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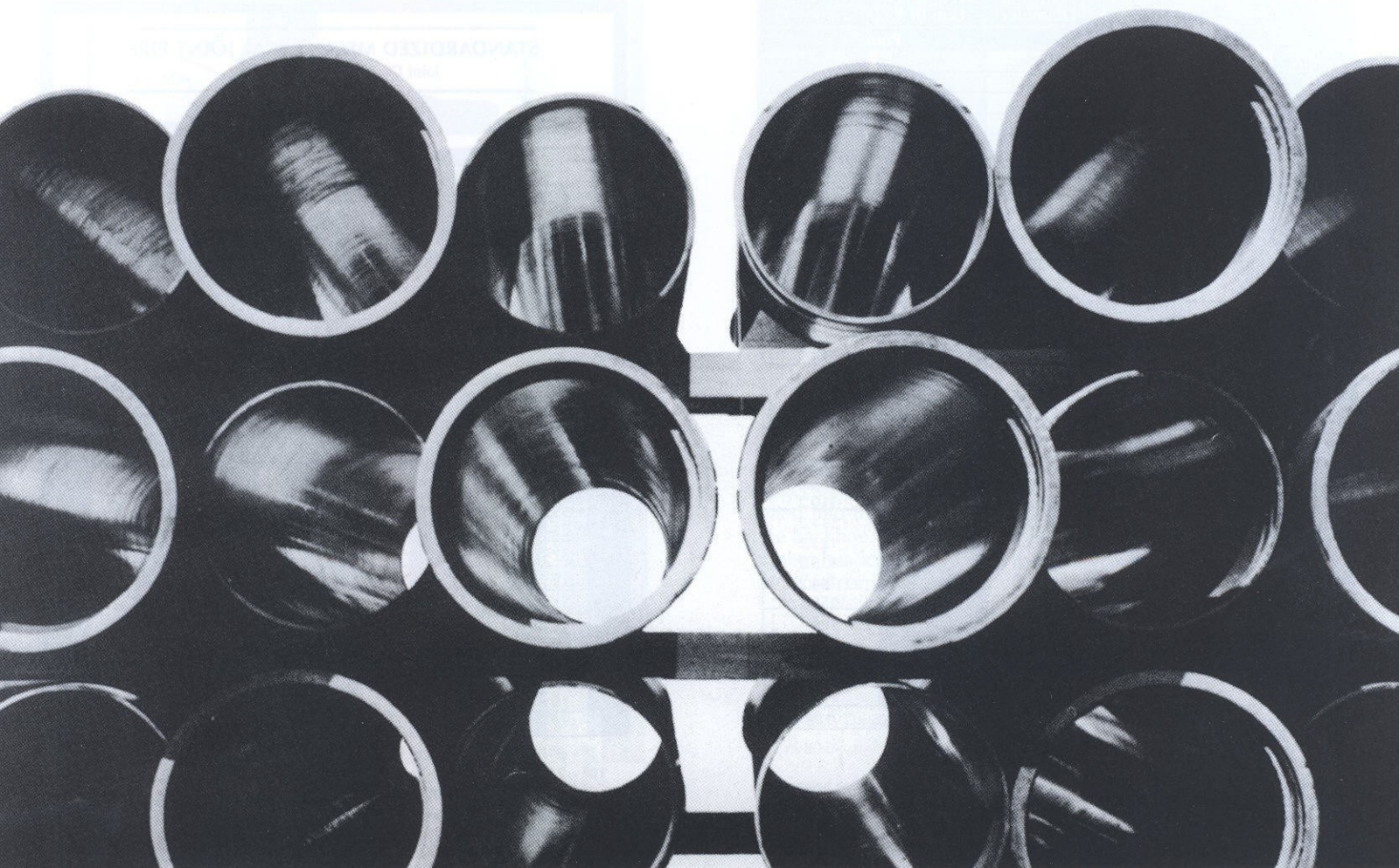
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NOMINAL THICKNESS FOR STANDARD PRESSURE CLASSES OF DUCTILE-IRON PIPE

Size in.	Outside Diameter in.	Pressure Class*				
		150	200	250	300	350
		Nominal Thickness – in.				
3	3.96	—	—	—	—	0.25**
4	4.80	—	—	—	—	0.25**
6	6.90	—	—	—	—	0.25**
8	9.05	—	—	—	—	0.25**
10	11.10	—	—	—	—	0.26
12	13.20	—	—	—	—	0.28
14	15.30	—	—	0.28	0.30	0.31
16	17.40	—	—	0.30	0.32	0.34
18	19.50	—	—	0.31	0.34	0.36
20	21.60	—	—	0.33	0.36	0.38
24	25.80	—	0.33	0.37	0.40	0.43
30	32.00	0.34	0.38	0.42	0.45	0.49
36	38.30	0.38	0.42	0.47	0.51	0.56

* Pressure Classes are defined as the rated water pressure of the pipe in psi. The thicknesses shown are adequate for the rated water working pressure plus a surge allowance of 100 psi. Calculations are based on a minimum yield strength of 42,000 and a 2.0 safety factor times the sum of the working pressure and 100 psi surge allowance.

