



WEAVER CONSTRUCTION MANAGEMENT, INC.
 3679 S. Huron St., Suite 404
 Englewood, CO 80110
 Phone: (303) 789-4111 FAX: (303) 789-4310

S U B M I T T A L T R A N S M I T A L

November 18, 2011
WCM Submittal No: 02615-004

PROJECT: Harold Thompson Regional WRF
 Birdsall Rd.
 Fountain, CO 80817
 Job No. 2908

ENGINEER: GMS, Inc.
 611 No. Weber St., #300
 Colorado Springs, CO 80903
 719-475-2935 Roger Sams

OWNER: Lower Fountain Metropolitan
 Sewage Disposal District
 901 S. Santa Fe Ave.
 Fountain, CO 80817
 719-382-5303 James Heckman

CONTRACTOR: Weaver Construction Management

SUBJECT: DIP Wall Pipes & Protecto 401 Lining for Pump & Disinfection Building

SPEC SECTION: 02615 - Ductile Iron Pipe

PREVIOUS SUBMISSION DATES: none

DEVIATIONS FROM SPEC: ___ YES X NO

CONTRACTOR'S STAMP: This submittal has been reviewed by WCM and approved with respect to the means, methods, techniques, & safety precautions & programs incidental thereto. Weaver General Construction also warrants that this submittal complies with contracted documents and comprises on deviations thereto.

Contractor's Stamp: Date: 11/18/11 Reviewed by: H.C. Myers (X) Reviewed Without Comments () Reviewed With Comments	Engineer's Stamp:
ENGINEER'S COMMENTS: _____ _____ _____	



Project: HDTWRF Project

Location: Fountain, CO

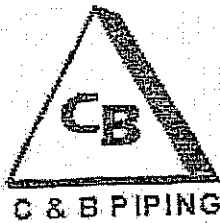
Supplier: Superior Sales

Date: 11/18/11

Subject: Submittal 02615-004 DIP Wall pipes & Protecto 401 Lining for Pump & Disinfection Building

- 1. Products previously were submitted and approved under 02615-001, but submittal did not specifically include the pump and disinfection building.**

02615.001.



C & B Piping, Inc.
P.O. Box 942
Leeds, AL 35094

Phone: (205) 699-0455
Fax: (205) 699-0773

TO WHOM IT MAY CONCERN:

- (1) ALL DUCTILE IRON PIPE IS IN ACCORDANCE WITH ANSI/AWWA C151/A21.51, ANSI/AWWA C150/A21.50. ALL DUCTILE IRON PIPE USED FOR FABRICATION IS CLASS 53 MINIMUM.
- (2) INTERIOR LINING IS ~~CEMENT MORTAR LINED, DOUBLE THICKNESS, OR BARE IF APPLICABLE, AND BITUMINOUS SEAL COAT IN ACCORDANCE WITH ANSI/21.4 AND AWWA C-104.~~ PROTECTO 401 LINED 40 MILS THICK FOR SEWER PIPE IS AVAILABLE WHEN REQUIRED.
- (3) EXTERIOR COATING IS STANDARD SHOP PRIMER OR BITUMINOUS COAT AS REQUIRED.
- (4) ALL FLANGES ARE SCREWED ON, FACED AND DRILLED IN ACCORDANCE TO AWWA C-110/A21.10 AND AWWA/C-115/A21.15. ALL FLANGES ARE DRILLED TO ANSI B16.1 SPECIFICATIONS, CLASS 125 OR CLASS 250, AS SPECIFIED. ALL FLANGES ARE DUCTILE IRON.
- (5) ALL WALL RINGS ARE DUCTILE IRON AND FULLY WELDED TO THE PIPE ON BOTH SIDES.
- (6) ALL FABRICATED DUCTILE IRON GROOVED END PIPE IS IN ACCORDANCE WITH ANSI/AWWA C-606. CONTRACTOR TO SPECIFY RIGID OR FLEXIBLE RADIUS GROOVE. RIGID RADIUS GROOVE WILL BE SUPPLIED IF NOT SPECIFIED.
- (7) ALL FLANGED FITTING SUPPLIED BY C & B PIPING, INC. CONFORM TO AWWA C110/ANSI A21.10. ALL MJ FITTINGS CONFORM TO ANSI/AWWA C-110/A21.10 AND AWWA C-111/A21.11 OR ANSI/AWWA C-153/A21.53, AS SPECIFIED.

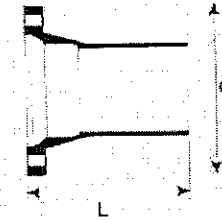
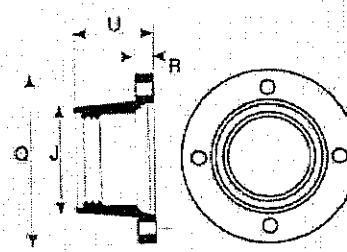
C & B PIPING, INC.

www.sigmaco.com

For use with ductile iron pipe fabricated in accordance with AWWA/ANSI C115/A21.15. Cast Iron per ASTM A126 Class B. Ductile Iron per ASTM A536.

Bolt holes are tapped for use with stud bolts threaded per ANSI B16.1 where applicable. Bells threaded in accordance with USAS B2.1 where applicable.

Flanges are fully machined, drilled and faced in accordance with ANSI B16.1 - 125 lb.

