	ECCENTRICITY BOLT CIRCLE $\leq 2\frac{1}{2}$ 0.8 mm max (0.03 in max) ≥ 3 1.6 mm max (0.06 in max)
THICKNESS ≤ 18 $+3.2$ mm / -0 ($+0.12$ in / -0) ≥ 20 $+4.8$ mm / -0 ($+0.18$ in / -0)	LENGTH THRU HUB ≤ 10 1.6 mm (0.06 in) ≥ 12 ± 3.2 mm (± 0.12 in)	DIAMETER CONTACT FACE 1.6 mm RF (0.06 in) ± 0.8 mm (± 0.03 in) 6.35 mm RF (0.25 in) ± 0.4 mm (± 0.01 in) Tongue & Groove Male-Female ± 0.4 mm (± 0.01 in)		<p style="text-align: center;"> $37.5^\circ \pm 2.5^\circ$ 6 mm min 1:3 max slope 45° max 2 mm ± 1 mm </p> <p> 1 mm (0.03 in) 2 mm (0.07 in) 6 mm (0.23 in) </p>	

Dimensional Tolerances of Slip On Flanges ASME B16.5



DIMENSIONAL TOLERANCES OF SLIP ON FLANGES ASME B16.5

OUTSIDE DIAMETER (NOTE 1)
 $\leq 24 = 1.6 \text{ mm}$
 $> 24 = \pm 3.2 \text{ mm}$

INSIDE DIAMETER
 $\leq 10 = \pm 0.8 \text{ mm}$
 $\geq 12 = +1.6 \text{ mm} / - 0 \text{ mm}$

OUTSIDE DIAMETER OF HUB
 $\leq 12 = + 2.4 \text{ mm} / - 1.6 \text{ mm}$
 $\geq 14 = \pm 3.2 \text{ mm}$

DIAMETER OF COUNTERBORE
 Same as for Inside Diameter

DRILLING
 Bolt Circle = 1.6 mm
 Bolt Hole Spacing = $\pm 0.8 \text{ mm}$

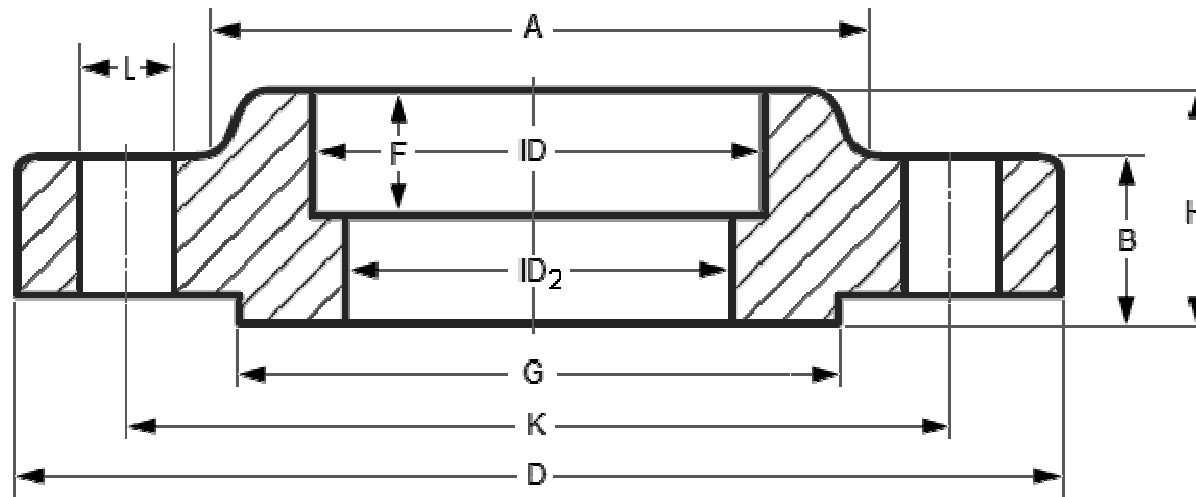
ECCENTRICITY OF BOLT CIRCLE
 $\leq 2\frac{1}{2} = 0.8 \text{ mm max.}$
 $\geq 3 = 1.6 \text{ mm max.}$

THICKNESS
 $\leq 18 = + 3.2 \text{ mm} / - 0$
 $\geq 20 = + 4.8 \text{ mm} / - 0$

LENGTH THRU HUB
 $\leq 18 = + 3.2 \text{ mm} / - 0.8 \text{ mm}$
 $\geq 20 = + 4.8 \text{ mm} / - 1.6 \text{ mm}$

