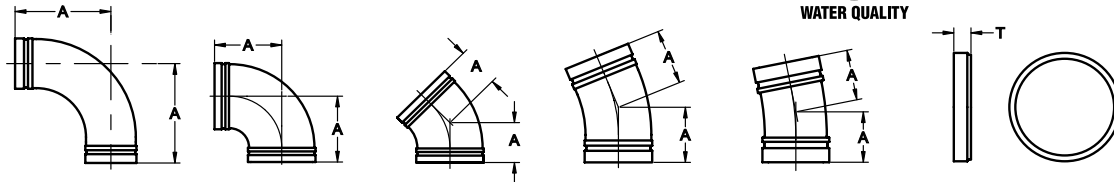




MATERIAL SPECIFICATIONS

- Material - Ductile Iron per ASTM A536 Grade 65-45-12.
- Interior lining - Cement lined per ANSI/AWWA C104/A21.4 sizes 3" single thickness and sizes 4"-36" double thickness and asphaltic seal coated.
- Exterior coating – Rust inhibitor prime coat.
- Fittings supplied with rigid radius grooves in accordance with ANSI/AWWA C606.
- Fittings conform to ANSI/AWWA C110/A21.10 for center-to-end dimensions. Wall thickness per ANSI/AWWA C153/A21.53 or ANSI/AWWA C110/A21.10.
- Fittings rated to 350 psi for sizes 3"-12", 250 psi for sizes 14"-24" and 150 psi for sizes 30"-36".
- Sizes 3"-12" UL, ULC listed and Factory Mutual approved.
- The Standard asphaltic seal coat applied on cement lining is UL/ANSI/NSF Standards 61 and 372 Approved.
- Optional linings and coatings are available.
- All fittings are UL/ANSI/NSF Standards 61 and 372 Approved.



PIPE SIZE		AE-6C 90° L.R. ELBOW		AE-1C 90° ELBOW		AE-2C 45° ELBOW		AE-3C 22 1/2° ELBOW		AE-4C 11 1/4° ELBOW		AK-1C CAP		
NOM. SIZE	ACTUAL PIPE SIZE	A	APPROX. WEIGHT (LBS)/(KG)	A	APPROX. WEIGHT (LBS)/(KG)	A	APPROX. WEIGHT (LBS)/(KG)	A	APPROX. WEIGHT (LBS)/(KG)	A	APPROX. WEIGHT (LBS)/(KG)	T	MAX. ALLOWABLE TAP	APPROX. WEIGHT (LBS)/(KG)
3	3.96	7.75	19	5.50	10	3.00	7	3.00	8	3.00	9	1.07	2 1/2	3
80	100.6	197	8.6	140	4.5	76	3.2	76	3.6	76	4.1	27		1.4
4	4.80	9.00	21	6.50	15	4.00	10	4.00	11	4.00	11	1.07	3	4
100	121.9	229	9.5	165	6.8	102	4.5	102	5.0	102	5.0	27		1.8
6	6.90	11.50	43	8.00	28	5.00	22	5.00	25	5.00	21	1.07	5	7
150	175.3	292	19.5	203	12.7	127	10.0	127	11.3	127	9.5	27		3.2
8	9.05	14.00	75	9.00	44	5.50	35	5.50	39	5.50	39	1.31	6	15
200	229.9	356	34.0	229	20.0	140	15.9	140	17.7	140	17.7	33		6.8
10	11.10	16.50	114	11.00	72	6.50	53	6.50	54	6.50	77	1.39	6	22
250	281.9	419	51.7	279	32.7	165	24.0	165	24.5	165	34.9	35		10.0
12	13.20	19.00	150	12.00	99	7.50	76	7.50	77	7.50	120	1.39	6	34
300	335.3	483	68.0	305	44.9	191	34.5	191	34.9	191	54.4	35		15.4
14	15.30	21.50	261	14.00	165	7.50	92	7.50	92	7.50	101	1.39	6	43
350	388.6	546	118.4	356	74.8	191	41.7	191	41.7	191	45.8	35		19.5
16	17.40	24.00	337	15.00	207	8.00	124	8.00	112	8.00	121	1.75	6	85
400	442.0	610	152.9	381	93.9	203	56.2	203	50.8	203	54.9	45		38.5
18	19.50	26.50	451	16.50	330	8.50	191	8.50	145	8.50	146	1.75	6	103
450	495.3	673	204.6	419	149.7	216	86.6	216	65.8	216	66.2	45		46.7
20	21.60	29.00	588	18.00	424	9.50	258	9.50	200	9.50	202	1.75	6	120
500	548.6	737	266.7	457	192.3	241	117.0	241	90.7	241	91.6	45		54.4
24	25.80	34.00	909	22.00	646	11.00	409	11.00	282	11.00	284	1.75	6	180
600	655.3	864	412.3	559	293.0	279	185.5	279	127.9	279	128.8	45		81.6
30	32.00	41.50	2136	25.00	1145	15.00	1146	15.00	681	15.00	699	4.00	6	323
750	762.0	1054	968.9	635	519.4	381	519.8	381	308.9	381	317.1	102		146.5
36	38.30	49.00	3120	28.00	1697	18.00	1262	18.00	975	18.00	1124	4.00	6	554
900	914.4	1245	1415.2	711	769.7	457	572.4	457	442.3	457	509.8	102		251.3

*All dimensions in black text are in inches except where indicated. *All dimensions in blue text (below number) are in millimeters except where indicated.

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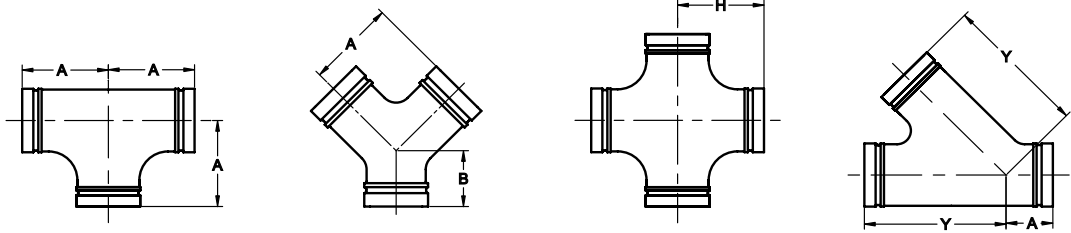
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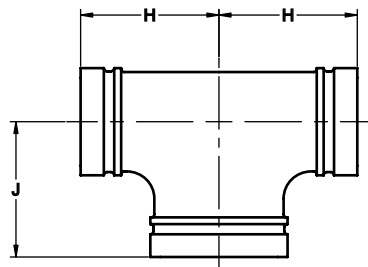
STAR[®] PIPE PRODUCTS



