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FACTORY-MADE WROUGHT BUTTWELDING FITTINGS

General

This Standard covers overall dimensions, tolerances, ratings, testing, and markings for wrought factory-made butt-welding fittings in sizes NPS 1; 2 through 48 (DN 15 through 1200).

Welding

Installation welding requirements are outside the scope of this Standard.

PRESSURE RATINGS

The allowable pressure ratings for fittings designed in accordance with this Standard may be calculated as for straight seamless pipe of equivalent material (as shown by comparison of composition and mechanical properties in the respective material specifications) in accordance with the rules established in the applicable sections of ASME B31, Code for Pressure Piping. For the calculation, applicable data for the pipe size, wall thickness, and material that is equivalent to that of the fitting shall be used. Pipe size, wan thickness (or schedule number), and material identity on the fittings are in lieu of pressure rating markings.

SIZE

NPS, followed by a dimensionless number, is the designation for nominal fitting size. NPS is related to the reference nominal diameter, DN, used in international standards. The relationship is, typically, as follows:

DN	NPS
15	1⁄2
20	3⁄4
32	1
40	1½
50	2
65	2½
80	3
100	4

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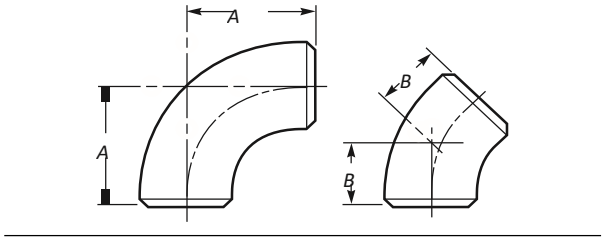
ASME B16.9 Long Radius Elbows Dimensions



Pipe Size (NPS)	Outside Diameter at Bevel	90-deg Elbows, A	45-deg Elbows, B
1⁄2	21.3	38	16
3⁄4	26.7	38	19
1	33.4	38	22
11⁄4	42.2	48	25
11⁄2	48.3	57	29
2	60.3	76	35
21⁄2	73	95	44
3	88.9	114	51
31⁄2	101.6	133	57
4	114.3	152	64
5	141.3	190	79
6	168.3	229	95
8	219.1	305	127
10	273	381	159
12	323.8	457	190
14	355.6	533	222
16	406.4	610	254
18	457	686	286
20	508	762	318
22	559	838	343
24	610	914	381
26	660	991	406
28	711	1 067	438
30	762	1 143	470
32	813	1 219	502
34	864	1 295	533
36	914	1 372	565
38	965	1 448	600
40	1 016.0	1 524	632
42	1 067.0	1 600	660
44	1 118.0	1 676	695
46	1 168.0	1 753	727

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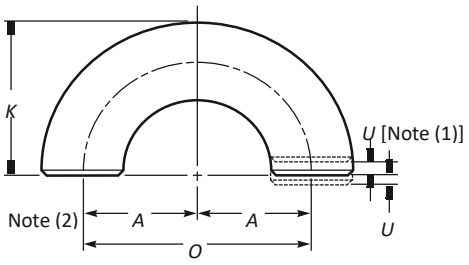
ASME B16.9 Long Radius Returns Dimensions



Nominal Pipe Size (NPS) lh	Outside Diameter at Bevel	Center-to-Center, O	Back-to-Face, K
1/2	21.3	76	48
3 ⁄4	26.7	76	51
1	33.4	76	56
11⁄4	42.2	95	70
11⁄2	48.3	114	83
2	60.3	152	106
21⁄2	73	190	132
3	88.9	229	159
31⁄2	101.6	267	184
4	114.3	305	210
5	141.3	381	262
6	168.3	457	313
8	219.1	610	414
10	273	762	518
12	323.8	914	619
14	355.6	1 067	711
16	406.4	1 219	813
18	457	1 372	914
20	508	1 524	1 016
22	559	1 676	1 118
24	610	1 829	1 219

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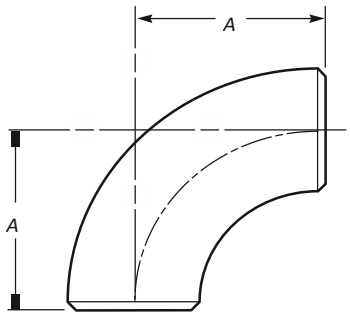
ASME B16.9 Short Radius Elbows Dimensions



