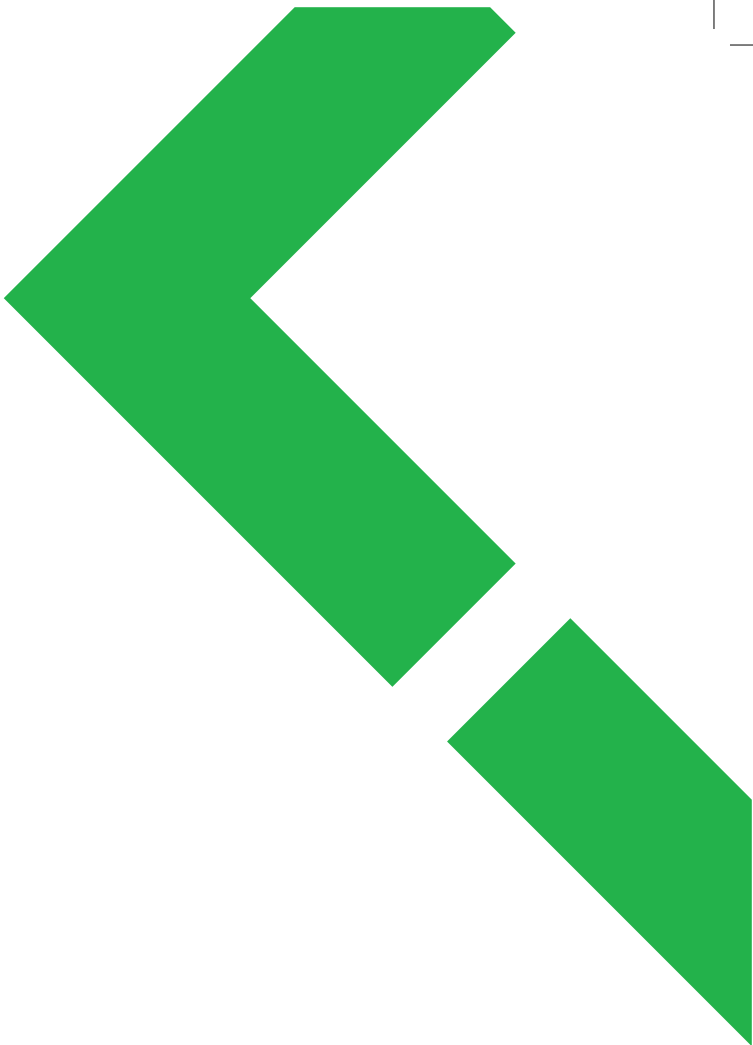




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Pipe & Fittings Data Charts

OCTOBER 2022



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AMERICAN STANDARD STEEL PIPE ASME B36.10



Nominal Size		Outside Diameter	Nominal Wall Thickness & Weight for Welded & Seamless Steel Pipe ASME B36.10										KEY: Dimensions - mm (Black) Weight - kg/m (Green)			
DN	NPS	mm	STD	EXTRA STRONG	XX STRONG	SCHED. 10	SCHED. 20	SCHED. 30	SCHED. 40	SCHED. 60	SCHED. 80	SCHED. 100	SCHED. 120	SCHED. 140	SCHED. 160	
6	1/8	10.3	1.73 0.37	2.41 0.47	-	-	-	-	1.73 0.37	-	-	-	-	-	-	
8	1/4	13.7	2.24 0.63	3.02 0.80	-	-	-	-	2.24 0.63	-	-	-	-	-	-	
10	3/8	17.1	2.31 0.84	3.20 1.10	-	-	-	-	2.31 0.84	-	-	-	-	-	-	
15	1/2	21.3	2.77 1.27	3.73 1.62	7.47 2.55	-	-	-	2.77 1.27	-	-	-	-	-	4.78 1.95	
20	3/4	26.7	2.87 1.69	3.91 2.20	7.82 3.64	-	-	-	2.87 1.69	-	-	-	-	-	5.56 2.90	
25	1	33.4	3.38 2.50	4.55 3.24	9.09 5.45	-	-	-	3.38 2.50	-	-	-	-	-	6.35 4.24	
32	1 - 1/4	42.2	3.56 3.39	4.85 4.47	9.7 7.77	-	-	-	3.56 3.39	-	-	-	-	-	6.35 5.61	
40	1 - 1/2	48.3	3.68 4.05	5.08 5.41	10.15 9.56	-	-	-	3.68 4.05	-	-	-	-	-	7.14 7.25	
50	2	60.3	3.91 5.44	5.54 7.48	11.07 13.44	-	-	-	3.91 5.44	-	-	-	-	-	8.74 11.11	
65	2 - 1/2	73.0	5.16 8.63	7.01 11.41	14.02 20.39	-	-	-	5.16 8.63	-	-	-	-	-	9.53 14.92	
80	3	88.9	5.49 11.29	7.62 15.27	15.24 27.67	-	-	-	5.49 11.29	-	-	-	-	-	11.13 21.35	
90	3 - 1/2	101.6	5.74 13.57	8.08 18.63	-	-	-	-	5.74 13.57	-	-	-	-	-	-	
100	4	114.3	6.02 16.07	8.56 22.32	17.12 41.03	-	-	-	6.02 16.07	-	-	-	11.13 28.32	-	13.49 33.54	
125	5	141.3	6.55 21.77	9.53 30.97	19.05 57.43	-	-	-	6.55 21.77	-	-	-	12.7 40.28	-	15.88 49.11	
150	6	168.3	7.11 28.26	10.97 42.56	21.95 79.22	-	-	-	7.11 28.26	-	-	-	14.27 54.20	-	18.26 67.56	
200	8	219.1	8.18 42.55	12.7 64.64	22.23 107.92	-	6.35 33.31	7.04 36.81	8.18 42.55	10.31 53.08	-	15.09 75.92	18.26 90.44	20.62 100.92	23.01 111.27	
250	10	273.1	9.27 60.31	12.7 81.55	25.4 155.15	-	6.35 41.77	7.8 51.03	9.27 60.31	XS 81.55	15.09 96.01	18.26 114.75	21.44 133.06	XXS 155.15	28.58 172.33	
300	12	323.9	9.53 73.88	12.7 97.46	25.4 186.97	-	6.35 49.73	8.38 65.20	10.31 79.73	14.27 108.96	17.48 132.08	21.44 159.91	XXS 186.97	28.58 208.14	33.32 238.76	
350	14	355.6	9.53 81.33	12.7 107.10	-	6.35 54.59	7.92 67.90	Std.W.T. 81.33	11.13 94.55	15.09 126.70	19.05 158.10	23.83 194.96	27.79 224.65	31.75 253.56	35.71 281.70	
400	16	406.4	9.53 93.27	12.7 123.30	-	6.35 62.64	7.92 77.83	Std.W.T. 93.27	11.13 123.30	16.66 160.12	21.44 203.53	26.19 245.56	30.96 286.64	36.53 333.19	40.49 365.35	
450	18	457	9.53 105.16	12.7 139.15	-	6.35 70.57	7.92 87.71	11.13 122.38	14.27 155.80	19.05 205.74	23.83 254.55	29.36 309.62	34.93 363.56	39.67 408.26	45.24 459.37	
500	20	508	9.53 117.15	12.7 155.12	-	6.35 78.55	7.92 117.15	Std.W.T. 155.12	15.09 183.42	20.62 247.83	26.19 311.17	32.54 381.53	38.1 441.49	44.45 508.11	50.01 564.81	
550	22	559	9.53 129.13	12.7 171.09	-	6.35 86.54	7.92 129.13	Std.W.T. 171.09	15.09 -	22.23 294.25	28.58 373.83	34.93 451.42	41.28 527.05	47.63 600.63	53.98 672.26	
600	24	610	9.53 141.12	12.7 187.06	-	6.35 94.53	7.92 141.12	Std.W.T. 209.64	14.27 255.41	17.48 355.26	24.61 442.08	30.96 547.71	38.89 640.03	46.02 720.15	52.37 808.22	
650	26	660	9.53 152.87	12.7 202.72	-	7.92 127.36	XS 202.72	-	-	-	-	-	-	-	-	
700	28	711	9.53 164.85	12.7 218.69	-	7.92 137.32	XS 218.69	15.88 271.21	-	-	-	-	-	-	-	
750	30	762	9.53 176.84	12.7 234.67	-	7.92 147.28	XS 234.67	15.88 292.18	-	-	-	-	-	-	-	
800	32	813	9.53 188.82	12.7 250.64	-	7.92 157.24	XS 250.64	15.88 312.15	17.48 342.91	-	-	-	-	-	-	
850	34	864	9.53 200.31	12.7 266.61	-	7.92 167.20	XS 266.61	15.88 332.12	17.48 364.90	-	-	-	-	-	-	
900	36	914	9.53 212.56	12.7 282.27	-	7.92 176.96	XS 282.27	15.88 351.7	19.05 420.42	-	-	-	-	-	-	
1050	42	1067	9.53 248.52	12.7 330.19	-	-	-	-	-	-	-	-	-	-	-	

Formula to attain approximate mass in kilograms per metre (kg/m) for Steel Round Pipe and Tubing

$$m = (D - t) \times t \times 0.02466$$

Where: m = mass to the nearest 0.01 kg/m
 D = Outside Diameter in millimetres
 (To nearest 0.1mm for OD up to 406.4mm)
 (To nearest 1.0mm for OD 457mm and above)
 t = Wall Thickness to nearest 0.01mm

Example

Nominal Size
 DN300 NPS12
 OD = 323.9mm
 W.T. = 9.53mm

Step 1. 323.9 – 9.53 = 314.37
 Step 2. 314.37 x 9.53 = 2995.9461
 Step 3. 2995.9461 x 0.024 66
 = 73.88kg/m