AWWA Grooved Fittings



PIPE SIZE		AT-1C TEE		AY-1C TRUE WYE			AX-1C CROSS		AL-1C 45° LATERAL		
NOM. SIZE	ACTUAL PIPE SIZE	A	APPROX. WEIGHT (LBS)/(KG)	A	B	APPROX. WEIGHT (LBS)/(KG)	H	APPROX. WEIGHT (LBS)/(KG)	Y	A	APPROX. WEIGHT (LBS)/(KG)
3	3.96	5.50	16	5.50	5.50	25	5.50	24	10.0	3.00	21
80	100.6	140	7.3	140	140	11.4	140	10.9	254	76	9.5
4	4.80	6.50	22	6.50	3.00	55	6.50	28	12.00	3.00	34
100	121.9	165	10.0	165	76	24.9	165	12.7	305	76	15.4
6	6.90	8.00	42	8.00	3.50	90	8.00	64	14.50	3.50	64
150	175.3	203	19.1	203	89	40.8	203	29.0	368	89	29.0
8	9.05	9.00	65	9.00	4.50	140	9.00	81	17.50	4.50	104
200	229.9	229	29.5	229	114	63.5	229	36.7	445	114	47.2
10	11.10	11.00	122	11.00	5.00	220	11.00	127	20.50	5.00	145
250	281.9	279	55.3	279	127	99.8	279	57.6	521	127	65.8
12	13.20	12.00	161	12.00	5.50	315	12.00	156	24.50	5.50	225
300	335.3	305	73.0	305	140	142.9	305	70.8	622	140	102.1
14	15.30	14.00	221	14.00	6.00	425	14.00	307	27.00	6.00	436
350	388.6	356	100.2	356	152	192.8	356	139.3	686	152	197.8
16	17.40	15.00	290	15.00	6.50	555	15.00	426	30.00	6.50	592
400	442	381	131.5	381	165	251.7	381	193.2	762	165	268.5
18	19.50	16.50	461	16.50	7.00	720	16.50	567	32.00	7.00	754
450	495.3	419	209.1	419	178	326.6	419	257.2	813	178	342.1
20	21.60	18.00	589	18.00	8.00	910	18.00	717	35.00	8.00	989
500	548.6	457	267.2	457	203	412.8	457	325.2	889	203	448.6
24	25.80	22.00	980	22.00	9.00	1135	22.00	1177	40.50	9.00	1519
600	655.3	559	444.5	559	229	514.8	559	533.9	1029	229	689.0
30	32.00	25.00	1505	25.00	10.00	1700	25.00	1366	49.00	10.00	3280
750	762.0	635	682.6	635	254	771.1	635	619.6	1245	254	1487.8
36	38.30	28.00	2175	28.00	15.25	2300	28.00	1885	56.00	15.25	5020
900	914.4	711	986.6	711	387	1043.3	711	855.0	1422	387	2277.0



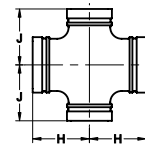
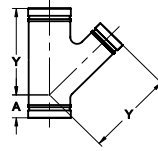
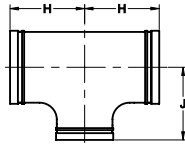
PIPE SIZE	AT-1C TEE		
NOM. SIZE	H	J	APPROX. WEIGHT (LBS)/(KG)
4 X 4 X 6 100 X 100 X 150	8.00 203	8.00 203	47 21.3
6 X 6 X 8 150 X 150 X 200	8.00 203	8.00 203	79 35.8
8 X 8 X 10 200 X 200 X 250	11.00 279	11.00 279	164 74.4
10 X 10 X 12 250 X 250 X 300	12.00 305	12.00 305	226 102.5

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STAR® PIPE PRODUCTS



AWWA Grooved Fittings



PIPE SIZE		AT-2C REDUCING TEE			AL-2C 45° REDUCING LATERAL			AX-2C REDUCING CROSS		
NOM. SIZE		H	J	APPROX. WEIGHT (LBS)/(KG)	Y	A	APPROX. WEIGHT (LBS)/(KG)	H	J	APPROX. WEIGHT (LBS)/(KG)
4	X 3	6.50	6.50	26	12.00	3.00	45	6.50	6.50	22
100	X 80	165	165	11.8	305	76.0	20.4	165	165	10.0
6	X 3	8.00	8.00	53	14.50	3.50	52	8.00	8.00	46
150	X 80	203	203	24.0	368	89.0	23.6	203	203	20.9
	X 4	8.00	8.00	42	14.50	3.50	55	8.00	8.00	38
	X 100	203	203	19.0	368	89.0	24.9	203	203	17.2
8	X 3	9.00	9.00	57	+	+	+	+	+	+
200	X 80	229	229	25.8	+	+	+	+	+	+
	X 4	9.00	9.00	62	17.50	4.50	88	9.00	9.00	76
	X 100	229	229	28.1	445	114	39.9	229	229	34.5
	X 6	9.00	9.00	67	17.50	4.50	93	9.00	9.00	82
	X 150	229	229	30.4	445	114	42.1	229	229	37.2
10	X 4	11.00	11.00	94	20.50	5.00	120	11.00	11.00	120
250	X 100	279	279	42.6	521	127	54.4	279	279	54.5
	X 6	11.00	11.00	101	20.50	5.00	124	11.00	11.00	114
	X 150	279	279	45.8	521	127	56.2	279	279	51.7
	X 8	11.00	11.00	119	20.50	5.00	133	11.00	11.00	123
	X 200	279	279	54.0	521	127	60.3	279	279	56.8
12	X 4	12.00	12.00	112	24.50	5.50	175	12.00	12.00	174
300	X 100	305	305	50.8	622	140	79.4	305	305	78.9
	X 6	12.00	12.00	127	24.50	5.50	180	12.00	12.00	130
	X 150	305	305	57.6	622	140	81.6	305	305	59.0
	X 8	12.00	12.00	134	24.50	5.50	186	12.00	12.00	139
	X 200	305	305	60.8	622	140	84.4	305	305	63.1
	X 10	12.00	12.00	153	24.50	5.50	196	12.00	12.00	154
	X 250	305	305	69.4	622	140	88.9	305	305	69.9
14	X 6	14.00	14.00	194	27.00	6.00	330	14.00	14.00	215
350	X 150	356	356	88.0	686	152	149.7	356	356	97.5
	X 8	14.00	14.00	199	27.00	6.00	346	14.00	14.00	221
	X 200	356	356	90.3	686	152	156.9	356	356	100.2
	X 10	14.00	14.00	258	27.00	6.00	540	14.00	14.00	235
	X 250	356	356	117.0	686	152	244.9	346	346	106.6
	X 12	14.00	14.00	267	27.00	6.00	625	14.00	14.00	244
	X 300	356	356	121.2	686	152	283.5	356	356	110.7
16	X 6	15.00	15.00	231	30.00	6.50	570	15.00	15.00	266
400	X 150	381	381	104.8	762	165	258.5	381	381	120.7
	X 8	15.00	15.00	236	30.00	6.50	585	15.00	15.00	276
	X 200	381	381	107.0	762	165	265.4	381	381	125.2
	X 10	15.00	15.00	246	30.00	6.50	630	15.00	15.00	291
	X 250	381	381	111.6	762	165	285.8	381	381	132.0
	X 12	15.00	15.00	269	30.00	6.50	650	15.00	15.00	305
	X 300	381	381	122.0	762	165	294.8	381	381	138.3
	X 14	15.00	15.00	341	30.00	6.50	692	15.00	15.00	280
	X 350	381	381	154.7	762	165	313.9	381	381	127.0
18	X 6	13.00	15.50	320	+	+	+	+	+	+
450	X 150	330	394	145.1	+	+	+	+	+	+
	X 8	13.00	15.50	311	+	+	+	15.50	15.50	272
	X 200	330	394	141.1	+	+	+	394	394	123.4
	X 10	13.00	15.50	332	32.00	7.00	765	15.50	15.50	277
	X 250	330	394	150.6	813	178	347.0	394	394	125.6
	X 12	13.00	15.50	332	32.00	7.00	800	15.50	15.50	291
	X 300	330	394	150.6	813	178	362.9	394	394	132.0
	X 14	16.50	16.50	409	32.00	7.00	865	16.50	16.50	361
	X 350	419	419	185.5	813	178	392.4	419	419	163.7
	X 16	16.50	16.50	453	32.00	7.00	895	16.50	16.50	367
	X 400	419	419	205.5	813	178	406.0	419	419	166.5