** Calculated thicknesses for these sizes and pressure ratings are less than those shown above. Presently these are the lowest nominal thicknesses available in these sizes.

NOTE: Per ANSI/AWWA C150/A21.50 the thicknesses above include the 0.08" service allowance and the casting tolerance listed below by size ranges:

SIZE (Inches)	CASTING TOLERANCES (Inches)
3 - 8	-0.05
10 - 12	-0.06
14 - 36	-0.07

STANDARD DIMENSIONS AND WEIGHTS OF 3" THROUGH 36" PUSH-ON JOINT DUCTILE-IRON PIPE

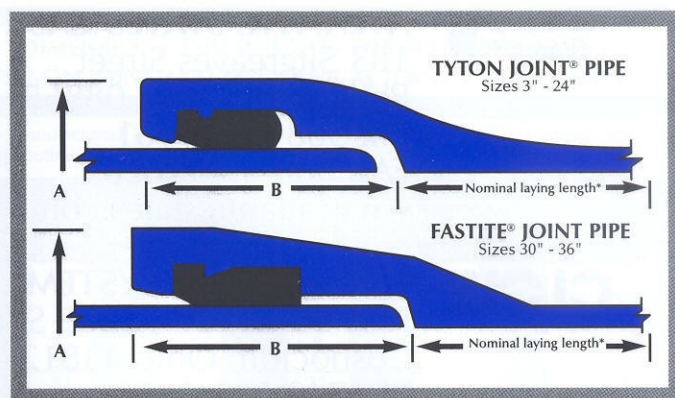
Size Inches	Pressure Class	Thickness	Outside Diameter*	18-Foot Laying Length	
				Weight Per Length †	Avg. Weight Per Foot ††
		Inches		Pounds	
**3	350	0.25	3.96	185	9.2
**4	350	0.25	4.80	225	11.3
**6	350	0.25	6.90	300	16.6
**8	350	0.25	9.05	395	22.0
10	350	0.26	11.10	510	28.4
12	350	0.28	13.20	655	36.4
14	250	0.28	15.30	770	42.9
	300	0.30	15.30	825	45.8
	350	0.31	15.30	850	47.2
16	250	0.30	17.40	940	52.3
	300	0.32	17.40	1000	55.5
	350	0.34	17.40	1060	58.8
18	250	0.31	19.50	1090	60.5
	300	0.34	19.50	1185	65.9
	350	0.36	19.50	1250	69.5
20	250	0.33	21.60	1290	71.6
	300	0.36	21.60	1395	77.6
	350	0.38	21.60	1470	81.6
24	200	0.33	25.80	1550	86.1
	250	0.37	25.80	1725	95.8
	300	0.40	25.80	1855	103.0
	350	0.43	25.80	1985	110.2
30	150	0.34	32.00	2000	111.2
	200	0.38	32.00	2220	123.2
	250	0.42	32.00	2435	135.2
	300	0.45	32.00	2595	144.2
36	350	0.49	32.00	2810	156.1
	150	0.38	38.30	2675	148.7
	200	0.42	38.30	2935	163.1
	250	0.47	38.30	3260	181.1
	300	0.51	38.30	3520	195.5
	350	0.56	38.30	3840	213.4

* Tolerances of O.D. of spigot end: 3-12 in., ±0.06 in., 14-24 in., +0.05 in., -0.08 in., 30-36 in., +0.08 in., -0.06 in.

** Available in 20' lengths.

† Including bell; calculated weight of pipe rounded off to nearest 5 lbs.

†† Including bell; average weight per foot, based on calculated weight of pipe before rounding.