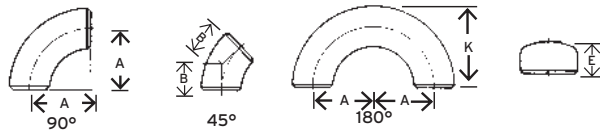
CARBON STEEL BUTTWELDING FITTINGS TO ASME B16.9, B16.28 & BS.1640



Nom. Size DN	Pipe OD mm	Wall Thickness (mm)											A	B	K	D	V	E. Std. Wt. & Ex. Stg.	Nom. Size DN		
		Sch. 10	Sch. 20	Sch. 30	Std. Wt.	Sch. 40	Sch. 60	X Stg.	Sch. 80	Sch. 100	Sch. 120	Sch. 140								Sch. 160	X.X. Stg.
15	21.3	-	-	-	2.77	2.77	-	3.73	3.73	-	-	-	4.78	7.47	38	16	47.5	-	-	25.4	15
20	26.7	-	-	-	2.87	2.87	-	3.91	3.91	-	-	-	5.56	7.82	38	19	43	19	33	25.4	20
25	33.4	-	-	-	3.38	3.38	-	4.55	4.55	-	-	-	6.35	9.09	38	22	55.5	25.4	41	38.1	25
32	42.2	-	-	-	3.56	3.56	-	4.85	4.85	-	-	-	6.35	9.70	47.5	25.4	70	32	52	38.1	32
40	48.3	-	-	-	3.68	3.68	-	5.08	5.08	-	-	-	7.14	10.15	57	29	82.5	38	62	38.1	40
50	60.3	-	-	-	3.91	3.91	-	5.54	5.54	-	-	-	8.74	11.07	76	35	106	51	81	38.1	50
65	73.0	-	-	-	5.16	5.16	-	7.01	7.01	-	-	-	9.53	14.02	95	44.5	132	63.5	100	38.1	65
80	88.9	-	-	-	5.49	5.49	-	7.62	7.62	-	-	-	11.13	15.24	114	51	159	76	121	50.8	80
90	101.6	-	-	-	5.74	5.74	-	8.08	8.08	-	-	-	-	16.15	133	57	184	89	140	63.5	90
100	114.3	-	-	-	6.02	6.02	-	8.56	8.56	-	11.13	-	13.49	17.12	152	63.5	210	102	159	63.5	100
125	141.3	-	-	-	6.55	6.55	-	9.53	9.53	-	12.70	-	15.88	19.05	190	79	262	127	197	76.2	125
150	168.3	-	-	-	7.11	7.11	-	10.97	10.97	-	14.27	-	18.26	21.95	229	95	313	152	237	88.9	150
200	219.1	-	6.35	7.04	8.18	8.18	10.31	12.70	12.70	15.09	18.26	20.62	23.01	22.23	305	127	414	203	313	102	200
250	273.1	-	6.35	7.80	9.27	9.27	12.70	12.70	15.09	18.26	21.44	25.40	28.58	25.40	381	159	517	254	390	127	250
300	323.9	-	6.35	8.38	9.53	10.31	14.27	12.70	17.48	21.44	25.40	28.58	33.32	25.40	457	190	619	305	467	152	300
350	355.6	6.35	7.92	9.53	9.53	11.13	15.09	12.70	19.05	23.83	27.79	31.75	35.71	-	533	222	711	356	533	165	350
400	406.4	6.35	7.92	9.53	9.53	12.7	16.66	12.70	21.44	26.19	30.96	36.53	40.49	-	610	254	813	406	610	178	400
450	457	6.35	7.92	11.13	9.53	14.27	19.05	12.70	23.83	29.36	34.93	39.67	45.24	-	686	286	914	457	686	203	450
500	508	6.35	9.53	12.70	9.53	15.09	20.62	12.70	26.19	32.54	38.10	44.45	50.01	-	762	318	1016	508	762	229	500
600	610	6.35	9.53	14.27	9.53	17.48	24.61	12.70	30.96	38.89	46.02	52.37	59.54	-	914	381	1219	610	914	267	600
750	762	7.92	12.70	15.88	9.53	-	-	12.70	-	-	-	-	-	-	1143	470	1524	762	1143	267	750
900	914	7.92	12.70	15.88	9.53	19.05	-	12.70	-	-	-	-	-	-	1372	565	-	914	1372	267	900

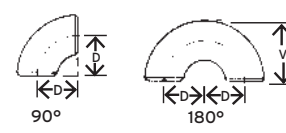
B16.9

Long radius welding elbows, return bends & caps

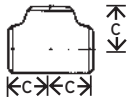


B16.28

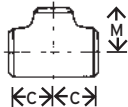
Radius welding elbows, return bends



Straight tees (B16.9)



Reducing tees (B16.9)



Concentric & eccentric Reducers (B16.9)



Nominal Size DN	C	M	H	Nominal Size DN		C	M	H	Nominal Size DN		C	M	H
				Large End	Small End				Large End	Small End			
20	28.6	-	-	100	100	105	-	-	400	400	305	-	-
15	28.6	28.6	38.1	100	90	105	102	102	400	350	305	305	356
25	38.1	-	-	100	80	105	98.4	102	400	300	305	295	356
20	38.1	38.1	50.8	100	65	105	95.3	102	400	250	305	283	356
15	38.1	38.1	50.8	100	50	105	88.9	102	400	200	305	273	356
32	47.6	-	-	100	40	105	85.7	102	400	150	305	264	356
25	47.6	47.6	50.8	125	125	124	-	-	450	450	343	-	-
20	47.6	47.6	50.8	125	100	124	117	127	450	400	343	330	381
15	47.6	47.6	50.8	125	90	124	114	127	450	350	343	330	381
40	57.2	-	-	125	80	124	111	127	450	300	343	321	381
32	57.2	57.2	63.5	125	65	124	108	127	450	250	343	308	381
25	57.2	57.2	63.5	125	50	124	105	127	450	200	343	298	381
20	57.2	57.2	63.5	150	150	143	-	-	500	500	381	-	-
15	57.2	57.2	63.5	150	125	143	137	140	500	450	381	368	508
50	63.5	-	-	150	100	143	130	140	500	400	381	356	508
40	63.5	60.3	76.2	150	90	143	127	140	500	350	381	356	508
32	63.5	57.2	76.2	150	80	143	124	140	500	300	381	346	508
25	63.5	50.8	76.2	150	65	143	121	140	500	250	381	333	508
20	63.5	44.5	76.2	200	200	178	-	-	600	600	381	324	508
65	76.2	-	-	200	150	178	168	152	600	432	-	-	-
50	76.2	69.9	88.9	200	125	178	162	152	600	500	432	432	508
40	76.2	66.7	88.9	200	100	178	155	152	600	450	432	419	508
32	76.2	63.5	88.9	200	80	178	152	152	600	400	432	406	508
25	76.2	57.2	88.9	250	250	216	-	-	600	350	432	406	508
80	85.7	-	-	250	200	216	203	178	600	300	432	397	508
65	85.7	82.6	88.9	250	150	216	194	178	600	250	432	384	508
50	85.7	76.2	88.9	250	125	216	191	178	600	750	559	-	-
40	85.7	73.0	88.9	250	100	216	184	178	600	600	559	533	610
32	85.7	69.9	88.9	300	300	254	-	-	750	500	559	508	610
25	85.7	69.9	88.9	300	250	254	241	203	750	450	559	495	610
90	95.3	-	-	300	200	254	229	203	750	400	559	483	610
80	95.3	92.1	102	300	150	254	219	203	750	900	673	-	-
65	95.3	88.9	102	300	100	254	210	203	750	750	673	635	610
50	95.3	82.6	102	350	350	279	-	-	900	600	673	610	610
40	95.3	79.4	102	350	300	279	270	330	900	500	673	584	610
				350	250	279	257	330	900	450	673	572	610
				350	200	279	248	330					
				350	150	279	238	330					

Note: All dimensions are in millimetres (mm)

AMERICAN STANDARD FLANGES TEMPERATURE / PRESSURE RATINGS



Temperature / Pressure Ratings						
Carbon Steel Pipe Flanges to ANSI / ASME 16.5 - 1988 (BS 1560) Forgings to ASTM A105 and A350 - LF2 Forgings to ASTM A181 Grade II for Class 150 and 300 Only						
Temperature (°C)	Maximum Working Pressure in kPa by Classes (for approximate PSI divide by 7)					
	Class 150 (PN20)	Class 300 (PN50)	Class 600 (PN100)	Class 900 (PN150)	Class 1500 (PN250)	Class 2500 (PN420)
-29 to 38	1960	5110	10210	15320	25530	42550
50	1920	5010	10020	15020	25040	41730
100	1770	4640	9280	13910	23190	38650
150	1580	4520	9050	13570	22610	37690
200	1400	4380	8760	13150	21910	36520
250	1210	4170	8340	12520	20860	34770
300	1020	3870	7750	11620	19370	32280
350	840	3700	7390	11090	18480	30800
375	740	3650	7290	10940	18230	30390
400	650	3450	6900	10350	17250	28750
425	560	2880	5750	8630	14380	23960
450	470	2000	4010	6010	10020	16690
475	370	1350	2710	4060	6770	11290
500	280	880	1760	2640	4400	7330
525	190	520	1040	1550	2590	4320
540	130	330	650	980	1630	2720

Flanges above 600 NPA are not included in ANSI B16.5 and the class designations in these large diameters do not imply specific temperature / pressure ratings.