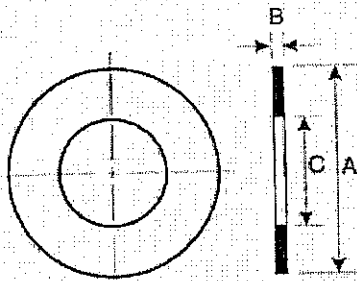


PLAIN END MJ BELL ADAPTERS

THREADED MJ BELL ADAPTERS

Size	Item No.	Wt.	O.D.	R	U	Thread Length	Q	J	Bolt Circle	Tap Size	No. Bolts
3	MBA3	11	3.96	0.94	4.12	1.25	7.69	4.5	6.19	5/8-11	4
4	MBA4	16	4.80	1.00	4.25	1.31	9.12	5.32	7.50	3/4-10	4
6	MBA6	23	6.90	1.06	4.43	1.44	11.12	7.56	9.50	3/4-10	6
8	MBA8	31	9.05	1.12	4.75	1.75	13.37	9.73	11.75	3/4-10	6
10	MBA10	41	11.10	1.19	4.87	1.88	15.69	12.06	14.00	3/4-10	8
12	MBA12	55	13.20	1.25	5.12	2.00	17.94	14.16	16.25	3/4-10	8
14	MBA14	85	15.30	1.31	6.50	2.00	20.31	16.25	18.75	3/4-10	10
16	MBA16	105	17.40	1.38	6.75	2.00	22.56	18.43	21.00	3/4-10	12
18	MBA18	125	19.50	1.44	7.00	2.20	24.83	20.53	23.25	3/4-10	12
20	MBA20	150	21.60	1.50	7.24	2.38	27.08	22.63	25.50	3/4-10	14
24	MBA24	235	25.80	1.62	7.50	2.63	31.58	26.82	30.00	3/4-10	16
30	MBA30	375	32.00	1.81	9.13	3.25	39.12	32.75	36.88	1-8	20
36	MBA36	500	38.30	2.00	9.75	4.00	46.00	39.12	43.75	1-8	24
42	MBA42	640	44.50	2.00	10.25	4.50	53.12	45.31	50.62	1 1/4 x 7	28
48	MBA48	810	50.80	2.00	10.25	5.12	60.00	51.75	57.50	1 1/4 x 7	32

Size	Item No.	L	Wt.
3	MB23	24	39
4	MB24	24	50
6	MB26	24	76
8	MB28	24	107
10	MB210	24	146
12	MB212	24	193
14	MB214	24	184
16	MB216	24	231
18	MB218	24	269
20	MB220	24	360
24	MB224	24	436
30	MB230	24	737
36	MB236	24	1084
42	MB242	24	1228
48	MB248	24	1546



ANCHOR FLANGES (Ductile Iron)

Size	Wt.	Item No.	A	B	C
3	3	AF3	6.50	0.50	4.03
4	4	AF4	7.40	0.50	4.87
6	5	AF6	9.50	0.50	6.97
8	7	AF8	12.00	0.50	9.13
10	8	AF10	14.10	0.50	11.17
12	11	AF12	16.25	0.50	13.27
14	13	AF14	18.40	0.50	15.38
16	16	AF16	21.00	0.50	17.48
18	18	AF18	23.10	0.50	19.59
20	22	AF20	25.70	0.50	21.69
24	26	AF24	30.00	0.50	25.90
30	49	AF30	37.00	0.625	32.10
36	60	AF36	43.40	0.625	38.40
42	82	AF42	49.50	0.75	44.50
48	94	AF48	55.90	0.75	50.90

FILLER FLANGES (Cast Iron)

1-1/4" Thick

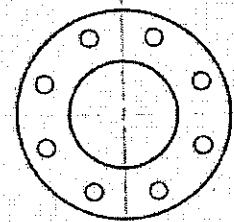
Size	Item No.	O.D.	Wt.
3	FF31	7.50	11
4	FF41	9.00	15
6	FF61	11.00	20
8	FF81	13.50	29
10	FF101	16.00	37
12	FF121	19.00	52

2-1/4" Thick

Size	Item No.	O.D.	Wt.
3	FF32	7.50	21
4	FF42	9.00	28
6	FF62	11.00	36
8	FF82	13.50	52
10	FF102	16.00	66
12	FF122	19.00	94

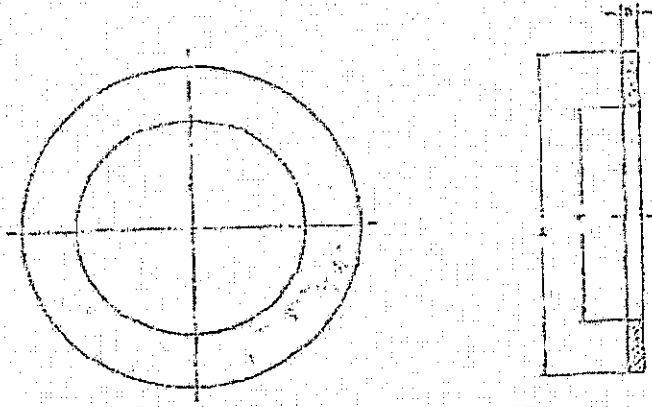
3-1/4" Thick

Size	Item No.	O.D.	Wt.
3	FF33	7.50	28
4	FF43	9.00	37
6	FF63	11.00	48
8	FF83	13.50	69
10	FF103	16.00	88
12	FF123	19.00	126