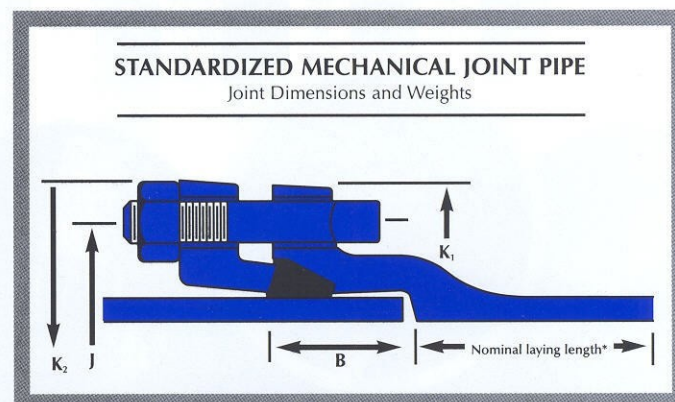
Size in.	*Pipe Thickness Inches		Outside Diameter Inches	Dimension in Inches	
	From	To		A	B
3	.25	.40	3.96	5.80	3.00
4	.25	.41	4.80	6.86	3.15
6	.25	.43	6.90	8.75	3.38
8	.25	.45	9.05	11.05	3.69
10	.26	.47	11.10	13.15	3.75
12	.28	.49	13.20	15.30	3.75
14	.28	.51	15.30	17.85	5.00
16	.30	.52	17.40	20.00	5.00
18	.31	.53	19.50	22.10	5.00
20	.33	.54	21.60	24.25	5.00
24	.33	.56	25.80	28.50	5.00
30	.34	.63	32.00	34.95	6.50
36	.38	.73	38.30	41.37	6.50

* 3" - 4" Nominal 20' laying length. - 6" Nominal 18' or 20'

10" - 36" Nominal 18' laying length.

8" Nominal 18' or 20'

Dimensions subject to manufacturing tolerances.



Size Inches	Pipe Thickness Inches		Out- side Dia- meter Inches	Dimensions in Inches				Bolts			Bell Weights Pounds	Gland Bolts Gasket Weight Pounds
	From	To		B	J	K ₁	K ₂	No.	Size Inches	Length Inches		
3	.25	.40	3.96	2.50	6.19	7.62	7.69	4	3/8	3	11	7
4	.26	.41	4.80	2.50	7.50	9.06	9.12	4	3/8	3 1/2	16	10
6	.25	.43	6.90	2.50	9.50	11.06	11.12	6	3/4	3 1/2	18	16
8	.27	.45	9.05	2.50	11.75	13.31	13.37	6	3/4	4	24	25
10	.29	.47	11.10	2.50	14.00	15.62	15.62	8	3/4	4	31	30
12	.31	.49	13.20	2.50	16.25	17.88	17.88	8	3/4	4	37	40
14	.33	.51	15.30	3.50	18.75	20.25	20.25	10	3/4	4 1/2	61	45
16	.34	.52	17.40	3.50	21.00	22.50	22.50	12	3/4	4 1/2	74	55
18	.35	.53	19.50	3.50	23.25	24.75	24.75	12	3/4	4 1/2	85	65
20	.36	.54	21.60	3.50	25.50	27.00	27.00	14	3/4	4 1/2	98	85
24	.38	.56	25.80	3.50	30.00	31.50	31.50	16	3/4	5	123	105

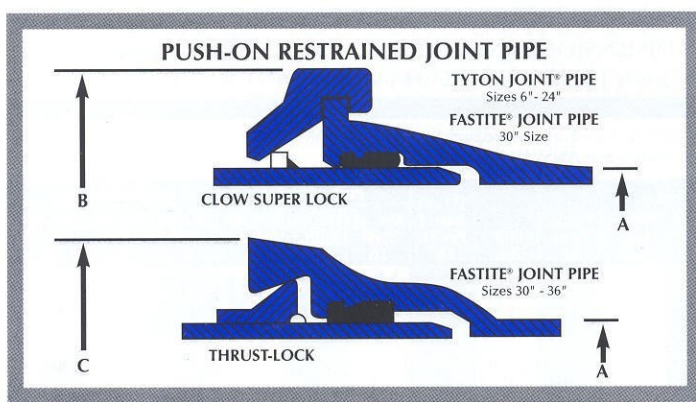
* 3" - 4" Nominal 20' laying length. - 6" Nominal 18' or 20'

10" - 24" Nominal 18' laying length.

8" Nominal 18' or 20'

Dimensions subject to manufacturing tolerances.