+ Contact Star Pipe Products for Details

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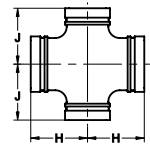
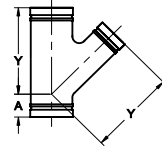
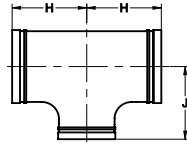
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STAR[®] PIPE PRODUCTS





AWWA Grooved Fittings



PIPE SIZE		AT-2C REDUCING TEE			AL-2C 45° REDUCING LATERAL			AX-2C REDUCING CROSS		
NOM. SIZE		H	J	APPROX. WEIGHT (LBS)/(KG)	Y	A	APPROX. WEIGHT (LBS)/(KG)	H	J	APPROX. WEIGHT (LBS)/(KG)
20	X 6	14.00	17.00	407	+	+	+	+	+	+
500	X 150	356	432	184.6	+	+	+	+	+	+
	X 8	14.00	17.00	412	+	+	+	17.00	17.00	343
	X 200	356	432	186.9	+	+	+	432	432	155.6
	X 10	14.00	17.00	419	+	+	+	17.00	17.00	343
	X 250	356	432	190.1	+	+	+	432	432	155.6
	X 12	14.00	17.00	426	35.00	8.00	1000	17.00	17.00	357
	X 300	356	432	193.2	889	203	453.6	432	432	161.9
	X 14	14.00	17.00	443	35.00	8.00	1062	17.00	17.00	327
	X 350	356	432	200.9	889	203	481.7	432	432	148.3
	X 16	18.00	18.00	571	35.00	8.00	1105	18.00	18.00	458
	X 400	457	457	259.0	889	203	501.2	457	457	207.7
	X 18	18.00	18.00	584	35.00	8.00	1150	18.00	18.00	469
	X 450	457	457	264.9	889	203	521.6	457	457	212.7
24	X 6	15.00	19.00	534	+	+	+	+	+	+
600	X 150	381	483	242.2	+	+	+	+	+	+
	X 8	15.00	19.00	540	+	+	+	+	+	+
	X 200	381	483	244.9	+	+	+	+	+	+
	X 10	15.00	19.00	549	+	+	+	+	+	+
	X 250	381	483	249.0	+	+	+	+	+	+
	X 12	15.00	19.00	593	+	+	+	15.00	19.00	475
	X 300	381	483	269.0	+	+	+	381	483	215.5
	X 14	15.00	19.00	610	40.50	9.00	1510	15.00	19.00	450
	X 350	381	483	276.7	1029	229	684.9	381	483	204.1
	X 16	15.00	19.00	574	40.50	9.00	1580	15.00	19.00	446
	X 400	381	483	260.4	1029	229	716.7	381	483	202.3
	X 18	22.00	22.00	820	40.50	9.00	871	22.00	22.00	782
	X 450	559	559	371.9	1029	229	395.1	559	559	354.7
	X 20	22.00	22.00	937	40.50	9.00	1705	22.00	22.00	788
	X 500	559	559	425.0	1029	229	773.4	559	559	357.4
30	X 6	18.00	23.00	870	+	+	+	+	+	+
750	X 150	457	584	394.6	+	+	+	+	+	+
	X 8	18.00	23.00	875	+	+	+	+	+	+
	X 200	457	584	396.9	+	+	+	+	+	+
	X 10	18.00	23.00	880	+	+	+	+	+	+
	X 250	457	584	399.2	+	+	+	+	+	+
	X 12	18.00	23.00	890	49.00	10.00	2178	18.00	23.00	888
	X 300	457	584	403.7	1245	254	987.9	457	584	402.8
	X 14	18.00	23.00	900	49.00	10.00	2208	18.00	23.00	853
	X 350	457	584	408.2	1245	254	1001.5	457	584	386.9
	X 16	18.00	23.00	912	49.00	10.00	2248	18.00	23.00	843
	X 400	457	584	413.7	1245	254	1019.7	457	584	382.4
	X 18	18.00	23.00	927	49.00	10.00	2294	18.00	23.00	839
	X 450	457	584	420.5	1245	254	1040.5	457	584	380.6
	X 20	18.00	23.00	942	49.00	10.00	2339	18.00	23.00	835
	X 500	457	584	427.3	1245	254	1061.0	457	584	378.7
	X 24	25.00	25.00	1475	49.00	10.00	2451	18.00	23.00	1304
	X 600	635	635	669.0	1245	254	1111.8	457	584	591.5
36	X 8	20.00	26.00	1410	+	+	+	+	+	+
900	X 200	508	660	639.6	+	+	+	+	+	+
	X 10	20.00	26.00	1415	+	+	+	+	+	+
	X 250	508	660	641.8	+	+	+	+	+	+
	X 12	20.00	26.00	1420	+	+	+	20.00	26.00	1262
	X 300	508	660	644.1	+	+	+	508	66	572.4
	X 14	20.00	26.00	1425	54.00	15.25	3200	20.00	26.00	1222
	X 350	508	660	646.4	1372	387	1451.5	508	66	554.3
	X 16	20.00	26.00	1430	54.00	15.25	3493	20.00	26.00	1213
	X 400	508	660	648.6	1372	387	1584.4	508	66	550.2
	X 18	20.00	26.00	1435	54.00	15.25	3533	20.00	26.00	1204
	X 450	508	660	650.9	1372	387	1602.5	508	66	546.1
	X 20	20.00	26.00	1440	54.00	15.25	3574	20.00	26.00	1190
	X 500	508	660	653.2	1372	387	1621.1	508	66	539.8
	X 24	20.00	26.00	1445	54.00	15.25	3675	20.00	26.00	1163
	X 600	508	660	655.4	1372	387	1666.5	508	66	527.5
	X 30	28.00	28.00	2113	56.00	15.25	3879	28.00	28.00	1865
	X 750	711	711	958.4	1422	387	1759.5	711	711	845.9

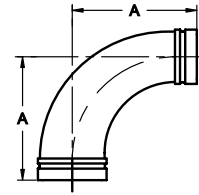
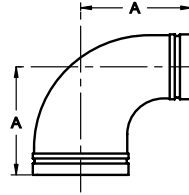
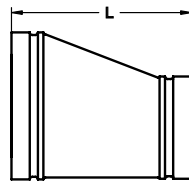
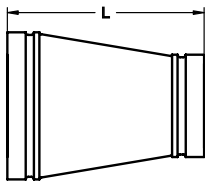
+ Contact Star Pipe Products for Details

*All dimensions in black text are in inches except where indicated. *All dimensions in blue text (below number) are in millimeters except where indicated.