Dimensions in Inches
Weights in Pounds

Ductile Iron Wall Collars



Nominal Pipe Size	Outside Diameter (A)	Overall Thickness (B)	Inside Diameter (C)
3"	6.48	0.50	4.00
4"	7.38	0.50	4.85
6"	9.46	0.50	6.95
8"	11.98	0.50	9.10
10"	14.05	0.50	11.15
12"	16.20	0.50	13.20
14"	18.35	0.50	15.35
16"	20.95	0.50	17.45
18"	23.05	0.50	19.50
20"	25.65	0.50	21.60
24"	29.95	0.50	25.85
30"	36.90	0.63	32.00
36"	43.25	0.63	38.30
42"	49.35	0.75	44.40
48"	55.75	0.75	50.75
54"	62.65	0.75	57.65
60"	66.75	0.75	61.70

* All dimensions are in inches where applicable.

* Material: Ductile Iron (ASTM A536 - 70:50:05)

* Wall collars have 0.06" raised face.

* For use with Ductile Iron Pipe fabricated in accordance with AWWA/ANSI C115/A21.15 & NAPF 300 standards.



MECHANICAL JOINT C153 DUCTILE IRON COMPACT FITTINGS

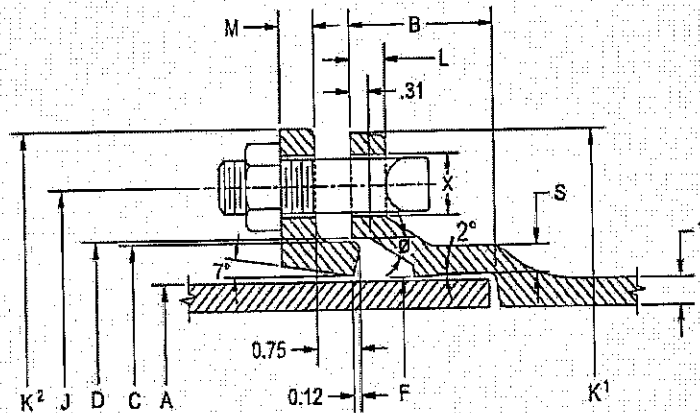
Sizes 3" thru 12" UL Listed For Fire Main Equipment

SAMPLE SPECIFICATIONS

Mechanical Joint watermain fittings with accessories, 3" through 48" shall be manufactured from Ductile Iron in accordance with and meet all applicable terms and provisions of standards ANSI/AWWA C153/A21.53 ANSI/AWWA C111/A21.11 (current revisions). Ductile Iron Mechanical Joint Fittings 3" through 24" shall be rated for 350 PSI working pressure. 30" through 48" shall be rated for 250 psi working pressure. Flanged ductile-iron fittings in 24-in. (610 mm) and smaller sizes may be rated for 350 psi (2,413 kPa) with the use of special gaskets. All coated fittings meet requirements of NSF-61.

NOTE - EXCEPTIONS: Mechanical Joint Fittings with flanged branches are rated for water pressure of 250 PSI.

NOTE: Fittings are CEMENT LINED and seal coated in accordance with ANSI/AWWA C104/A21.4, also available double cement lined, bare or epoxy coated.



JOINT DIMENSIONS IN INCHES

BOLTS

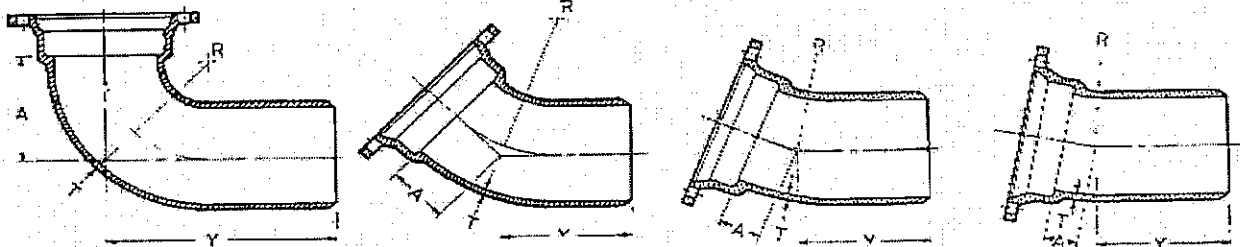
Size	A Dia.	B	C Dia.	D Dia.	F Dia.	J Dia.	K' Dia.	K² Dia.	L	M	S	T	X	Size	No.
3	3.96	2.50	4.84	4.94	4.06	6.19	7.62	7.69	.58	.62	.39	.33	3/4	5/8x3	4
4	4.80	2.50	5.92	6.02	4.90	7.50	9.06	9.12	.60	.75	.39	.34	7/8	3/4x3 1/2	4
6	6.90	2.50	8.02	8.12	7.00	9.50	11.06	11.12	.63	.88	.43	.36	7/8	3/4x3 1/2	6
8	9.05	2.50	10.17	10.27	9.15	11.75	13.31	13.37	.66	1.00	.45	.38	7/8	3/4x3 1/2	6
10	11.10	2.50	12.22	12.34	11.20	14.00	15.62	15.62	.70	1.00	.47	.40	7/8	3/4x3 1/2	8
12	13.20	2.50	14.32	14.44	13.30	16.25	17.88	17.88	.73	1.00	.49	.42	7/8	3/4x3 1/2	8
14	15.30	3.50	16.40	16.54	15.44	18.75	20.31	20.25	.79	1.25	.56	.47	7/8	3/4x4	10
16	17.40	3.50	18.50	18.64	17.54	21.00	22.56	22.50	.85	1.31	.57	.50	7/8	3/4x4	12
18	19.50	3.50	20.60	20.74	19.64	23.25	24.83	24.75	1.00	1.38	.68	.54	7/8	3/4x4	12
20	21.60	3.50	22.70	22.84	21.74	25.50	27.08	27.00	1.02	1.44	.69	.57	7/8	3/4x4	14
24	25.80	3.50	26.90	27.04	25.94	30.00	31.58	31.50	1.02	1.56	.75	.61	7/8	3/4x4 1/2	16
30	32.00	4.00	33.29	33.46	32.17	36.88	39.12	39.12	1.31	2.00	.82	.66	1 1/8	1x5 1/2	20
36	38.30	4.00	39.59	39.76	38.47	43.75	46.00	46.00	1.45	2.00	1.00	.74	1 1/8	1x5 1/2	24
42	44.50	4.00	45.79	45.96	44.67	50.62	53.12	53.12	1.45	2.00	1.25	.82	1 3/8	1 1/2x6 1/2	28
48	50.80	4.00	52.09	52.26	50.97	57.50	60.00	60.00	1.45	2.00	1.35	.90	1 3/8	1 1/2x6 1/2	32