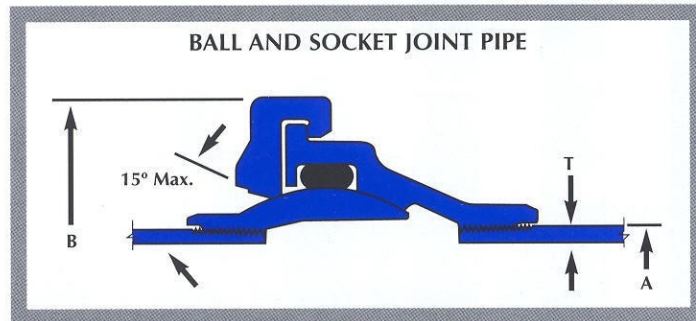
RATED WORKING PRESSURE AND MAXIMUM DEPTH OF COVER



Nominal Pipe Size Inches	Pressure Rating* psi	Joint Deflection		A Pipe O.D. Inches	B Retainer O.D. Inches	C Bell O.D. Inches
		In Degrees	Inches in 18 feet			
6	350	4	15	6.90	11.75	—
8	350	4	15	9.05	14.38	—
10	350	4	15	11.10	16.75	—
12	350	4	15	13.20	19.13	—
14	350	3	11	15.30	21.75	—
16	350	3	11	17.40	24.00	—
18	350	3	11	19.50	26.38	—
20	350	3	11	21.60	28.63	—
24	350	3	11	25.80	33.75	—
30	250	2	7	32.00	40.13	38.75
36	250	1½	7	38.30	—	45.63

* In the 14" and larger sizes, pressure rating is limited to the rating of the pipe barrel thickness selected.

Dimensions subject to manufacturing tolerances.



Size	Thickness		A Pipe O.D.	B Retainer O.D.	Full Length Weight - LB.**			Safe End Pull (Lb.)
	Class (A21.51)	T			As Shipped	UnderWater		
						Full of Air	Full of Water	
6	55	.40	6.90	13.88	545	240	465	50,000
8	55	.42	9.05	16.63	770	240	655	70,000
10	55	.44	11.10	19.13	1005	220	860	95,000
12	55	.46	13.20	22.00	1270	155	1080	120,000
14	56	.51	15.30	24.50	1655	160	1410	145,000
16	56	.52	17.40	27.00	1990	45	1685	165,000
18	56	.53	19.50	30.00	2375	-70	2015	195,000
	58*	.59			2560	110	2170	
20	56	.54	21.60	32.75	2810	-200	2375	210,000
	59*	.63			3110	100	2635	
24	56	.56	25.80	38.25	3700	-620	3110	260,000
	62*	.74			4415	95	3715	
30	58	.71	32.00	46.25	5855	-900	4920	335,000
	61*	.83			6435	-180	5360	
36	57	.78	38.30	54.25	8145	-1300	6880	400,000
	59*	.88			8725	-725	7330	

* Thickness required to overcome buoyancy.

** Weights listed are for 18'-0" laying lengths. Nominal full lengths vary by size.
Pipe, Bell, Ball and Retainer are ductile iron.

Dimensions and weights subject to manufacturing tolerances.

6"-24" pressure rating: 350 psi

30"-36" pressure rating: 250 psi

Size in.	Pressure† Class psi.	Nominal Thickness in.	Laying Condition				
			Type 1 Trench	Type 2 Trench	Type 3 Trench	Type 4 Trench	Type 5 Trench
			Maximum Depth of Cover ‡ — ft				
3	350	0.25	78	88	99	100§	100§
4	350	0.25	53	61	69	85	100§
6	350	0.25	26	31	37	47	65
8	350	0.25	16	20	25	34	50
10	350	0.26	11**	15	19	28	45
12	350	0.28	10**	15	19	28	44
14	250	0.28	††	11**	15	23	36
	300	0.30	††	13	17	26	42
	350	0.31	††	14	19	27	44
16	250	0.30	††	11**	15	24	34
	300	0.32	††	13	17	26	39
	350	0.34	††	15	20	28	44
18	250	0.31	††	10**	14	22	31
	300	0.34	††	13	17	26	36
	350	0.36	††	15	19	28	41
20	250	0.33	††	10	14	22	30
	300	0.36	††	13	17	26	35
	350	0.38	††	15	19	28	38
24	200	0.33	††	8**	12	17	25
	250	0.37	††	11	15	20	29
	300	0.40	††	13	17	24	32
	350	0.43	††	15	19	28	37
30	150	0.34	††	—	9	14	22
	200	0.38	††	8**	12	16	24
	250	0.42	††	11	15	19	27
	300	0.45	††	12	16	21	29
	350	0.49	††	15	19	25	33
36	150	0.38	††	—	9	14	21
	200	0.42	††	8**	12	15	23
	250	0.47	††	10	14	18	25
	300	0.51	††	12	16	20	28
	350	0.56	††	15	19	24	32

† Ductile-iron pipe is adequate for the rated working pressure indicated for each nominal size plus a surge allowance of 100 psi. Calculations are based on a 2.0 safety factor times the sum of working pressure and 100 psi surge allowance. (See ANSI/AWWA C150/A21.50 for design formulae.) Ductile-iron pipe for working pressures higher than 350 psi is available.

‡ An allowance for a single H-20 truck with 1.5 impact factor is included for all depths of cover.

§ Calculated maximum depth of cover exceeds 100 ft.



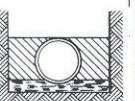


** Minimum allowable depth of cover is 3 ft.

†† For pipe 14 in. and larger, consideration should be given to the use of laying conditions other than Type 1.

