



# Section TECH-F

## Mechanical Data

### TECH-F-1 Standard Weights and Dimensions of Mechanical Joint Cast Iron Pipe, Centrifugally Cast

Extracted from USA Standard Cast Iron Pipe Flanges and Flanged Fittings (USAS B16. 1-1967), with the permission of the publisher. The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, New York 10017.

Nom. Size & (Outside Diam), In.	Thickness, In.	Wall Weight Per Foot*	Average Thickness Class
3 (3.96)	0.32	11.9	22
	0.35	12.9	23
	0.38	13.8	24
4 (4.80)	0.35	16.1	22
	0.38	17.3	23
	0.41	18.4	24
	0.44	19.6	25
6 (6.90)	0.38	25.4	22
	0.41	27.2	23
	0.44	29.0	24
	0.48	31.3	25
8 (9.05)	0.52	33.6	26
	0.41	36.2	22
	0.44	38.6	23
	0.48	41.8	24
	0.52	45.0	25
10 (11.10)	0.56	48.1	26
	0.60	51.2	27
	0.44	48.0	22
	0.48	52.0	23
	0.52	55.9	24
	0.56	59.9	25
12 (13.20)	0.60	63.8	26
	0.65	68.6	27
	0.48	62.3	22
	0.52	67.1	23
	0.56	59.9	25
	0.60	76.6	25
	0.65	82.5	26
14 (15.30)	0.70	88.3	27
	0.76	95.2	28
	0.48	73.6	21
	0.51	77.8	22
	0.55	83.4	23
	0.59	89.0	24
	0.64	95.9	25
	0.69	102.7	26
	0.75	110.9	27
	0.81	118.9	28

Nom. Size & (Outside Diam), In.	Thickness, In.	Wall Weight Per Foot*	Average Thickness Class
16 (17.40)	0.50	87.6	21
	0.54	94.0	22
	0.58	100.3	23
	0.63	108.3	24
	0.68	116.2	25
	0.73	124.0	26
	0.79	133.3	27
	0.85	142.7	28
18 (19.50)	0.54	106.0	21
	0.58	113.2	22
	0.63	122.2	23
	0.68	131.0	24
	0.73	140.0	25
	0.79	150.6	26
	0.85	161.0	27
20 (21.60)	0.92	173.2	28
	0.57	124.2	21
	0.62	134.2	22
	0.67	144.2	23
	0.72	154.1	24
	0.78	165.9	25
	0.84	177.6	26
24 (25.80)	0.91	191.2	27
	0.98	214.8	28
	0.63	164.2	21
	0.68	176.2	22
	0.73	188.2	23
	0.79	202.6	24
	0.85	216.8	25
	0.92	233.2	26
	0.99	249.7	27
	1.07	268.2	28

\*Based on 20 Ft. Laying Length of Mech. Joint Pipe including Bell.

# TECH-F-2 125 Lb. & 250 Lb. Cast Iron Pipe Flanges and Flanged Fittings

Nominal Pipe Size	Diam. of Flange	Thickness of Flange (Min.)	Diam. of Bolt Circle	Number of Bolts	Diam. of Bolts	Diam. of Drilled Bolt Holes	Length of Bolts
1	4 1/4	7/16	3 1/8	4	1/2	5/8	1 3/4
1 1/4	4 5/8	1/2	3 1/2	4	1/2	5/8	2
1 1/2	5	9/16	3 7/8	4	1/2	5/8	2
2	6	5/8	4 3/4	4	5/8	3/4	2 1/4
2 1/2	7	1 1/16	5 1/2	4	5/8	3/4	2 1/2
3	7 1/2	3/4	6	4	5/8	3/4	2 1/2
3 1/2	8 1/2	13/16	7	8	5/8	3/4	2 3/4
4	9	15/16	7 1/2	8	5/8	3/4	3
5	10	15/16	8 1/2	8	3/4	7/8	3
6	11	1	9 1/2	8	3/4	7/8	3 1/4
8	13 1/2	1 1/8	11 3/4	8	3/4	7/8	3 1/2
10	16	1 3/16	14 1/4	12	7/8	1	3 3/4
12	19	1 1/4	17	12	7/8	1	3 3/4
14	21	1 3/8	18 3/4	12	1	1 1/8	4 1/4
16	23 1/2	1 7/16	21 1/2	16	1	1 1/8	4 1/2
18	25	1 9/16	22 3/4	16	1 1/8	1 1/4	4 3/4
20	27 1/2	1 11/16	25	20	1 1/8	1 1/4	5
24	32	1 7/8	29 1/2	20	1 1/4	1 3/8	5 1/2
30	38 3/4	2 1/8	36	28	1 1/4	1 3/8	6 1/4
36	46	2 3/8	42 3/4	32	1 1/2	1 3/8	7
42	53	2 5/8	49 1/2	36	1 1/2	1 3/8	7 1/2
48	59 1/2	2 3/4	56	44	1 1/2	1 3/8	7 3/4

Chart 2 American Standard Class 125 Cast Iron Pipe Flanges (ASA B16.1)

Nominal Pipe Size	Diam. of Flange	Thickness of Flange <sup>3</sup> (Min.)	Diam. of Bolt Circle	Diam. of Bolt Holes <sup>1</sup>	Number of Bolts <sup>1</sup>	Size of Bolt	Length of Bolts <sup>2</sup>
1	4 7/8	1 1/16	3 1/2	3/4	4	5/8	2 1/2
1 1/4	5 1/4	3/4	3 7/8	3/4	4	5/8	2 1/2
1 1/2	6 1/8	13/16	4 1/2	7/8	4	3/4	2 3/4
2	6 1/2	7/8	5	3/4	8	5/8	2 3/4
2 1/2	7 1/2	1	5 7/8	7/8	8	3/4	3 1/4
3	8 1/4	1 1/8	6 5/8	7/8	8	3/4	3 1/2
3 1/2	9	1 3/16	7 1/4	7/8	8	3/4	3 1/2
4	10	1 1/4	7 7/8	7/8	8	3/4	3 3/4
5	11	1 3/8	9 1/4	7/8	8	3/4	4
6	12 1/2	1 7/16	10 5/8	7/8	12	3/4	4
8	15	1 5/8	13	1	12	7/8	4 1/2
10	17 1/2	1 7/8	15 1/4	1 1/8	16	1	5 1/4
12	20 1/2	2	17 3/4	1 1/4	16	1 1/8	5 1/2
14	23	2 1/8	20 1/4	1 1/4	20	1 1/8	6
16	25 1/2	2 1/4	22 1/2	1 3/8	20	1 1/4	6 1/4
18	28	2 3/8	24 3/4	1 3/8	24	1 1/4	6 1/2
20	30 1/2	2 1/2	27	1 3/8	24	1 1/4	6 3/4
24	36	2 3/4	32	1 5/8	24	1 1/2	7 3/4
*30	43	3	39 1/4	2	28	1 1/2	8 1/2
*36	50	3 3/8	46	2 1/4	32	2	9 1/2
*42	57	3 11/16	52 3/2	2 1/4	36	2	10 1/4
*48	65	4	60 3/4	2 1/4	40	2	10 3/4

