LUKE draily
construction company, inc.

construction managers | general contractors | design builders

SUBMITTAL REVIEW

Date: July 14, 2017

Submittal # 005 Sanitary and Water Subm 33 4000 05 a

Subcontractor: Kat Excavation
Bart Fisher

Project#: 417 The Residence at Echelon

Submit To: NSPJ Architects
Tim Hauschild
Clint Evans

SUBMITTAL FOR APPROVAL

Job Name/No: 417 Residence at Echelon

☒ REVIEWED ☐ REVISE & RESUBMIT
☐ REVIEWED& NOTED ☐ REJECTED

Submittal received for general compliance with the Contract Documents. Contractor's review does not relieve sub/vendor of responsibility for dimension, quantities, accuracy or completion of submittals or from any responsibilities required by terms and conditions of Subcontract/PO with Luke Draily Construction Co., Inc.. Sub/Vendors shall follow all manufacturer installation instructions. Installing contractor shall be responsible to coordinate with trades for hookup, supports, routing, etc.

By: TJ Watreas Date: 7-14-17

Engineering Solutions — Shop Drawing Review

Project: RTE Date: 9/27/17

Submittal #: SAN/H2O By: MJS

☑ APPROVED ☐ REJECTED

☐ APPROVED AS NOTED

75 NW Business Park Lane, Riverside, MO 64150 Tel: (816) 459-8531 Fax: (816) 459-8533
www.lukedraily.com

THE RESIDENCES AT ECHELON
LEE'S SUMMIT, MISSOURI

Contractor: Luke Draily Construction Inc.
75 NW Business Park Ln
Riverside, MO, 64150
816-459-8531

Architect: NSPJ Architects
3515 W. 75th Street, Suite 201
Prairie Village, KS 66208
913-831-1415

Subcontractor: KAT EXCAVATION, INC.
309 North Oak St.
Bates City, MO 64011
816-690-4611
Contractor Project #: 3273

Date Issued: 330000-01-0

Submittal Description: Sanitary and Water Materials

Supplier: Blue Springs Winwater

Manufacturer: See Submittal

Complete either (a) or (b) below:

[x] a) The Subcontractor/Supplier has verified that the material, equipment, or other item contained in this Submittal meets all the requirements specified, shown, or indicated in the Contract Documents with no exeptions.

[ ] b) The Subcontractor/Supplier has verified that the material, equipment, or other item contained in this Submittal meets all the requirements specified, shown, or indicated in the Contract Documents with exceptions. Exceptions are noted within submittal.

Signature (By Contractor):

BLUE SPRINGS Winwater™ COMPANY

Submittal

Customer: Kat Excavating

Job: The Residences at Echelon - LSMO

Location: Lees Summit, Mo

Date: 6/13/17

Pipelife: Sdr 26 and C900 DR 18.

Copperhead: Tracer wire.

Plastic Trends: Sdr 26 fittings.

Fernco: Couplings.

Tyler Union: FBE fittings and tuf grips.

AA Thread: poly wrap and poly tape.

Clow Valve: MJ valves.

Sigma: Detectable tape and castings.

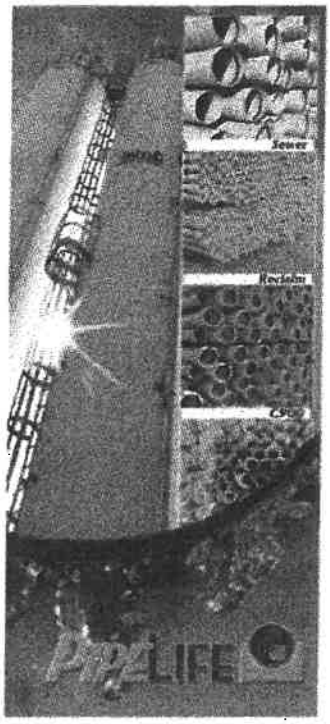
Kennedy: Hydrant.

McWane: 401 lining cl 52 DIP.

Foundry: Flange pipe.

PIPELIFE

Sewer



PipeLife Jetstream manufactures sewer pipe from 4 " to 18" in both bell end and gasketed products. Our pipes are manufactured under ASTM D-3034 and ASTM D-2729 Standards . PipeLife Jetstream Sewer pipe is available in 14ft and 20ft lengths.

The primary purpose of PipeLife Jetstream IPS is for the conveyance of sewage from the building and for the collection and transmission to treatment source.

PipeLife Jetstream uses compound according to Class 12454-B as prescribed in ASTM-1784. All sewer pipe shall meet the requirements of ASTM D-3034 for sizes 4" - 15" and ASTM F-679 for 18" pipe. Integral gasket joints are manufactured according to ASTM F477 and ASTM D3139. To aid in the installation of PipeLife Jetstream's IPS , each spigot end is beveled and includes a depth mark for insertion guidance.

SDR 35

Nominal Size	O.D	I.D.	Wall Thickness	WT. Per FT.
4	4.215	4.095	.120	.986
6	6.275	6.095	.180	2.27
8	8.400	8.16	.240	4.08
10	10.500	10.200	.300	6.35
12	12.500	12.140	.360	9.11
15	15.300	14.863	.437	13.78

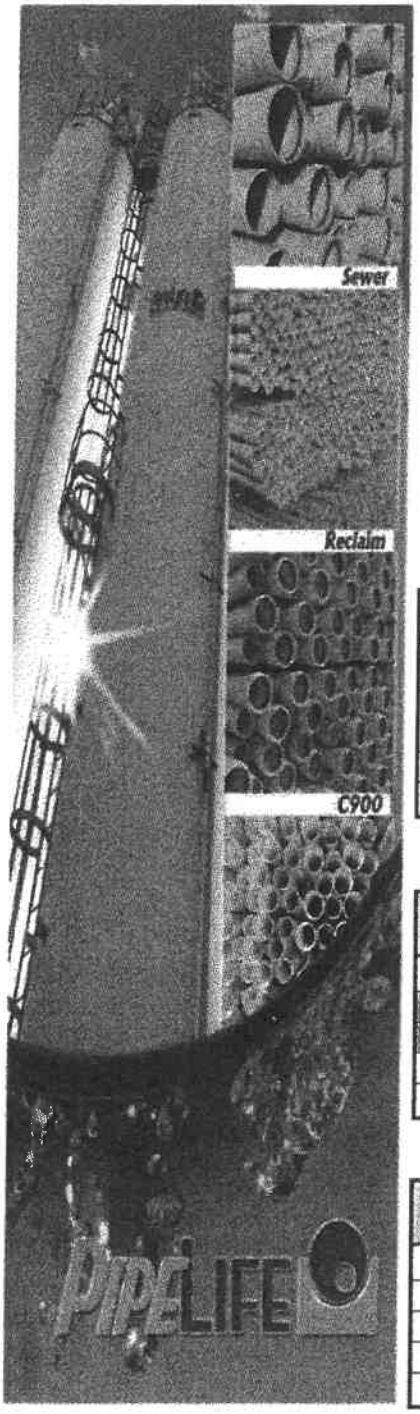
Nominal Size	O.D	I.D.	Wall Thickness	WT. Per FT.
4	4.215	4.053	.162	1.435
6	6.275	6.034	.241	3.157
8	8.400	8.077	.323	5.664
10	10.500	10.096	.404	8.873
12	12.500	12.019	.481	12.612
15	15.300	14.712	.588	18.962