Standards Applicable to Ductile Iron Pipe and Fittings

Thickness Design of Ductile Iron Pipe	ANSI/AWWA C150/A21.50
Ductile Iron Pipe for Water and Other Liquids	ANSI/AWWA C151/A21.51
Ductile Iron Pipe for Gravity Flow Service	FEDERAL WWP421D, Grade C
Ductile Iron Fittings for Water and Other Liquids	ANSI/ASTM A746
30" through 36"	ANSI/AWWA C110/A21.10
Ductile Iron Compact Fittings	ANSI/AWWA C153/A21.53
3" through 24"	ANSI/AWWA C110/A21.10
Flanged Fittings	ANSI B16-1
Ductile Iron Pipe with Threaded Flanges	ANSI/AWWA C115/A21.15
Coatings and Linings:	
Asphaltic	ANSI/AWWA C151/A21.51
Cement Lining	ANSI/AWWA C110/A21.10
Various Epoxy Linings and Coatings	ANSI/AWWA C153/A21.53
Exterior Polyethylene Encasement	ANSI/AWWA C104/A21.4
MANUFACTURER'S STANDARD	
Installation	ANSI/AWWA C105/A21.5
Joints - Pipe and Fittings	
Push-On and Mechanical Rubber-Gasket Joints	ANSI/AWWA C111/A21.11
Flanged	FEDERAL WWP421D
Grooved and Shouldered	ANSI/AWWA C115/A21.15
Pipe Threads	ANSI B16.1
Installation	ANSI/AWWA C606
	ANSI/B2.1
	ANSI/AWWA C600

LAYING CONDITIONS

Type 1†	Type 2	Type 3	Type 4	Type 5
Flat-bottom trench.* Loose backfill.	Flat-bottom trench.* Backfill lightly consolidated to centerline of pipe.	Pipe bedded in 4-in. minimum loose soil.** Backfill lightly consolidated to top of pipe.	Pipe bedded in sand, gravel or crushed stone to depth of 1/8 pipe diameter, 4-in. minimum. Backfill compacted to top of pipe. (Approximately 80% Standard Proctor, AASHTO T-99.)	Pipe bedded in compacted granular material to centerline of pipe. Compacted granular or select** material to top of pipe. (Approximately 90% Standard Proctor, AASHTO T-99.)
				

Notes:

Consideration of the pipe-zone embedment conditions included in this figure may be influenced by factors other than pipe strength. For additional information on pipe bedding and backfill, see ANSI/AWWA C600.

* For nominal pipe sizes 14 in. and larger, consideration should be given to the use of laying conditions other than Type 1.

† Flat bottom is defined as undisturbed earth.

** Loose soil or select material is defined as native soil excavated from the trench, free of rocks, foreign materials, and frozen earth.

§ American Association of State Highway and Transportation Officials, 444 N. Capitol St. N.W., Suite 225, Washington, DC 20001.

Mechanical Joint Pipe

Maximum Allowable Joint Deflection

Size of Pipe	Y-Maximum Joint Deflection in Degrees	X Deflection in Inches 18 ft. Length	Approximate Radius in Feet of Curve Produced by Succession of Joints 18 ft. length
3	8°-18'	35*	140*
4	8°-18'	35*	140*
6	7°-7'	30*	160*
8	5°-21'	20	195
10	5°-21'	20	195
12	5°-21'	20	195
14	3°-35'	13.5	285
16	3°-35'	13.5	285
18	3°-0'	11	340
20	3°-0'	11	340
24	2°-23'	9	450

*20- Ft. Length

Push-on Joint Pipe

Maximum Deflection Full Length Pipe

Size of Pipe	Maximum Joint Deflection in Degrees	Deflection in inches		Approximate Radius in Feet of Curve Produced by Succession of Joints 3° same as 4°	
		18 foot length	20 foot length	18 foot length	20 foot length
3	5°		21		230
4	5°		21		230
6	5°	19	21	205	230
8	5°	19	21	205	230
10	5°	19		205	
12	5°	19		205	
14	4°	15		260	
16	4°	15		260	
18	3°	11		345	
20	3°	11		345	
24	3°	11		345	
36	3°	11		345	

*20- Ft. Length

DIMENSIONS AND WEIGHTS FOR SPECIAL CLASSES OF PUSH-ON JOINT AND MECHANICAL JOINT DUCTILE IRON PIPE

Pipe manufactured in accordance with ANSI/AWWA C151/A21.51 under method of design outlined in ANSI/AWWA C150/A21.50.