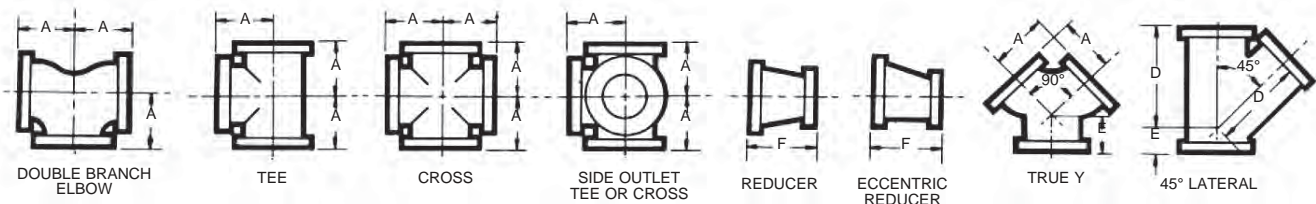
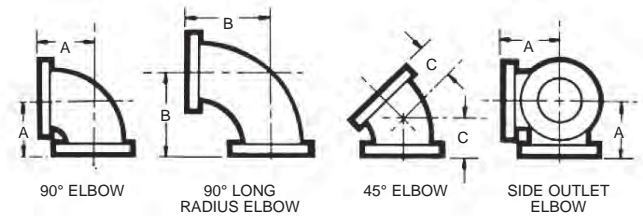
Chart 3 American Standard Class 250 Cast Iron Pipe Flanges (ASA B16b)

Nominal Pipe Size	Center to Face					Face to Face F	Body Wall Thickness <sup>t</sup>
	A	B	C	D	E		
1	3 1/2	5	1 3/4	5 3/4	1 3/4	....	5/16
1 1/4	3 3/4	5 1/2	2	6 1/4	1 3/4	....	5/16
1 1/2	4	6	2 1/4	7	2	....	5/16
2	4 1/2	6 1/2	2 1/2	8	2 1/2	5	5/16
2 1/2	5	7	3	9 1/2	2 1/2	5 1/2	5/16
3	5 1/2	7 3/4	3	10	3	6	3/8
3 1/2	6	8 1/2	3 1/2	11 1/2	3	6 1/2	7/16
4	6 1/2	9	4	12	3	7	1/2
5	7 1/2	10 1/4	4 1/2	13 1/2	3 1/2	8	1/2
6	8	11 1/2	5	14 1/2	3 1/2	9	9/16
8	9	14	5 1/2	17 1/2	4 1/2	11	5/8
10	11	16 1/2	6 1/2	20 1/2	5	14	3/4
12	12	19	7 1/2	24 1/2	5 1/2	14	13/16
14	14	21 1/2	7 1/2	27	6	16	7/8
16	15	24	8	30	6 1/2	18	1
18	16 1/2	26 1/2	8 1/2	32	7	19	1 1/16
20	18	29	9 1/2	35	8	20	1 1/8
24	22	34	11	40 1/2	9	24	1 1/4
30	25	41 1/2	15	49	10	30	1 7/16
36	28*	49	18	....	....	36	1 5/8
42	31*	56 1/2	21	....	....	42	1 13/16
48	34*	64	24	....	....	48	2

Chart 4 American Standard Class 125 Cast Iron Flanged Fittings (ASA B16.1)

Nominal Pipe Size	Inside Diam. of Fitting (Min.)	Wall Thickness of Body*	Diam. of Raised Face	Center to Face					Face to Face F
				A	B	C	D	E	
2	2	7/16	4 3/16	5	6 1/2	3	9	2 1/2	5
2 1/2	2 1/2	1/2	4 15/16	5 1/2	7	3 1/2	10 1/2	2 1/2	5 1/2
3	3	9/16	5 11/16	6	7 3/4	3 1/2	11	3	6
3 1/2	3 1/2	9/16	6 5/16	6 1/2	8 1/2	4	12 1/2	3	6 1/2
4	4	5/8	6 15/16	7	9	4 1/2	13 1/2	3	7
5	5	11/16	8 5/16	8	10 1/4	5	15	3 1/2	8
6	6	3/4	9 11/16	8 1/2	11 1/2	5 1/2	17 1/2	4	9
8	8	13/16	11 15/16	10	14	6	20 1/2	5	11
10	10	15/16	14 1/16	11 1/2	16 1/2	7	24	5 1/2	12
12	12	1	16 7/16	13	19	8	27 1/2	6	14
14	13 1/4	1 1/8	18 15/16	15	21 1/2	8 1/2	31	6 1/2	16
16	15 1/4	1 1/4	21 1/16	16 1/2	24	9 1/2	34 1/2	7 1/2	18
18	17	1 3/8	23 5/16	18	26 1/2	10	37 1/2	8	19
20	19	1 1/2	25 9/16	19 1/2	29	10 1/2	40 1/2	8 1/2	20
24	23	1 5/8	30 1/4	22 1/2	34	12	47 1/2	10	24

Chart 5 American Standard Class 250 Cast Iron Flanged Fittings (ASA B16b)



# TECH-F-3 Steel Pipe, Dimensions and Weights

Size: Nom. & (Outside Diam.), In.*	Wall Thickness, In.	Weight per Foot, Plain Ends, Lb.	Schedule No.
1/8 (0.405)	0.068	0.24	40 S
	0.095	0.31	80 XS
1/4 (0.540)	0.088	0.42	40 S
	0.119	0.54	80 XS
3/8 (0.675)	0.091	0.57	40 S
	0.126	0.74	80 XS
1/2 (0.840)	0.109	0.85	40 S
	0.147	1.09	80 XS
	0.188	1.31	160
	0.294	1.71	XXS
3/4 (1.050)	0.113	1.13	40 S
	0.154	1.47	80 XS
	0.219	1.94	160
	0.308	2.44	XXS
1 (1.315)	0.133	1.68	40 S
	0.179	2.17	80 XS
	0.250	2.84	160
	0.308	2.44	XXS
1 1/4 (1.660)	0.140	2.27	40 S
	0.191	3.00	80 XS
	0.250	3.76	160
	0.382	5.21	XXS
1 1/2 (1.900)	0.145	2.72	40 S
	0.200	3.63	80 XS
	0.281	4.86	160
	0.400	6.41	XXS
2 (2.375)	0.154	3.65	40 S
	0.218	5.02	80 XS
	0.344	7.46	160
	0.436	9.03	XXS
2 1/2 (2.875)	0.203	5.79	40 S
	0.276	7.66	80 XS
	0.375	10.01	160
	0.552	13.70	XXS
3 (3.500)	0.216	7.58	40 S
	0.300	10.25	80 XS
	0.438	14.31	160
	0.600	18.58	XXS
3 1/2 (4.000)	0.226	9.11	40 S
	0.318	12.51	80 XS
	0.237	10.79	40 S
	0.337	14.98	80 XS
4 (4.500)	0.438	18.98	120
	0.531	22.52	160
	0.674	27.54	XXS
	0.258	14.62	40 S
5 (5.563)	0.375	20.78	80 XS
	0.500	27.04	120
	0.625	32.96	160
	0.750	38.55	XXS
6 (6.625)	0.280	18.97	40 S
	0.432	28.57	80 XS
	0.562	36.42	120
	0.719	45.34	160
8 (8.625)	0.864	53.16	XXS
	0.250	22.36	20
	0.277	24.70	30
	0.322	28.55	40 S
10 (10.750)	0.406	35.66	60
	0.500	43.39	80 XS
	0.594	50.93	100
	0.719	45.34	160
	0.812	67.79	140
	0.875	72.42	XXS
	0.906	74.71	160
	0.250	28.04	20
0.307	34.24	30	
10 (10.750)	0.365	40.48	40 S
	0.500	54.74	60 XS
	0.594	64.40	80
	0.719	77.00	100
	0.844	89.27	120
	1.000	104.13	140 XXS
	1.125	115.65	160