DIAMETER OF CONTACT FACE
 1.6 mm Raised Face = $\pm 0.8 \text{ mm}$
 6.35 mm Raised Face, Tongue & Groove / Male-Female = $\pm 0.4 \text{ mm}$

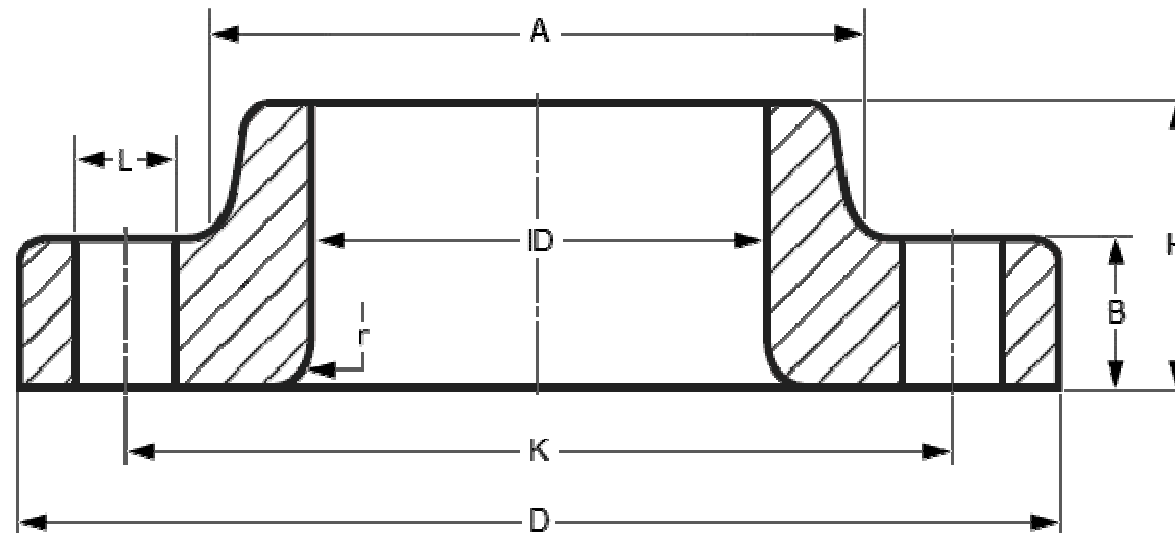
Dimensional Tolerances of Socket Weld Flanges ASME B16.5



DIMENSIONAL TOLERANCES OF SOCKET WELD FLANGES ASME B16.5

OUTSIDE DIAMETER (NOTE 1) ≤ 24 = ± 1.6 mm > 24 = ± 3.2 mm	INSIDE DIAMETER ≤ 10 = ± 0.8 mm ≥ 12 = + 1.6 mm / - 0 mm	OUTSIDE DIAMETER OF HUB ≤ 12 = + 2.4 mm / - 1.6 mm ≥ 14 = ± 3.2 mm	DIAMETER OF COUNTERBORE Same as for Inside Diameter	DRILLING Bolt Circle = 1.6 mm Bolt Hole Spacing = ± 0.8 mm	ECCENTRICITY OF BOLT CIRCLE ≤ 2½ = 0.8 mm max. ≥ 3 = 1.6 mm max.
THICKNESS ≤ 18 = + 3.2 mm / - 0 ≥ 20 = + 4.8 mm / - 0		LENGTH THRU HUB ≤ 18 = + 3.2 mm / - 0.8 mm ≥ 20 = + 4.8 mm / - 1.6 mm		DIAMETER OF CONTACT FACE 1.6 mm Raised Face = ± 0.8 mm 6.35 mm Raised Face, Tongue & Groove / Male-Female = ± 0.4 mm	

Dimensional Tolerances of Lap Joint Flanges ASME B16.5



DIMENSIONAL TOLERANCES OF LAP JOINT FLANGES ASME B16.5

OUTSIDE DIAMETER (NOTE 1)