AWWA Grooved Fittings



PIPE SIZE		AR-1C CONC. REDUCER		AR-2C ECC. REDUCER		AE-5C 90° RED. EL		AE-7C 90° L.R. RED. EL	
NOM. SIZE		L	APPROX. WEIGHT (LBS)/(KG)	L	APPROX. WEIGHT (LBS)/(KG)	A	APPROX. WEIGHT (LBS)/(KG)	A	APPROX. WEIGHT (LBS)/(KG)
4	X 3	7.00	8	7.00	9	6.50	17	9.00	20
100	X 80	178	3.6	178	4.1	165	7.7	229	8.1
6	X 3	9.00	15	9.00	20	8.00	25	11.50	36
150	X 80	229	6.8	229	9.1	203	11.3	292	16.3
	X 4	9.00	16	9.00	17	8.00	27	11.50	40
	X 100	229	7.3	229	7.7	203	12.2	292	18.1
8	X 3	11.00	33	11.00	30	+	+	+	+
200	X 80	279	15.0	279	13.6	+	+	+	+
	X 4	11.00	28	11.00	28	9.00	40	14.00	60
	X 100	279	12.7	279	12.7	229	18.1	356	27.2
	X 6	11.00	30	11.00	30	9.00	43	14.00	71
	X 150	279	13.6	279	13.6	229	19.5	356	32.2
10	X 4	12.00	36	12.00	35	11.00	55	16.50	90
250	X 100	305	16.3	305	15.9	279	24.9	419	40.8
	X 6	12.00	42	12.00	39	11.00	60	16.50	106
	X 150	305	19.1	305	17.7	279	27.2	419	48.1
	X 8	12.00	46	12.00	43	11.00	65	16.50	121
	X 200	305	20.9	305	19.5	279	29.5	419	54.9
12	X 4	14.00	49	14.00	50	12.00	70	+	+
300	X 100	356	22.2	356	22.7	305	31.8	+	+
	X 6	14.00	53	14.00	54	12.00	75	19.00	143
	X 150	356	24.0	356	24.5	305	34.0	483	64.9
	X 8	14.00	67	14.00	58	12.00	84	19.00	163
	X 200	356	30.4	356	26.3	305	38.1	483	73.9
	X 10	14.00	73	14.00	70	12.00	92	19.00	188
	X 250	356	33.1	356	31.8	305	41.7	483	85.3
14	X 6	16.00	80	16.00	81	14.00	112	+	+
350	X 150	406	36.3	406	36.7	356	50.8	+	+
	X 8	16.00	86	16.00	88	14.00	127	21.50	183
	X 200	406	39.0	406	40.0	356	57.6	546	83.0
	X 10	16.00	91	16.00	93	14.00	170	21.50	213
	X 250	406	41.3	406	42.2	356	77.1	546	96.6
	X 12	16.00	104	16.00	96	14.00	195	21.50	240
	X 300	406	47.2	406	43.5	356	88.5	546	108.9
16	X 6	18.00	110	18.00	115	15.00	123	+	+
400	X 150	457	49.9	457	52.5	381	55.8	+	+
	X 8	18.00	122	18.00	125	15.00	145	24.00	228
	X 200	457	55.3	457	56.7	381	65.8	610	103.4
	X 10	18.00	129	18.00	131	15.00	195	24.00	263
	X 250	457	58.5	457	59.4	381	88.5	610	119.3
	X 12	18.00	134	18.00	137	15.00	240	24.00	295
	X 300	457	60.8	457	62.1	381	108.9	610	133.8
	X 14	18.00	141	18.00	160	15.00	280	24.00	290
	X 350	457	64.0	457	72.6	381	127.0	610	131.5
18	X 8	19.00	148	19.00	150	16.50	170	+	+
450	X 200	483	67.1	483	68.0	419	77.1	+	+
	X 10	19.00	158	19.00	160	16.50	200	26.50	323
	X 250	483	71.1	483	72.6	419	90.7	673	146.5
	X 12	19.00	167	19.00	169	16.50	305	26.50	336
	X 300	483	75.7	483	76.6	419	138.3	673	152.4
	X 14	19.00	184	19.00	185	16.50	345	26.50	355
	X 350	483	83.5	483	84.0	419	156.5	673	161.0
	X 16	19.00	194	19.00	190	16.50	360	26.50	386
	X 400	483	88.0	483	86.0	419	163.3	673	175.1

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+ Contact Star Pipe Products for Details

*All dimensions in black text are in inches except where indicated. *All dimensions in blue text (below number) are in millimeters except where indicated.

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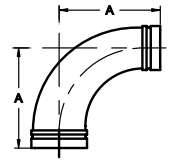
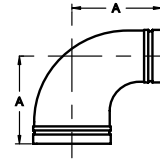
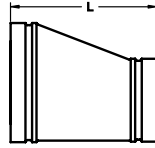
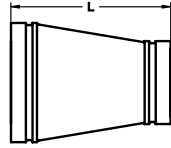
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AWWA Grooved Fittings