STEEL PIPE, BUTTWELD FITTINGS & FLANGES TO ASME STANDARDS



ASME B36.10 Steel Pipe Dimensions					Approximate Mass of Popular Sizes												
Nominal Pipe Size DN	Outside Diam. mm	Inside Diam. mm	Identification		Pipe Steel Pipe kg/m	Buttweld Fittings			A.S.M.E Flanges								
			Std. X.S	Sch. No.		90° L/R Elbows kg/ea	Tees Equal kg/ea	Con. & Ecc. Red. kg/ea	PN20 (150)			PN50 (300)			PN100 (600)	PN150 (900)	
									SOW/ SW Thrded kg/ea	W/N kg/ea	Blind kg/ea	SOW/ SW Thrded kg/ea	W/N kg/ea	Blind kg/ea	W/N kg/ea	W/N kg/ea	
15	21.3	15.8 13.9	Std. XS	40 80	1.27 1.62	0.08 0.10	0.16 0.21	- -	0.45	0.79	0.57	0.73	0.91	0.79	0.91	2.00	
20	26.7	20.9 18.9	Std. XS	40 80	1.69 2.20	0.08 0.11	0.21 0.27	0.07 0.10	0.68	0.86	0.91	1.25	1.41	1.13	1.59	2.72	
25	33.4	26.6 24.3	Std. XS	40 80	2.50 3.24	0.17 0.21	0.34 0.43	0.14 0.18	0.95	1.09	1.09	1.36	1.81	1.77	1.86	3.86	
32	42.2	35.1 32.5	Std. XS	40 80	3.39 4.47	0.28 0.39	0.64 0.75	0.18 0.23	1.13	1.41	1.25	2.04	2.27	2.68	2.72	4.54	
40	48.3	40.9 38.1	Std. XS	40 80	4.05 5.41	0.39 0.50	0.95 1.13	0.27 0.32	1.36	1.81	1.70	2.81	3.06	2.83	3.74	6.35	
50	60.3	52.5 49.2	Std. XS	40 80	5.44 7.48	0.68 1.00	1.45 1.72	0.41 0.54	2.22	2.83	2.77	3.13	3.74	3.52	4.65	10.89	
65	73.0	62.7 59.0	Std. XS	40 80	8.63 11.41	1.39 1.82	2.45 2.95	0.68 0.91	3.82	4.42	4.04	4.54	5.56	5.44	6.44	16.33	
80	88.9	77.9 73.7	Std. XS	40 80	11.29 15.27	2.18 2.86	3.45 4.30	0.91 1.27	4.08	5.22	5.44	6.12	7.37	7.26	8.50	14.51	
90	101.6	90.1 85.4	Std. XS	40 80	13.57 18.63	3.05 4.1	4.5 5.9	1.36 1.81	4.99	5.44	6.35	7.71	9.53	9.98	12.25	—	
100	114.3	102.3 97.2	Std. XS	40 80	16.07 22.32	4.2 5.7	5.7 7.3	1.59 2.18	5.94	7.48	7.37	9.53	11.79	11.79	17.24	23.13	
125	141.3	128.2 122.3	Std. XS	40 80	21.77 30.97	6.8 10.0	9.1 11.8	2.7 3.8	6.12	9.53	9.07	12.70	15.42	15.88	30.84	39.01	
150	168.3	154.1 146.3	Std. XS	40 80	28.26 42.56	10.9 16.3	13.6 19.0	3.9 5.4	8.16	11.34	12.70	16.33	19.96	20.87	34.02	49.90	
200	219.1	202.7 193.7	Std. XS	40 80	42.55 64.64	21.8 33.1	25 33.5	5.9 8.6	12.70	19.05	21.77	25.40	32.21	38.10	52.16	84.82	
250	273.1	254.5 247.7	Std. XS	40 60	60.31 81.55	38.6 52	41 54	10 14	17.24	25.40	31.75	35.38	44.00	53.34	90.36	121.56	
300	323.9	304.8 298.5	Std. XS	- -	73.88 97.46	57 75	57 77	15 20	27.22	38.10	45.36	50.80	64.41	86.18	101.60	168.74	
350	355.6	336.6 330.2	Std. XS	30 -	81.33 107.39	73 97	73 93	28 37	35.38	51.26	58.97	74.39	84.37	107.05	157.40	254.92	
400	406.4	387.4 381.0	Std. XS	30 40	93.27 123.30	98 130	91 120	35 46	42.18	63.50	77.11	101.60	111.58	145.15	209.11	310.71	
450	457	438.2 431.8	Std. XS	- -	105.16 139.15	120 165	135 190	40 53	52.62	68.04	102.51	126.10	138.35	181.89	217.27	419.12	
500	508	489.0 482.6	Std. XS	20 30	117.15 155.12	150 200	168 245	61 82	65.32	81.65	123.38	149.69	174.63	231.33	312.98	527.98	
600	610	590.6 584.2	Std. XS	20 -	141.12 187.06	220 280	240 350	77 95	91.63	118.84	203.21	222.26	247.21	342.92	443.16	680.39	
750	762	743.0 736.6	Std. XS	- 20	176.84 234.67	332 440	388 484	107 143	142.88	163.29	326.59	367.41	421.84	680.39	589.67	975.22	
900	914	895.4 889.0	Std. XS	- 20	212.56 282.27	481 638	588 731	129 172	217.72	235.87	510.29	544.31	589.67	1031.92	793.79	1564.89	

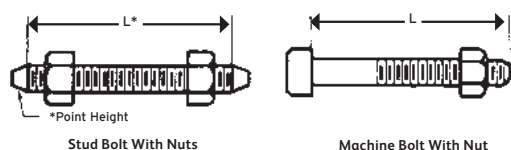
Approximate mass per unit for austenitic stainless steel pipe and fittings can be obtained by applying a factor of 1.015.

BOLTS & STUDS FOR ASME B16.5 FLANGES



Bolting

To suit R.F. Flange sizes DN 15 to 600 to ASME — B16.5 (BS. 1560) and DN 750 & 900 to BS. 3293



Diameter of Bolts is shown in inches. For nominal diameters 1 inch and smaller, threads are U.N.C.; nominal diameters 1 - 1/8 inch and larger threads are 8 U.N. (8 T.P.I.).

Length of Bolts (L) is shown in millimetres rounded to the nearest 5mm. Stud Bolt lengths (L*) do not include the height of points. Machine Bolt lengths (L) include the height of point. The length shown includes the height of the Raised Face in all cases.

Nom Flge Size DN	PN 20 (Class 150)				PN 50 (Class 300)				PN 100 (Class 600)			PN 150 (Class 900)			PN 250 (Class 1500)			PN 420 (Class 2500)			Nom Flge Size DN									
	No. Bolts	Dia. Bolts ins.	Stud Bolts mm	Mach. Bolts mm	No. Bolts	Dia. Bolts ins.	Stud Bolts mm	Mach. Bolts mm	No. Bolts	Dia. Bolts ins.	Stud Bolts mm	No. Bolts	Dia. Bolts ins.	Stud Bolts mm	No. Bolts	Dia. Bolts ins.	Stud Bolts mm	No. Bolts	Dia. Bolts ins.	Stud Bolts mm										
15	4	1/2	60	45	4	1/2	65	55	4	1/2	80	USE PN250 DIMENSIONS IN THESE SIZES									4	3/4	105	4	3/4	125	15			
20	4	1/2	65	50	4	5/8	75	60	4	5/8	90										4	3/4	115	4	3/4	125	4	3/4	125	20
25	4	1/2	65	55	4	5/8	80	65	4	5/8	90										4	7/8	125	4	7/8	140	4	7/8	140	25
32	4	1/2	70	55	4	5/8	80	65	4	5/8	100										4	7/8	125	4	1	150	4	1	150	32
40	4	1/2	70	60	4	3/4	90	75	4	3/4	105										4	1	140	4	1 1/8	170	4	1 1/8	170	40
50	4	5/8	80	65	8	5/8	90	75	8	5/8	105										8	7/8	145	8	1	175	8	1	175	50
65	4	5/8	90	75	8	3/4	100	85	8	3/4	120										8	1	160	8	1 1/8	195	8	1 1/8	195	65
80	4	5/8	90	75	8	3/4	110	90	8	3/4	125	8	7/8	145	8	1 1/8	180	8	1 1/4	220	80									
90	8	5/8	90	75	8	3/4	110	95	8	7/8	140	-	-	-	-	-	-	-	-	-	90									
100	8	5/8	90	75	8	3/4	110	95	8	7/8	145	8	1 1/8	170	8	1 1/4	195	8	1 1/2	255	100									
125	8	3/4	90	80	8	3/4	120	100	8	1	165	8	1 1/4	190	8	1 1/2	250	8	1 3/4	300	125									
150	8	3/4	100	85	12	3/4	125	105	12	1	170	12	1 1/8	195	12	1 3/8	260	8	2	345	150									
200	8	3/4	110	90	12	7/8	140	110	12	1 1/8	195	12	1 3/8	220	12	1 5/8	290	12	2	380	200									
250	12	7/8	115	95	16	1	155	130	16	1 1/4	215	16	1 3/8	235	12	1 7/8	335	12	2 1/2	485	250									
300	12	7/8	120	100	16	1 1/8	170	145	20	1 1/4	220	20	1 3/8	255	16	2	375	12	2 3/4	540	300									
350	12	1	130	110	20	1 1/8	175	150	20	1 3/8	235	20	1 1/2	275	16	2 1/4	405				350									
400	16	1	135	115	20	1 1/4	190	160	20	1 1/2	255	20	1 5/8	285	16	2 1/2	445				400									
450	16	1 1/8	150	125	24	1 1/4	195	170	20	1 5/8	275	20	1 7/8	325	16	2 3/4	495				450									
500	20	1 1/8	160	135	24	1 1/4	205	180	24	1 5/8	290	20	2	345	16	3	540				500									
600	20	1 1/4	175	145	24	1 1/2	230	195	24	1 7/8	330	20	2 1/2	435	16	3 1/2	615				600									
750	28	1 1/4	190	160	28	1 3/4	290	250	28	2	355	PN150, 250 & 420 - NOT LISTED IN BS 3293									750									
900	32	1 1/2	215	180	32	2	325	280	28	2 1/2	400										900									

Raised Face height of 2 mm for PN20 & 50 and 7 mm for PN100, 150, 250 & 420 is included in dimension L (Bolt Length).

Material Specifications

- ASTM A193 Grade B7** Standard specification for alloy steel and stainless steel bolting materials for high temperature service.
- ASTM A194 Grade 2H** Standard specification for carbon and alloy steel nuts for bolts for high pressure and high temperature service.
- ASTM A320** Standard specification for alloy steel bolting materials for low temperature service. Grade L7 covers alloy steel stud bolts. Grade L4 covers alloy steel nuts to suit Grade L7 stud bolts.

Inch/ Metric Bolting interchangeable for ASME B16.5 flanges as below

For	Use	For	Use
1/2"	M14	1 1/2"	M39
5/8"	M16	1 5/8"	M42
3/4"	M20	1 3/4"	M45
7/8"	M24	1 7/8"	M48
1"	M27	2"	M52
1 1/8"	M30	2 1/4"	M56
1 1/4"	M33	2 1/2"	M64
1 3/8"	M36	2 3/4"	M72

FLANGE IDENTIFICATION CHART

A guide to the key dimensions of popular steel flange types

Size (mm)	Table / Class	Diam. of Flange	Bolt Circle Diam.	No. of Bolts	Diam. / Length Bolts / Studs Steel Flanges	Diam. Holes	Flange Thickness Cast / Forged Steel
15	Table D	95	67	4	M12 x 45	14	5*
	Table E	95	67	4	M12 x 45	14	6*
	Table H	115	83	4	M16 x 60	18	13
	ANSI 150	89	60.3	4	1/2 x 60	16	11.5
	ANSI 300	95	66.7	4	1/2 x 65	16	14.5
	ANSI 600	95	66.7	4	1/2 x 80	16	14.5
	PN 16	95	65	4	—	14	—
20	Table D	100	73	4	M12 x 45	14	5*
	Table E	100	73	4	M12 x 45	14	6*
	Table H	115	83	4	M16 x 60	18	13
	ANSI 150	98	69.8	4	1/2 x 65	16	14
	ANSI 300	117	82.5	4	5/8 x 75	20	16
	ANSI 600	117	82.5	4	5/8 x 90	20	16
	PN 16	105	75	4	—	14	—
25	Table D	115	83	4	M12 x 45	14	5*
	Table E	115	83	4	M12 x 45	14	7*
	Table H	120	87	4	M16 x 60	18	14
	ANSI 150	108	79.4	4	1/2 x 65	16	14
	ANSI 300	124	88.9	4	5/8 x 80	20	18
	ANSI 600	124	88.9	4	5/8 x 105	20	18
	PN 16	115	85	4	—	14	—
32	Table D	120	87	4	M12 x 50	14	6*
	Table E	120	87	4	M12 x 50	14	8*
	Table H	135	98	4	M16 x 65	18	17
	ANSI 150	117	88.9	4	1/2 x 70	16	16
	ANSI 300	133	98.4	4	5/8 x 80	20	22
	ANSI 600	133	98.4	4	5/8 x 100	20	22
	PN 16	140	100	4	—	18	—
40	Table D	135	98	4	M12 x 50	14	6*
	Table E	135	98	4	M12 x 50	14	9*
	Table H	140	105	4	M16 x 65	18	17
	ANSI 150	127	98.4	4	1/2 x 70	16	17
	ANSI 300	156	114.3	4	3/4 x 90	23	22
	ANSI 600	156	114.3	4	3/4 x 105	23	22
	PN 16	150	110	4	—	18	—
50	Table D	150	114	4	M16 x 60	18	8*
	Table E	150	114	4	M16 x 60	18	10*
	Table H	165	127	4	M16 x 75	18	19
	ANSI 150	152	120.6	4	5/8 x 80	20	20
	ANSI 300	165	127	8	5/8 x 90	20	22
	ANSI 600	165	127	8	5/8 x 105	20	26
	PN 16	165	125	4	—	16	—
65	Table D	165	127	4	M16 x 60	18	8*
	Table E	165	127	4	M16 x 60	18	10*
	Table H	185	146	8	M16 x 75	18	19
	ANSI 150	178	139.7	4	5/8 x 90	20	23
	ANSI 300	191	149.2	8	3/4 x 100	23	26
	ANSI 600	191	149.2	8	3/4 x 120	23	30
	PN 16	185	145	4	—	18	—