Size: Nom. & (Outside Diam.), In.*	Wall Thickness, In.	Weight per Foot, Plain Ends, Lb.	Schedule No.	
12 (12.750)	0.250	33.38	20	
	0.330	43.77	30	
	0.375	49.56	S	
	0.406	53.56	40	
	0.500	65.42	XS	
	0.562	73.22	60	
	0.688	88.57	80	
	0.844	107.29	100	
	1.000	125.49	120 XXS	
	1.125	139.68	140	
	14 (14.000)	1.312	160.33	160
		0.250	36.71	10
0.312		45.68	20	
0.375		54.57	30 S	
0.438		63.37	40	
0.500		72.09	XS	
0.594		85.01	60	
0.750		106.13	80	
0.938		130.79	100	
1.094		150.76	120	
1.250		170.22	140	
1.406		189.15	160	
16 (16.000)	0.250	42.05	10	
	0.312	52.36	20	
	0.375	62.58	30 S	
	0.500	82.77	40 XS	
	0.656	107.54	60	
	0.844	136.58	80	
	1.031	164.86	100	
	1.219	192.40	120	
	1.438	223.57	140	
	1.594	245.22	160	
	18 (18.000)	0.250	47.39	10
		0.312	59.03	20
0.375		70.59	S	
0.438		82.06	30	
0.500		93.45	XS	
0.562		104.76	40	
0.750		138.17	60	
0.938		170.84	80	
1.156		208.00	100	
1.375		244.14	120	
1.562		274.30	140	
1.781		308.55	160	
20 (20.000)	0.250	47.39	10	
	0.375	78.60	20 S	
	0.500	93.45	XS	
	0.594	123.06	40	
	0.812	166.50	60	
	1.031	208.92	80	
	1.281	256.15	100	
	1.500	296.37	120	
	1.750	341.10	140	
	1.969	379.14	160	
	22 (22.000)	0.250	58.07	10
		0.375	86.61	20 S
0.500		114.81	30 XS	
0.875		197.42	60	
1.125		250.82	80	
1.375		302.88	100	
1.625		353.61	120	
1.875		403.01	140	
2.125		451.07	160	
24 (24.000)		0.250	63.41	10
		0.375	94.62	20 S
		0.250	63.41	10
	0.375	94.62	20 S	
	0.500	125.49	XS	
	0.562	140.80	30	
	0.688	171.17	40	
	0.969	238.29	60	
	1.219	296.53	80	
	1.531	367.45	100	
	1.812	429.50	120	
	2.062	483.24	140	
2.344	542.09	160		

# TECH-F-4 150 Lb. and 300 Lb. Steel Pipe Flanges and Fittings

Extracted from USA Standard Cast Iron Pipe Flanges and Flanged Fittings (USAS, B16. 5-1968), with the permission of the publisher, The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York NY 10017.

Nominal Pipe Size	Diam. of Flange O	Thick-ness of Flange (Min.)*	Diam. of Bolt Circle	Diam. of Bolt Holes	Number of Bolts	Diam. of Bolts	Length of (with 1/4"16" Raised Face)
1/2	3 1/2	7/16	2 3/8	5/8	4	1/2	1 3/4
3/4	3 7/8	1/2	2 1/4	5/8	4	1/2	2
1	4 1/4	9/16	3 1/8	5/8	4	1/2	2
1 1/4	4 5/8	5/8	3 1/2	5/8	4	1/2	2 1/4
1 1/2	5	1 1/16	3 7/8	5/8	4	1/2	2 1/4
2	6	3/4	4 3/4	3/4	4	5/8	2 3/4
2 1/2	7	7/8	5 1/2	3/4	4	5/8	3
3	7 1/2	15/16	6	3/4	4	5/8	3
3 1/2	8 1/2	15/16	7	3/4	8	5/8	3
4	9	15/16	7 1/2	3/4	8	5/8	3
5	10	15/16	8 1/2	7/8	8	3/4	3 1/4
6	11	1	9 1/2	7/8	8	3/4	3 1/4
8	13 1/2	1 1/8	11 3/4	7/8	8	3/4	3 1/2
10	16	1 3/16	14 1/4	1	12	7/8	3 3/4
12	19	1 1/4	17	1	12	7/8	4
14	21	1 3/8	18 3/4	1 1/8	12	1	4 1/4
16	23 1/2	1 7/16	21 1/4	1 1/8	16	1	4 1/2
18	25	1 9/16	22 3/4	1 1/4	16	1 1/8	4 3/4
20	27 1/2	1 11/16	25	1 1/4	20	1 1/8	5 1/4
24	32	1 7/8	29 1/2	3/8	20	1 1/4	5 3/4

Chart 6 150 Lb. Steel Pipe Flanges

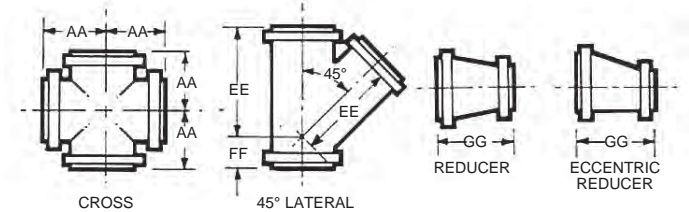
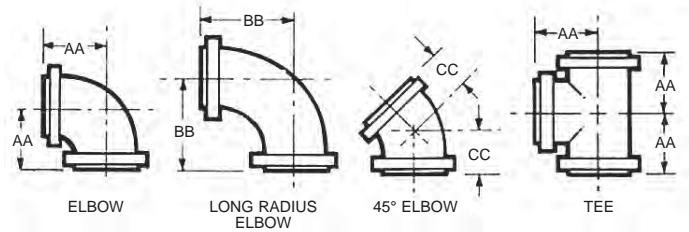
Nominal Pipe Size	Flange Diam.	Flange Thick-ness (Min.)*	Bolt Circle Diam.	Diam. of Bolt Holes	No. of Bolts	Size of Bolts
1	4 7/8	1 1/16	3 1/2	3/4	4	5/8
1 1/4	5 1/4	3/4	3 7/8	3/4	4	5/8
1 1/2	6 1/8	13/16	4 1/2	7/8	4	3/4
2	6 1/2	7/8	5	—	8	5/8
2 1/2	7 1/2	1	5 7/8	7/8	8	3/4
3	8 1/4	1 1/8	6 3/8	7/8	8	3/4
3 1/2	9	1 3/16	7 1/4	7/8	8	3/4
4	10	1 1/4	7 7/8	7/8	8	3/4
5	11	1 3/8	9 1/4	7/8	8	3/4
6	12 1/2	1 7/16	10 5/8	7/8	12	3/4
8	15	1 5/8	13	1	12	7/8
10	17 1/2	1 7/8	15 1/4	1 1/8	16	1
12	20 1/2	2	17 3/4	1 1/4	16	1 1/8
14	23	2 1/8	20 1/4	1 1/4	20	1 1/8
16	25 1/2	2 1/4	22 1/2	1 3/8	20	1 1/4
18	28	2 3/8	24 3/4	1 3/8	24	1 1/4
20	30 1/2	2 1/2	27	1 3/8	24	1 1/4
24	36	2 3/4	32	1 5/8	24	1 1/2

Chart 7 300 Lb. Steel Pipe Flanges

\* A raised face of 1/16 inch is included in (a) minimum thickness of flanges, and (b) "center to contact surface" dimension of fitting. Where facings other than 1/16 inch raised face are used, the "center to contact surface" dimensions shall remain unchanged.