$\leq 24 = 1.6 \text{ mm}$
 $> 24 = \pm 3.2 \text{ mm}$

INSIDE DIAMETER

$\leq 10 = \pm 0.8 \text{ mm}$
 $\geq 12 = +1.6 \text{ mm} / -0 \text{ mm}$

OUTSIDE DIAMETER OF HUB

$\leq 12 = +2.4 \text{ mm} / -1.6 \text{ mm}$
 $\geq 14 = \pm 3.2 \text{ mm}$

DIAMETER OF COUNTERBORE

Same as for Inside Diameter

DRILLING

Bolt Circle = 1.6 mm
 Bolt Hole Spacing = $\pm 0.8 \text{ mm}$

ECCENTRICITY OF BOLT CIRCLE

$\leq 2\frac{1}{2} = 0.8 \text{ mm max.}$
 $\geq 3 = 1.6 \text{ mm max.}$

THICKNESS

$\leq 18 = +3.2 \text{ mm} / -0$
 $\geq 20 = +4.8 \text{ mm} / -0$

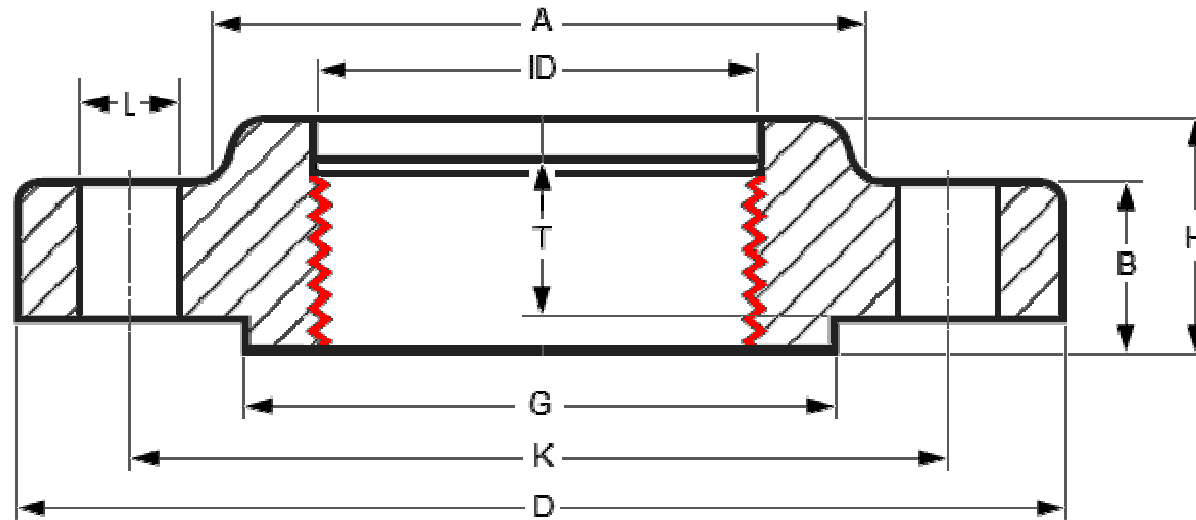
LENGTH THRU HUB

$\leq 18 = +3.2 \text{ mm} / -0.8 \text{ mm}$
 $\geq 20 = +4.8 \text{ mm} / -1.6 \text{ mm}$

DIAMETER OF CONTACT FACE

1.6 mm Raised Face = $\pm 0.8 \text{ mm}$
 6.35 mm Raised Face, Tongue & Groove / Male-Female = $\pm 0.4 \text{ mm}$

Dimensional Tolerances of Threaded Flanges ASME B16.5



DIMENSIONAL TOLERANCES OF THREADED FLANGES ASME B16.5

OUTSIDE DIAMETER (NOTE 1)