*It is impractical to use thickness less than 12.00mm for plate flanges.
Dimensions AS 2129 – ANSI/ASME B16.5

FLANGE IDENTIFICATION CHART

Size (mm)	Table / Class	Diam. of Flange	Bolt Circle Diam.	No. of Bolts	Diam. / Length Bolts / Studs Steel Flanges	Diam. Holes	Flange Thickness Cast / Forged Steel
80	Table D	185	146	4	M16 x 60	18	10*
	Table E	185	146	4	M16 x 60	18	11*
	Table H	205	165	8	M16 x 75	18	22
	ANSI 150	191	152.4	4	5/8 x 90	20	24
	ANSI 300	210	168.3	8	3/4 x 110	23	32
	ANSI 600	210	168.3	8	3/4 x 125	23	32
	PN 16	200	160	8	—	18	—
100	Table D	215	178	4	M16 x 65	18	10*
	Table E	215	178	8	M16 x 65	18	13
	Table H	230	191	8	M16 x 85	18	25
	ANSI 150	229	190.5	8	5/8 x 90	20	24
	ANSI 300	254	200	8	3/4 x 110	23	32
	ANSI 600	273	215.9	8	7/8 x 145	26	38
	PN 16	220	180	8	—	18	—
125	Table D	255	210	8	M16 x 65	18	22
	Table E	255	210	8	M16 x 65	18	14
	Table H	280	235	8	M20 x 95	22	29
	ANSI 150	254	215.9	8	3/4 x 90	23	24
	ANSI 300	279	234.9	8	3/4 x 120	23	35
	ANSI 600	330	266.7	8	1 x 165	29	45
	PN 16	250	210	8	—	18	—
150	Table D	280	235	8	M16 x 65	18	13
	Table E	280	235	8	M20 x 65	22	17
	Table H	305	260	12	M20 x 95	22	29
	ANSI 150	279	241.3	8	3/4 x 100	23	26
	ANSI 300	318	269.9	12	3/4 x 125	23	37
	ANSI 600	356	292.1	12	1 x 170	29	48
	PN 16	285	240	8	—	22	—
200	Table D	335	292	8	M16 x 65	18	13
	Table E	335	292	8	M20 x 65	22	19
	Table H	370	324	12	M20 x 100	22	32
	ANSI 150	343	298.4	8	3/4 x 110	23	29
	ANSI 300	381	330.2	12	7/8 x 140	26	41
	ANSI 600	419	349.2	12	1 1/8 x 195	32	56
	PN 10	340	295	8	—	22	—
	PN 16	340	280	12	—	22	—
250	Table D	405	356	8	M20 x 75	22	—
	Table E	405	356	12	M20 x 75	22	22
	Table H	430	381	12	M24 x 120	26	35
	ANSI 150	406	361.9	12	7/8 x 115	29	30
	ANSI 600	510	431.8	16	1 1/4 x 215	35	64
	PN 10	395	350	8	—	22	—
	PN 16	405	350	12	—	22	—

*It is impractical to use thickness less than 12.00mm for plate flanges.
 Dimensions AS 2129 – ANSI/ASME B16.5

FLANGE IDENTIFICATION CHART

Size (mm)	Table / Class	Diam. of Flange	Bolt Circle Diam.	No. of Bolts	Diam. / Length Bolts / Studs Steel Flanges	Diam. Holes	Flange Thickness Cast / Forged Steel
300	Table D	455	406	12	M20 x 85	22	22
	Table E	455	406	12	M24 x 85	26	25
	Table H	490	438	16	M24 x 110	26	41
	ANSI 150	483	431.8	12	7/8 x 120	26	32
	ANSI 300	520	450.8	16	1 1/8 x 170	32	51
	PN 10	445	400	12	—	22	—
	PN 16	450	410	12	—	25	—
350	Table D	525	470	12	M24 x 95	26	25
	Table E	525	470	12	M24 x 95	26	29
	Table H	550	495	16	M27 x 130	30	48
	ANSI 150	535	476.2	12	1 x 130	29	35
	ANSI 300	585	514.3	20	1 1/8 x 175	32	54
375	Table D	550	495	12	M24 x 95	26	22
	Table E	550	495	12	M24 x 95	26	32
400	Table D	580	521	12	M24 x 95	26	22
	Table E	580	521	12	M24 x 100	26	32
	Table H	610	552	20	M27 x 140	30	54
	ANSI 150	597	539.7	16	1 x 130	29	37
	ANSI 300	650	571.5	20	1 1/4 x 190	35	57
450	Table D	640	584	12	M24 x 95	26	25
	Table E	640	584	16	M24 x 120	26	35
	Table H	675	610	20	M30 x 160	33	60
	ANSI 150	635	577.8	16	1 1/8 x 150	32	40
	ANSI 300	710	628.6	24	1 1/4 x 195	35	60
500	Table D	705	641	16	M24 x 110	26	29
	Table E	705	641	16	M24 x 110	26	38
	Table H	735	673	24	M30 x 170	33	67
	ANSI 150	700	635	20	1 1/8 x 160	32	43
	ANSI 300	775	685.8	24	1 1/4 x 205	35	64
600	Table D	825	756	16	M27 x 120	30	32
	Table E	825	756	16	M30 x 140	33	48
	Table H	850	781	24	M33 x 200	36	76
	ANSI 150	815	749.3	20	1 1/4 x 175	35	48
	ANSI 300	915	812.8	24	1 1/2 x 230	42	70

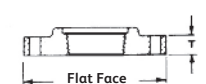
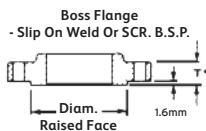
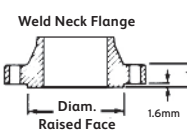
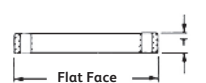
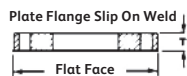
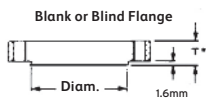
*It is impractical to use thickness less than 12.00mm for plate flanges.
Dimensions AS 2129 – ANSI/ASME B16.5

AUSTRALIAN STANDARD FLANGES



Nom. Size DN	Table D						Table E						Table F						Nom. Size DN		
	Flange			Drilling			Flange			Drilling			Flange			Drilling					
	OD mm	Thickness		Bolt Circle Dia. mm	No. of Bolts	Dia. of Bolts mm	OD mm	T10 mm	T11 mm	T6 mm	Bolt Circle Dia. mm	No. of Bolts	Dia. of Bolts mm	OD mm	T10 mm	T11 mm	T6 mm	Bolt Circle Dia. mm		No. of Bolts	Dia. of Bolts mm
15	95	6	5	67	4	M12	95	6	6	6	67	4	M12	95	8	8	10	67	4	M12	15
20	100	6	5	73	4	M12	100	6	6	6	73	4	M12	100	8	8	10	73	4	M12	20
25	115	8	5	83	4	M12	115	8	8	7	83	4	M12	120	10	10	10	87	4	M16	25
32	120	8	6	87	4	M12	120	8	8	8	87	4	M12	135	10	10	13	98	4	M16	32
40	135	10	6	98	4	M12	135	10	10	9	98	4	M12	140	11	11	13	105	4	M16	40
50	150	10	8	114	4	M16	150	10	10	10	114	4	M16	165	11	12	16	127	4	M16	50
65	165	11	8	127	4	M16	165	11	11	10	127	4	M16	185	13	13	16	146	8	M16	65
80	185	13	10	146	4	M16	185	13	13	11	146	4	M16	205	14	15	16	165	8	M16	80
100	215	16	10	178	4	M16	215	16	16	13	178	8	M16	230	17	17	19	191	8	M16	100
125	255	17	13	210	8	M16	255	17	17	14	210	8	M16	280	19	20	22	235	8	M20	125
150	280	17	13	235	8	M16	280	17	17	17	235	8	M20	305	22	23	22	260	12	M20	150
200	335	19	13	292	8	M16	335	19	20	19	292	8	M20	370	25	28	25	324	12	M20	200
250	405	19	16	356	8	M20	405	22	25	22	356	12	M20	430	25	32	29	381	12	M24	250
300	455	22	19	406	12	M20	455	25	28	25	406	12	M24	490	29	37	32	438	16	M24	300
350	525	25	22	470	12	M24	525	25	32	29	470	12	M24	550	32	42	35	495	16	M27	350
400	580	25	22	521	12	M24	580	25	36	32	521	12	M24	610	32	47	41	552	20	M27	400
450	640	29	25	584	12	M24	640	29	41	35	584	16	M24	675	35	52	44	610	20	M30	450
500	705	32	29	641	16	M24	705	32	46	38	641	16	M24	735	38	57	51	673	24	M30	500
600	825	35	32	756	16	M27	825	38	-	48	756	16	M30	850	41	68	57	781	24	M33	600
700	910	-	35	845	20	M27	910	-	-	51	845	20	M30	935	-	-	60	857	24	M33	700
750	995	-	41	927	20	M30	995	-	-	54	927	20	M33	1015	-	-	67	940	28	M33	750
800	1060	-	41	984	20	M33	1060	-	-	54	984	20	M33	1060	-	-	68	984	28	M33	800
900	1175	-	48	1092	24	M33	1175	-	-	64	1092	24	M33	1185	-	-	76	1105	32	M36	900
1000	1255	-	51	1175	24	M33	1255	-	-	67	1175	24	M36	1275	-	-	83	1194	36	M36	1000
1200	1490	-	60	1410	32	M33	1490	-	-	79	1410	32	M36	1530	-	-	95	1441	40	M39	1200