Nominal Pipe Size	AA	BB	CC	EE	FF	GG
1	3 1/2	5	1 3/4	5 3/4	1 3/4	4 1/2
1 1/4	3 3/4	5 1/2	2	6 1/4	1 3/4	4 1/2
1 1/2	4	6	2 1/4	7	2	4 1/2
2	4 1/2	6 1/2	2 1/2	8	2 1/2	5
2 1/2	5	7	3	9 1/2	2 1/2	5 1/2
3	5 1/2	7 3/4	3	10	3	6
3 1/2	6	8 1/2	3 1/2	11 1/2	3	6 1/2
4	6 1/2	9	4	12	3	7
5	7 1/2	10 1/4	4 1/2	13 1/2	3 1/2	8
6	8	11 1/2	5	14 1/2	3 1/2	9
8	9	14	5 1/2	17 1/2	4 1/2	11
10	11	16 1/2	6 1/2	20 1/2	5	12
12	12	19	7 1/2	24 1/2	5 1/2	14
14	14	21 1/2	7 1/2	27	6	16
16	15	24	8	30	6 1/2	18
18	16 1/2	26 1/2	8 1/2	32	7	19
20	18	29	9 1/2	35	8	20
24	22	34	11	40 1/2	9	24

Chart 8 150 Lb. Steel Flanged Fittings



Nominal Pipe Size	AA	BB	CC	EE	FF	GG
1	4	5	2 1/4	6 1/2	2	4 1/2
1 1/4	4 1/4	5 1/2	2 1/2	7 1/4	2 1/4	4 1/2
1 1/2	4 1/2	6	2 3/4	8 1/2	2 1/2	4 1/2
2	5	6 1/2	3	9	2 1/2	5
2 1/2	5 1/2	7	3 1/2	10 1/2	2 1/2	5 1/2
3	6	7 3/4	3 1/2	11	3	6
3 1/2	6 1/2	8 1/2	4	12 1/2	3	6 1/2
4	7	9	4 1/2	13 1/2	3	7
5	8	10 1/4	5	15	3 1/2	8
6	8 1/2	11 1/2	5 1/2	17 1/2	4	9
8	10	14	6	20 1/2	5	11
10	11 1/2	16 1/2	7	24	5 1/2	12
12	13	19	8	27 1/2	6	14
14	15	21 1/2	8 1/2	31	6 1/2	16
16	16 1/2	24	9 1/2	34 3/4	7 1/2	18
18	18	26 1/2	10	37 1/2	8	19
20	19 1/2	29	10 1/2	40 1/2	8 1/2	20
24	22 1/2	34	12	47 1/2	10	24

Chart 9 300 Lb. Steel Flanged Fittings

# TECH-F-5 150 Lb. ANSI / Metric Flange Comparison

Flange Nom. I.D.	Outside Diameter			Bolt Circle			Thickness (Min.)			Bolt Hole			Bolts Quantity			Bolt Size			Raised Face Diameter		
	ANSI 150 lb.	ISO 10 Bar	JIS 10 K	ANSI 150 lb.	ISO 10 Bar	JIS 10 K	ANSI 150 lb.	ISO 10 Bar	JIS 10 K	ANSI 150 lb.	ISO 10 Bar	JIS 10 K	ANSI 150 lb.	ISO 10 Bar	JIS 10 K	ANSI 150 lb.	ISO 10 Bar	JIS 10 K	ANSI 150 lb.	ISO 10 Bar	JIS 10 K
	1.00	4.25	4.53	4.92	3.12	3.35	3.54	0.56	0.63	0.55	0.62	0.55	0.75	4	-	-	0.5	-	-	2.00	2.68
25	108	115	125	79	85	90	14	16	14	16	14	19	-	4	4	-	M12	M16	51	68	67
1.50	5.00	5.91	5.51	3.88	4.33	4.13	0.69	0.71	0.63	0.62	0.71	0.75	4	-	-	0.5	-	-	2.88	3.46	3.19
40	127	150	140	98	110	105	17	18	16	16	18	19	-	4	4	-	M16	M16	73	88	81
2.00	6.00	6.50	6.10	4.75	4.92	4.72	0.75	0.79	0.63	0.75	0.71	0.75	4	-	-	0.62	-	-	3.62	4.02	3.78
50	52	165	155	121	125	120	19	20	16	19	18	19	-	4	4	-	M16	M16	92	102	96
2.50	7.00	7.28	6.89	5.50	5.71	5.51	0.88	0.79	0.71	0.75	0.71	0.75	4	-	-	0.62	-	-	4.12	4.80	4.57
65	178	185	175	140	145	140	22	20	18	19	18	19	-	8	4	-	M16	M16	105	122	116
3.00	7.50	7.87	7.28	6.00	6.30	5.91	0.94	0.79	0.71	0.75	0.71	0.75	4	-	-	0.62	-	-	5.00	5.24	4.96
80	191	200	185	152	160	150	24	20	18	19	18	19	-	8	8	-	M16	M16	127	133	126
3.50	8.50	0.00	7.68	7.00	0.00	6.30	0.94	0.00	0.71	0.75	0.00	0.75	8	-	-	0.62	-	-	5.50	0.00	5.35
90	216	0	195	178	0	160	24	0	18	19	0	19	-	-	8	-	-	M16	140	0	136
4.00	9.00	8.66	8.27	7.50	7.09	6.89	0.94	0.87	0.71	0.75	0.71	0.75	8	-	-	0.62	-	-	6.19	6.22	5.94
100	229	220	210	191	180	175	24	22	18	19	18	19	-	8	8	-	M16	M16	157	158	151
6.00	11.00	11.22	11.02	9.50	9.45	9.45	1.00	0.94	0.87	0.88	0.87	0.91	8	-	-	0.75	-	-	8.50	8.35	8.35
150	279	285	280	241	240	240	25	24	22	22	22	23	-	8	8	-	M20	M20	216	212	212
8.00	13.50	13.39	12.99	11.75	11.61	11.42	1.12	0.94	0.87	0.88	0.87	0.91	8	-	-	0.75	-	-	10.62	10.55	10.31
200	343	340	330	298	295	290	28	24	22	22	22	23	-	8	12	-	M20	M20	270	268	262
10.00	16.00	15.55	15.75	14.25	13.78	13.98	1.19	1.02	0.94	1.00	0.87	0.98	12	-	-	0.88	-	-	12.75	12.60	12.76
250	406	395	400	362	350	355	30	26	24	25	22	25	-	12	12	-	M20	M22	324	320	324
12.00	19.00	17.52	17.52	17.00	15.75	15.75	1.25	1.10	0.94	1.00	0.87	0.98	12	-	-	0.88	-	-	15.00	14.57	14.49
300	483	445	445	432	400	400	32	28	24	25	22	25	-	12	16	-	M20	M22	381	370	368
14.00	21.00	19.88	19.29	18.75	18.11	17.52	1.38	1.18	1.02	1.12	0.87	0.98	12	-	-	1.00	-	-	16.25	16.93	16.26
350	533	505	490	476	460	445	35	30	26	28	22	25	-	16	16	-	M20	M22	413	430	413
16.00	23.50	22.24	22.05	21.25	20.28	20.08	1.44	1.26	1.10	1.12	1.02	1.06	16	-	-	1.00	-	-	18.50	18.98	18.70
400	597	565	560	540	515	510	37	32	28	28	26	27	-	16	16	-	M24	M24	470	482	475
18.00	25.00	24.21	24.41	22.75	22.24	22.24	1.56	1.38	1.18	1.25	1.02	1.06	16	-	-	1.12	-	-	21.00	20.94	20.87
450	635	615	620	578	565	565	40	35	30	32	26	27	-	20	20	-	M24	M24	533	532	530
20.00	27.50	26.38	26.57	25.00	24.41	24.41	1.69	1.50	1.18	1.25	1.02	1.06	20	-	-	1.12	-	-	23.00	23.03	23.03
500	699	670	675	635	620	620	43	38	30	32	26	27	-	20	20	-	M24	M24	584	585	585
24.00	32.00	30.71	31.30	29.50	28.54	28.74	1.88	1.65	1.26	1.38	1.16	1.30	20	-	-	1.25	-	-	27.25	26.97	27.17
600	813	780	795	749	725	730	48	42	32	35	29.5	33	-	20	24	-	M27	M30	692	685.0	690
30.00	38.75	0.00	38.19	36.00	0.00	35.43	2.12	0.00	1.42	1.38	0.00	1.30	28	-	-	1.25	-	-	33.75	0.00	33.66
750	984	0	970	914	0	900	54	0	36	35	0	33	-	0	24	-	-	M30	857	0	855
36.00	46.00	43.90	44.09	42.75	41.34	41.34	2.38	1.34	1.50	1.62	1.28	1.30	32	-	-	1.50	-	-	40.25	39.57	39.57
900	1168	1115	1120	1086	1050	1050	60	34	38	41	32.5	33	-	28	28	-	M30	M30	1022	1005.0	1005
42.00	53.00	48.43	48.62	49.50	45.67	45.67	2.62	1.34	1.57	1.62	1.40	1.54	36	-	-	1.50	-	-	47.00	43.70	43.70
1000	1230	1230	1235	1257	1160	1160	67	34	40	41	35.5	39	-	28	28	-	M33	M36	1194	1110.0	1110
48.00	59.50	57.28	57.68	56.00	54.33	54.33	2.75	1.50	1.73	1.62	1.54	1.54	44	-	-	1.50	-	-	53.50	52.36	52.17
1200	1230	1455	1465	1422	1380	1380	70	38	44	41	39	39	-	32	32	-	M36	M36	1359	1330	1325