$\leq 24 = 1.6 \text{ mm}$
 $> 24 = \pm 3.2 \text{ mm}$

INSIDE DIAMETER

Within Limits on Boring Gauge

DRILLING

Bolt Circle = 1.6 mm
 Bolt Hole Spacing = $\pm 0.8 \text{ mm}$

ECCENTRICITY OF BOLT CIRCLE

$\leq 2\frac{1}{2} = 0.8 \text{ mm max.}$
 $\geq 3 = 1.6 \text{ mm max.}$

OUTSIDE DIAMETER OF HUB

$\leq 12 = +2.4 \text{ mm} / -1.6 \text{ mm}$
 $\geq 14 = \pm 3.2 \text{ mm}$

DIAMETER OF COUNTERBORE

Same as for Inside Diameter

THICKNESS

$\leq 18 = +3.2 \text{ mm} / -0$
 $\geq 20 = +4.8 \text{ mm} / -0$

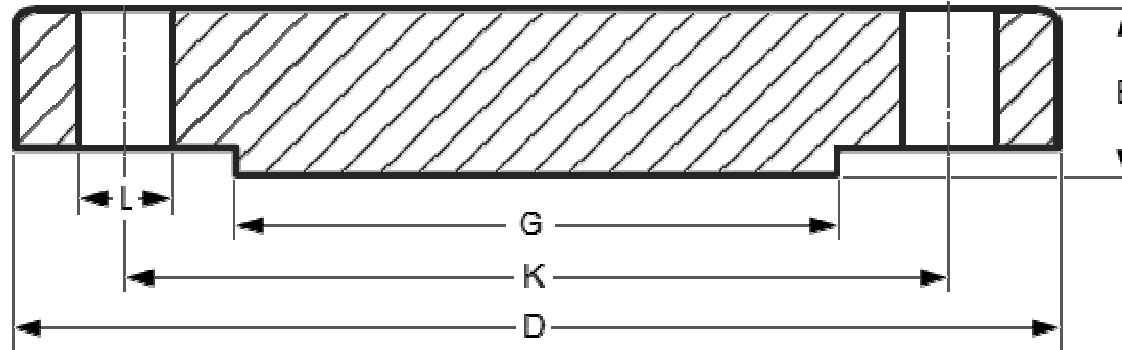
LENGTH THRU HUB

$\leq 18 = +3.2 \text{ mm} / -0.8 \text{ mm}$
 $\geq 20 = +4.8 \text{ mm} / -1.6 \text{ mm}$

DIAMETER OF CONTACT FACE

1.6 mm Raised Face = $\pm 0.8 \text{ mm}$
 6.35 mm Raised Face, Tongue & Groove / Male-Female = $\pm 0.4 \text{ mm}$

Dimensional Tolerances of Blind Flanges ASME B16.5



DIMENSIONAL TOLERANCES OF BLIND FLANGES ASME B16.5

OUTSIDE DIAMETER (NOTE 1)

≤ 24 = 1.6 mm
 > 24 = ± 3.2 mm

INSIDE DIAMETER

not applicable

OUTSIDE DIAMETER OF HUB

≤ 12 = + 2.4 mm / - 1.6 mm
 ≥ 14 = ± 3.2 mm

DRILLING

Bolt Circle = 1.6 mm
 Bolt Hole Spacing = ± 0.8 mm

ECCENTRICITY OF BOLT CIRCLE

≤ 2½ = 0.8 mm max.
 ≥ 3 = 1.6 mm max.

THICKNESS

≤ 18 = + 3.2 mm / - 0
 ≥ 20 = + 4.8 mm / - 0

LENGTH THRU HUB

≤ 18 = + 3.2 mm / - 0.8 mm
 ≥ 20 = + 4.8 mm / - 1.6 mm

DIAMETER OF CONTACT FACE

1.6 mm Raised Face = ± 0.8 mm
 6.35 mm Raised Face, Tongue & Groove / Male-Female = ± 0.4 mm

TOLERANCES: ASME B16.47

7.1 Facings

Required tolerances for various flange facings are as follows.

- (a) outside diameter of raised face, ± 2 mm (± 0.08 in.)
- (b) 2 mm (0.06 in.) raised face, ± 0.5 mm (± 0.02 in.)
- (c) 7 mm (0.25 in.) raised face, ± 2 mm (± 0.08 in.)
- (d) ring-joint groove tolerances are shown Table 28 (Table I-26)

7.2 Flange Thickness

Required tolerances for flange thickness, t_f are as follows:

<u>Flange Thickness, t_f</u>	<u>Tolerances</u>
$t_f < 25$ mm (1.0 in.)	+3.0 mm, -0.0 mm (+0.12 in., -0.00 in.)
25 mm (1.0 in.) $< t_f < 50$ mm (2.0 in.)	+5.0 mm, -0.0 mm (+0.19 in., -0.00 in.)
50 mm (2.0 in.) $< t_f < 75$ mm (3.0 in.)	+8.0 mm, -0.0 mm (+0.31 in., -0.00 in.)
$t_f > 75$ mm (3.0 in.)	+10.0 mm, -0.0 mm (+0.38 in., -0.00 in.)

The plus tolerance is applicable to bolting bearing surfaces whether as-forged, as-cast, spot-faced, or back faced. See para. 6.3.

7.3 Welding End Flange Ends and Hubs

7.3.1 Outside Diameter. The required tolerance for the nominal outside diameter, dimension A, of Fig. 1 (Fig. I-1), of welding ends of welding neck flanges is: +5.0 mm, -2.0 mm (+0.19 in., -0.06 in.).

7.3.2 Inside Diameter. Required tolerances for the nominal inside diameter, dimension B, of Figs. 1 and 2 (Figs. I-1 and I-2), of welding ends of welding neck flanges are as follows:

- (a) for Fig. 1: +3.0 mm, -2.0 mm (+0.12 in., -0.06 in.)
- (b) for Fig. 2: +0.0 mm, -2.0 mm (+0.00 in., -0.06 in.)