Nom. Size DN	Table H							Table J							Table R							Nom. Size DN
	Flange				Drilling			Flange				Drilling			Flange				Drilling			
	OD mm	Thickness		* T6 mm	† Dia. R/F mm	Bolt Circle Dia. mm	No. of Bolts	Dia. of Bolts mm	OD mm	* T6 mm	Dia. R/F mm	Bolt Circle Dia. mm	No. of Bolts	Dia. of Bolts mm	OD mm	* T18 mm	Dia. R/F mm	Bolt Circle Dia. mm	No. of Bolts	Dia. of Bolts mm		
15	115	10	11	13	57	83	4	M16	115	16	57	83	4	M16	115	19	64	83	4	M16	15	
20	115	10	11	13	57	83	4	M16	115	16	57	83	4	M16	115	19	64	83	4	M16	20	
25	120	11	12	14	64	87	4	M16	120	19	64	87	4	M16	125	22	76	95	4	M16	25	
32	135	11	13	17	76	98	4	M16	135	19	76	98	4	M16	135	22	76	98	4	M16	32	
40	140	13	14	17	83	105	4	M16	140	22	83	105	4	M16	150	25	89	114	4	M20	40	
50	165	13	16	19	102	127	4	M16	165	25	102	127	4	M20	165	25	102	127	8	M16	50	
65	185	14	17	19	114	146	8	M16	185	25	114	146	8	M20	185	29	114	146	8	M20	65	
80	205	16	19	22	127	165	8	M16	205	32	127	165	8	M20	205	32	127	165	8	M20	80	
100	230	19	23	25	152	191	8	M16	230	35	152	191	8	M20	240	35	152	197	8	M24	100	
125	280	22	27	29	178	235	8	M20	280	38	178	235	8	M24	280	41	178	235	12	M24	125	
150	305	25	30	29	210	260	12	M20	305	38	210	260	12	M24	305	44	210	260	12	M24	150	
200	370	32	39	32	260	324	12	M20	370	41	260	324	12	M24	370	51	260	324	12	M27	200	
250	430	35	45	35	311	381	12	M24	430	48	311	381	12	M27	430	60	311	387	16	M27	250	
300	490	38	52	41	362	438	16	M24	490	51	362	438	16	M27	510	70	362	457	16	M30	300	
350	550	41	58	48	419	495	16	M27	550	57	419	495	16	M30	585	79	419	527	16	M33	350	
400	610	44	64	54	483	552	20	M27	610	64	483	552	20	M30	640	89	483	584	20	M33	400	
450	675	48	71	60	533	610	20	M30	675	70	533	610	20	M33	735	98	572	673	20	M36	450	
500	735	51	78	67	597	673	24	M30	735	79	597	673	24	M33	805	105	622	730	20	M39	500	
600	850	57	92	76	699	781	24	M33	850	92	699	781	24	M36	-	-	-	-	-	-	-	



Copper Alloy

T.30 – Plate or Boss
T.11 – Blank

Forged or Plate Steel

T.6 – Plate or Boss or Blank, or Weldneck (except for valves)
T.18 – Plate or Blank or Weldneck (except for valves)

Notes:

- (1) All dimensions are in millimetres (mm).
- (2) Only metric preferred sizes listed, except for DN 750 which is a Non-preferred size.
- ** (3) It is impractical to use flange thickness less than 12mm for Steel Plate Flanges.
- * (4) Thickness includes 1.6mm height for the Raised Face.
- † (5) The Raised Face is non-preferred for Table "H".
- (6) It is normal practice to supply Steel Flanges to Tables A, D, C, E, F and H. — Flat Faced.
- (7) All copper alloy flanges shall be Flat Faced.
- (8) All flanges shall be drilled to Standard Tables unless otherwise specified. (For Bolt dimensions see separate page).

Important: For DN 150 and DN 200 Flanges, the O.D. of pipe being used must be specified. Dimensions for Flange Tables A, C, K, S and T on application.

I.S.O. METRIC HEXAGON STEEL BOLTS

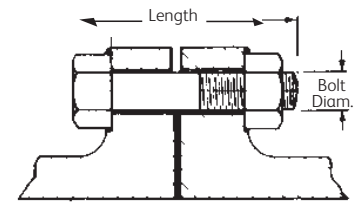
(For use with AS.2129 Flanges)

Steel hexagon Bolts and Nuts (XOX) are recommended for use within a temperature range of -50°C to +300°C. Outside of this temperature range, Stud Bolts should be used as recommended in AS.2528.

A quick reference chart for sizing bolts and nuts for a range of regularly used standard flanges is given below:

APPLICABLE TO PLATE & FORGED STEEL LOOSE FLANGES ONLY

Note: Integral valve flanges quite often differ in thickness to equivalent loose flanges. When integral flanges are involved due allowance should be made to bolt lengths.



Nominal Flange Size DN	Table D		Table E		Table F		Table H	
	No. Bolts Per Flange	XOX Bolt & Nut dia. x lgth	No. Bolts Per Flange	XOX Bolt & Nut dia. x lgth	No. Bolts Per Flange	XOX Bolt & Nut dia. x lgth	No. Bolts Per Flange	XOX Bolt & Nut dia. x lgth
15	4	M12 x 40mm*	4	M12 x 40mm*	4	M12 X 40mm*	4	M16 x 45mm*
20	4	M12 x 40mm*	4	M12 x 40mm*	4	M12 X 40mm*	4	M16 x 45mm*
25	4	M12 x 40mm*	4	M12 x 40mm*	4	M16 X 45mm*	4	M16 x 50mm*
32	4	M12 x 40mm*	4	M12 x 40mm*	4	M16 X 45mm*	4	M16 x 55mm*
40	4	M12 x 40mm*	4	M12 x 40mm*	4	M16 X 45mm*	4	M16 x 55mm*
50	4	M16 x 45mm*	4	M16 x 45mm*	4	M16 X 50mm*	4	M16 x 60mm*
65	4	M16 x 45mm*	4	M16 x 45mm*	8	M16 X 50mm*	8	M16 x 60mm*
80	4	M16 x 45mm*	4	M16 x 45mm*	8	M16 X 50mm*	8	M16 x 65mm*
100	4	M16 x 45mm*	8	M16 x 45mm*	8	M16 X 60mm*	8	M16 x 70mm*
125	8	M16 x 45mm*	8	M16 x 50mm*	8	M20 X 70mm*	8	M20 x 80mm*
150	8	M16 x 45mm*	8	M20 x 60mm*	12	M20 X 70mm*	12	M20 x 80mm*
200	8	M16 x 45mm*	8	M20 x 60mm*	12	M20 X 75mm*	12	M20 x 90mm*
250	8	M20 x 55mm*	12	M20 x 70mm*	12	M24 X 85mm*	12	M24 x 100mm*
300	12	M20 x 60mm*	12	M24 x 80mm*	16	M24 X 100mm*	16	M24 x 110mm*
350	12	M24 x 75mm*	12	M24 x 85mm*	16	M27 X 100mm*	16	M27 x 130mm*
400	12	M24 x 75mm*	12	M24 x 100mm*	20	M27 X 120mm*	20	M27 x 140mm*
450	12	M24 x 80mm*	16	M24 x 100mm*	20	M30 X 130mm*	20	M30 x 160mm*
500	16	M24 x 85mm*	16	M24 x 110mm*	24	M30 X 140mm*	24	M30 x 170mm*
600	16	M27 x 100mm*	16	M30 x 130mm*	24	M33 X 150mm*	24	M33 x 190mm*
700	20	M27 x 100mm*	20	M30 x 140mm*	24	M33 X 160mm*		
750	20	M30 x 120mm*	20	M33 x 150mm*	28	M33 X 170mm*		
800	20	M33 x 120mm*	20	M33 x 150mm*	28	M33 X 180mm*		
900	24	M33 x 140mm*	24	M33 x 170mm*	32	M36 X 200mm*		
1000	24	M33 x 140mm*	24	M36 x 180mm*	36	M36 X 220mm*		
1200	32	M33 x 160mm*	32	M36 x 200mm*	40	M39 X 240mm*		

Notes:

- All dimensions are in millimetres (mm).
- High strength structural bolts to AS 1252 may be substituted for property class 8.8 bolts if agreed to by the purchaser.
- Bolts to AS 1252 are heavy hexagon series and the selection of such bolts would be subject to space being available on the relevant flange.

Temp in °C	Temperature / Pressure Ratings for Carbon Steel Flanges			
	Maximum Allowable Pressure in kPa by Flange Tables			
	(For approximate PSI divide by 7)			
	D	E	F	H
-50 to 232	700	1400	2100	3500
250	650	1300	2000	3300
275	600	1200	1800	3100
300	570	1100	1700	2900
325	550	1000	1600	2600
350	500	950	1400	2400
375	450	900	1300	2200
400	400	800	1200	2000
425	350	700	1000	1700
450				1300
475				900
Max. Hydrostatic Test Pressure kPa	1050	2100	3150	5250

Bolt lengths listed apply to flat-faced or 1.6mm raised face flanges with allowance for 1.6mm gasket thickness.

*For approximate Stud Bolt Lengths take the XOX Bolt Length and add the metric diameter in mm rounded to the nearest 5mm increment up.

Note: This does not include length of point.

This chart shows bolt diameters as recommended in AS.2129. Some of these are Non-preferred sizes e.g. (M27), (M33) and (M39) which are not readily available in Australia.

Stud Bolts should be used as alternatives to bolts where the size is greater than M24 and it is therefore suggested that Stud Bolts as specified in AS.2528 or BS.4882 should be used.

Inch series bolts interchangeable as follows:

For	Use	For	Use
1/4"	M6	7/8"	M24
5/16"	M8	1"	(M27)
3/8"	M10	1 1/8"	M30
1/2"	M12	1 1/4"	(M33)
5/8"	M16	1 3/8"	M36
3/4"	M20	1 1/2"	(M39)

Bolt Hole Diameters

For bolts to M24, clearance hole 2mm larger.

Above M24, clearance hole 3mm larger.

XOX Bolts & Nuts

XOX is the trade term used for H.R.H. commercial steel bolts and nuts.

H.R.H. denotes Hexagon Head x Round Shank x Hexagon Nut.

XOX Bolting		
Temp. Range: -50°C to +300°C		
Flange Specifications		
Table	Bolts	Nuts
D, E, F	AS 1110 Gr.4.6 or AS 1111 Gr.4.6	AS 1112 Gr.5
H	AS 1110 Gr8.8	AS 1112 Gr.8

LIGHT / EXTRA LIGHT PIPE TO AUSTRALIAN STANDARDS



Grade C350 pipe is a lightweight, high strength pipe for general mechanical and structural applications.

C350 is manufactured by cold-forming and high frequency electric resistance welding.

C350 is available in black, ILG and galvanized finishes.