# TECH-F-6 300 Lb. ANSI / Metric Flange Comparison

Flange Nom. I.D.	Outside Diameter			Bolt Circle			Thickness (Min.)			Bolt Hole			Bolts Quantity			Bolt Size			Raised Face Diameter		
	ANSI 300 lb.	ISO 16 Bar	JIS 16 K	ANSI 300 lb.	ISO 16 Bar	JIS 16 K	ANSI 300 lb.	ISO 16 Bar	JIS 16 K	ANSI 300 lb.	ISO 16 Bar	JIS 16 K	ANSI 300 lb.	ISO 16 Bar	JIS 16 K	ANSI 300 lb.	ISO 16 Bar	JIS 16 K	ANSI 300 lb.	ISO 16 Bar	JIS 16 K
1.00	4.88	4.53	4.92	3.50	3.35	3.54	0.69	0.63	0.55	0.75	0.55	0.75	4	-	-	0.62	-	-	2.00	2.68	2.64
25	124	115	125	90	85	90	17	16	14	19	14	19	-	4	4	-	M12	M16	51	68	67
1.50	6.12	5.91	5.51	4.50	4.33	4.13	0.81	0.71	0.63	0.88	0.71	0.75	4	-	-	0.75	-	-	2.88	3.46	3.19
40	156	150	140	114	110	105	21	18	16	22	18	19	-	4	4	-	M16	M16	73	88	81
2.00	6.50	6.50	6.10	5.00	4.92	4.72	0.88	0.79	0.63	0.75	0.71	0.75	8	-	-	0.62	-	-	3.62	4.02	3.78
50	165	165	155	127.0	125	120	22	20	16	19	18	19	-	4	8	-	M16	M16	92	102	96
2.50	7.50	7.28	6.89	5.88	5.71	5.51	1.00	0.79	0.71	0.88	0.71	0.75	8	-	-	0.75	-	-	4.12	4.80	4.57
65	191	185	175	149	145	140	25	20	18	22	18	19	-	8	8	-	M16	M16	105	122	116
3.00	8.25	7.87	7.87	6.62	6.30	6.30	1.12	0.79	0.79	0.88	0.71	0.91	8	-	-	0.75	-	-	5.00	5.24	5.20
80	210	200	200	169	160	160	29	20	20	22	18	23	-	8	8	-	M16	M20	127	133	132
3.50	9.00	0.00	8.27	7.25	0.00	6.69	1.19	0.00	0.79	0.88	0.00	0.91	8	-	-	0.75	-	-	5.50	0.00	5.71
90	229	-	210	184	-	170	30	-	20	22	-	23	-	-	8	-	-	M20	140	0	145
4.00	10.00	8.66	8.86	7.88	7.09	7.28	1.25	0.87	0.87	0.88	0.71	0.91	8	-	-	0.75	-	-	6.19	6.22	6.30
100	254	220	225	200	180	185	32	22	22	22	18	23	-	8	8	-	M16	M20	157	158	160
6.00	12.50	11.22	12.01	10.62	9.54	10.24	1.44	0.94	0.94	0.88	0.87	0.98	12	-	-	0.75	-	-	8.50	8.35	9.06
150	381	285	305	270	240	260	37	24	24	22	22	25	-	8	12	-	M20	M22	216	212	230
8.00	15.00	13.39	13.78	13.00	11.61	12.01	1.62	1.02	1.02	1.00	0.87	0.98	12	-	-	0.88	-	-	10.62	10.55	10.83
200	381	340	350	330	295	305	41	26	26	25	22	25	-	12	12	-	M20	M22	270	268	275
10.00	17.50	15.94	16.93	15.25	13.98	14.96	1.88	1.10	1.10	1.12	1.02	1.06	16	-	-	1.00	-	-	12.75	12.60	13.58
250	445	405	430	387	355	380	48	28	28	28	26	27	-	12	12	-	M24	M24	324	320	345
12.00	20.50	18.11	18.90	17.75	16.14	16.93	2.00	1.26	1.18	1.25	1.02	1.06	16	-	-	1.12	-	-	15.00	14.57	15.55
300	521	460	480	451	410	430	51	32	30	32	26	27	-	12	16	-	M24	M24	381	370	395
14.00	23.00	20.47	21.26	20.25	18.50	18.90	2.12	1.38	1.34	1.25	1.02	1.30	20	-	-	1.12	-	-	16.25	16.93	17.32
350	584	520	540	514	470	480	54	35	34	32	26	33	-	16	16	-	M24	M30	413	430	440
16.00	25.50	22.83	23.82	22.50	20.67	21.26	2.25	1.50	1.50	1.38	1.16	1.30	20	-	-	1.25	-	-	18.50	18.98	19.49
400	648	580	605	572	525	540	57	38	38	35	29.5	33	-	16	16	-	M27	M30	470	482	495
18.00	28.00	25.20	26.57	24.75	23.03	23.82	2.83	1.65	1.57	1.38	1.16	1.30	24	-	-	1.25	-	-	21.00	20.94	22.05
450	711	640	675	629	585	605	60	42	40	35	29.5	33	-	20	20	-	M27	M30	533	532	560
20.00	30.50	28.15	28.74	27.00	25.59	25.98	2.50	1.81	1.65	1.38	1.28	1.30	24	-	-	1.25	-	-	23.00	23.03	24.21
500	775	715	730	686	650	660	64	46	42	35	32.5	33	-	20	20	-	M30	M30	584	585	615
24.00	36.00	33.07	33.27	32.00	30.31	30.31	2.75	2.05	1.81	1.62	1.40	1.54	24	-	-	1.50	-	-	27.25	26.97	28.35
600	914	840	845	813	770	770	70	52	46	41	35.5	39	-	20	24	-	M33	M36	692	685.0	720
30.00	43.00	0.00	40.16	39.25	0.00	36.81	3.00	0.00	2.05	1.88	0.00	1.65	28	-	-	1.75	-	-	33.75	0.00	34.65
750	1092	0	1020	997	0	935	76	0	52	48	0	42	-	0	24	-	0	M39	857	0	880
36.00	50.00	44.29	46.65	46.00	41.34	42.91	3.38	2.99	2.28	2.12	1.54	1.89	32	-	-	2.00	-	-	40.25	39.57	40.55
900	1270	1125	1185	1168	1050	1090	86	76	58	54	39	48	-	28	28	-	M36	M45	1022	1005.0	1030
42.00	57.00	49.41	51.97	52.75	46.06	47.64	3.69	3.31	2.44	2.12	1.65	2.20	36	-	-	2.00	-	-	47.00	43.70	44.88
1000	1448	1255	1320	1340	1170	1210	94	84	62	54	42	56	-	28	28	-	M39	M52	1194	1110.0	1140
48.00	65.00	58.46	60.24	60.75	54.72	55.91	4.00	3.86	2.76	2.12	1.89	2.20	40	-	-	2.00	-	-	58.44	52.36	53.15
1200	1651	1485	1530	1543	1390	1420	102	98	70	54	48	56	-	32	32	-	M45	M52	1484	1330	1350