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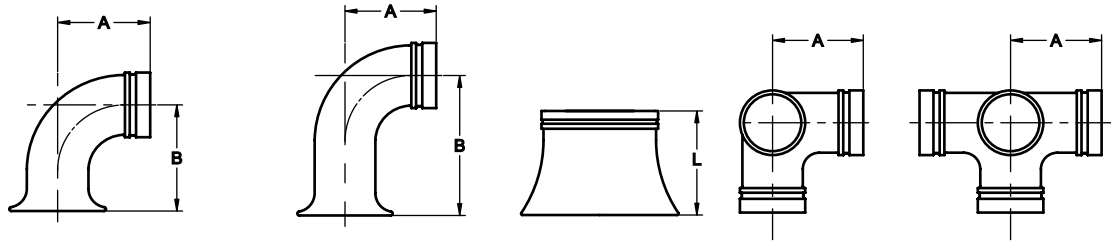
PIPE SIZE		AR-1C CONC. REDUCER		AR-2C ECC. REDUCER		AE-5C 90° RED. EL		AE-7C 90° L.R. RED. EL	
NOM. SIZE		L	APPROX. WEIGHT (LBS)/(KG)	L	APPROX. WEIGHT (LBS)/(KG)	A	APPROX. WEIGHT (LBS)/(KG)	A	APPROX. WEIGHT (LBS)/(KG)
20 500	X 8	20.00	173	20.00	175	+	+	+	+
	X 200	508	78.5	508	79.4	+	+	+	+
	X 10	20.00	182	20.00	185	18.00	242	29.00	390
	X 250	508	82.6	508	83.9	457	109.8	737	176.9
	X 12	20.00	201	20.00	203	18.00	365	29.00	420
	X 300	508	91.2	508	92.1	457	165.6	737	190.5
	X 14	20.00	205	20.00	207	18.00	405	29.00	440
	X 350	508	93.0	508	93.9	457	183.7	737	199.6
	X 16	20.00	215	20.00	219	18.00	440	29.00	466
	X 400	508	97.5	508	99.3	457	199.6	737	211.4
24 600	X 18	20.00	266	20.00	269	18.00	485	29.00	507
	X 450	508	120.7	508	122.0	457	220.0	737	230.0
	X 8	+	+	+	+	+	+	+	+
	X 200	+	+	+	+	+	+	+	+
	X 10	+	+	+	+	+	+	+	+
	X 250	+	+	+	+	+	+	+	+
	X 12	24.00	293	24.00	295	22.00	525	34.00	620
	X 300	610	132.9	610	133.8	559	238.1	864	281.2
	X 14	24.00	300	24.00	305	22.00	535	34.00	640
	X 350	610	136.1	610	138.3	559	242.7	864	290.3
30 750	X 16	24.00	324	24.00	330	22.00	545	34.00	658
	X 400	610	147.0	610	149.7	559	247.2	864	298.5
	X 18	24.00	386	24.00	384	22.00	565	34.00	745
	X 450	610	175.1	610	174.2	559	256.3	864	337.9
	X 20	24.00	381	24.00	385	22.00	598	34.00	759
	X 500	610	172.8	610	174.6	559	271.2	864	344.3
	X 6	+	+	+	+	+	+	+	+
	X 150	+	+	+	+	+	+	+	+
	X 8	+	+	+	+	+	+	+	+
	X 200	+	+	+	+	+	+	+	+
36 900	X 10	+	+	+	+	+	+	+	+
	X 250	+	+	+	+	+	+	+	+
	X 12	+	+	+	+	+	+	+	+
	X 300	+	+	+	+	+	+	+	+
	X 14	+	+	+	+	25.00	566	+	+
	X 350	+	+	+	+	635	256.7	+	+
	X 16	+	+	30.00	466	25.00	596	41.50	1000
	X 400	+	+	762	211.4	635	270.3	1054	453.6
	X 18	30.00	500	30.00	500	25.00	631	41.50	1150
	X 450	762	226.8	762	226.8	635	286.2	1054	521.6
42 1050	X 20	30.00	535	30.00	715	25.00	675	41.50	1245
	X 500	762	242.7	762	324.3	635	306.2	1054	564.7
	X 24	30.00	689	30.00	595	25.00	1170	41.50	1400
	X 600	762	312.5	762	269.9	635	530.7	1054	635.0
	X 8	+	+	+	+	+	+	+	+
	X 200	+	+	+	+	+	+	+	+
	X 10	+	+	+	+	+	+	+	+
	X 250	+	+	+	+	+	+	+	+
	X 12	+	+	+	+	+	+	+	+
	X 300	+	+	+	+	+	+	+	+
48 1200	X 14	+	+	+	+	+	+	+	+
	X 350	+	+	+	+	+	+	+	+
	X 16	36.00	621	+	+	+	+	+	+
	X 400	914	281.7	+	+	+	+	+	+
	X 18	+	+	+	+	+	+	+	+
	X 450	+	+	+	+	+	+	+	+
	X 20	36.00	1280	36.00	+	+	+	49.00	1710
	X 500	914	580.6	914	+	+	+	1245	775.6
	X 24	36.00	1370	36.00	+	+	+	49.00	1960
	X 600	914	621.4	914	+	+	+	1245	889.0
54 1350	X 30	36.00	1136	36.00	+	+	+	49.00	2280
	X 750	914	515.3	914	+	+	+	1245	1034.2

+ Contact Star Pipe Products for Details
 *All dimensions in black text are in inches except where indicated. *All dimensions in blue text (below number) are in millimeters except where indicated.





AWWA Grooved Fittings



PIPE SIZE		AE-8C 90° FLARE			AE-9C 90° LONG RADIUS FLARE			AS-1C STRAIGHT FLARE		AE-10C** 90° SIDE OUTLET		AT-3C** TEE SIDE OUTLET	
NOM. SIZE	ACTUAL SIZE	A	B	APPROX. WEIGHT (LBS)/(KG)	A	B	APPROX. WEIGHT (LBS)/(KG)	L	APPROX. WEIGHT (LBS)/(KG)	A	APPROX. WEIGHT (LBS)/(KG)	A	APPROX. WEIGHT (LBS)/(KG)
3	3.96	5.50	8.50	18	7.75	11.25	23	8.00	13	5.50	13	5.50	28
80	100.6	140	216	8.2	197	286	10.4	203	5.9	140	5.9	140	12.7
4	4.80	6.50	9.50	35	9.00	12.50	42	8.00	17	6.50	30	6.50	42
100	121.9	165	241	15.9	229	318	19.1	203	7.7	165	13.6	165	19.1
6	6.90	8.00	12.00	70	11.50	15.00	68	8.00	23	8.00	58	8.00	85
150	175.3	203	305	31.8	292	381	30.9	203	10.4	203	26.3	203	38.6
8	9.05	9.00	13.00	120	14.00	18.50	118	10.00	43	9.00	90	9.00	114
200	229.9	229	330	54.4	356	470	53.5	254	19.5	229	40.8	229	51.7
10	11.10	11.00	15.00	157	16.50	22.50	188	10.00	58	11.00	124	11.00	219
250	281.9	279	381	71.2	419	572	85.3	254	26.3	279	56.3	279	99.3
12	13.20	12.00	16.00	190	19.00	25.50	275	12.00	100	12.00	170	12.00	295
300	335.3	305	406	86.2	483	648	124.7	305	45.4	305	77.1	305	133.8
14	15.30	14.00	22.00	235	21.50	29.00	325	12.00	120	14.00	202	14.00	290
350	388.6	356	559	106.6	546	737	147.4	305	40.8	356	91.6	356	131.5
16	17.40	15.00	23.00	300	24.00	32.00	435	16.00	156	15.00	272	15.00	337
400	442.0	381	584	136.1	610	813	197.3	406	70.8	381	123.4	381	152.9
18	19.50	16.50	24.50	391	26.50	35.00	571	16.00	205	16.50	378	16.50	456
450	495.3	419	622	177.4	673	889	259.0	406	93.0	419	171.5	419	206.8
20	21.60	18.00	26.00	496	29.00	38.00	713	18.00	221	18.00	468	18.00	607
500	548.6	457	660	225.0	737	965	331.6	457	100.3	457	212.3	457	275.3
24	25.80	22.00	30.00	808	34.00	44.50	1642	18.00	293	22.00	736	22.00	1048
600	655.3	559	762	366.5	864	1130	744.8	457	132.9	559	333.8	559	475.4
30	32.00	+	+	+	+	+	+	24.00	567	25.00	1097	25.00	1647
750	762.0	+	+	+	+	+	+	610	257.2	635	497.6	635	747.1
36	38.30	+	+	+	+	+	+	24.00	736	28.00	1740	28.00	2182
900	914.4	+	+	+	+	+	+	610	333.9	711	789.3	711	989.7

+ Contact Star Pipe Products for Details

*All dimensions in black text are in inches except where indicated.