F-679

18	18.701	18.165	0.536	20.78

PIPELIFE

C900



PipeLife Jetstream manufactures AWWA C900 product family which includes 4" to 12" C.I OD pipes. AWWA C900 standards include all specifications relating to the production and testing of C900 pipes. In three pressure ratings of DR25, DR 18 and DR 14.

Our C900 is suitable for the transmission and distribution of water. PipeLife Jetstream carries various certifications from NSF International (NSF), Underwriters Laboratories (UL) and Factory Mutual (FM).

PipeLife Jetstream uses compound according to ASTM D1784—12454 as well as integral gasket joints according to ASTM F477 and ASTM D3139. To aid in the installation of PipeLife Jetstream's C900 , each spigot end is beveled and includes a depth mark for insertion guidance.

DR 14 Pressure Ratings are: **UL** 305 and **FM** 200 PSI both at 73.4 degrees

Size	Outside Diameter	Minimum Wall Thickness	Weight LBS/Foot	Pieces per Pallet	Order Units	*Optional Colors
4	4.80	0.343	3.22	36	2.4	Yes
6	6.90	0.493	6.70	18	3	Yes
8	9.05	0.646	11.55	10	2.4	Yes
10	11.10	0.793	17.46	4	2	Yes
12	13.20	0.943	24.75	4/3	4	Yes

12454 (Type 1, Grade 1, PVC 1120) Material

DR 18 Pressure Ratings are: **UL** 235 PSI and **FM** 150 PSI both at 73.4 degrees

Size	Outside Diameter	Minimum Wall Thickness	Weight LBS/Foot	Pieces per Pallet	Order Units	*Optional Colors
4	4.800	0.267	2.55	36	2.4	Yes
6	6.900	0.383	5.29	18	3	Yes
8	9.050	0.503	9.15	10	2.4	Yes
10	11.100	0.617	13.82	4	2	Yes
12	13.200	0.733	19.56	4/3	4	Yes

DR 25 Pressure Ratings are: **UL** 165 PSI

Size	Outside Diameter	Minimum Wall Thickness	Weight LBS/Foot	Pieces per Pallet	Order Units	*Optional Colors
4	4.800	0.192	1.87	36	2.4	Yes
6	6.900	0.276	3.90	18	3	Yes
8	9.050	0.362	6.69	10	2.4	Yes
10	11.100	0.444	10.16	4	2	Yes
12	13.200	0.528	14.43	4	4	Yes

Copperhead High Strength Tracer Wire

Part# (1230*-HS-**)

*= Color- B=Blue, G=Green, Y=Yellow, P=Purple, R-Red, B=Black, N=Orange

**=Spool Size- 500', 1000', 2500'

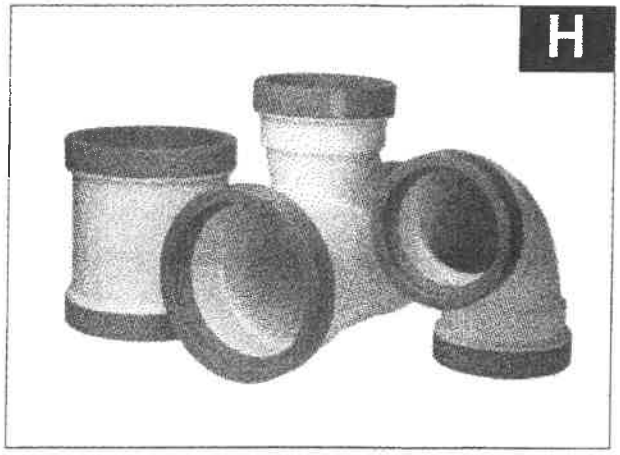
Tracer wire shall be a #12 AWG HS-CCS high-strength copper clad steel conductor (HS-CCS), insulated with a 30 mil, high-density, high molecular weight polyethylene (HDPE) insulation, and rated for direct burial use at 30 volts. HS-CCS conductor must be a 21% conductivity for locating purposes, Break load 380# minimum. HDPE insulation shall be RoHS compliant and utilize virgin grade material. Insulation color shall meet the APWA color code standard for identification of buried utilities. Tracer wire shall be *Copperhead*™ HS-CCS HDPE 30 mil insulation or *pre-approved* equal and made in the USA.

PO Box 1081 Monticello, MN 55362 Ph 877-726-5644 Fax 763-271-3694
www.copperheadwire.com

Heavy Wall Gasketed Sewer Fittings SDR 26

Injection Molded in Sizes 4" – 12"

Fabricated in Sizes 15" – 36"



With a 34.5% thicker wall than SDR 35 and high impact retention ring. Royal Building Product's PVC Heavy Wall Gasketed Sewer fittings are manufactured to last. The distinctive green gasket is also heavy duty and engineered to make assembly fast and easy. Just push the pipe in until it hits the square stop for a solid, positive seal.

SDR 26 Heavy Wall Gasketed Sewer fittings also feature distinctive green high impact gasket retention rings for easy identification in the field. The deep lead into the gasket reduces the possibility of gasket damage or rolling. In addition, the shock absorbing ring inhibits fittings from breaking under impact.

Applications

Heavy Wall Gasketed Sewer fittings can be used where extra heavy (SDR 26) is specified by your local jurisdiction. SDR 26 fittings are intended for non-pressure drainage of sewage and surface water.

Certifications

Heavy Wall Gasketed Sewer fittings are third party tested and listed by NSF to meet specifications defined in ASTM D3034 and F1336 and CSA to meet specifications defined in CSA B182.2, where applicable.

Product Spotlights

Vertical Riser Adapter (H984, H986, H988)

This simple solution in conjunction with the unique integral flange, inhibits system failure due to pipe spearing beyond the pipe stop.

Refer to page H11 for pricing and available configurations.