# TECH-F-7 Weights and Dimensions of Steel & Wrought Iron Pipe Recommended for Use as Permanent Well Casings

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Size In.	Steel Pipe, Black or Galvanized				
	Diameter - In.		Thickness In.	Weight Per Foot - Lb <sup>1</sup>	
	External	Internal		Plain Ends (Calculated)	With Threads and Couplings (Nominal) <sup>2</sup>
6	6.625	6.065	0.280	18.97	19.18
8	8.625	8.249	0.188	16.90	17.80
8	8.625	8.071	0.277	24.70	25.55
8	8.625	7.981	0.322	28.55	29.35
10	10.750	10.192	0.279	31.20	32.75
10	10.750	10.136	0.307	34.24	35.75
10	10.750	10.020	0.365#	40.48	41.85
12	12.750	12.090	0.330	43.77	45.45
12	12.750	12.000	0.375#	49.56	51.15
14	14.000	13.500	0.250	36.71	
14	14.000	13.250	0.375#	54.57	57.00
16	16.000	15.376	0.312	52.36	
16	16.000	15.250	0.375#	62.58	65.30
18	18.000	17.376	0.312	59.03	
18	18.000	17.250	0.375#	70.59	73.00
20	20.000	19.376	0.312	65.71	
20	20.000	19.250	0.375#	78.60	81.00
22	22.000	21.376	0.312	72.38	
22	22.000	21.250	0.375	86.61	
22	22.000	21.000	0.500	114.81	
24	24.000	23.376	0.312	79.06	
24	24.000	23.250	0.375	94.62	
24	24.000	23.000	0.500#	125.49	
26	26.000	25.376	0.312	85.73	
26	26.000	25.000	0.500#	136.17	
28	28.000	27.376	0.312	92.41	
28	28.000	27.000	0.500#	146.85	
30	30.000	29.376	0.312	99.08	
30	30.000	29.000	0.500#	157.53	
32	32.000	31.376	0.312	105.76	
32	32.000	31.000	0.500#	168.21	
34	34.000	33.376	0.312	112.43	
34	34.000	33.000	0.500#	178.89	
36	36.000	35.376	0.312	119.11	
36	36.000	35.000	0.500#	189.57	

#Thickness indicated is believed to be best practice. If soil and water conditions are unusually favorable, lighter pipe may be used if permitted in the purchaser's specifications.

<sup>1</sup>Manufacturing weight tolerance is 10 percent over and 3.5 percent under nominal weight for pipe 6-20 in. in size and +/- percent of nominal weight for larger sizes.

<sup>2</sup>Nominal weights of pipe with threads and couplings (based on lengths of 20 ft. including coupling) are shown for purposes of specification. Thread data are contained in the various standards covering sizes which can be purchased with threads.

Size In.	Wrought-Iron Pipe, Black or Galvanized				
	Diameter - In.		Thickness In.	Weight Per Foot - Lb <sup>1</sup>	
	External	Internal		Plain Ends (Calculated)	With Threads and Couplings (Nominal) <sup>2</sup>
6	6.625	6.053	0.286	18.97	19.45
8	8.625	7.967	0.329	28.55	29.35
10	10.750	10.005	0.372	40.48	41.85
12	12.750	11.985	0.383	49.56	51.15
14	14.000	13.234	0.383	54.56	57.00
16	16.000	15.324	0.383	62.58	65.30
18	18.000	17.165	0.417	76.84	81.20
20	20.000	19.125	0.438	89.63	94.38
20	20.000	19.000	0.500*	102.10	106.62
22	22.000	21.125	0.438	98.77	
22	22.000	21.000	0.500*	112.57	
24	24.000	23.125	0.438	107.96	
24	24.000	23.000	0.500*	123.04	
26	26.000	25.125	0.438	117.12	
26	26.000	25.000	0.500*	133.51	
28	28.000	27.125	0.438	126.27	
28	28.000	27.000	0.500*	143.99	
30	30.000	29.125	0.438	135.42	
30	30.000	29.000	0.500*	154.46	

<sup>1</sup>Manufacturing weight tolerance is 10 percent over and 3.5 percent under nominal weight for pipe ~20 in. in size and +10 percent of nominal weight for larger sizes.

<sup>2</sup>Based on length of 20 ft. including coupling. Threaded pipe has 8 threads per inch.

\*Thickness indicated is believed to be best practice. If soil and water conditions are unusually favorable tighter pipe may be used if permitted in the purchaser's specifications.

**NOTE:** Welded joints advocated for pipe larger than 20 in. in diameter; also for smaller diameter pipe, where applicable, to obtain clearance and maintain uniform grout thickness.

# TECH-F-8 Capacities of Tanks of Various Dimensions

Diam.	Gals.	Area Sq. Ft.	Diam.	Gals.	Area Sq. Ft.	Diam.	Gals.	Area Sq. Ft.	Diam.	Gals.	Area Sq. Ft.
1'	5.87	.785	4' 2"	102.00	13.635	10'	587.52	78.54	21' 6"	2715.80	363.05
1' 1"	6.89	.922	4' 3"	106.12	14.186	10' 3"	617.26	82.52	21' 9"	2779.30	371.54
1' 2"	8.00	1.069	4' 4"	110.32	14.748	10' 6"	640.74	86.59	22'	2843.60	380.13
1' 3"	9.18	1.277	4' 5"	114.61	15.321	10' 9"	678.95	90.76	22' 3"	2908.60	388.82
1' 4"	10.44	1.396	4' 6"	118.97	15.90	11'	710.90	95.03	22' 6"	2974.30	397.61
1' 5"	11.79	1.576	4' 7"	123.42	16.50	11' 3"	743.58	99.40	22' 9"	3040.80	406.49
1' 6"	13.22	1.767	4' 8"	127.95	17.10	11' 6"	776.99	103.87	23'	3108.00	415.48
1' 7"	14.73	1.969	4' 9"	132.56	17.72	11' 9"	811.14	108.43	23' 3"	3175.90	424.56
1' 8"	16.32	2.182	4' 10"	137.25	18.35	12'	846.03	113.10	23' 6"	3244.60	433.74
1' 9"	17.99	2.405	4' 11"	142.02	18.99	12' 3"	881.65	117.86	23' 9"	3314.00	443.01
1' 10"	19.75	2.640	5'	146.91	19.64	12' 6"	918.00	122.72	24'	3384.10	452.39
1' 11"	21.58	2.885	5' 1"	151.81	20.30	12' 9"	955.09	127.68	24' 3"	3455.00	461.86
2'	23.50	3.142	5' 2"	156.83	20.97	13'	992.91	132.73	24' 6"	3526.60	471.44
2' 1"	25.50	3.409	5' 3"	161.94	21.65	13' 3"	1031.50	137.89	24' 9"	3598.90	481.11
2' 2"	27.58	3.687	5' 4"	167.11	22.34	13' 6"	1070.80	142.14	25'	3672.00	490.87
2' 3"	29.74	3.976	5' 5"	172.38	23.04	13' 9"	1110.80	148.49	25' 3"	3745.80	500.74
2' 4"	31.99	4.276	5' 6"	177.71	23.76	14'	1151.50	153.94	25' 6"	3820.30	510.71
2' 5"	34.31	4.587	5' 7"	183.14	24.48	14' 3"	1193.00	159.48	25' 9"	3895.60	527.77
2' 6"	36.72	4.909	5' 8"	188.66	25.22	14' 6"	1235.30	165.13	26'	3971.60	530.93
2' 7"	39.21	5.241	5' 9"	194.25	25.97	14' 9"	1278.20	170.87	26' 3"	4048.40	541.19
2' 8"	41.78	5.585	5' 10"	199.92	26.73	15'	1321.90	176.71	26' 6"	4125.90	551.55
2' 9"	44.43	5.940	5' 11"	205.67	27.49	15' 3"	1366.40	182.65	26' 9"	4204.10	562.00
2' 10"	47.16	6.305	6"	211.51	28.27	15' 6"	1411.50	188.69	27'	4283.00	572.66
2' 11"	49.98	6.681	6' 3"	229.50	30.68	15' 9"	1457.40	194.83	27' 3"	4362.70	583.21
3'	52.88	7.069	6' 6"	248.23	35.18	16'	1504.10	201.06	27' 6"	4443.10	593.96
3' 1"	55.86	7.467	6' 9"	267.69	35.78	16' 3"	1551.40	207.39	27' 9"	4524.30	604.81
3' 2"	58.92	7.876	7'	287.88	38.48	16' 6"	1599.50	213.82	28'	4606.20	615.75
3' 3"	62.06	8.296	7' 3"	308.81	41.28	16' 9"	1648.40	220.35	28' 3"	4688.80	626.80
3' 4"	65.28	8.727	7' 6"	330.48	44.18	19'	2120.90	283.53	28' 6"	4772.10	637.94
3' 5"	68.58	9.168	7' 9"	352.88	47.17	19' 3"	2177.10	291.04	28' 9"	4856.20	649.18
3' 6"	71.97	9.621	8'	376.01	50.27	19' 6"	2234.00	298.65	29'	4941.00	660.52
3' 7"	75.44	10.085	8' 3"	399.80	53.46	19' 9"	2291.70	306.35	29' 3"	5026.60	671.96
3' 8"	78.99	10.559	8' 6"	424.48	56.75	20'	2350.10	314.16	29' 6"	5112.90	683.49
3' 9"	82.62	11.045	8' 9"	449.82	60.13	20' 3"	2409.20	322.06	29' 9"	5199.90	695.13
3' 10"	86.33	11.541	9"	475.89	63.62	20' 6"	2469.10	330.06	30'	5287.70	706.86
3' 11"	90.13	12.048	9' 3"	502.70	67.20	20' 9"	2529.60	338.16	30' 3"	5376.20	718.69
4'	94.00	12.566	9' 6"	530.24	70.88	21'	2591.00	346.36	30' 6"	5465.40	730.62
4' 1"	97.96	13.095	9' 9"	558.51	74.66	21' 3"	2653.00	346.36	30' 9"	5555.40	742.64