Also available with one or both ends swaged as follows:

NB	XL	L
20	✓	X
25	✓	✓
32	✓	✓
40	✓	✓
50	✓	X

Specification

Grade C350 pipe is manufactured and tested to meet the requirement of the following specifications:

- AS 1163 Structural Steel Hollow Sections (Grade C350, C350L0).
- AS/NZ 4792 Hot dip galvanized (zinc) coatings on ferrous hollow sections by a continuous or a specialised process.

Mechanical properties

Minimum Yield Strength	350MPa
Minimum Tensile Strength	450MPa
Minimum Elongation in 5.65 √So	20%

Supply conditions

Surface Finish	Black/ILG/Galvanized
Straightness	Refer to
Thickness Tolerance	Australian
Dimension Tolerance	Standards
Standard Length	6.5m
Length Tolerance	+50mm/-0mm

Galvanizing

Grade C350 pipe is manufactured and tested to meet the requirement of AS 4792 Galvanized Coatings.

Min. Ave Coating Mass 300g/m²

The coating adherence of the galvanizing is satisfactory for the pipe to be bent to a radius 6 times the diameter of the pipe.

Welding

The following consumables are recommended by AS 1554.1 when welding C350 sections.

Manual metal-arc (MMAW) E41XX, E48XX

Gas metal-arc (MIG) (GMAW) W50X

Mass and Bundling Data - Calculated in accordance with AS 1163

Dimensions		Nominal Size DN (mm)	Bundling			Mass					
Designation d _o (mm)	t (mm)		Bundle Dimensions mm (W x H)	Lengths Per Bundle (6.5m)	Metres Per Bundle (m)	Nominal Mass (kg/m)		Mass per Bundle (m/tonne)		Mass per Bundle (tonnes)	
						Black	Galv.	Black	Galv.	Black	Galv.
26.9 x 2.0 CHS	20 XL	350 306	127	825.5	1.23	1.29	814	767	1.010	1.070	
2.3 CHS	20 LT	350 306	127	825.5	1.40	1.46	717	680	1.150	1.200	
33.7 x 2.0 CHS	25 XL	372 327	91	591.5	1.56	1.64	640	602	0.920	0.970	
2.6 CHS	25 LT	372 327	91	591.5	1.99	2.07	501	497	1.180	1.230	
42.4 x 2.0 CHS	32 XL	383 337	61	396.5	1.99	2.10	502	473	0.790	0.830	
2.6 CHS	32 LT	383 337	61	396.5	2.55	2.65	392	374	1.010	1.050	
48.3 x 2.3 CHS	40 XL	436 384	61	396.5	2.61	2.73	383	364	1.030	1.080	
2.9 CHS	40 LT	436 384	61	396.5	3.25	3.36	308	295	1.290	1.330	
60.3 x 2.3 CHS	50 XL	422 374	37	240.5	3.29	3.44	304	288	0.790	0.830	
2.9 CHS	50 LT	422 374	37	240.5	4.11	4.25	244	234	0.990	1.020	
76.1 x 2.3 CHS	65 XL	533 472	37	240.5	4.19	4.33	239	231	1.007	1.040	
3.2 CHS	65 LT	533 472	37	240.5	5.75	5.94	174	167	1.380	1.430	
88.9 x 2.6 CHS	80 XL	445 397	19	123.5	5.53	5.75	181	174	0.683	0.710	
3.2 CHS	80 LT	445 397	19	123.5	6.76	6.98	148	143	0.840	0.860	
101.6 x 2.6 CHS	90 XL	508 454	19	123.5	6.35	6.60	158	152	0.784	0.815	
3.2 CHS	90 LT	508 454	19	123.5	7.70	8.04	129	124	0.960	0.990	
114.3 x 3.2 CHS	100 XL	572 510	19	123.5	8.77	9.05	114	110	1.083	1.118	
3.6 CHS	100 LT	572 510	19	123.5	9.83	10.11	102	98.6	1.214	1.249	
139.7 x 3.0 CHS	125 XL	698 382	13	84.5	10.11	10.50	98.9	95.2	0.855	0.887	
3.5 CHS	125 LT	698 382	13	84.5	11.76	12.10	85.1	82.4	0.993	1.022	
165.1 x 3.5 CHS	150 LT	660 451	10	65	13.95	14.40	71.7	69.4	0.907	0.936	

Notes:

LT = Light, XL = Extra Light

The term "tube" is synonymous with the term "pipe".

MEDIUM & HEAVY PIPE TO AUSTRALIAN STANDARDS



Specification C250 pipe is manufactured and tested to meet the requirement of the following specifications: <ul style="list-style-type: none"> AS 1074 Steel tubes and tubulars for ordinary service. AS 1163 Structural steel hollow sections (Grade C250, C250L0). 	Supply Conditions Surface Finish: Black/Painted/ Galvanized/ILG Straightness: Refer to Australian Standards Thickness Tolerance: 6.5mm Dimension Tolerance: +50mm/-0mm Standard Length: 6.5m Length Tolerance: +50mm/-0mm	Working Pressures – Welded Joints Where AS 1074 pipe is used in pressure piping covered by AS 4041, the maximum pressure shall not exceed 1210 kPa for AS 1074 pipe up to and including DN 100 and 1030 kPa for AS 1074 pipe exceeding DN 100.
Mechanical Properties Minimum Yield Strength: 250MPa Minimum Tensile Strength: 320MPa Minimum Elongation in 5.65 vSo: 20%	End Processing Options <ul style="list-style-type: none"> Plain End Shouldered Roll Grooved Threaded 	Threaded Pipe Screwed on one or both ends in accordance with AS 1074. The tapered Whitworth thread used complies with the requirements of AS 1722, Part 1 and is suitable for both parallel and taper threaded sockets.

WORKING PRESSURES – THREADED JOINTS TAPER/PARALLEL THREAD

Nom. Size DN (mm)	Type of Service										
	Water & Inert Oil		LPG	Fuel Oil				Other Applications (including Steam & Compressed Air)			
	Med. kPa	Heavy kPa	Med. & Heavy kPa	Medium Press kPa	Temp °C	Heavy Press kPa	Temp °C	Medium Press kPa	Temp °C	Heavy Press kPa	Temp °C
25	2070	2410	140	1030	100	1210	192	1210	100	1210	192
32	1720	2070	140	1030	100	1030	192	1030	100	1030	192
40	1720	2070	140	1030	100	1030	192	1030	100	1030	192
50	1380	1720	140	860	100	860	192	860	100	860	192
65	1380	1720	–	860	100	860	192	860	100	860	192
80	1380	1720	–	860	100	860	192	860	100	860	192
100	1030	1380	–	690	100	850	192	690	100	690	192
125	1030	1380	–	–	–	–	–	–	–	–	–
150	860	1030	–	–	–	–	–	–	–	–	–

CHS Grade C250		Mass and Bundling Data - Calculated in accordance with AS 1163										
Dimensions		Bundling				Mass						
Designation d _o	Nominal Size DN	Bundle Dimensions mm	Lengths Per Bundle	Metres Per Bundle	Nominal Mass				Mass per Bundle tonnes			
(mm)	(mm)	W x H	6.5m	m	kg/m		m/tonne		Black	Galv.		
					Black	Galv.	Black	Galv.	Black	Galv.		
26.9 x 2.6 CHS	20 M	350 306	127	825.5	1.56	1.62	642	613	1.29	1.32		
3.2 CHS	20 H	350 306	127	825.5	1.87	1.93	535	522	1.54	1.59		
33.7 x 3.2 CHS	25 M	372 327	91	591.5	2.41	2.49	415	406	1.43	1.47		
4.0 CHS	25 H	372 327	91	591.5	2.94	3.02	340	330	1.74	1.78		
42.4 x 3.2 CHS	32 M	383 337	61	396.5	3.10	3.20	322	310	1.23	1.27		
4.0 CHS	32 H	383 337	61	396.5	3.80	3.90	263	255	1.51	1.54		
48.3 x 3.2 CHS	40 M	436 384	61	396.5	3.57	3.68	280	270	1.41	1.46		
4.0 CHS	40 H	436 384	61	396.5	4.38	4.49	228	221	1.74	1.78		
60.3 x 3.6 CHS	50 M	422 374	37	240.5	5.03	5.18	199	192	1.21	1.25		
4.5 CHS	50 H	422 374	37	240.5	6.19	6.33	161	157	1.49	1.52		
76.1 x 3.6 CHS	65 M	533 472	37	240.5	6.43	6.61	156	150	1.55	1.59		
4.5 CHS	65 H	533 472	37	240.5	7.93	8.12	126	123	1.91	1.95		
88.9 x 4 CHS	80 M	445 397	19	123.5	8.37	8.58	120	116	1.03	1.06		
4.9 CHS	80 H	445 397	19	123.5	10.3	10.5	96.8	94.4	1.28	1.30		
101.6 x 4.0 CHS	90 M	508 454	19	123.5	9.63	9.88	104	100	1.19	1.22		
4.9 CHS	90 H	508 454	19	123.5	11.9	12.2	84	81.7	1.47	1.5		
114.3 x 4.5 CHS	100 M	571 509	19	123.5	12.2	12.4	82.2	79.8	1.5	1.54		
5.4 CHS	100 H	571 509	19	123.5	14.5	14.3	69.1	67.4	1.79	1.82		
139.7 x 5.0 CHS	125 M	698 382	13	84.5	16.6	16.9	60.2	58.6	1.4	1.43		
5.4 CHS	125 H	698 382	13	84.5	17.9	18.2	55.9	54.6	1.51	1.54		
165.1 x 5.0 CHS	150 M	660 451	10	65	19.7	20.1	50.7	49.3	1.28	1.31		
5.4 CHS	150 H	660 451	10	65	21.7	21.57	45.9	46	1.38	1.41		

M = Medium, H = Heavy

Shouldered ERW Pipe

Specifications

The following specifications describe the requirements for hot dip galvanised shouldered pipe suitable for use with either forged steel or cast iron couplings. Furthermore the pipe is suitable, depending on fluid type and service conditions, for service up to AS4041 Class 2 pipe work in underground applications.

Size Range

OD (mm)	t (mm)	Standard Lengths	Mass In Kg/m	Max Recommended Working Pressure	Max Recommended Test Pressure Ambient Temp.
114.3	2.1	6.0m	5.86	3.6MPa	5.4MPa
114.3	2.1	6.5m	5.86		
165.1	2.5	6.0m	10.02	3.0MPa	4.5MPa
165.1	2.5	6.5m	10.02		
219.1	3.5	6.0m	18.60	3.1MPa	4.7MPa
219.1	3.5	6.5m	18.60		
323.9	4.8	6.0m	38.22	2.9MPa	4.35MPa
355.6	4.8	6.0m	41.52	2.6MPa	3.9MPa
457.0	4.8	6.0m	53.52	2.0MPa	3.1MPa
610.0	6.0	6.0m	89.37	1.9MPa	2.9MPa

Note: The above maximum recommended test and working pressures are applicable only to the pipe and only if;

- The only applied stresses are those from the internal fluid pressure
- The pipeline is designed using the appropriate standard applicable to its use.