Third Party Tested

Short Specs

Heavy Wall Gasketed Sewer Fittings SDR 26 (4"- 36")

4" through 36" gasketed SDR 26 sewer fittings shall be manufactured in accordance with ASTM D3034 and F1336. Fitting gaskets shall comply with ASTM F477 or ASTM F913. Fitting gaskets shall be locked firmly in position to prevent displacement. 4" through 12" SDR 26 fittings shall have green color coded gasket retaining collars for easy identification. 4" through 8" fittings shall be injection molded from virgin PVC compound having a minimum cell classification of 12454 or 13343 in accordance with, and certified by the National Sanitation Foundation (NSF), to meet ASTM D1784. Gasketed SDR 26 sewer fittings may be injection molded or fabricated from pipe meeting the requirements of ASTM D3034. Gasket joints of all fitting sizes must comply with ASTM D3212 Internal Pressure Test (exfiltration) and Vacuum Test (infiltration) at 5 degrees of gasket joint deflection. Injection Molded Gasketed SDR 26 sewer fittings shall be certified by the National Sanitation Foundation (NSF) to meet ASTM D3034 & ASTM F1336 and certified at 200 psi internal pressure.

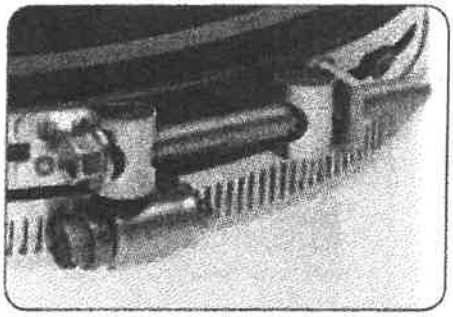
Where available, reducing branches on injection molded 8", 10", and 12" tees, wyes, and tee-wyes shall be minimum DR18 wall thickness in the reducing branch body and reducing branch hub area below the gasket race.

ATTENTION: Royal Building Products fittings are not to be used with compressed air or gases. Royal does not recommend that piping systems that include its products be tested with compressed air or gases.

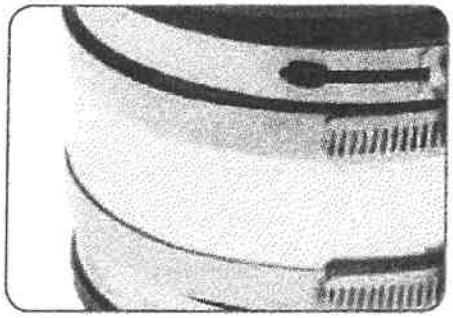
Royal Building Products
(formerly Plastic Trends)
56400 Mound Road
Shelby Twp., MI 48316
586.781.2700 • 800.232.5690
Fax: 586.781.0888
www.royalbuildingproducts.com

5000 Series Repair Couplings

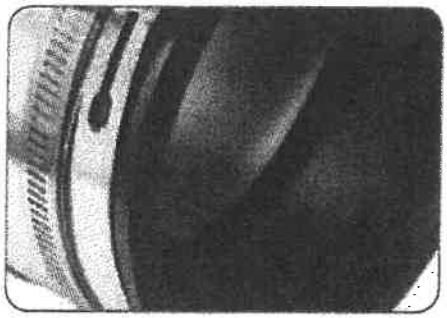
The Ultimate Nut & Bolt RC - Engineered for resistance to heavy earth loads and shear forces, while providing improved pipe alignment.



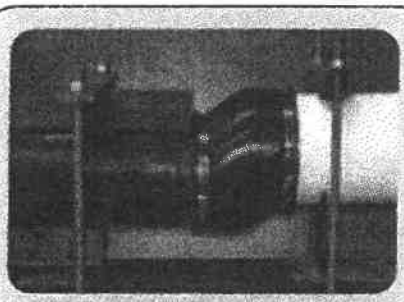
316 S.S. Nut and Bolt Clamps



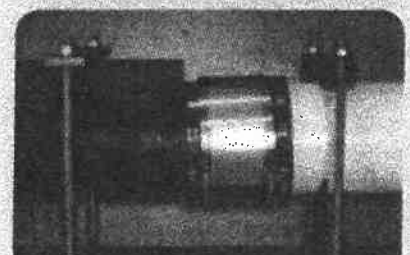
.012" (12mil) Stainless Steel Shield



One Piece Molded-in Bushing Gaskets



Shear Resistance Test using an unshielded sewer coupling per ASTM C 1173 (applied load 50 pounds per nominal inch of pipe diameter)



Shear Resistance Test using a Fernco 5000 Series Repair Coupling per ASTM C 1173 (applied load 50 pounds per nominal inch of pipe diameter)

Ultimate Shear Resistance - .012" (12mil) 300 series stainless steel shear ring is the heaviest the industry offers with excellent resistance to corrosion.

Ultimate Pipe Alignment - Due to the thickness and strength of the 5000 Series shear ring, you are assured consistent pipe alignment against shear forces from soil compaction, shifting and settling, and improper backfill.

Ultimate Sealing Clamps - 316 series stainless steel nut and bolt clamps provide the strongest seal and the greatest corrosion resistance possible.

Ultimate Sealing Gasket - Designed for same pipe size and material connections as well as differing pipe size and pipe material connections. The 5000 Series gasket has a smooth inside surface providing greater sealing performance than ribbed surfaces. The smooth internal wall of the gasket makes contact 360° over its entire length. This equates to a larger sealing surface and a higher coefficient of friction, providing maximum sealing capabilities as well as preventing slippage under the weight of shear forces. The gaskets have excellent resistance to sewer gas, common household chemicals found in the sewer system, as well as dry rot, fungus growth, ozone and UV. When properly installed Strong Back RC series gaskets will provide decades of problem free service.

Ultimate Transition Connections - For the transition connection of differing pipe sizes or materials, the 5000 Series gasket features a one piece molded-in bushing.

Ultimate Versatility - The 5000 Series offers the ability to connect clay, concrete, asbestos cement fibre, ductile iron, cast iron, steel, plastic and copper.

Meets requirements of:

- **ASTM C 1173** - Standard Specification for Flexible Transition Couplings for Underground Piping Systems
- **ASTM D 5926** - Standard Specification for Poly Vinyl Chloride (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems
- **CSA B602** - mechanical couplings for drain, waste, vent pipe and sewer pipe

MADE IN THE USA

UPC®

Environmental Commitment

Fernco Inc.