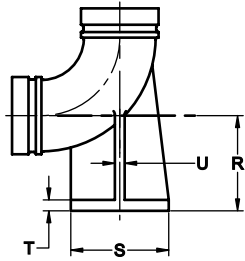
*All dimensions in blue text (below number) are in millimeters except where indicated.

**Reducing side outlet 90° elbows, tees and crosses are available. Contact Star Pipe Products for details.

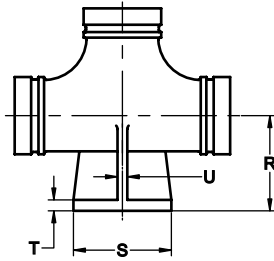
STAR[®] PIPE PRODUCTS



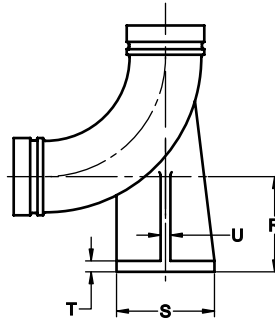
AWWA Grooved Fittings



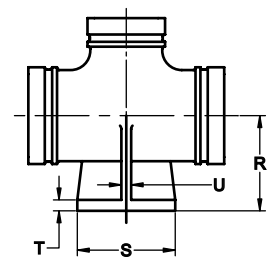
AE-11C
90° BASE ELBOW



AT-4C
BASE TEE



AE-12C
90° LONG RADIUS BASE ELBOW

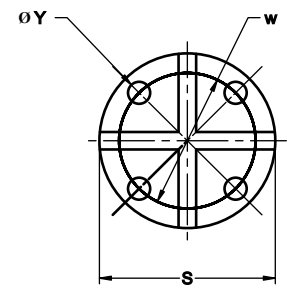


AT-5C
REDUCING BASE TEE

PIPE SIZE		BASE DIMENSIONS							APPROX. WEIGHT (LBS)/(KG)			
NOM. SIZE	ACTUAL SIZE	R	S	T	U	W	ØY	NO. OF BOLTS	AE-11C BASE ELBOW	AT-4C BASE TEE	AE-12C LR BASE ELBOW	AT-5C REDUCING BASE TEE
3	3.96	4.88	5.00	0.56	0.50	3.88	0.63	4	19	19	25	+
80	100.6	124	127	14	13	99	16		8.6	8.6	11.3	+
4	4.80	5.50	6.00	0.62	0.50	4.75	0.75	4	24	26	40	+
100	121.9	140	152	16	13	121	19		10.9	11.8	18.1	+
6	6.90	7.00	7.00	0.69	0.62	5.50	0.75	4	42	50	76	+
150	175.3	178	178	18	16	140	19		19.1	22.7	34.5	+
8	9.05	8.38	9.00	0.94	0.88	7.50	0.75	4	75	92	141	+
200	229.9	213	229	24	22	191	19		34.0	41.7	64.0	+
10	11.10	9.75	9.00	0.94	0.88	7.50	0.75	4	114	125	206	+
250	281.9	248	229	24	22	191	19		51.7	56.7	93.4	+
12	13.20	11.25	11.00	1.00	1.00	9.50	0.88	4	152	183	310	+
300	335.3	286	279	25	25	241	22		68.9	83.0	140.6	+
14	15.30	12.50	11.00	1.00	1.00	9.50	0.88	4	262	293	340	+
350	388.6	318	279	25	25	241	22		118.8	132.9	154.2	+
16	17.40	13.75	11.00	1.00	1.00	9.50	0.88	4	312	338	425	+
400	442.0	349	279	25	25	241	22		141.5	153.3	192.8	+
18	19.50	15.00	13.50	1.12	1.12	11.75	0.88	4	451	489	770	+
450	495.3	381	343	29	29	299	22		204.6	221.8	349.3	+
20	21.60	16.00	13.50	1.12	1.12	11.75	0.88	4	557	632	717	+
500	548.6	406	343	29	29	299	22		252.7	286.7	325.2	+
24	25.80	18.50	13.50	1.12	1.12	11.75	0.88	4	814	895	1056	+
600	655.3	470	343	29	29	299	22		369.2	406.0	479.0	+
30	32.00	23.00	16.00	1.19	1.15	14.25	1.00	4	1192	1742	2431	+
350	762.0	584	406	30	29	362	25		540.7	790.2	1102.7	+
36	38.30	26.00	19.00	1.25	1.15	17.00	1.00	4	1798	2240	3415	+
900	914.4	660	483	32	29	432	25		815.5	1016.0	1549.0	+

NOTES:

1. Bases of these fittings are intended for support in compression and are not to be used for anchors or supports in tension or shear.
2. Bases are faced and drilled. Dimension "R" is finished dimension.
3. Bases 3" - 24" meet the dimensions of ASME B16.1 and B16.42.



ROUND BASE

+ Contact Star Pipe Products for Details

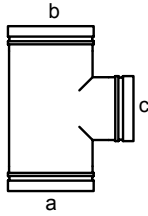
*All dimensions in black text are in inches except where indicated. *All dimensions in blue text (below number) are in millimeters except where indicated.



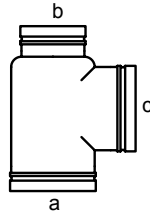
Reducing Fitting Outlet Designation

METHOD OF DESIGNATING OUTLETS OF REDUCING FITTINGS FOR SPECIFICATIONS

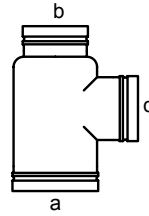
Reducing Tees



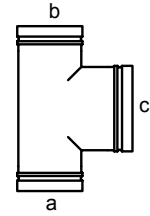
Reducing on Outlet



Reducing on One Run

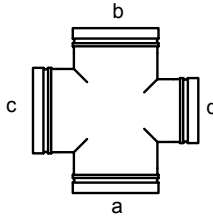


Reducing on One Run and Outlet

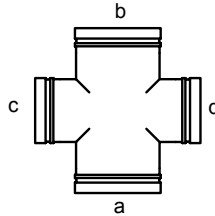


Reducing on Both Runs (Bull Head)