MECHANICAL JOINT C153 DUCTILE IRON COMPACT FITTINGS

Sizes 3" thru 12" UL Listed For Fire Main Equipment

BENDS



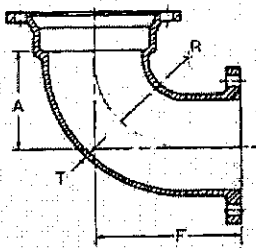
90° Bend MJ x PE (1/4)

45° Bend MJ x PE (1/8)

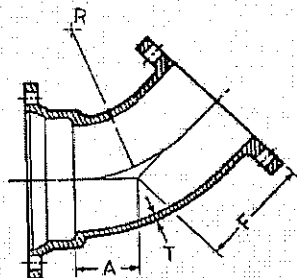
22 1/2° Bend MJ x PE (1/16)

11 1/4° Bend MJ x PE (1/32)

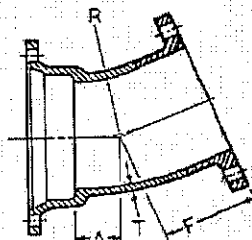
Size	Dimensions					Dimensions					Dimensions					Dimensions				
	T	A	Y	R	Weight	A	Y	R	Weight	A	Y	R	Weight	A	Y	R	Weight			
3	.34	3.5	9.0	2.5	18	2.0	7.5	2.47	17	1.50	7.00	2.57	19	1.25	6.75	7.62	15			
4	.35	4.0	9.5	3.0	26	2.5	8.0	3.56	22	1.75	7.25	3.81	20	1.50	7.00	5.12	20			
6	.37	6.0	11.5	5.0	45	3.2	8.7	5.49	38	2.25	7.75	6.35	33	1.50	7.00	5.12	32			
8	.39	7.5	13.0	7.0	64	4.0	9.5	8.44	55	2.84	8.34	11.80	51	2.05	7.55	15.80	44			
10	.41	9.5	15.0	9.0	108	5.0	10.5	10.88	78	3.35	8.85	14.35	66	2.31	7.81	18.36	60			
12	.43	9.0	14.4	6.0	114	6.0	11.5	13.25	104	3.50	9.00	12.70	89	2.56	8.06	20.90	79			
14	.51	12.0	20.0	11.5	219	5.5	13.4	10.85	165	3.93	11.93	17.25	152	2.59	10.59	21.25	137			
16	.52	13.0	21.0	12.5	254	6.0	14.0	13.25	206	3.98	11.98	17.50	181	2.62	10.62	21.50	161			
24	.62	17.0	25.0	15.5	710	7.5	16.6	14.69	460	9.00	17.66	37.69	455	9.00	26.12	12.00	475			
30	.68	21.5	30.5	--	865	10.5	19.5	--	715	6.75	15.75	--	600	--	--	--	--			



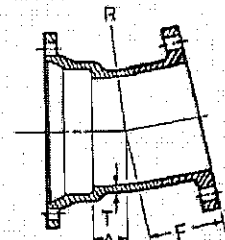
90° Bend MJ x Flange (1/4)



45° Bend MJ x Flange (1/8)



22 1/2° Bend MJ x Flange (1/16)



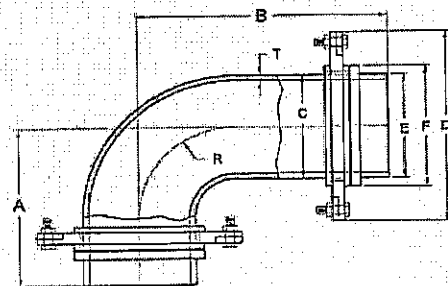
11 1/4° Bend MJ x Flange (1/32)