762mm and 914mm also available on application.



Surface Finish

Hot dip galvanised minimum coating thickness at any location of the product is 34microns, and the minimum mass per square metre of the coating shall be 300 g. Each pipe is visually inspected to ensure the coating on each pipe is adherent, smooth and free from dross, bubbles, spikes, lumps, flaking or peeling.

Bundling Data

OD (mm)	t (mm)	Standard Lengths	Mass In Kg/m	Lengths per Bundle	Mass per Bundle kg
114.3	2.1	6.0m	5.86	10	351.60
114.3	2.1	6.5m	5.86	10	380.90
165.1	2.5	6.0m	10.02	10	601.20
165.1	2.5	6.5m	10.02	10	651.30
219.1	3.5	6.0m	18.60	5	558.00
219.1	3.5	6.5m	18.60	5	604.50
323.9	4.8	6.0m	38.22	1	229.32
355.6	4.6	6.0m	51.52	1	309.12
457.0	4.8	6.0m	53.52	1	321.12
610.0	6.0	6.0m	89.37	1	536.22

A full range of Shouldered Fittings, Couplings, Valves and Manifolds are available for any size required.

Shouldered ERW Pipe

Chemical Composition

Coil feed material shall conform to API 5LB PSL1 chemical composition with special regard to Silicon content that ensures full adhesion of hot dipped galvanising.

Mechanical Properties

- Minimum Yield Strength: 245 MPa
- Minimum Tensile Strength: 415 MPa
- Minimum Elongation: 15%

Straightness and Length Tolerance

Pipes shall not deviate from a straight line by more than the length divided by 500 at the centre of the pipe length. Each pipe shall be the ordered length with a tolerance of -0.50mm, +20.0 mm.

End Squareness

Each pipe shall be cut with a squareness not exceeding 1.6mm.

Weld Bead

The external weld bead shall be trimmed to an essentially flush condition. The maximum height of the internal weld bead shall not exceed 1.5mm.

Mass

The mass of any mill length of pipe shall not be less than 98% of the nominal mass.

Roundness

Each pipe shall meet or exceed the requirements for Out-of-roundness as defined in API5L Specifications:

OD (mm)	Out-of-Roundness	
	Except Ends (mm)	Ends (mm)
114.3	2.29	1.72
165.1	3.30	2.48
219.1	4.38	3.29
323.9	7.03	5.27
355.6	7.11	5.33
457.0	9.14	6.86
610.0	12.20	9.15

Non-Destructive Testing

Traditional automated non-destructive examinations such as; Ultrasonic and Hydrostatic as outlined in API5L are completed on every length of pipe. Hydrostatic test pressures are calculated as follows and held for five (5) seconds.

$$P \text{ (MPa)} = \frac{1.2 \times YS \times t}{D}$$

Where YS = minimum YS of pipe (MPa) = and t = nominal thickness (mm)

A second Hydrostatic Test, as outlined in API5L, is completed on every length of pipe after the shouldered ring has been welded to the pipe, prior to the galvanisation process.

Identification and Documentation

The identity of each pipe is maintained through galvanising process to ensure that the correct Heat Number and Purchase Order Number is stencilled on each pipe. Each Pipe is marked with the following in permanent ink:

- Diameter (mm)
- Manufacturing specification and grade
- Heat Number

Each pipe is traceable to a Test Certificate which shall be supplied to the purchaser. SI units shall be used. For at least each heat of steel, the Test Certificate shall contain, at minimum:

- Details of the pipe section, specification and grade.
- Measured Chemical composition, for each element intentionally added and each element in the IIW CEq formula.
- Bare pipe measured Yield Strength, Tensile Strength & Elongation.
- A statement of compliance for welding to AS3992.
- A statement of compliance with regard to the non-destructive test method used.
- A statement of compliance for coating to the galvanising Standard.

References

- AS/NZS 3679.1:1996 (Amd. 1 & 2) Structural steel Part 1: Hot-rolled bars & sections
- AS/NZS 3992:1998 (Amd. 1) Pressure equipment – Welding and brazing qualification
- AS 4041:2006 Pressure piping
- AS/NZS 4680:2006 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
- ISO 9001:2008 Quality management systems – Requirements
- ANSI/API Specification 5L 44th edition:2007 Specification for Line Pipe

STAINLESS STEEL PIPES TO AMERICAN STANDARD ASME B36.19



Nominal Size DN	Outside Diameter (mm)	Nominal Wall Thickness & Inside Diameter (mm)							
		Schedule 5S		Schedule 10S		Schedule 40S		Schedule 80S	
		Wall Thickness	Inside Diameter	Wall Thickness	Inside Diameter	Wall Thickness	Inside Diameter	Wall Thickness	Inside Diameter
6	10.29	-	-	1.24	7.81	1.73	6.83	2.41	5.47
8	13.72	-	-	1.65	10.42	2.24	9.24	3.02	7.68
10	17.15	-	-	1.65	13.85	2.31	12.53	3.20	10.75
15	21.34	1.65	18.04	2.11	17.12	2.77	15.80	3.73	13.88
20	26.67	1.65	23.37	2.11	22.45	2.87	20.93	3.91	18.85
25	33.40	1.65	30.10	2.77	27.86	3.38	26.64	4.55	24.30
32	42.16	1.65	38.86	2.77	36.62	3.56	35.04	4.85	32.46
40	48.26	1.65	44.96	2.77	42.72	3.68	40.90	5.08	38.10
50	60.33	1.65	57.03	2.77	54.79	3.91	52.51	5.54	49.25
65	73.03	2.11	68.81	3.05	66.93	5.16	62.71	7.01	59.01
80	88.90	2.11	84.68	3.05	82.80	5.49	77.92	7.62	73.66
100	114.30	2.11	110.08	3.05	108.20	6.02	102.26	8.56	97.18
125	141.30	2.77	135.76	3.40	134.50	6.55	128.19	9.52	122.25
150	168.28	2.77	162.74	3.40	161.47	7.11	154.05	10.97	146.33
200	219.08	2.77	213.54	3.76	211.56	8.18	202.72	12.70	193.68
250	273.05	3.40	266.24	4.19	264.67	9.27	254.51	12.70	247.65
300	323.85	3.96	315.93	4.57	314.71	9.52	304.08	12.70	298.45
350	355.60	3.96	347.68	4.78	346.05	-	-	-	-
400	406.40	4.19	398.02	4.78	396.85	-	-	-	-
450	457.20	4.19	448.82	4.78	447.65	-	-	-	-
500	508.00	4.78	498.45	5.54	496.93	-	-	-	-
600	609.60	5.54	598.53	6.35	596.90	-	-	-	-
750	762.00	6.35	749.30	7.92	746.16	-	-	-	-

TEMPERATURE CONVERSION TABLE



The SI Unit of thermodynamic temperature is the KELVIN – Symbol K. For most practical purposes of temperature measurement and most calculations involving temperatures, DEGREE CELSIUS, symbol °C will be used. The name CELSIUS was adopted internationally in 1948 instead of Centigrade, to avoid possible confusion with the identically named unit of angle used in some European countries.

Temperature Conversion Chart

- (A) To use, locate “given temperature” in “given temperature” column (coloured blue) whether °C or °F.
- (B) If “given temperature” is in degrees Celsius (°C), read degrees Fahrenheit (°F) in right hand column.
- (C) If “given temperature” is in degrees Fahrenheit (°F), read degrees Celsius (°C) in left hand column.
- (D) Example: (i) Given temperature is 35°C = 95°F from right hand column
 (ii) Given temperature is 35°F = 1.7°C from left hand column

-320 to 27			28 to 77			78 to 235			240 to 485			490 to 2400		
°C	Given Temp.	°F	°C	Given Temp.	°F	°C	Given Temp.	°F	°C	Given Temp.	°F	°C	Given Temp.	°F
-196	-320	—	-2.2	28	82.4	25.6	78	172.4	116	240	464	254	490	914
-184	-300	—	-1.7	29	84.2	26.1	79	174.2	118	245	473	257	495	923
-173	-280	—	-1.1	30	86.0	26.7	80	176.0	121	250	482	260	500	932
-162	-260	-436	-0.6	31	87.8	27.2	81	177.8	124	255	491	266	510	950
-151	-240	-400	0.0	32	89.6	27.8	82	179.6	127	260	500	271	520	968
-140	-220	-364	0.6	33	91.4	28.3	83	181.4	129	265	509	277	530	986
-129	-200	-328	1.1	34	93.2	28.9	84	183.2	132	270	518	282	540	1004
-115	-175	-283	1.7	35	95.0	29.4	85	185.0	135	275	527	288	550	1022
-101	-150	-238	2.2	36	96.8	30.0	86	186.8	138	280	536	293	560	1040
-90	-130	-202	2.8	37	98.6	30.6	87	188.6	141	285	545	299	570	1058
-84	-120	-184	3.3	38	100.4	31.1	88	190.4	143	290	554	304	580	1076
-79	-110	-166	3.9	39	102.2	31.7	89	192.2	146	295	563	310	590	1094
-73	-100	-148	4.4	40	104.0	32.2	90	194.0	149	300	572	316	600	1112
-68	-90	-130	5.0	41	105.8	32.8	91	195.8	152	305	581	321	610	1130
-62	-80	-112	5.6	42	107.6	33.3	92	197.6	154	310	590	327	620	1148
-57	-70	-94	6.1	43	109.4	33.9	93	199.4	157	315	599	332	630	1166
-51	-60	-76	6.7	44	111.2	34.4	94	201.2	160	320	608	338	640	1184
-46	-50	-58	7.2	45	113.0	35.0	95	203.0	163	325	617	343	650	1202
-40	-40	-40	7.8	46	114.8	35.6	96	204.8	166	330	626	349	660	1220
-34	-30	-22	8.3	47	116.6	36.1	97	206.6	168	335	635	354	670	1238
-29	-20	-4	8.9	48	118.4	36.7	98	208.4	171	340	644	360	680	1256
-23	-10	14	9.4	49	120.2	37.2	99	210.2	174	345	653	366	690	1274
-17.8	0	32	10.0	50	122.0	37.8	100	212.0	177	350	662	371	700	1292
-17.2	1	33.8	10.6	51	123.8	38.4	101	213.8	180	355	671	377	710	1310
-16.7	2	35.6	11.1	52	125.6	39.0	102	215.6	183	360	680	382	720	1328
-16.1	3	37.4	11.7	53	127.4	39.6	103	217.4	186	365	689	388	730	1346
-15.6	4	39.2	12.2	54	129.2	40.2	104	219.2	189	370	698	393	740	1364
-15.0	5	41.0	12.8	55	131.0	40.8	105	221.0	192	375	707	399	750	1382
-14.4	6	42.8	13.3	56	132.8	41.4	106	222.8	195	380	716	404	760	1400
-13.9	7	44.6	13.9	57	134.6	42.0	107	224.6	198	385	725	410	770	1418
-13.3	8	46.4	14.4	58	136.4	42.6	108	226.4	201	390	734	416	780	1436
-12.8	9	48.2	15.0	59	138.2	43.2	109	228.2	204	395	743	421	790	1454
-12.2	10	50.0	15.6	60	140.0	43.8	110	230.0	207	400	752	427	800	1472
-11.7	11	51.8	16.1	61	141.8	44.4	111	231.8	210	405	761	432	810	1490
-11.1	12	53.6	16.7	62	143.6	45.0	112	233.6	213	410	770	438	820	1508
-10.6	13	55.4	17.2	63	145.4	45.6	113	235.4	216	415	779	443	830	1526
-10.0	14	57.2	17.8	64	147.2	46.2	114	237.2	219	420	788	449	840	1544
-9.4	15	59.0	18.3	65	149.0	46.8	115	239.0	222	425	797	454	850	1562
-8.9	16	60.8	18.9	66	150.8	47.4	116	240.8	225	430	806	460	860	1580
-8.3	17	62.6	19.4	67	152.6	48.0	117	242.6	228	435	815	466	870	1598
-7.8	18	64.4	20.0	68	154.4	48.6	118	244.4	231	440	824	471	880	1616
-7.2	19	66.2	20.6	69	156.2	49.2	119	246.2	234	445	833	477	890	1634
-6.7	20	68.0	21.1	70	158.0	49.8	120	248.0	237	450	842	482	900	1652
-6.1	21	69.8	21.7	71	159.8	50.4	121	249.8	240	455	851	488	910	1670
-5.6	22	71.6	22.2	72	161.6	51.0	122	251.6	243	460	860	493	920	1688
-5.0	23	73.4	22.8	73	163.4	51.6	123	253.4	246	465	869	499	930	1706
-4.4	24	75.2	23.3	74	165.2	52.2	124	255.2	249	470	878	504	940	1724
-3.9	25	77.0	23.9	75	167.0	52.8	125	257.0	252	475	887	510	950	1742
-3.3	26	78.8	24.4	76	168.8	53.4	126	258.8	255	480	896	515	960	1760
-2.8	27	80.6	25.0	77	170.6	54.0	127	260.6	258	485	905	521	970	1778