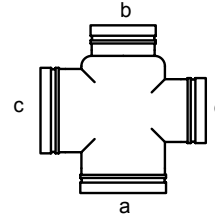
Reducing Crosses



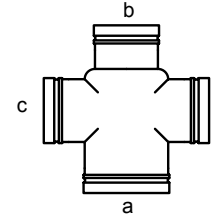
Reducing on One Outlet



Reducing on Both Outlets

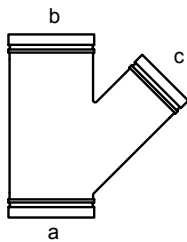


Reducing on One Run and Outlet

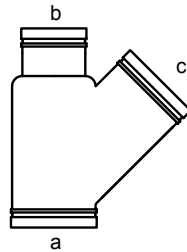


Reducing on One Run and Both Outlets

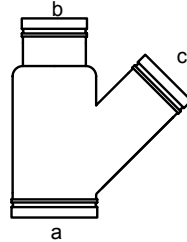
Reducing Laterals



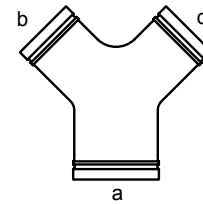
Reducing on Branch



Reducing on One Run

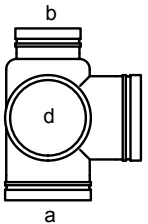


Reducing on One Run and Branch

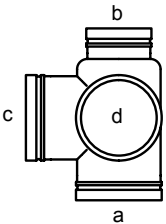


True Y

Side Outlet Tee

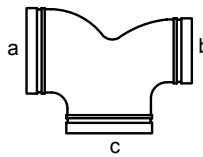


Right Hand



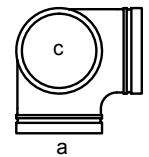
Left Hand

Double Branch Elbow

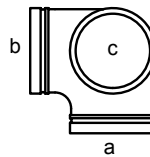


Double Branch Elbow

Side Outlet 90 deg. Elbow



Right Hand



Left Hand

The Largest opening establishes the basic size of a reducing fitting. The largest opening is named first, except for bull head tees which are reducing on both runs and double branch elbows where both branches are reducing; the outlet is the largest opening and named last in both cases.

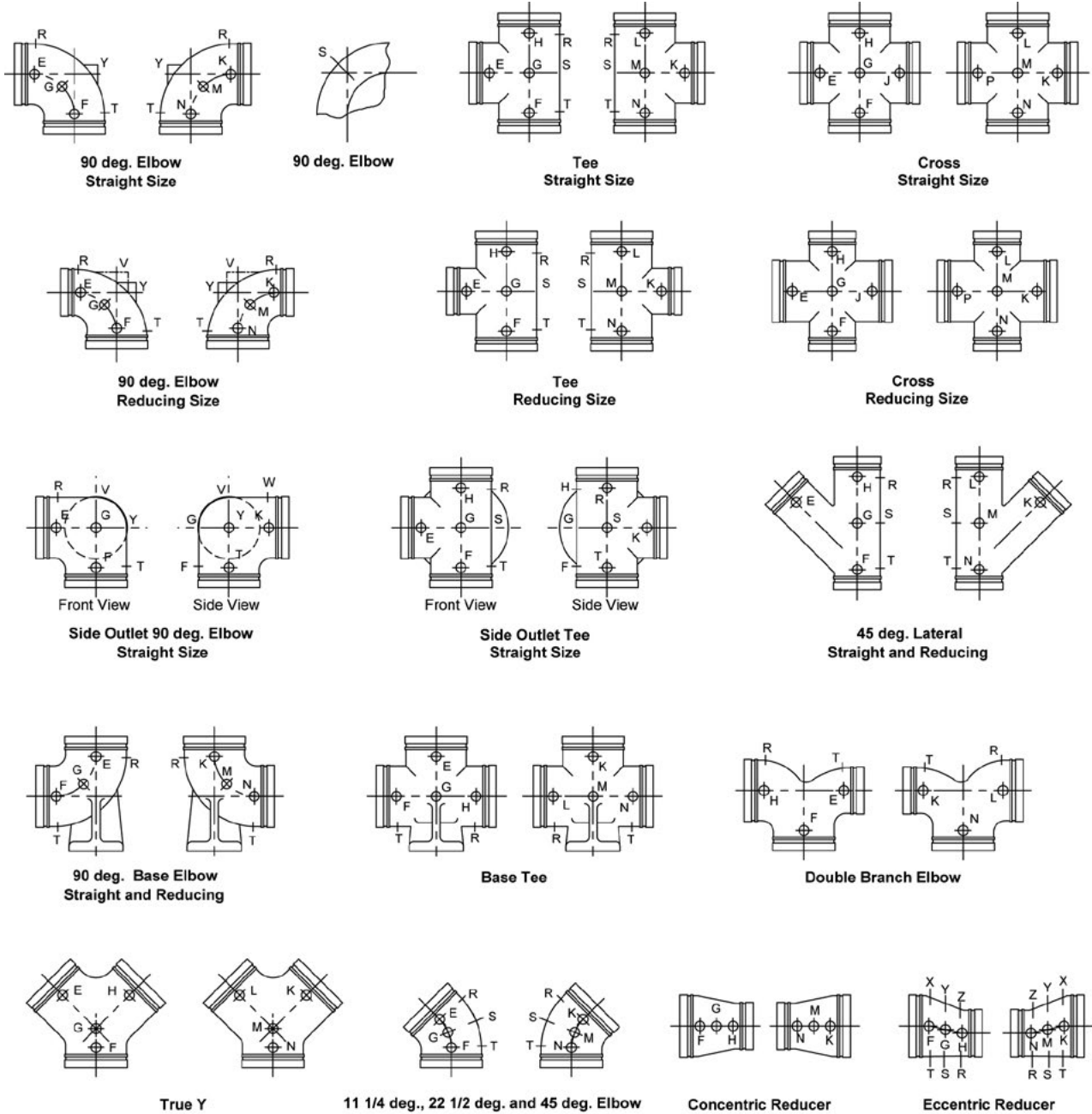
In designating the openings of reducing fittings, they should be read in the order indicated by the sequence of the letters, "a," "b," "c" and "d." In designating the outlets of side outlet reducing fittings, the side outlet is named last; and in the case of the side outlet cross, which is not shown, the side outlet is designated by the letter "e."

STAR[®] PIPE PRODUCTS



Tap Locations

METHOD OF DESIGNATING LOCATION OF TAPPED HOLES

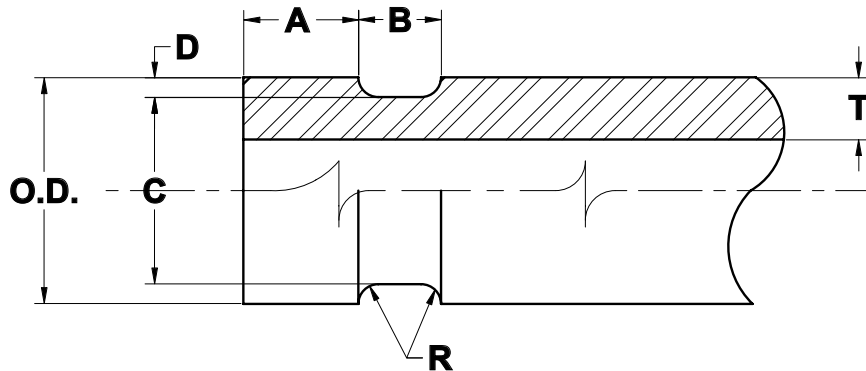


The above illustrations show two views of the same fitting and represent fittings with symmetrical shapes, with the exception of the side outlet elbow and the side outlet tee (straight sizes). If fitting wall thickness is insufficient for the required tap size or angle of tap, a boss will be required.