Size	Dimensions					Dimensions					Dimensions					Dimensions				
	T	A	R	F	Weight	A	R	F	Weight	A	R	F	Weight	A	R	F	Weight			
3	.34	3.5	2.5	5.5	21		
4	.35	4.0	3.0	6.5	28	2.50	3.56	4.0	34	1.75	3.81	4.0	34	1.50	5.12	4.0	19			
6	.37	6.0	5.0	8.0	45	3.25	5.49	5.0	57	2.25	5.35	5.0	57	1.50	5.12	5.0	30			
8	.39	7.5	7.0	9.0	73	4.25	7.93	5.5	83	2.50	7.62	5.5	83	1.75	7.70	5.5	50			
10	.41	9.5	9.0	11.0	113	5.00	9.76	6.5	122	3.00	10.16	6.5	122	2.00	10.25	6.5	75			
12	.43	10.5	10.0	12.0	141	6.00	12.19	7.5	159	3.50	12.70	7.5	159	2.25	12.82	7.5	88			
14	.51	12.0	11.5	14.0	217	5.50	10.85	8.5	207											
16	.52	13.0	12.5	15.0	280	6.00	12.02	9.5	290											

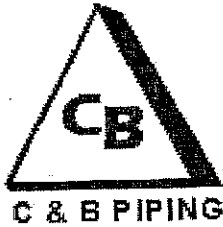
90° Swivel x Swivel Hydrant Ell

Size	Dimensions							
	T	A	B	C	D	E	F	R
6	.37	10.5	15.5	6.90	11.2	6.81	7.98	6.0

* Weight includes two swivel glands.



Tyler Utilities Division • 11910 CR 492 • Tyler, Texas 75706 • (800) 527-8478
 Union Foundry Company • Box 309 • Anniston, Alabama 36202 • (800) 226-7601



C & B Piping, Inc.
P.O. Box 942
Leeds, AL 35094

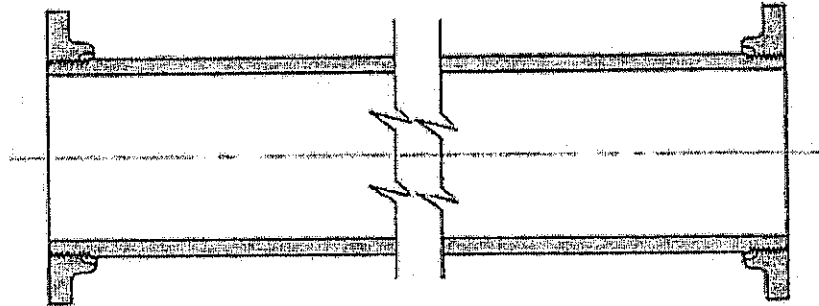
Phone: (205) 699-0455
Fax: (205) 699-0773

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C & B PIPING, INC.

Ductile Iron Flanged Pipe with Threaded Flanges



Size	Pressure Rating Psi	Outside Diameter of Pipe in.	Minimum Wall Thickness of Pipe in.	Maximum Length		Weight in Pounds		
						Flange	Pipe w/o Flanges	Pipe w/ Flanges **
				Ft.	In.		Per Foot	Per Length
3	250	3.96	0.31	19'	6"	7	10.9	225
4	350*	4.80	0.32	17'	6"	13	13.8	270
6	350*	6.90	0.34	17'	6"	17	21.4	410
8	350*	9.05	0.36	17'	6"	28	30.1	580
10	350*	11.10	0.38	17'	6"	38	39.2	760
12	350*	13.20	0.40	17'	6"	58	49.2	975
14	250	15.30	0.42	17'	6"	72	60.1	1195
16	250	17.40	0.43	17'	6"	90	70.1	1405
18	250	19.50	0.44	17'	6"	90	80.6	1590
20	250	21.60	0.45	17'	6"	115	91.5	1830
24	250	25.80	0.47	17'	6"	160	114.4	2325
30	250	32.00	0.51	17'	6"	240	154.4	3185
36	250	38.30	0.58	17'	6"	350	210.3	4380
42	250	44.50	0.65	17'	6"	500	274.0	5795
48	250	50.80	0.72	19'	6"	625	346.6	8010
54	150	57.56	0.81	19'	6"	670	441.9	9955
60	150	61.61	0.83	19'	6"	1035	485.0	11525
64	150	65.67	0.87	19'	6"	1510	542.0	13590

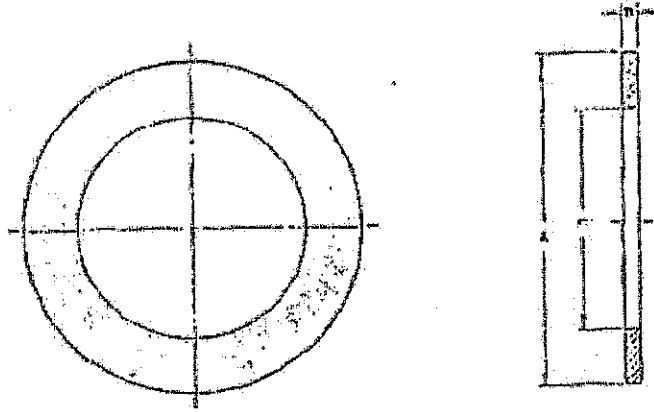
* Flange Pipe CL 53.

** Sizes 4"-42" -- weights shown for nominal 17'6" lengths.

3", 48"-64" -- weights shown for nominal 19'6" lengths.

For bolt hole details see page 4.