To find the capacity of tanks greater than shown above, find a tank of one-half the size desired, and multiply its capacity by four, or find one one-third the size desired and multiply its capacity by 9.

**Chart 10 Capacity of Round Tanks (per foot of depth)**

Dimensions in Feet	Contents in Gallons for Depth in Feet of:							
	1'	4'	5'	6'	8'	10'	11'	12'
<b>4 X 4</b>	119.68	479.	598.	718.	957.	1197.	1316.	1436.
<b>5 X 5</b>	187.00	748.	935.	1202.	1516.	1870.	2057.	2244.
<b>6 X 6</b>	269.28	1077.	1346.	1616.	2154.	2693.	2968.	3231.
<b>7 X 7</b>	366.52	1466.	1833.	2199.	2922.	3665.	4032.	4398.
<b>8 X 8</b>	478.72	1915.	2394.	2872.	3830.	4787.	5266.	5745.
<b>9 X 9</b>	605.88	2424.	3029.	3635.	4847.	6059.	6665.	7272.
<b>10 X 10</b>	748.08	2992.	3740.	4488.	5984.	7480.	8228.	8976.
<b>11 X 11</b>	905.08	3620.	4525.	5430.	7241.	9051.	9956.	10861.
<b>12 X 12</b>	1077.12	4308.	5386.	6463.	8617.	10771.	11848.	12925.

To find the capacity of a depth not given, multiply the capacity for one foot by the required depth in feet.

**Chart 11 Capacity of Square Tanks**



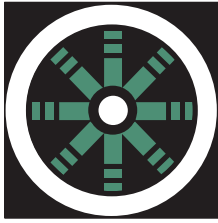
# Capacities of Tanks of Various Dimensions

Diameter	Gallons Per Foot of Length When Tank is Filled								
	1/10	1/5	3/10	2/5	1/2	3/5	7/10	4/5	9/10
1 ft.	.3	.8	1.4	2.1	2.9	3.6	4.3	4.9	5.5
2 ft.	1.2	3.3	5.9	8.8	11.7	14.7	17.5	20.6	22.2
3 ft.	2.7	7.5	13.6	19.8	26.4	33.0	39.4	45.2	50.1
4 ft.	4.9	13.4	23.8	35.0	47.0	59.0	70.2	80.5	89.0
5 ft.	7.6	20.0	37.0	55.0	73.0	92.0	110.0	126.0	139.0
6 ft.	11.0	30.0	53.0	78.0	106.0	133.0	158.0	182.0	201.0
7 ft.	15.0	41.0	73.0	107.0	144.0	181.0	215.0	247.0	272.0
8 ft.	19.0	52.0	96.0	140.0	188.0	235.0	281.0	322.0	356.0
9 ft.	25.0	67.0	112.0	178.0	238.0	298.0	352.0	408.0	450.0
10 ft.	30.0	83.0	149.0	219.0	294.0	368.0	440.0	504.0	556.0
11 ft.	37.0	101.0	179.0	265.0	356.0	445.0	531.0	610.0	672.0
12 ft.	44.0	120.0	214.0	315.0	423.0	530.0	632.0	741.0	800.0
13 ft.	51.0	141.0	250.0	370.0	496.0	621.0	740.0	850.0	940.0
14 ft.	60.0	164.0	291.0	430.0	576.0	722.0	862.0	989.0	1084.0
15 ft.	68.0	188.0	334.0	494.0	661.0	829.0	988.0	1134.0	1253.0