STAR® PIPE PRODUCTS



Pipe Preparations



DUCTILE IRON PRESSURE PIPE CUT GROOVING SPECIFICATIONS FOR FLEXIBLE AND RIGID JOINTS											
NOM. SIZE	PIPE OUTSIDE DIA.		GASKET SEAL		GROOVE WIDTH B +0.031/-0.016	GROOVE DIA. C		GROOVE DEPTH D		RADIUS R	MIN. WALL THICKNESS T
	ACTUAL O.D.	TOL.	FLEXIBLE JOINT A +0.016/-0.047	RIGID JOINT A +0.000/-0.020		ACTUAL	TOL.	MIN.	MAX.		
3	3.960	+0.045/-0.045	0.750	0.840	0.375	3.723	+0.000/-0.020	0.096	0.151	0.120	0.31
4	4.800	+0.060/-0.060	0.750	0.840	0.375	4.563	+0.000/-0.020	0.096	0.151	0.120	0.32
6	6.900	+0.060/-0.060	0.750	0.840	0.375	6.656	+0.000/-0.020	0.100	0.154	0.120	0.34
8	9.050	+0.060/-0.060	0.875	0.950	0.500	8.781	+0.000/-0.025	0.104	0.177	0.145	0.36
10	11.100	+0.060/-0.060	0.938	1.015	0.500	10.813	+0.000/-0.025	0.114	0.186	0.145	0.38
12	13.200	+0.060/-0.060	0.938	1.015	0.500	12.906	+0.000/-0.030	0.117	0.192	0.145	0.40
14	15.300	+0.050/-0.080	0.938	1.015	0.625	14.969	+0.000/-0.030	0.126	0.206	0.165	0.42
16	17.400	+0.050/-0.080	1.188	1.340	0.625	17.063	+0.000/-0.030	0.128	0.208	0.165	0.43
18	19.500	+0.050/-0.080	1.188	1.340	0.625	19.125	+0.000/-0.030	0.148	0.228	0.185	0.44
20	21.600	+0.050/-0.080	1.188	1.340	0.625	21.219	+0.000/-0.030	0.150	0.230	0.185	0.45
24	25.800	+0.050/-0.080	1.188	1.340	0.625	25.406	+0.000/-0.030	0.157	0.237	0.185	0.47
30	32.000	+0.080/-0.060	1.375	1.625	0.750	31.550	+0.000/-0.035	0.195	0.282	0.215	0.51
36	38.300	+0.080/-0.060	1.375	1.625	0.750	37.850	+0.000/-0.035	0.195	0.282	0.215	0.58

NOTES:

1. When rigid radius groove is used, the pipe or fitting ends are drawn together in contact as the coupling is tightened whereas when flexible radius groove is used it allows for moderate conditions of pipe movement or deflection due to thermal, seismic or settling activities.
2. Gasket seat "A" must be free from scores, seams, loose paint, scale, dirt, grease and rust to assure a leak tight seal.
3. Pipe end squareness (ends must be square cut) maximum allowable tolerance from square cut ends is 0.030" for 3" size, 0.045" for sizes 4" and 6", 0.060" for sizes 8" through 36".
4. Groove diameter must have uniform depth for entire circumference.
5. Pipe out of roundness - difference between maximum O.D. and minimum O.D. measured at 90° must not exceed total O.D. tolerance listed.

STAR[®] PIPE PRODUCTS





STAR PIPE PRODUCTS - SAMPLE SPECIFICATIONS

Grooved Piping System for AWWA Ductile Pipe – Mechanical grooved pipe couplings and fittings as manufactured by Star Pipe Products or equal shall be used on all ductile iron piping systems. Grooved end product manufacturer to be ISO-9001:2008 certified.

Pipe Materials – Grooved end ductile iron pipe shall be grooved in accordance with ANSI/AWWA Standard C-606. Rigid radius groove dimensions shall be utilized where flexibility is neither required nor desired. Flexible grooves shall be provided as necessary for settlement or expansion as determined and approved by the engineer.

Mechanical Couplings – Mechanical couplings shall be Star AC-9 cast of ductile iron conforming to ASTM A-536, grade 65-45-12, with rust resistant primer coating (unless specified otherwise) with a Flush synthetic rubber gasket and plated nuts and bolts, 3" - 36" size range.

Couplings Bolts/Nuts – Bolts shall be heat-treated plated carbon steel, track-head meeting the physical and chemical requirements of ASTM A-449 and physical requirements of ASTM A-183, or optional – hex head bolts and nuts shall be Type 316 stainless steel conforming to ASTM A-193, Grade B-8M, Class 2.

AC-9 Gaskets – Gaskets shall be flush design molded of synthetic rubber to conform to ductile pipe surfaces with a short center leg which shall bridge the pipe ends offering an initial seal on the leading edge of the pipe ends. Elastomers shall have properties as designated in ASTM D-2000. Reference shall always be made to the latest published Selection Guide for Star gaskets for proper gasket selection for the intended service.

Water Service/Ductile Iron Pipe – Gasket supplied for water service from -20° F to +200° F on ductile iron pipe shall be Grade "M" halogenated butyl, with brown color code, specially compounded to conform to ductile pipe surfaces recommended for water service within the specified temperature range plus a variety of diluted acids, oil-free air, and many chemical services (not recommended for petroleum services). Gasket supplied for water service from -20° F to +200° F for the Star AF-4 flange adapter shall be Grade "M" halogenated butyl.

Oil Service/Ductile Iron Pipe – Gasket supplied from -20° F to +180° F on ductile iron pipe shall be Grade "S" nitrile, with red color code, compounded to conform to ductile pipe surfaces recommended for petroleum products, air with oil vapors, vegetable and mineral oils within the specified temperature range, except hot dry air over +140° F and water over +150° F. Not recommended for hot water services.

Fittings – Fittings shall be ductile iron conforming to ASTM A-536, grade 65-45-12 and conform to the requirements of ANSI/AWWA-C110/A21.10 for center to end dimensions and ANSI/AWWA-C110/A21.10 or ANSI/AWWA C153/A21.53 for wall thickness. End preparation are per ANSI/AWWA-C606 rigid radius grooving.

Grooved/Flanged Transition Components – Star AF-4 flange adapter shall be used for connecting grooved fittings to flanged valves, pumps, pipe, fittings, and other Class 125 flanged components. The flange adapters shall be ductile iron conforming to ASTM A-536, grade 65-45-12, 3" - 24" size range. Gaskets shall have properties as designated by ASTM D-2000 of the same compounded elastomer as the couplings, and shall be suitable for the required service. Latch bolts & nuts shall be same as for the couplings.

STAR® PIPE PRODUCTS