7.3.3 Backing Ring Contact Surface. The required tolerance for the bore of the backing ring contact surface of welding neck flanges, dimension C of Fig. 2 (Fig. I-2) is: +0.25 mm, -0.0 mm (+0.01 in., -0.00 in.).

7.3.4 Hub Thickness. Despite the tolerances specified for dimensions A and B, the thickness of the hub at the welding end shall not be less than 87.5% of the nominal thickness of the pipe having an undertolerance of 12.5% for the pipe wall thickness to which the flange is to be attached or the minimum wall thickness as specified by the purchaser.

7.4 Hub Length for Welding Neck Flanges

The required tolerance for the overall length of hubs for welding neck flanges is: +3.0 mm, -5.0 mm (+0.12 in., -0.19 in.).

7.5 Drilling and Facing

7.5.1 Bolt Circle Diameter. The required tolerance for all bolt circle diameters is: ± 1.5 mm (± 0.06 in.).

7.5.2 Bolt Hole to Bolt Hole. The required tolerance for the center-to-center of adjacent bolt holes is: ± 0.8 mm (± 0.03 in.).

7.5.3 Bolt Circle Concentricity. The required tolerance for concentricity between the flange bolt circle diameter and machined facing diameter is: 1.5 mm (0.06 in.).

Dimensional Tolerances of Valves ASME B16.34

6.2 End Dimensions

6.2.1 Buttwelding Ends. Unless otherwise specified by the purchaser, the details of the welding-end preparation shall be in accordance with ASME B16.25 with

(a) the inside diameter (denoted as dimension *B* in ASME B16.25) having the following tolerance:

Size	Tolerance for "B" Dimension
NPS ≤ 10	± 1.0 mm (± 0.03 in.)
12 ≤ NPS ≤ 18	± 2.0 mm (± 0.06 in.)
20 ≤ NPS	+ 3.0, - 2.0 mm (+ 0.12, - 0.06 in.)

6.2.2 Flanged Ends. Flanged ends shall be prepared with flange facing, nut-bearing surfaces, outside diameter, thickness, and drilling in accordance with ASME B16.5 or ASME B16.47, Series A or Series B

6.2.3 Socket Welding Ends. The socket bore diameter, depth of socket, and end surfaces shall be in accordance with ASME B16.11. The minimum thickness of the socket wall extending over the socket depth, including any associated counterbore, shall be in accordance with Table 4.

6.2.4 Threaded Ends. End connections shall have taper pipe threads in accordance with ASME B1.20.1. The minimum thickness of the wall extending over the length of an internal thread, including any tap bore or counterbore, shall be in accordance with Table 4. Thread lengths and gaging requirements shall be in accordance with ASME B16.11.

Table VI-1 Basis Equations for Minimum Wall Thickness, mm

Class P_c	Diameter, d , mm	Metric Equation, t_m , mm	Round
150	$3 \leq d < 50$	$t_m(150) = 0.064 d + 2.34$	off, one decimal
150	$50 \leq d \leq 100$	$t_m(150) = 0.020 d + 4.50$	off, one decimal
150	$100 < d \leq 1\ 300$	$t_m(150) = 0.0163 d + 4.70$	off, one decimal
300	$3 \leq d < 25$	$t_m(300) = 0.080 d + 2.29$	off, one decimal
300	$25 \leq d \leq 50$	$t_m(300) = 0.07 d + 2.54$	off, one decimal
300	$50 < d \leq 1\ 300$	$t_m(300) = 0.033 d + 4.40$	off, one decimal
600	$3 \leq d < 25$	$t_m(600) = 0.086 d + 2.54$	off, one decimal
600	$25 \leq d \leq 50$	$t_m(600) = 0.058 d + 3.30$	off, one decimal
600	$50 < d \leq 1\ 300$	$t_m(600) = 0.0675 d + 2.79$	off, one decimal
900	$3 \leq d < 25$	$t_m(900) = 0.15 d + 2.29$	off, one decimal
900	$25 \leq d \leq 50$	$t_m(900) = 0.059 d + 4.83$	off, one decimal
900	$50 < d \leq 1\ 300$	$t_m(900) = 0.10449 d + 2.54$	off, one decimal
1500	$3 \leq d \leq 1\ 300$	$t_m(1500) = 0.18443 d + 2.54$	off, one decimal
2500	$3 \leq d \leq 1\ 300$	$t_m(2500) = 0.34091 d + 2.54$	off, one decimal
4500	$3 \leq d \leq 1\ 300$	$t_m(4500) = 0.78488 d + 2.54$	off, one decimal

GENERAL NOTES:

- (a) For t_m , see para. 6.1.1.
 (b) For d , see para. 6.1.2.