United States
PH: 810-653-9626
FX: 810-653-8714

www.fernco.com

Canada
PH: 519-332-6711
FX: 519-332-8610

5/10 MF0310

5001 RC Series - Clay to Clay

		A		B		C	
Fernco Part No.	Mission Part No.	in.	mm	in.	mm	in.	mm
5001-44RC	MR01 44 ARC	5.29	134	5.29	134	4.10	104
5001-44WCRC	MR01 44 ARC	5.51	140	5.51	140	3.97	101
5001-64RC	N/A	7.50	191	5.50	140	6.02	153
5001-66RC	MR01 66 ARC	7.50	191	7.50	191	6.02	153
5001-66WCRC	MR01 66 ARC	8.01	203	8.01	203	6.00	152
5001-88RC	MR01 88 ARC	9.65	245	9.65	245	5.99	152
5001-88WCRC	MR01 88 ARC	10.00	254	10.00	254	6.00	152
5001-1010RC	MR01 1010 ARC	12.40	315	12.40	315	5.90	150
5001-1010WCRC	MR01 3010 ARC	12.40	315	12.40	315	5.90	150
5001-1212RC	MR01 1212 ARC	14.51	369	14.51	369	6.38	162
5001-1515RC	MR01 1515 ARC	18.14	461	18.14	461	9.89	251
5001-1818RC	MR01 1818 ARC	21.90	556	21.90	556	9.63	245

5002 RC Series - Clay to Cast Iron or Plastic

		A		B		C	
Fernco Part No.	Mission Part No.	in.	mm	in.	mm	in.	mm
5002-43RC	MR02 43 ARC	5.29	134	3.38	86	4.10	104
5002-44RC	MR02 44 ARC	5.36	136	4.51	115	4.07	103
5002-44WCRC	MR02 44 ARC	5.44	138	4.55	116	3.96	101
5002-46RC	MR02 46 ARC	7.50	191	5.13	130	6.02	153
5002-55RC	MR02 55 ARC	6.60	168	5.50	140	5.74	146
5002-64RC	MR02 64 ARC	7.50	191	4.50	114	6.02	153
5002-64WCRC	MR02 64 ARC	8.02	204	4.57	116	6.00	152
5002-66RC	MR02 66 ARC	7.50	191	6.56	167	5.89	150
5002-66WCRC	MR02 66 ARC	8.04	204	6.38	162	5.91	150
5002-86RC	MR02 86 ARC	9.65	245	6.63	168	6.00	152
5002-88RC	MR02 88 ARC	9.76	248	8.57	218	5.96	151
5002-88WCRC	MR02 88 ARC	10.00	254	8.66	220	6.00	152
5002-1010RC	MR02 1010 ARC	12.40	315	10.75	273	5.90	150
5002-1010WCRC	MR02 1010 ARC	12.40	315	10.75	273	5.90	150
5002-1212RC	MR02 1212 ARC	14.51	369	12.60	320	6.38	162
5002-1515RC	MR02 1515 ARC	18.14	461	15.40	391	9.89	251
5002-1818RC	MR02 1818 ARC	21.90	556	19.00	483	9.63	245

5003 RC Series - Clay to Asbestos Cement Fibre or Ductile Iron

		A		B		C	
Fernco Part No.	Mission Part No.	in.	mm	in.	mm	in.	mm
5003-44RC	MR03 44 ARC	5.41	137	4.94	125	4.07	103
5003-66RC	MR03 66 ARC	7.25	184	6.84	174	5.93	151
5003-88RC	MR03 88 ARC	9.75	248	9.06	230	5.94	151
5003-1212RC	MR03 1212 ARC	14.51	369	13.20	335	6.38	162
5003-1516RC	MR03 1516 ARC	18.10	460	18.10	460	9.89	251

5004 RC Series - Concrete to Concrete

		A		B		C	
Fernco Part No.	Mission Part No.	in.	mm	in.	mm	in.	mm
5004-44RC	MR05 44 ARC	5.51	140	5.51	140	3.97	101
5004-66RC	MR04 66 ARC	7.58	193	7.58	193	5.94	151
5004-88RC	MR04 88 ARC	10.38	264	10.38	264	5.90	150
5004-1010RC	MR04 1010 ARC	12.40	315	12.40	315	5.90	150
5004-1212RC	MR04 1212 ARC	15.25	387	15.25	387	6.42	163
5004-1212LCRC	MR04 1212 ARC	16.10	409	16.10	409	9.89	251

5006 RC Series - Concrete to Cast Iron or Plastic

		A		B		C	
Fernco Part No.	Mission Part No.	in.	mm	in.	mm	in.	mm
5006-44RC	MR06 44 ARC	5.51	140	4.50	114	3.97	101
5006-66RC	MR06 66 ARC	7.58	193	6.63	168	5.94	151
5006-88RC	MR06 88 ARC	10.38	264	8.50	216	5.90	150
5006-1010RC	MR06 1010 ARC	12.40	315	10.75	273	5.90	150
5006-1212RC	MR06 1212 ARC	15.25	387	12.60	320	6.42	163
5006-1212LCRC	MR06 1212 ARC	16.10	409	12.60	320	9.89	251

5051 RC Series -
Asbestos Cement Fibre (AC) or Ductile Iron to CI or PL

		A		B		C	
Fernco Part No.	Mission Part No.	in.	mm	in.	mm	in.	mm
5051-44RC	MR51 44 ARC	4.80	122	4.39	112	3.94	100
5051-46RC	N/A	6.60	168	4.75	121	5.74	146
5051-64RC	N/A	6.95	177	4.38	111	5.92	150
5051-66RC	MR51 66 ARC	6.96	177	6.69	170	5.91	150
5051-88RC	MR51 88 ARC	9.25	235	8.51	216	5.97	152
5051-1010RC	MR51 1010 ARC	11.02	280	10.52	267	5.85	148
5051-1212RC	MR51 1212 ARC	13.20	335	12.60	320	5.97	152
5051-1615RC	MR51 1615 ARC	18.14	461	15.40	391	9.89	251

5055 RC Series - Asbestos Cement Fibre or Ductile Iron to Asbestos Cement Fibre or Ductile Iron

		A		B		C	
Fernco Part No.	Mission Part No.	in.	mm	in.	mm	in.	mm
5055-44RC	MR55 44 ARC	4.75	121	4.75	121	3.96	101
5055-66RC	MR55 66 ARC	6.65	169	6.65	169	5.92	150
5055-88RC	MR55 88 ARC	9.05	230	9.05	230	5.98	152
5055-1212RC	MR55 1212 ARC	13.20	335	13.20	335	5.98	152