Ductile Iron Wall Collars



Nominal Pipe Size	Outside Diameter (A)	Overall Thickness (B)	Inside Diameter (C)
3"	6.48	0.50	4.00
4"	7.38	0.50	4.85
→ 6"	9.46	0.50	6.95
8"	11.98	0.50	9.10
10"	14.05	0.50	11.15
→ 12"	16.20	0.50	13.20
14"	18.35	0.50	15.35
→ 16"	20.95	0.50	17.45
18"	23.05	0.50	19.50
20"	25.65	0.50	21.60
→ 24"	29.95	0.50	25.85
30"	36.90	0.63	32.00
36"	43.25	0.63	38.30
42"	49.35	0.75	44.40
48"	55.75	0.75	50.75
54"	62.65	0.75	57.65
60"	66.75	0.75	61.70

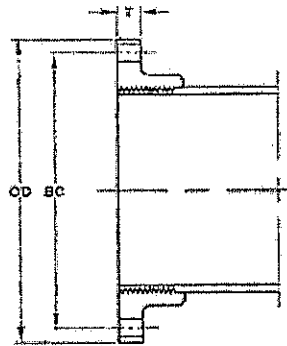
* All dimensions are in inches where applicable.

* Material: Ductile Iron (ASTM A536 - 70:50:05)

* Wall collars have 0.06" raised face.

* For use with Ductile Iron Pipe fabricated in accordance with AWWA/ANSI C115/A21.15 & NAPF 300 standards.

Ductile Iron Flanged Pipe with Threaded Flanges Flange Details



Size In.	Dimensions in Inches					No. of Bolts
	OD	BC	T	Bolt Hole Dia.	Bolt Dia. & Lgth.	
3	7.50	6.00	.75 ± .12	3/4	5/8 x 2 1/2	4
4	9.00	7.50	.94 ± .12	3/4	5/8 x 3	8
6	11.00	9.50	1.00 ± .12	7/8	3/4 x 3 1/2	8
8	13.50	11.75	1.12 ± .12	7/8	3/4 x 3 1/2	8
10	16.00	14.25	1.19 ± .12	1	7/8 x 4	12
12	19.00	17.00	1.25 ± .12	1	7/8 x 4	12
14	21.00	18.75	1.38 ± .19	1 1/8	1 x 4 1/2	12
16	23.50	21.25	1.44 ± .19	1 1/8	1 x 4 1/2	16
18	25.00	22.75	1.56 ± .19	1 1/4	1 1/8 x 5	16
20	27.50	25.00	1.69 ± .19	1 1/4	1 1/8 x 5	20
24	32.00	29.50	1.88 ± .19	1 3/8	1 1/4 x 5 1/2	20
30	38.75	36.00	2.12 ± .25	1 3/8	1 1/4 x 6 1/2	28
36	46.00	42.75	2.38 ± .25	1 5/8	1 1/2 x 7	32
42	53.00	49.50	2.62 ± .25	1 5/8	1 1/2 x 7 1/2	36
48	59.50	56.00	2.75 ± .25	1 5/8	1 1/2 x 8	44
54	66.25	62.75	3.00 ± .25	2	1 3/4 x 8 1/2	44
60	73.00	69.25	3.12 ± .25	2	1 3/4 x 9	52
64	80.00	76.00	3.38 ± .25	2	1 3/4 x 9	52

FACING:

Flanges are plain faces without projection or raised face and are furnished smooth or with shallow serrations.

BACK FACING:

Flanges may be back or spot faced for compliance with flange thickness tolerances.

LAYING LENGTH DIMENSIONS:

Pipe face-to-face dimensions conform to a tolerance of ±0.12 in. for sizes 3-64 in.

Fittings face-to-face dimensions conform to a tolerance of 0.06 in. for sizes 3-10 in. and ±.12 in. for sizes 12-64 in.

Center-to-face tolerances are one half the face-to-face tolerances.

The largest opening governs the tolerance for all openings.

FLANGES:

The bolt circle and bolt holes of these flanges match those of ANSI / AWWA C115 / A21.15 and Class 125 flanges shown in ANSI B16.1 and can be joined with A21.15 and Class 125 B16.1 flanges. The flanges do not match the Class 250 flanges shown in ANSI B16.1 and cannot be joined with Class 250 B16.1 flange fittings and valves.



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Standard For Lining Ductile Iron Pipe and Fittings For Sewer Service

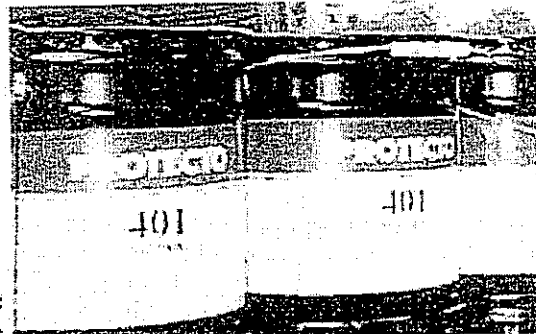
QUALIFIED UNDER	
ASTM E-96	ASTM G-14
ASTM G-95	ASTM D-714
ASTM B-117	ASTM D-1308

PROTECTO 401 Table of Contents

— Select Item Below —

Protecto 401 lined ductile iron pipe and fittings provide the maximum protection and the strength necessary to do the job in tough sewer pipe applications. Protecto 401 has successfully been used in hundreds of sanitary sewer applications and has been proven with both laboratory testing and years of actual sewer service on all sizes of ductile iron pipe and fittings. The development of Protecto 401 was begun in 1979. The first ductile iron sewer pipe was lined and placed in service in 1981. Since then hundreds of miles of ductile iron sewer pipe have been lined with Protecto 401 with no lining failure.