Conversion Factors
 Degrees Fahrenheit to Celsius
 $(°F - 32) \times 5/9 = °C$

Degrees Celsius to Fahrenheit
 $(°C \times 9/5) + 32 = °F$

CONVERSION FACTORS – IMPERIAL TO METRIC (Approx.)

“SI” denotes the INTERNATIONAL SYSTEM of Metric Units adopted in Australia			
This table may be used in two ways: Multiply column “A” by column “B” to obtain column “C” Alternatively Divide column “C” by column “B” to obtain column “A”			
Remarks	A Multiply	B By	C To Obtain
AREA: Symbol m ² The SI unit of AREA is the SQUARE METRE.	Square Inches	645.16	mm ²
	Square Feet	0.929	m ²
	Square Yards	0.836	m ²
	Acre	4047	m ²
	Hectare (ha)	10000	m ²
DENSITY: Symbol kg/m ³ The SI unit of DENSITY is the kilogram per cubic metre.	lb/in ³	27.68	t/m ³
	lb/ft ³	16.02	kg/m ³
	lb/yd ³	0.5933	kg/m ³
ENERGY: Symbol J The SI unit of ENERGY is the JOULE. 1 J = 1 N.m A joule is the energy expended or the work done when a force of one newton moves the point of application a distance of one metre in the direction of that force.	1. ELECTRICAL ENERGY		
	kilowatt hour (kW.h)	3.6	MJ
	2. HEAT ENERGY		
	British thermal unit (Btu)	1.055	kJ
	Btu/gal	0.2321	kJ/L ++
	Btu/ft ³	37.26	kJ/m ³
	3. MECHANICAL ENERGY		
	foot poundal (ft.pdl)	.04214	J
	inch pound-force (in.lbf)	0.1130	J
	foot pound-force (ft.lbf)	1.356	J
	foot ton force (ft.tonf)	3.037	kJ
	Metre kilogram force (m.kgf)	9.807	J
	FORCE: Symbol N (NEWTON) The SI unit of FORCE (kg.m/s ²) has been given the special name – NEWTON. The newton is the force which when applied to a body having a mass of one kilogram, causes an acceleration of one metre per second in the direction of application of the force.	Poundal (pdl)	0.1383
Pound-force (lbf)		4.448	N
ton-force (tonf)		9.964	kN
*kilogram-force (kgf)		9.807	N
*also known as kilopond (kp)			
FORCE PER UNIT LENGTH: The SI unit is NEWTON PER METRE: Symbol N/m	pounds-force per inch (lbf/in)	175.1	N/m
	pounds-force per foot (lbf/ft)	14.59	N/m
	ton-force per foot (ton/ft)	32.69	kN/m
LENGTH: Symbol m The SI unit of LENGTH is the METRE.	inches	25.4	millimetres (mm)
	feet	0.3048	metres (m)
	yards	0.9144	metres (m)
	chain	20.12	metres (m)
	mile	1609	metres (m)
	mile	1.609	kilometres (km)
MASS: Symbol kg The SI unit of MASS is the KILOGRAM.	ounce	28.35	grams (g)
	pound	0.4536	kilograms (kg)
	slug	14.59	kg
	ton (2240 lb)	1016.05	kg
	short ton (2000 lb)	907.2	kg
	ton (2240 lb)	1.016	tonne (t)
	pounds per foot (lb/ft)	1.488	kg/m
	pounds per yard (lb/yd)	0.4961	kg/m
POWER: Symbol W The SI unit of POWER is the WATT.	Btu per hour (Btu/hr)	0.2931	W
	horsepower (hp)	0.7457	kW
	ton of refrigeration	3.517	kW

TEMPERATURE

The SI unit of TEMPERATURE is the KELVIN – Symbol K. For most practical purposes of temperature measurement and most calculations involving temperatures, degrees Celsius, symbol °C will be used.

DEGREES FAHRENHEIT TO CELSIUS: $(^{\circ}\text{F} - 32) \times 5/9 = ^{\circ}\text{C}$

DEGREES CELSIUS TO FAHRENHEIT: $(^{\circ}\text{C} \times 9/5) + 32 = ^{\circ}\text{F}$

CONVERSION FACTORS – IMPERIAL TO METRIC (Approx.)



“SI” denotes the INTERNATIONAL SYSTEM of Metric Units adopted in Australia

This table may be used in two ways:

Multiply column “A” by column “B” to obtain column “C”

Alternatively Divide column “C” by column “B” to obtain column “A”

Remarks	A Multiply	B By	C To Obtain
PRESSURE: Symbol Pa	lbf/in ²	6.895	kPa
The SI unit of PRESSURE or stress is the NEWTON PER SQUARE METRE which has been given the name PASCAL.	kip/in ² (1000 psi)	6.895	MPa
	lbf/ft ²	47.88	Pa
1 N/m ² = 1Pa = 0.000145lbf/in ²	kgf/cm ²	98.07	kPa
A pascal is the pressure or stress which arises when a force of one newton is applied uniformly over an area of one square metre.	bar	100	kPa
	Vertical column (head) of water. (H ₂ O at 20°C)		
	metres of water	9.79	kPa
	feet of water	2.984	kPa
	torr (vacuum)	0.1333	kPa
	1mm Hg. (mercury)	0.1333	kPa
	1in. Hg. (mercury)	3.386	kPa
	atmosphere (atm)	101.325	kPa
	microns	0.133	Pa
TORQUE: Symbol N.m (Moment of force)	Poundal-foot		
	pdl.ft	0.04214	N.m
The SI unit of TORQUE is the NEWTON METRE. The newton metre is the work done when a force of one newton moves the point of application a distance of one metre in the direction of that force.	pound-force inch		
	lbf.inch	0.1130	N.m
	lbf.inch	1.152	kgf.cm
	pound-force feet		
	lbf.ft	1.356	N.m
1 N.m = 1 J	lbf.ft	13.83	kgf.cm
	ton-force feet		
	tonf.ft	3.037	kN.m
	kilogram-force		
	kgf.m	9.807	N.m
	kgf.cm	0.09807	N.m
VELOCITY: Symbol m/s	ft. per second (ft/s)	0.3048	m/s
The SI unit of VELOCITY is the METRE PER SECOND.	ft. per minute (ft/min)	0.00508	m/s
	miles per hour	0.4470	m/s
	miles per hour	1.609	km/h
VOLUME: CAPACITY:	DRY:		
Symbol m ³	cubic inch (in ³)	16387	mm ³
The SI unit of VOLUME is the CUBIC METRE.	cubic foot (ft ³)	0.02832	m ³
	cubic yard (yd ³)	0.7646	m ³
NOTE: ++	litre (L) ++	1 000 000	mm ³
Capital “L” is now the legal preferred symbol for litre in Australia.	litre (L) ++	0.001	m ³
	gallons (Imp.)	0.004546	m ³
	IMPERIAL LIQUID		
	fluid ounce	28.41	millilitre (ml)
	pint (20 fl. oz)	568.3	millilitre (ml)
	quart (2 pints)	1.137	litre (L) ++
	gallon (Imp.)	4.546	litre (L) ++
	gallon (US)	3.785	litre (L) ++
	litre (water 4°C)	1.000	kilogram (kg)
	Imp. gallons (water 20°C)	4.536	kilogram (kg)
VOLUME: RATE OF FLOW Symbol m ³ /s	Imp. gal. per minute (gal/min)	0.0000758	m ³ /s
The SI unit of VOLUME RATE OF FLOW is the CUBIC METRE PER SECOND.	Imp. gal. per minute	0.272765	m ³ /hr
	Imp. gal. per minute	0.0758	litre per second (L/s)
	cubic ft. per minute	0.000472	m ³ /s
	cubic ft. per minute	0.472	litre per second (L/s) 1 m ³ = 1 kL
SUNDRY ITEMS:	miles per gallon	0.3540	km per litre
	gallons per mile	2.825	litres per km

TEMPERATURE

The SI unit of TEMPERATURE is the KELVIN – Symbol K. For most practical purposes of temperature measurement and most calculations involving temperatures, degrees Celsius, symbol °C will be used.

DEGREES FAHRENHEIT TO CELSIUS: (°F – 32) x 5/9 = °C

DEGREES CELSIUS TO FAHRENHEIT: (°C x 9/5) + 32 = °F

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