5056 RC Series -
CI, PL, Copper, or Steel to CI, PL, Copper, or Steel

		A		B		C	
Fernco Part No.	Mission Part No.	in.	mm	in.	mm	in.	mm
5056-43RC	MR56 43 ARC	4.58	116	3.38	86	4.02	102
5056-44RC	MR56 44 ARC	4.58	116	4.58	116	4.02	102
5056-44XLRC	N/A		0		0		0
5056-54RC	MR56 54 ARC	5.52	140	4.38	111	3.97	101
5056-55RC	MR56 55 ARC	5.52	140	5.52	140	3.97	101
5056-64RC	MR56 64 ARC	6.60	168	4.50	114	5.74	146
5056-66RC	MR56 66 ARC	6.60	168	6.60	168	5.74	146
5056-88RC	MR56 88 ARC	8.64	219	8.64	219	6.04	153
5056-1010RC	MR56 1010 ARC	10.63	270	10.63	270	5.89	150
5056-1212RC	MR56 1212 ARC	12.52	318	12.52	318	6.32	161
5056-1515RC	MR56 1515 ARC	15.44	392	15.44	392	9.89	251
5056-1818RC	MR56 1818 ARC	19.00	483	19.00	483	9.89	251
5056-2424RC	N/A	25.10	638	25.10	638	9.89	251

TYLER UNION®
Quality Waterworks Products

20U - ANSI/AWWA C116/A21.16
Protective Fusion Bonded
Epoxy for AWWA Fittings
Revised 12/2015

☐ DOMESTIC ☒ NON-DOMESTIC

SUBMITTAL: PROTECTIVE FUSION BONDED EPOXY

(Current revisions for all noted Standards apply)

Tyler Union Waterworks standard applied coating thickness for protective fusion bonded epoxy (FBE) is 6 to 8 mil and our FBE is NSF61, NSF-372 and Annex G approved. Tyler Union Waterworks FBE water works fittings are coated internally and externally in accordance with the applicable requirements of ANSI/AWWA C116/A21.16. Section 4.3.2 of the ANSI/AWWA C116 standard provides that FBE mil thickness in the joint area shall not have a coating of less than 4 mil. Additionally, the standard advises it may be necessary to establish a limit for the maximum applied thickness in the joint areas.

Tyler Union Waterworks upon request at time of order placement, can provide FBE fittings with increased mil thickness. However, FBE thickness greater than 6 to 8 mil may interfere with the pipe to fitting fit and inhibit the sealing for a leakproof joint. For these reasons, Tyler Union Waterworks does not provide warranty for FBE lined and coated fittings with greater than 8 mil thickness in the joint area.

Tyler Union Waterworks FBE is tested and approved per Underwriters Laboratories UL262. Testing of FBE involves immersing coated parts in four aqueous solutions at 158°F and evaluate for blistering during 90 day continuous exposure period. The solutions are distilled water, 2% sodium chloride in distilled water, distilled water with a pH adjusted to 4.0 using potassium hydrogen phthalate, and distilled water with pH adjusted to 10.0 using sodium carbonate. Tyler Union Waterworks FBE is also tested for blister resistance when immersed in acid, alkali, alcohol, and hydrocarbons at room temperature over 90 days. Additional test data and recommended exposures for Tyler Union Waterworks FBE is as provided in Tables 1 thru 3.

The ANSI/AWWA C116/A21.16 standard describes the use of protective fusion bonded epoxy coatings as being utilized for the interior and exterior surfaces of ductile or gray iron fittings supplied for "water systems". Section 1.1 of the standard specifically provides that the standard does not cover instances where coatings are agreed upon by purchaser and manufacturer for sewer or other special applications. Though not always recommended for use in **Sewer systems; FBE coated and lined fittings may be used in sewer applications conveying materials conforming to the properties as provided in Tables 2 and 3 on page 2.

TABLE #1

TEST	METHOD	CONDITIONS	RESULT
Abrasion Resistance	ASTM D4060	CS-17 wheels, 1000 cycles, 1 kg load	32 mg loss
Adhesion	ASTM D3359 - Method A	X-cut and tape	5A
Adhesion	ASTM D3359 - Method B	Crosshatch and tape	5B
Gloss, 60°	ASTM D523	N/A	70-85
Humidity Resistance	ASTM D2247	1000 hours at 100°F	No blisters or rusting
Impact	ASTM D2794	N/A	Pass 40 inch-lbs. direct
Pencil hardness	ASTM D3363	N/A	Pass 4H
Salt Spray	ASTM B117	1000 hours	No blisters or face rust, no scoreline creepage
Water Resistance	AWWA C550	90 days immersion at 70°C	Pass
Weather Resistance	ASTM G154	UVA-340, cycle 4 hrs UV at 60°C, 4 hrs condensation at 50°C	Chalks after 200 hours exposure

☐ DOMESTIC ■ NON-DOMESTIC

SUBMITTAL: PROTECTIVE FUSION BONDED EPOXY

(Current revisions for noted Standards apply)

TABLE #2	
Immersion Environments with the following chemicals (ambient temperature)	
Aliphatic Hydrocarbons	Fresh water
Calcium Chloride (10% solution)	Fuel Oil
Calcium Hydroxide (10% solution)	Hexane
Calcium Sulfate (saturated solution)	Kerosine
Calcium Carbonate (saturated solution)	Motor oil
Distilled water	Magnesium Sulfate (saturated solution)
Gasoline (unleaded)	Potassium Acetate (saturated solution)
Diesel Fuel	Soap solutions
Sodium Chloride (5% solution)	Sodium Nitrate (10% solution)
Sodium Hydroxide (5% solution)	Trisodium Phosphate (5% solution)

TABLE #3	
Splash and Spillage Environments against the following chemicals	
Aromatic Hydrocarbons	Butanol
Ethanol	Hydrochloric Acid (5% solution)
Isopropyl Alcohol	Methanol
Sulfuric Acid (5% solution)	Toluene
Xylene	

*NOTE:

Due to the prescribed application methods of protective fusion bonded epoxy and the combination of varying fitting diameters, recesses, raised lettering, tapping bosses, and numerous radiused surfaces; the applied thickness of the FBE coating or lining may vary 1 to 2 mils over the coated surfaces of a fitting.

**NOTE:

Final determination of the suitability of this product for your application shall be determined by the end user .

Additional types of epoxy coatings are available upon request at time of order placement. Please contact a Tyler Union Waterworks Customer Service representative to discuss the additional coating and lining options that are available.