Because Protecto 401 Ceramic Epoxy Lining was designed and is used as protection for ductile iron sanitary sewer pipe, it provides the reliability of cement mortar lining with the excellent corrosion protection of novalac epoxy. This concentration of effort has resulted in performance unparalleled by other linings.



Protecto 401 has been tested extensively. The Table of Contents contains results of these tests and other data associated with lining for ductile

iron sewer pipe. *Because the specifications for application and testing of Protecto 401 Ceramic Epoxy have been developed for ductile iron pipe using test data and performance history, no deviations from the specification shall be permitted without prior written approval of the lining manufacturer. If required, third party inspection of Protecto 401 Ceramic Epoxy lined ductile iron pipe shall be done only after written notice to the applicator of Protecto 401 Ceramic Epoxy. Any third party inspection shall be accomplished using standard Protecto 401 Ceramic Epoxy Quality Control Procedures.*

Protecto 401 is applied to the interior of ductile pipe and fittings utilizing specialized application equipment and a stringent specification. The lining is designed to be applied at a nominal 40 mils thickness. A nondestructive pinhole detection test and a thickness test is performed to insure a sound, chemically resistant protective lining for ductile iron pipe and fittings.

Protecto 401 is intended for use in domestic sanitary sewage lines. Chemical injection for odor control may damage pipe, gaskets, and/or protective linings and should be undertaken with extreme caution. Requests for industrial sewer applications of Protecto 401 lined ductile pipe and fittings should be made to a pipe marketing representative for individual recommendations.



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SIMULATED SEWER ENVIRONMENT ACCELERATED TESTING OF PROTECTO 401 LINING IN PRODUCTION RUN DUCTILE IRON PIPE

TEST	RESULTS
120°F Water Immersion	2.0 years No undercutting at scribe. No effect when rated using ASTM D 714-87
160°F Distilled Water Immersion	2.0 years No undercutting at scribe. No effect when rated using ASTM D 714-87
140°F 25% Sodium Hydroxide Immersion	2.0 years No effect when rated using ASTM D 714-87
20% Sulfuric Acid Immersion	2.0 years No effect when rated using ASTM D 714-87
ASTM D 714-87 Salt Spray 5% Salt @ 98°F	2.0 years No undercutting at scribe. No other effect when rated using ASTM D 714-87
EN 12412-1 Section 7.8 Abrasion Resistance	.002 inch (.05mm) loss After one million cycles

Note: All Immersion tests are currently ongoing.

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TEST METHOD: ASTM G-95: Standard Test Method for Resistance to Cathodic Disbondment by the Attached Cell Method.

COATING SYSTEM: PROTECTO 401 CERAMIC EPOXY Lining: Plant applied Protecto 401 Ceramic Epoxy lined ductile iron pipe (DIP) cut into 6 inch x 6 inch coupons.

PROCEDURE: Following ASTM G-95, a five inch tall by four inch diameter section of PVC pipe, ground to the approximate curvature of the internal surface of the pipe coupon, was attached via RTC silicone caulk. A 0.25 inch holiday was drilled through the coating to metal in the center of each coupon. A 0.25 inch hole was drilled through one corner of each coupon and fitted with a bolt to provide attachment of the negative lead from the impressed current cathodic protection power supply. Triplicate coupons were subjected to simulated cathodic protection by impressing a 1.5 volt potential between the metal and an electrode within the CD cell for a period of thirty days. The electrolyte used was 3% sodium chloride in tap water.

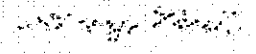
An additional set of coupons were subjected to the same test regime with the exception that they were maintained at 60°C on a sand bath. The hot (60°C) cells were covered with plastic wrap to minimize evaporative losses. Evolved hydrogen was able to escape through the plastic and did not present a problem.

The values given are in mm of disbondment increase in diameter from original RADIUS of holiday.

Panel Number:	Increase in RADIUS:	Panel Number:	Increase in RADIUS:
154 (Room Temp.)	0 mm	* 155 hot (60°C)	xx
157 (Room Temp.)	0 mm	* 158 hot (60°C)	xx
156 (Room Temp.)	0.5 mm	159 hot (60°C)	2 mm

* Over heated; suffered thermal damage after leaking dry over week end.

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Dr. George Mills



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DATE: March 14, 1994

TEST METHOD: ASTM D-1308: Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Finishes. (Chemical Soak Test with Nine Test Solutions)

COATING SYSTEM: PROTECTO 401 CERAMIC EPOXY Lining: Plant applied Protecto 401 lined ductile iron pipe (DIP) cut into 3 inch x 4 inch coupons.

TEST DURATION and CONDITIONS: 1080 hours (45 days). Room temperature, panels submerged 50% to provide liquid and vapor phase testing.

Coupons, cut from plant applied Protecto 401 Ceramic Epoxy lined pipe, were subjected to specific 1080 hour (45 day), 70°C partial submersion in a series of strong chemicals. The test solutions and results are tabulated below.