Size In	Thick-ness Class	Thick-ness In.	OD* In.	Wt. of Barrel Per Ft. Lb.	Push-on Joint			Mechanical Joint		
					Wt. of Bell Lb.	Wt. Per Lb. Lb.	Avg. Wt. Per Ft. Lb.	Wt. of Bell Lb.	Wt. Per Lb. Lb.	Avg. Wt. Per Ft. Lb.
3	51	.25	3.96	8.9	9	185	9.4	11	190	9.4
3	52	.28	3.96	9.9	9	205	10.4	11	210	10.4
3	53	.31	3.96	10.9	9	225	11.4	11	230	11.4
3	54	.34	3.96	11.8	9	245	12.2	11	245	12.4
3	55	.37	3.96	12.8	9	264	13.2	11	265	13.4
3	56	.40	3.96	13.7	9	285	14.2	11	285	14.2
4	51	.26	4.80	11.3	11	235	11.8	16	240	12.1
4	52	.29	4.80	12.6	11	265	13.2	16	270	13.4
4	53	.32	4.80	13.8	11	285	14.4	16	290	14.6
4	54	.35	4.80	15.0	11	310	15.6	16	315	15.8
4	55	.38	4.80	16.1	11	335	16.6	16	340	16.9
4	56	.41	4.80	17.3	11	335	17.8	16	360	18.1
6	50	.25	6.90	16.0	15	305	16.8	18	305	17.0
6	51	.28	6.90	17.8	15	335	18.6	18	340	18.8
6	52	.31	6.90	19.6	15	370	20.4	18	370	20.6
6	53	.34	6.90	21.4	15	400	22.2	18	405	22.4
6	54	.37	6.90	23.2	15	435	24.0	18	435	24.2
6	55	.40	6.90	25.0	15	465	25.8	18	470	26.0
6	56	.43	6.90	26.7	15	495	27.5	18	500	27.7
8	50	.27	9.05	22.8	22	430	24.0	24	435	24.1
8	51	.30	9.05	25.2	22	475	26.4	24	480	26.5
8	52	.33	9.05	27.7	22	520	28.9	24	525	29.0
8	53	.36	9.05	30.1	22	565	31.3	24	565	31.4
8	54	.39	9.05	32.5	22	605	33.7	24	610	33.8
8	55	.42	9.05	34.8	22	650	36.0	24	650	36.1
8	56	.45	9.05	37.2	22	690	38.4	24	695	38.5
10	50	.29	11.10	30.1	29	570	31.7	31	575	31.8
10	51	.32	11.10	33.2	29	625	34.8	31	630	34.9
10	52	.35	11.10	36.2	29	680	37.8	31	685	37.9
10	53	.38	11.10	39.2	29	735	40.8	31	735	40.9
10	54	.41	11.10	42.1	29	785	43.7	31	790	43.8
10	55	.44	11.10	45.1	29	840	46.7	31	845	46.8
10	56	.47	11.10	48.0	29	895	49.6	31	895	49.7
12	50	.31	13.20	38.4	35	725	40.3	37	730	40.5
12	51	.34	13.20	42.0	35	790	43.9	37	795	44.1
12	52	.37	13.20	45.6	35	855	47.5	37	860	47.7
12	53	.40	13.20	49.2	35	920	51.1	37	925	51.3
12	54	.43	13.20	52.8	35	985	54.7	37	985	54.9
12	55	.46	13.20	56.3	35	1050	58.2	37	1050	58.4
12	56	.49	13.20	59.9	35	1115	61.8	37	1115	62.0
14	50	.33	15.30	47.5	60	915	50.8	61	915	50.9
14	51	.36	15.30	51.7	60	990	55.0	61	990	55.1
14	52	.39	15.30	55.9	60	1065	59.2	61	1065	59.3
14	53	.42	15.30	60.1	60	1140	63.4	61	1145	63.5
14	54	.45	15.30	64.2	60	1215	67.5	61	1215	67.5
14	55	.48	15.30	68.4	60	1290	71.7	61	1290	71.8
14	56	.51	15.30	72.5	60	1365	75.8	61	1365	75.9
16	50	.34	17.40	55.8	68	1070	59.6	74	1080	59.9
16	51	.37	17.40	60.6	68	1160	64.4	74	1165	64.7
16	52	.40	17.40	65.4	68	1245	69.2	74	1250	69.5
16	53	.43	17.40	70.1	68	1330	73.9	74	1335	74.2
16	54	.46	17.40	74.9	68	1415	78.7	74	1420	79.0
16	55	.49	17.40	79.7	68	1505	83.5	74	1510	83.8
16	56	.52	17.40	84.4	68	1585	88.2	74	1595	88.5
18	50	.35	19.50	64.4	78	1235	68.7	85	1245	69.1
18	51	.38	19.50	69.3	78	1335	74.1	85	1340	74.5
18	52	.41	19.50	75.2	78	1430	79.5	85	1440	79.9
18	53	.44	19.50	80.6	78	1530	84.9	85	1535	85.3
18	54	.47	19.50	86.0	78	1625	90.3	85	1635	90.7
18	55	.50	19.50	91.3	78	1720	95.6	85	1730	96.0
18	56	.53	19.50	96.7	78	1820	101.0	85	1825	101.4
20	50	.36	21.60	73.5	87	1410	78.3	98	1420	78.9
20	51	.39	21.60	79.5	87	1520	84.3	98	1530	84.9
20	52	.42	21.60	85.5	87	1625	90.3	98	1635	90.9
20	53	.45	21.60	91.5	87	1735	96.3	98	1745	96.9
20	54	.48	21.60	97.5	87	1840	102.3	98	1855	102.9
20	55	.51	21.60	103.4	87	1950	108.2	98	1960	108.8
20	56	.54	21.60	109.3	87	2055	114.1	98	2065	114.7
24	50	.38	25.80	92.9	105	1775	98.7	123	1795	99.7
24	51	.41	25.80	100.1	105	1905	105.9	123	1925	106.9
24	52	.44	25.80	107.3	105	2035	113.1	123	2055	114.1
24	53	.47	25.80	114.4	105	2165	120.2	123	2180	121.2
24	54	.50	25.80	121.6	105	2295	127.4	123	2310	128.4
24	55	.53	25.80	128.8	105	2425	134.6	123	2440	135.6
24	56	.56	25.80	135.9	105	2555	141.7	123	2570	142.7
30	50	.39	32.00	118.5	170	2305	127.8	...	...	...
30	51	.43	32.00	130.5	170	2520	139.9	...	...	...
30	52	.47	32.00	142.5	170	2735	151.9	...	...	...
30	53	.51	32.00	154.4	170	2950	163.8	...	...	...
30	54	.55	32.00	166.3	170	3165	175.7	...	...	...
30	55	.59	32.00	178.2	170	3380	187.6	...	...	...
30	56	.63	32.00	190.0	170	3590	199.4	...	...	...
36	50	.43	38.30	156.5	239	3055	169.8	...	...	...
36	51	.48	38.30	174.5	239	3380	187.8	...	...	...
36	52	.53	38.30	192.4	239	3700	205.7	...	...	...
36	53	.58	38.30	210.3	239	4025	223.6	...	...	...
36	54	.63	38.30	228.1	239	4345	241.4	...	...	...
36	55	.68	38.30	245.9	239	4665	259.2	...	...	...
36	56	.73	38.30	263.7	239	4985	277.0	...	...	...