TYLER UNION

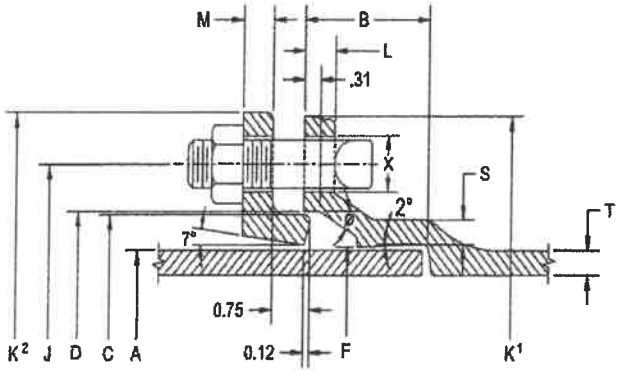
MECHANICAL JOINT C153 DUCTILE IRON COMPACT FITTINGS

Sizes 3"-12" UL & 3"-10" FM Listed
For Fire Main Equipment

SAMPLE SPECIFICATIONS (Current ANSI/AWWA revisions apply)

Mechanical joint watermain fittings with accessories, 2" through "64" shall be manufactured from ductile iron in accordance with and meet all applicable terms and provisions of standards ANSI/AWWA C153/A21.53 and ANSI/AWWA C111/A21.11. Ductile iron mechanical joint fittings 2" through 24" shall be rated for 350 PSI working pressure. Ductile iron 30" through 48" shall be rated for 250 psi working pressure. Flanged ductile iron fittings in 24" (610 mm) and smaller sizes may be rated for 350 psi (2,413 kPa) with the use of special (annular ring or comparable) gaskets. All coated and lined fittings meet requirements of NSF-61, NSF-372, and Annex G.

NOTE - EXCEPTIONS: Mechanical joint fittings with flanged branches are rated for water pressure of 250 PSI.
NOTE - Wyes over 12" are not pressure rated. Contact manufacturer for rating in your application.
NOTE - Fittings are cement lined and seal coated in accordance with ANSI/AWWA C104/A21.4. Fittings are available double cement-lined, bare, or epoxy coated upon request. Epoxy coating per ANSI/AWWA C116
NOTE - Installation per AWWA C600 and AWWA C651



NOMINAL JOINT DIMENSIONS IN INCHES

Size	A Dia.	B	C Dia.	D Dia.	F Dia.	J Dia.	K¹ Dia.	K² Dia.	L	M	S	T	X	BOLTS Size	BOLTS No.
2	2.51	2.50	3.50	3.60	2.61	4.75	6.19	6.89	.58	.62	.36	.30	¾	⅝x3	2
3	3.96	2.50	4.84	4.94	4.06	6.19	7.62	7.69	.58	.62	.39	.33	¾	⅝x3	4
4	4.80	2.50	5.92	6.02	4.90	7.50	9.06	9.12	.60	.75	.39	.34	⅞	¾x3½	4
6	6.90	2.50	8.02	8.12	7.00	9.50	11.06	11.12	.63	.88	.43	.36	⅞	¾x3½	6
8	9.05	2.50	10.17	10.27	9.15	11.75	13.31	13.37	.66	1.00	.45	.38	⅞	¾x4	6
10	11.10	2.50	12.22	12.34	11.20	14.00	15.62	15.62	.70	1.00	.47	.40	⅞	¾x4	8
12	13.20	2.50	14.32	14.44	13.30	16.25	17.88	17.88	.73	1.00	.49	.42	⅞	¾x4	8
14	15.30	3.50	16.40	16.54	15.44	18.75	20.31	20.25	.79	1.25	.55	.47	⅞	¾x4½	10
16	17.40	3.50	18.50	18.64	17.54	21.00	22.56	22.50	.85	1.31	.58	.50	⅞	¾x4½	12
18	19.50	3.50	20.60	20.74	19.64	23.25	24.83	24.75	1.00	1.38	.68	.54	⅞	¾x4½	12
20	21.60	3.50	22.70	22.84	21.74	25.50	27.08	27.00	1.02	1.44	.69	.57	⅞	¾x4½	14
24	25.80	3.50	26.90	27.04	25.94	30.00	31.58	31.50	1.02	1.56	.75	.61	⅞	¾x5	16
30	32.00	4.00	33.29	33.46	32.17	36.88	39.12	39.12	1.31	2.00	.82	.66	1⅛	1x6	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	1⅛	1x6	24
42	44.50	4.00	45.79	45.96	44.67	50.62	53.12	53.12	1.45	2.00	1.35	.82	1⅜	1¼x6½	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	1⅜	1¼x6½	32

NOTE: 2 inch MJ ASTM A536 ductile iron Compact fittings (2"-22.5 bend, 2"-45 bend, 2"-90 bend, 2"x12" solid sleeve, 2"x2" tee, 4"x2" tee, and 4"x2" reducer) are available beginning 2012. Call Tyler Union for availability or additional product dimensions.
*NOTE: Contact Tyler Union for 54"-64" product information.
NOTE: The fitting laying lengths provided are approximate, contact Tyler Union Waterworks for the laying length of a specific fitting.

TYLER UNION®
Quality Waterworks Products
www.tylerunion.com

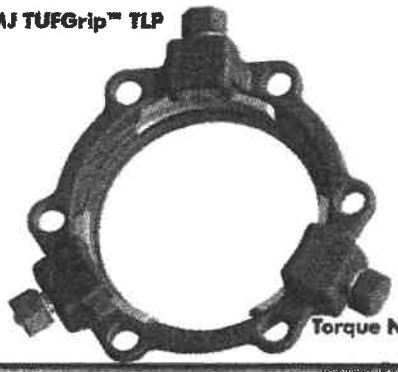
NON-DOMESTIC PRODUCT SUBMITTAL

TUFGRIP™

Series 2000 for PVC & PVCO Pipe

"A Proven Third Generation Mechanical Joint Restraint"

MJ TUFGrip™ TLP



TYLER UNION®
Quality Waterworks Products

Tyler Union's TUF Grip restraints represent the culmination of 20 years of engineering and testing. As a 3rd generation restraint, TUF Grip is the best available technology in the Waterworks market for use in restraining PVC pipe.

HK&A Designed by Harold Kennedy & Associates, Inc.

"BETTER BY DESIGN"

SPECIFICATIONS:

- Proven to restrain plain end PVC pipe in diameters 3" thru 36" and PVCO pipe in diameters 4" thru 12"
- Restraint design conforms to applicable requirements of ANSI/AWWA C111, ANSI/AWWA C153, and ANSI/AWWA C110
- Restraint engineered for securing plain end pipe to mechanical joint fittings conforming to ANSI/AWWA C110, C111, and C153
- Rated for working water pressure of 305 psi for 3"-12", 235 psi for 14"-24", 150 psi for 30", and 125 psi for 36" (details on page 2)
- Cast of ASTM compliant 65-45-12 ductile iron complete with cast on date code and country of origin for traceability
- Restraint and all components are designed and proven for a 2:1 safety factor based on the PVC and PVCO pipe pressure rating
- Deflection rating when installed on pipe with nominal diameter shall be 3° for 3" thru 12", 2° for 14" thru 16", and 1.5° for 18" thru 36"
- Standard coating for Non-Domestic restraint is 4-6 mil of *Alkyd resin baking enamel - ***Note: Epoxy coatings available upon request**
- Gripping wedge, wedge collar bolt and twist off torque limiting nut shall be e-coated
- FM approved for 4" thru 12" applications and UL listed and approved for 3" thru 12" applications
- Color coded red for pipe type (C900 PVC/C905 PVC/ *C909 PVCO/D2241 PVC) - ***Note: Refer to page 2 for C909 pipe applications**