Nominal Pipe Size (NPS)	Outside Diameter at Bevel	Center-to-End, A
1	33.4	25
11⁄4	42.2	32
11⁄2	48.3	38
2	60.3	51
21⁄2	73	64
3	88.9	76
31⁄2	101.6	89
4	114.3	102
5	141.3	127
6	168.3	152
8	219.1	203
10	273	254
12	323.8	305
14	355.6	356
16	406.4	406
18	457	457
20	508	508
22	559	559
24	610	610

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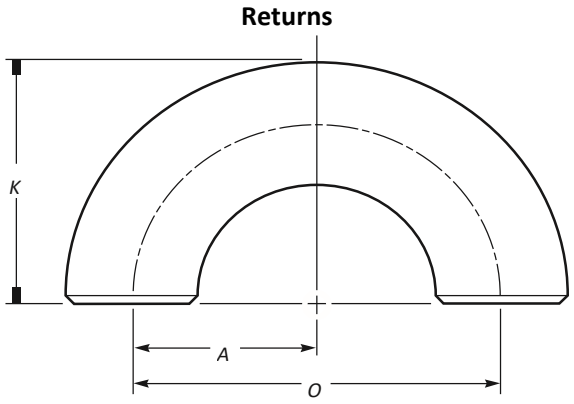
ASME B16.9 Short Radius 180 Deg Returns Dimensions



Nominal Pipe Size (NPS)	Outside Diameter at Bevel	Central to central O	Back to face K
11⁄4	42.2	48	48
11⁄2	48.3	57	57
2	60.3	64	64
21⁄2	73	76	76
3	88.9	86	86
31⁄2	101.6	95	95
4	114.3	105	105
5	141.3	124	124
6	168.3	143	143
8	219.1	178	178
10	273	216	216
12	323.8	254	254
14	355.6	279	279
16	406.4	305	305
18	457	343	343
20	508	381	381
22	559	419	419
24	610	432	432
26	660	495	495

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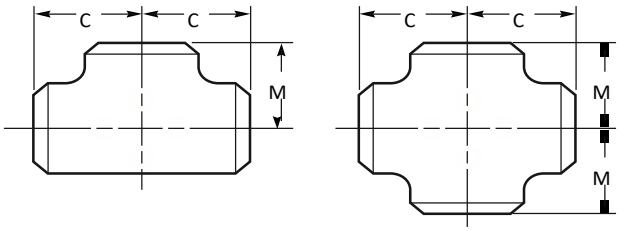
ASME B16.9 Straight Tees and Crosses Dimensions



Nominal Pipe Size (NPS)	Outside Diameter at Bevel	Run, C	Center-to-End Outlet, M [Notes (1) and (2)]
1⁄2	21.3	25	25
3⁄4	26.7	29	29
1	33.4	38	38
1¼	42.2	48	48
1½	48.3	57	57
2	60.3	64	64
2½	73	76	76
3	88.9	86	86
3½	101.6	95	95
4	114.3	105	105
5	141.3	124	124
6	168.3	143	143
8	219.1	178	178
10	273	216	216
12	323.8	254	254
14	355.6	279	279
16	406.4	305	305
18	457	343	343
20	508	381	381
22	559	419	419
24	610	432	432
26	660	495	495
28	711	521	521
30	762	559	559
32	813	597	597
34	864	635	635
36	914	673	673
38	965	711	711
40	1 016.0	749	749
42	1 067.0	762	711
44	1 118.0	813	762

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Reducing Outlet Tees and Reducing Outlet Crosses Dimensions

Nominal Pipe Size (NPS)	Outside Diameter Max.	Short Pattern Min.	Radius of Length,F [Notes (3), (4)]	Diameter of Barrel Length,F [Notes (3), (4)]	Fillet, R [Note (5)]	Lap, G [Note (5)]
1⁄2	0.896	0.809	3	2	0.12	0.12
3⁄4	1.106	1.019	3	2	0.12	0.12
1	1.376	1.284	4	2	0.12	0.12
11⁄4	1.716	1.629	4	2	0.19	0.19
11⁄2	1.965	1.869	4	2	0.25	0.25
2	2.456	2.344	6	2.5	0.31	0.31
21⁄2	2.966	2.844	6	2.5	0.31	0.31
3	3.596	3.469	6	2.5	0.38	0.38
31⁄2	4.096	3.969	6	3	0.38	0.38
4	4.593	4.469	6	3	0.44	0.44
5	5.683	5.532	8	3	0.44	0.44
6	6.743	6.594	8	3.5	0.5	0.5
8	8.743	8.594	8	4	0.5	0.5
10	10.913	10.719	10	5	0.5	0.5
12	12.913	12.719	10	6	0.5	0.5
14	14.17	13.969	12	6	0.5	0.5
16	16.18	15.969	12	6	0.5	0.5
18	18.19	17.969	12	6	0.5	0.5
20	20.24	19.969	12	6	0.5	0.5
22	22.24	21.969	12	6	0.5	0.5
24	24.24	23.969	12	6	0.5	0.5