† Including Bell; calculated weight of pipe rounded off to nearest 5 lbs.

‡ Including Bell; average weight per foot, based on calculated weight of pipe before rounding.

Weights and dimensions are nominal per above standards.

* Tolerances of OD of spigot end: 3-12 in., ±0.06 in., 14-24 in., +0.05 in., -0.08 in., 30-36 in., +0.08 in., -0.06 in.

3"-6" Nominal 20' laying length. -8" Nominal 18' or 20'

10" - 36" Nominal 18' laying length.

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ASSEMBLY INSTRUCTIONS

TYTON AND FASTITE PUSH-ON JOINTS

THE PROCEDURES DESCRIBED BELOW SHOULD BE FOLLOWED TO ASSURE PROPER JOINT ASSEMBLY. SUPPLEMENTAL INFORMATION IS COVERED IN THE ATLANTIC STATES INSTRUCTIONS FLYER.

THERE ARE SEVERAL DIFFERENT DESIGNS OF PUSH-ON JOINTS FOR DUCTILE-IRON PIPE AND FITTINGS. **BE SURE THAT THE CORRECT GASKET IS USED.**

IT IS ESPECIALLY IMPORTANT THAT THE GASKET IS INSTALLED IN A CLEAN BELL.

THE GASKET GROOVE IN THE TYTON OR FASTITE BELL SHOULD **NOT** BE LUBRICATED PRIOR TO GASKET INSERTION.

JOINT ASSEMBLY PROCEDURE

- STEP 1. **BELL CLEANING:** Thoroughly clean out the bell. Remove all foreign matter: dirt, sand, mud, ice or excess paint.
- STEP 2. **PLAIN END PREPARATION:** Clean off the plain end, removing any dirt, foreign matter or excess paint. Make sure that the plain end is beveled. File smooth any sharp edges which might damage the gasket.
- STEP 3. **GASKET INSERTION:** Insert the gasket in its recess in the bell, with the large end of the gasket entering first. Make sure that the gasket faces in the correct direction and is properly seated.
- STEP 4. **LUBRICATION:** Apply a thin coating of lubricant to the inside surface of the installed gasket just prior to joint assembly. Make certain the entire inner surface of the gasket is coated. Also apply a thin coating of lubricant to the beveled portion of the plain end.
- STEP 5. **JOINING:** Guide the plain end into the bell and compress the gasket by pushing the plain end all the way into the bell socket. Keep the bell and plain end in reasonably straight alignment during assembly. Any deflection should be taken after the joint is assembled.