FEATURES & ADVANTAGES:

- Torque limiting nut on gripping wedge assembly twists off within a designed torque range eliminating the need for specialized tools
- Gripping wedge assembly pivots providing stronger engagement of pipe wall at lower torque requirement (45-60 ft.-lbs.)
- Proven restraint technology utilizing fewer gripping wedges in frequently applied diameters, reducing trench time and project cost
- There is no washer or spacer to remove when installing restraints on 3" to 12" ASTM D2241 PVC pipe with IPS outside diameter
- Restraint's heavy duty construction and design eliminates the need for costly thrust blocks and tie rods
- Suitable for Potable and Wastewater applications
- Approved for use on multiple classes of pipe - **Additional pressure ratings and associated pipe classes provided on pages 2 and 3**

ISO 9001-2008 Registered | Listed with Underwriters Laboratory | Factory Mutual Approved

Product Source/Type	Name of Project	Name of Contractor	Project Engineer	Spec. Section and/or Project No.

Tyler Union Waterworks Contact Information
Tyler: 11910 CR 492 • Tyler, Texas 75706 • (800) 527-8478
Anniston: 1501 W 17th St • Anniston, AL 36201 • (800) 226-7601
Corona: 1001 El Camino Ave • Corona, CA 92879 • (866) 527-8471

AA Thread Seal Tape, Inc.
1275 KYLE COURT
WAUCONDA, IL 60084
Tel: (800) 537-7139 • Fax: (847) 526-2209
E-Mail: support@aathread.aranya.com
Website: aathread.com

Product Specifications

Model # 76002, Model # 76002 12 MIL Clear Polyethylene Encasements for Ductile Iron Pipe

SPECIFICATIONS

Item #	76002
Item Name	12 MIL Clear Polywrap
Pipe Diameter	up to 8"
Tube Size	20" x 220'
Width	20
Length	220
Pipe Length	20
Perforations	22
Thickness	12
Country of Origin	USA
Tensile Strength	MD-4594 psi, TD-4410 psi
Elongation	MD-1073%, TD-1126%
Dielectric Strength	1946 V/MIL
Impact Resistance	1189
Propagation Tear Resistance	MD-4462 g/f, TD-5539 g/f
Standard	ANSI/AWWA C105/A21.5
Markings	Pipe Diameter, Corrosion Warning, MIL thickness, Spec, Date of manufacture.
Quantity/Case	1 roll
Lbs./Roll	47
Length<!--1-->	21 1/2
Width<!--1-->	10
Height	10
Units Per Package	1
Note	This material is clear plastic and has "Waterline" printed on it.

AA Thread Seal Tape, Inc.
1275 KYLE COURT
WAUCONDA, IL 60084
Tel: (800) 537-7139 • Fax: (847) 526-2209
E-Mail: support@aathread.aranya.com
Website: aathread.com

Product Specifications

Model # 60211, Model # 60211 Black Pipe Wrapping Tape - Made in Taiwan

SPECIFICATIONS

Item #	60211
Item Name	10 MIL Black Pipe Wrapping Tape
Size	2" x 100'
Thickness	10
Country of Origin	Taiwan
Width	2
Length	100
Tensile Strength	25 lbs./in. (43.8 N/10mm)
Elongation	200%
Adhesion to Steel	20 oz./in. (2.4 N/10mm)
Adhesion to Backing	20 oz./in. (2.4 N/10mm)
Dielectric Strength	1250 V/Mil
Max. Temperature	176°F (80°C)
Min. Temperature	14°F (-10°C)
Max. Volts	600V
Quantity/Case	36 rolls
Quantity/Sleeve	6 rolls
Weight/Case	39
Length<!--1-->	13 1/2
Width<!--1-->	9 1/4
Height	13 1/4
Units Per Package	1
Package Type	Each
Description	10 MIL X 2" X 100' BLK PIPE WRAP TAPE

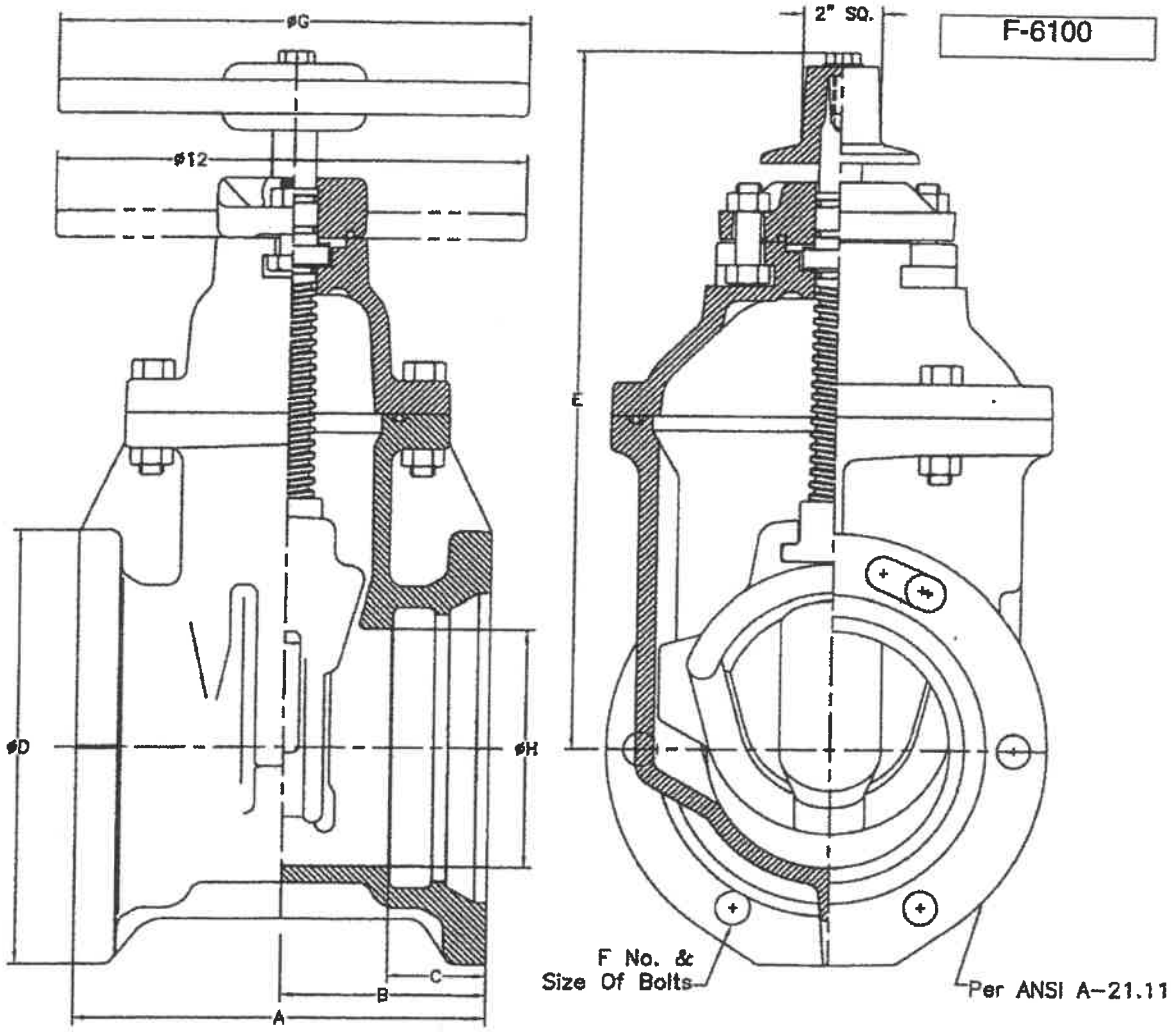
Complies with applicable requirements of AWWA C509