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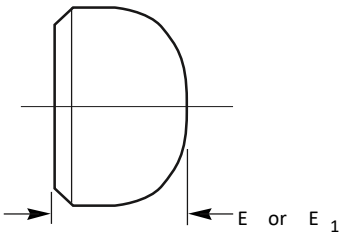
ASME B16.9 Caps Dimensions



Nominal Pipe Size (NPS)	Outside Diameter at Bevel	Length, *E* [Note (1)]	Limiting Wall Thickness for Length, *E*	Length, E_1 [Note (2)]
1⁄2	21.3	25	4.57	25
3⁄4	26.7	25	3.81	25
1	33.4	38	4.57	38
1¼	42.2	38	4.83	38
1½	48.3	38	5.08	38
2	60.3	38	5.59	44
2½	73	38	7.11	51
3	88.9	51	7.62	64
3½	101.6	64	8.13	76
4	114.3	64	8.64	76
5	141.3	76	9.65	89
6	168.3	89	10.92	102
8	219.1	102	12.7	127
10	273	127	12.7	152
12	323.8	152	12.7	178
14	355.6	165	12.7	191
16	406.4	178	12.7	203
18	457	203	12.7	229
20	508	229	12.7	254
22	559	254	12.7	254
24	610	267	12.7	305
26	660	267	. . .	. . .
28	711	267	. . .	. . .
30	762	267	. . .	. . .
32	813	267	. . .	. . .
34	864	267	. . .	. . .
36	914	267	. . .	. . .
38	965	305	. . .	. . .
40	1 016.0	305	. . .	. . .
42	1 067.0	305	. . .	. . .
44	1 118.0	343	. . .	. . .
46	1 168.0	343	. . .	. . .

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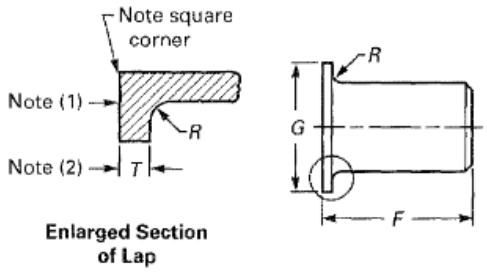
ASME B16.9 Lap Joint Stub Ends Dimensions



Nominal Pipe Size (NPS)	Outside Diameter Max.	Short Pattern Min.	Radius of Length,F [Notes (3), (4)]	Diameter of Barrel Length,F [Notes (3), (4)]	Fillet, *R* [Note (5)]	Lap, *G* [Note (5)]
1⁄2	0.896	0.809	3	2	0.12	1.38
3⁄4	1.106	1.019	3	2	0.12	1.69
1	1.376	1.284	4	2	0.12	2
11⁄4	1.716	1.629	4	2	0.19	2.5
11⁄2	1.965	1.869	4	2	0.25	2.88
2	2.456	2.344	6	2.5	0.31	3.62
21⁄2	2.966	2.844	6	2.5	0.31	4.12
3	3.596	3.469	6	2.5	0.38	5
31⁄2	4.096	3.969	6	3	0.38	5.5
4	4.593	4.469	6	3	0.44	6.19
5	5.683	5.532	8	3	0.44	7.31
6	6.743	6.594	8	3.5	0.5	8.5
8	8.743	8.594	8	4	0.5	10.62
10	10.913	10.719	10	5	0.5	12.75
12	12.913	12.719	10	6	0.5	15
14	14.17	13.969	12	6	0.5	16.25
16	16.18	15.969	12	6	0.5	18.5
18	18.19	17.969	12	6	0.5	21
20	20.24	19.969	12	6	0.5	23
22	22.24	21.969	12	6	0.5	25.25
24	24.24	23.969	12	6	0.5	27.25

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Generic Marking Standards and Requirements

Component Identification

The ASME B16.9 Code requires random examination of materials and components to ensure conformance to listed specifications and standards. B31.3 also requires these materials to be free from defects. Component standards and specifications have various marking requirements.

ASME B16.9 Standard

ASME B16.9 is the most commonly used marking standard. It contains a variety of specific marking requirements that are too lengthy to list in this appendix; please refer to it when necessary to confirm the markings on a component.