MECHANICAL JOINT

THE PROCEDURES DESCRIBED BELOW SHOULD BE FOLLOWED TO ASSURE PROPER JOINT ASSEMBLY.

THERE ARE SEVERAL DIFFERENT SIZES OF BOLTS. CHECK TO SEE YOU HAVE PROPER SIZE AND NUMBER.

- STEP 1. **BELL AND SPIGOT CLEANING AND LUBRICATION:**
Thoroughly clean bell gasket area and spigot-of pipe of all foreign material. Lubrication and additional cleaning should be provided by brushing both the gasket and plain end with soapy water or pipe lubricant just prior to slipping gasket into the plain end.
- STEP 2. **GLAND AND GASKET:** Place gland with lip extension toward the plain end, and the gasket with the narrow edge toward the plain end of the pipe.
- STEP 3. **JOINING:** Insert the pipe into the bell and press the gasket firmly and **evenly** into the gasket recess. Keep the joint straight during assembly. Make deflection after joint assembly but before tightening bolts. (Lubrication as in Step #1 will help facilitate gasket seating.)
- STEP 4. **BOLTS:** Push the gland toward the bell and center around the pipe with the gland lip against the gasket. Insert bolts and hand-tighten nuts.
- STEP 5. **TIGHTENING:** Tighten bolts to normal range of bolt torque as indicated in table. Maintain approximately the same distance between gland and the face of the bell flange. This is done by partially tightening the bottom bolts first then the top bolts next bolts on either side, finally the remaining bolts. This is repeated as many times as required.

ASSEMBLY OF FIELD CUT PIPE

When pipe are cut in the field, the cut end may be readily conditioned so that it can be used to make the next joint. The outside of the cut end should be beveled about 1/4-inch at an angle of about 30 degrees (Figure 1). This can be quite easily done with a coarse file or a portable grinder. The operation removes any sharp, rough edges which otherwise might injure the gasket.



Figure 1

When ductile-iron pipe 14" or larger is to be cut in the field, the material should be ordered as "GAUGED FULL LENGTH". Pipe that is "gauged full length" is specially marked to avoid confusion. The ANSI/AWWA standard for ductile-iron pipe requires factory gauging of the spigot end. Accordingly, pipe selected for field cutting should also be field gauged in the location of the cut and found to be within the tolerances shown in Table 1. In the field the mechanical joint gland can be used as a gauging device.

Table 1. Suitable Pipe Diameters for Field Cuts and Restrained Joint Field Fabrication

Nominal Pipe Size In.	Min. Pipe Diameter In.	Max. Pipe Diameter In.	Min. Pipe Circumference In.	Max. Pipe Circumference In.
3	3.90	4.02	12 ³ / ₄	12 ⁷ / ₈
4	4.74	4.86	14 ²⁹ / ₃₂	15 ⁹ / ₃₂
6	6.84	6.96	21 ¹ / ₂	21 ⁷ / ₈
8	8.99	9.11	28 ³ / ₄	28 ³ / ₈
10	11.04	11.16	34 ¹¹ / ₁₆	35 ¹ / ₁₆
12	13.14	13.26	41 ⁹ / ₃₂	41 ²¹ / ₃₂
14	15.22	15.35	47 ¹³ / ₁₆	48 ⁷ / ₃₂
16	17.32	17.45	54 ¹³ / ₃₂	54 ¹³ / ₁₆
18	19.42	19.55	61	61 ¹³ / ₃₂
20	21.52	21.65	67 ¹⁹ / ₃₂	68
24	25.72	25.85	80 ¹³ / ₁₆	81 ⁷ / ₃₂
30	31.94	32.08	100 ¹¹ / ₃₂	100 ²⁹ / ₃₂
36	38.24	38.38	120 ⁷ / ₈	120 ⁹ / ₁₆

Above table based on ANSI/AWWA C151/A21.51 guidelines for push-on joints

THE BACKHOE METHOD OF ASSEMBLY

A backhoe may be used to assemble pipe of intermediate and larger sizes. The plain end of the pipe should be carefully guided by hand into the bell of the previously assembled pipe. The bucket of the backhoe may then be used to push the pipe until fully seated. A timber header should be used between the pipe and backhoe bucket to avoid damage to the pipe.