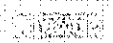
CHEMICAL SYSTEM	RESULTS
3% Sulfuric Acid	Pass: Coating unaffected; Corrosion to opposite side of metal coupon.
10% Sulfuric Acid	Pass: Coating unaffected; Corrosion to opposite side of metal coupon.
5% Sodium Hydroxide	Pass: Coating unaffected.
20% Sodium Hydroxide	Pass: Coating unaffected.
25% Sodium Hydroxide	Pass: Coating unaffected.
10% Hydrochloric Acid	Pass: Coating unaffected; Heavy corrosion loss to opposite side of coupon.
Gasoline	Pass: Coating unaffected; Some discoloration of gasoline.
Toluene	Pass: Coating unaffected; Some discoloration of toluene.
DI Water	Pass: Coating unaffected.
Hot Water (45 day @ 76°C)	Pass: Coating unaffected.

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Dr. George Mills

Date: 12 July 1994

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PROTECTO 401 CERAMIC EPOXY

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Procedures for sealing cut ends and repairing field damaged areas of PROTECTO 401 lined pipe and fittings.

PROTECTO 401 JOINT COMPOUND TECHNICAL DATA

DESCRIPTION: A brushable novalac epoxy designed for sealing cut ends and repairs when pipes are lined with Protecto 401 Ceramic Epoxy.

LIMITATIONS: This material should be used on spigots and in bell sockets only after the pipe or fitting is lined with Protecto 401 Ceramic Epoxy. Protecto Joint Compound can be used over Protecto 401 or on bare substrate. **Note: Do not apply Protecto 401 over Protecto Joint Compound.**

SURFACE PREPARATION: The surface preparation shall be equal to the specifications for the project or as outlined in the touch-up procedure. Do not apply Protecto Joint Compound over wet or frozen surfaces.

DRY FILM THICKNESS: As outlined in specifications.

APPLICATION DATA

APPLICATION: Brush, roll, or airless spray.

THINNING: Thin or clean up with Methyl Ethyl Ketone.

PHYSICAL DATA:

VOLATILE ORGANIC CONTENTS:

< 1.40 lbs. per gal. mixed unthinned

SAFETY DATA: See individual product label for safety and health data information. Individual Material Safety Data Sheets are available upon request.

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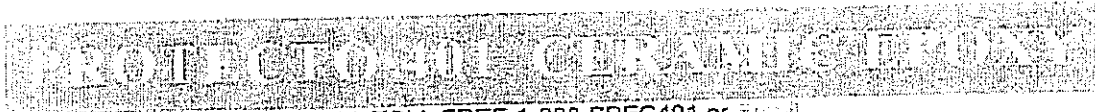
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Procedures for sealing cut ends and repairing field damaged areas of PROTECTO 401 lined pipe and fittings.

1. Remove burrs caused by field cutting of ends or handling damage and smooth out the edge of the lining if rough.
2. Remove all traces of oil, grease, asphalt, dust, dirt, etc.
3. Remove any damaged lining caused by field cutting operations or handling and clean any exposed metal by sanding or scraping. Sandblasting or power tool cleaning roughening is also acceptable. It is recommended that any loose lining be removed by chiseling, cutting, or scraping into well adhered lined area before patching. Be sure to overlap at least 1" of lining in the area to be repaired.
4. With the area to be sealed or repaired absolutely clean and suitably roughened, apply a coat of Protecto Joint Compound using the following procedure:
 - a. **Mixing Procedure** - The repair kit for Protecto 401 contains two small cans of Protecto Joint Compound. Protecto Joint Compound is a two component epoxy and the contents of the small container shall be mixed with the contents of the large container. If less than the full contents of each can is to be mixed, the material may be mixed using the mixing ratio printed on the labels. After Part B is added to Part A, the mixture shall be thoroughly agitated. All activated material must be used within one hour of mixing.
 - b. **Application of Material** - After the material has been thoroughly mixed, it can be applied to the prepared surface by brush. Brushing is usually best due to the fact that the areas to be repaired are usually small. Practices conducive to a good coating are contained in the technical data sheet for Protecto Joint Compound.
5. It is important to coat the entire freshly cut exposed metal surface of the cut pipe end. To ensure proper sealing, overlap at least one inch of the lining with this repair material.

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TEST REPORT PROTECTO 401 CERAMIC EPOXY

March 2, 1995

GM&A has completed a test program on Protecto 401 Ceramic Epoxy lined pipe coupons. The results of the completed tests are reported herein. They include the following test procedures:

ASTM G-14: Standard Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test).

Coating System: PROTECTO 401 CERAMIC EPOXY (Internal) Lining. Plant applied to the internal surface of ductile iron with a reported age in excess of eighteen months.

The conditions of the test include the following: 48 hour minimum temperature and humidity equilibration within the lab at 73°F (23°C). Coupons were approximately 3 x 6 inch with coating applied at a DFT of 33 to 48 mils (825 to 1175 microns). The weight of the falling impactor was 4 pounds. Continuity was determined with a low voltage, wet sponge holiday detector per ASTM G-62. Four panels were evaluated for the test using a Gardner Model #5510 Impact Tester.

Panel No:	1	2	3	4
Total number of impacts:	6	6	8	8
Film Thickness (mils):	37-39	39-44	33-36	45-48

The impact results using a four (4) pound weight were as follows:

Height of Drop, inches:	16	17	18	19	20
Number of Impacts:	5	5	14	2	2
Number of Pass:	5	5	9	0	0
Number of Fail:	0	0	5	2	2

RESULTS: The average impact strength of the coating as tested was determined to be 72 inch pounds.

Date: 2 March 1995



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