Chart 12 Cylindrical Tanks Set Horizontally and Partially Filled

Diam. In.	Length of Cylinder																		Diam. In.	
	1"	1'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'	17'	18'	20'	22'		24'
1		0.04	0.20	0.24	0.28	0.32	0.36	0.40	0.44	0.48	0.52	0.56	0.60	0.64	0.68	0.72	0.80	0.88	0.96	1
2	0.01	0.16	0.80	0.96	1.12	1.28	1.44	1.60	1.76	1.92	2.08	2.24	2.40	2.56	2.72	2.88	3.20	3.52	3.84	2
3	0.03	0.37	1.84	2.20	2.56	2.92	3.30	3.68	4.04	4.40	4.76	5.12	5.48	5.84	6.22	6.60	7.36	8.08	8.80	3
4	0.05	0.65	3.26	3.92	4.58	5.24	5.88	6.52	7.18	7.84	8.50	9.16	9.82	10.5	11.1	11.8	13.0	14.4	15.7	4
5	0.08	1.02	5.10	6.12	7.14	8.16	9.18	10.2	11.2	12.2	13.3	14.3	15.3	16.3	17.3	18.4	20.4	22.4	24.4	5
6	0.12	1.47	7.34	8.80	10.3	11.8	13.2	14.7	16.1	17.6	19.1	20.6	22.0	23.6	25.0	26.4	29.4	32.2	35.2	6
7	0.17	2.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	40.0	44.0	48.0	7
8	0.22	2.61	13.0	15.6	18.2	20.8	23.4	26.0	28.6	31.2	33.8	36.4	39.0	41.6	44.2	46.8	52.0	57.2	62.4	8
9	0.28	3.31	16.5	19.8	23.1	26.4	29.8	33.0	36.4	39.6	43.0	46.2	49.6	52.8	56.2	60.0	66.0	72.4	79.2	9
10	0.34	4.08	20.4	24.4	28.4	32.6	36.8	40.8	44.8	48.8	52.8	56.8	61.0	65.2	69.4	73.6	81.6	89.6	97.6	10
11	0.41	4.94	24.6	29.6	34.6	39.4	44.4	49.2	54.2	59.2	64.2	69.2	74.0	78.8	83.8	88.8	98.4	104.	118.	11
12	0.49	5.88	29.4	35.2	41.0	46.8	52.8	58.8	64.6	70.4	76.2	82.0	87.8	93.6	99.6	106	118.	129.	141.1	12
13	0.57	6.90	34.6	41.6	48.6	55.2	62.2	69.2	76.2	83.2	90.2	97.2	104.	110.	117.	124.	138.	152.	166.	13
14	0.67	8.00	40.0	48.0	56.0	64.0	72.0	80.0	88.0	96.0	104.	112.	120.	128.	136.	144.	160.	176.	192.	14
15	0.77	9.18	46.0	55.2	64.4	73.6	82.8	92.0	101.	110.	120.	129.	138.	147.	156.	166.	184.	202.	220.	15
16	0.87	10.4	52.0	62.4	72.8	83.2	93.6	104.	114	125.	135.	146.	156.	166.	177.	187.	208.	229.	250.	16
17	0.98	11.8	59.0	70.8	81.6	94.4	106.	118.	130.	142.	153.	163.	177.	189.	201.	212.	236.	260.	283.	17
18	1.10	13.2	66.0	79.2	92.4	106.	119.	132.	145.	158.	172.	185.	198.	211.	224.	240.	264.	290.	317.	18
19	1.23	14.7	73.6	88.4	103.	118.	132.	147.	162.	177.	192.	206.	221.	235.	250.	265.	294.	324.	354.	19
20	1.36	16.3	81.6	98.0	114.	130	147.	163.	180.	196.	212.	229	245.	261.	277.	294.	326.	359.	392.	20
21	1.50	18.0	90.0	108	126	144.	162.	180.	198.	216.	238.	252.	270.	288.	306.	324.	360.	396.	432.	21
22	1.65	19.8	99.0	119.	139.	158.	178.	198.	218.	238.	257.	277.	297.	317.	337.	356.	396.	436.	476.	22
23	1.80	21.6	108.	130.	151.	173.	194.	216.	238.	259.	281.	302.	324.	346.	367.	389.	432.	476.	518.	23
24	1.96	23.5	118.	141.	165.	188.	212.	235.	259.	282.	306.	330.	353.	376.	400.	424	470.	518.	564.	24
25	2.12	25.5	128.	153.	179.	204	230.	255.	281.	306.	332.	358.	383.	408.	434.	460.	510.	562.	612.	25
26	2.30	27.6	138.	166.	193.	221.	248.	276.	304.	331.	359.	386.	414.	442.	470.	496.	552.	608.	662.	26
27	2.48	29.7	148.	178.	208.	238.	267.	297.	326.	356.	386.	416.	426.	476.	504.	534.	594.	652.	712.	27
28	2.67	32.0	160	192.	224.	256.	288.	320.	352.	384.	416.	448.	480.	512.	544.	576.	640.	704.	768.	28
29	2.86	34.3	171.	206.	240.	274.	309.	343.	377.	412.	446.	480.	514.	548.	584.	618.	686.	754.	824.	29
30	3.06	36.7	183	220.	257.	294.	330.	367.	404.	440.	476.	514.	550.	588.	624.	660.	734.	808.	880.	30
32	3.48	41.8	209	251.	293.	334.	376.	418.	460.	502.	544.	586.	628.	668.	710.	752.	836.	920.	1004.	32
34	3.93	47.2	236.	283.	330.	378.	424.	472.	520.	566.	614.	660.	708.	756.	802.	848.	944.	1040.	1132.	34
36	4.41	52.9	264.	317.	370.	422.	476.	528.	582.	634.	688.	740.	792.	844.	898.	952.	1056.	1164.	1268.	36

Chart 13 Capacities, in U.S. Gallons of Cylinders of Various Diameters and Lengths



# Section TECH-G Motor Data

## TECH-G-1 Motor Enclosures

The selection of a motor enclosure depends upon the ambient and surrounding conditions. The two general classifications of motor enclosures are open and totally enclosed. An open motor has ventilating openings which permit passage of external air over and around the motor windings. A totally enclosed motor is constructed to prevent the free exchange of air between the inside and outside of the frame, but not sufficiently enclosed to be termed air-tight.

These two categories are further broken down by enclosure design, type of insulation, and/or cooling method. The most common of these types are listed below.

**Open Drip Proof** - An open motor in which all ventilating openings are so constructed that drops of liquid or solid particles falling on the motor at any angle from 0 to 15 degrees from vertical cannot enter the machine. This is the most common type and is designed for use in nonhazardous, relatively clean, industrial areas.

**Encapsulated** - A dripproof motor with the stator windings completely surrounded by a protective coating. An encapsulated motor offers more resistance to moisture and/or corrosive environments than an ODP motor.

**Totally Enclosed, Fan-Cooled** - An enclosed motor equipped for external cooling by means of a fan integral with the motor, but external to the enclosed parts. TEFC motors are designed for use in extremely wet, dirty, or dusty areas.

**Explosion-Proof, Dust-Ignition-Proof** - An enclosed motor whose enclosure is designed to withstand an explosion of a specified dust, gas, or vapor which may occur within the motor and to prevent the ignition of this dust, gas, or vapor surrounding the motor. A motor manufacturer should be consulted regarding the various classes and groups of explosion-proof motors available and the application of each.

Motor insulation is classified according to the total allowable temperature. This is made up of a maximum ambient temperature plus a maximum temperature rise plus allowances for hot spots and service factors. Class B insulation is the standard and allows for a total temperature of 130°C. The maximum ambient is 40°C, and the temperature rise is 70°C, for ODP motors and 75°C for TEFC motors.

## TECH-G-2 NEMA Frame Assignments

### SINGLE-PHASE MOTORS Horizontal and Vertical open type

Design L, 60 cycles, class B insulation system, open type, 1.15 service factor.

hp	speed, rpm		
	3600	1800	1200
3/4	-	-	145T
1	-	143T	182T
1 1/2	143T	145T	184T
2	145T	182T	-
3	182T	184T	-
5	184T	213T	-
7 1/2	213T	215T	-

### POLYPHASE SQUIRREL-CAGE MOTORS Horizontal and Vertical

open type

fan cooled

Designs A and B - class B insulation system, open type 1.15 service factor, 60 cycles.

hp	speed, rpm		
	3600	1800	900
1/2	-	-	143T
3/4	-	-	143T
1	-	143T	145T
1 1/2	143T	145T	182T
2	145T	145T	184T
3	145T	182T	213T
5	182T	184T	215T
7 1/2	184T	213T	254T
10	213T	215T	256T
15	215T	254T	284T
20	254T	256T	286T
25	256T	284T	324T
30	284TS	286T	326T
40	286TS	324T	364T
50	324TS	326T	365T
60	326TS	364TS	404T
75	364TS	365TS	405T
100	365TS	404TS	444T
125	404TS	405TS	445T
150	405TS	444TS	-
200	444TS	454TS	-
250	445TS*	-	-

Designs A and B - class B insulation system totally-enclosed fan-cooled type, 1.00 service factor, 60-cycles.

hp	speed, rpm			
	3600	1800	1200	900
1/2	-	-	-	143T
3/4	-	-	143T	145T
1	-	143T	145T	182T
1 1/2	143T	145T	182T	184T
2	145T	145T	184T	213T
3	182T	182T	213T	215T
5	184T	184T	215T	254T
7 1/2	213T	213T	254T	256T
10	215T	215T	256T	284T
15	254T	254T	284T	286T
20	256T	256T	286T	324T
25	284TS	284T	324T	326T
30	286TS	286T	326T	364T
40	324TS	324T	364T	365T
50	326TS	326T	365T	404T
60	364TS	364TS	404T	405T
75	365TS	365TS	405T	444T
100	405TS	405TS	444T	445T
125	444TS	444TS	445T	-
150	445TS	445TS	-	-

\*The 250 hp rating at the 3600 rpm speed has a 1.0 service factor