2"-12" R/W VALVE MECHANICAL JOINT ENDS GENERAL DIMENSIONS

CLOW VALVE COMPANY

MODEL 2639 & 2640

F-6100



VALVE SIZE	A	B	C	D	E	F	G	H
2	8 1/4	4 1/8	2 1/2	4 1/2	10 7/8	4-5/8	7 1/4	2
2 1/2	——	——	——	——	——	——	——	——
3	8 1/2	4 1/4	2 1/2	7 3/4	12 3/8	4-5/8	10	3
4	9 1/2	4 3/4	2 1/2	9 1/8	14 3/4	4-3/4	10	4 1/4
6	10 1/2	5 1/4	2 1/2	11 3/8	19	6-3/4	12	6 1/4
8	13 1/8	6 9/16	2 1/2	13 3/4	22 1/2	6-3/4	14	8 1/4
10	15 1/2	7 3/4	2 1/2	15 3/4	26 1/2	8-3/4	18	10 1/4
12	16	8	2 5/8	18	30	8-3/4	18	12 1/4

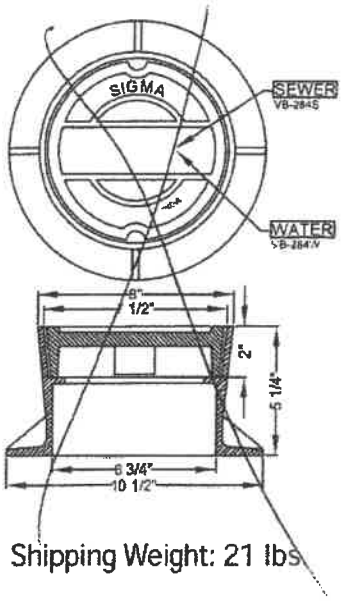
SIGMA

Valve, Curb, & Service Boxes

Municipal Construction

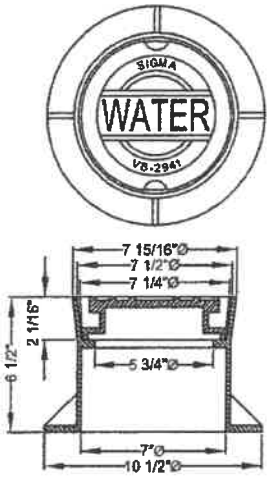
CASTINGS

VB-284



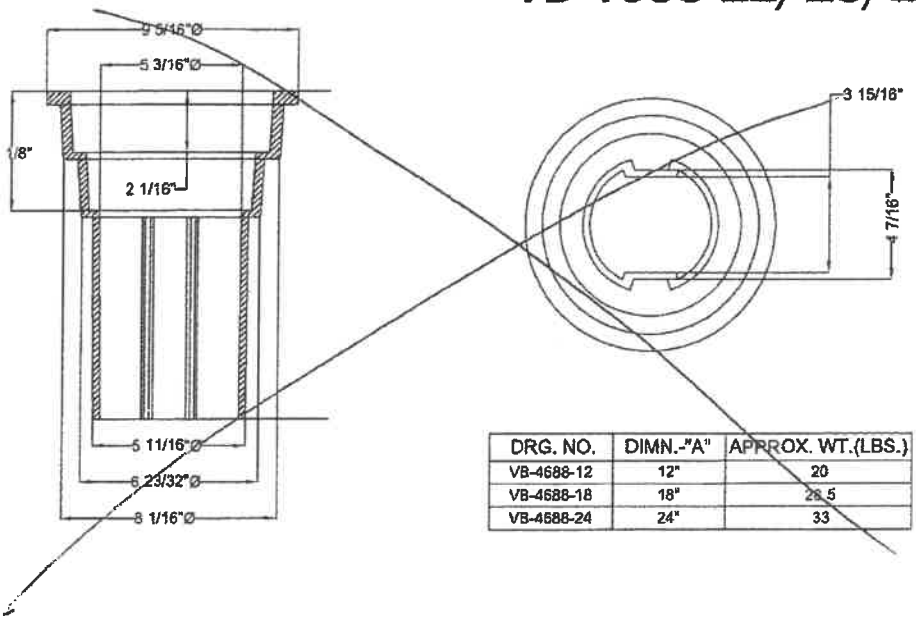
Shipping Weight: 21 lbs.

VB-294W



Shipping Weight: 25 lbs.

VB-4688-12/18/24



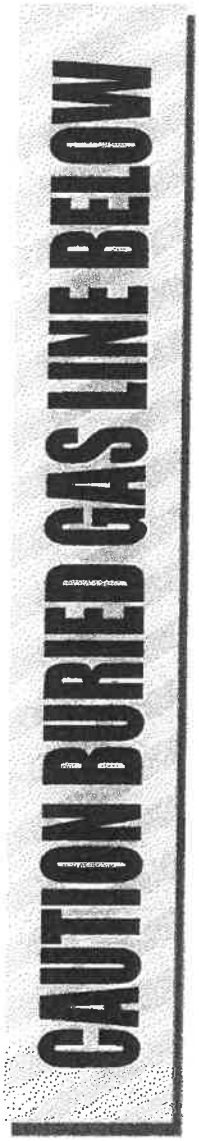
DRG. NO.	DIMN.-"A"	APPROX. WT.(LBS.)
VB-4688-12	12"	20
VB-4688-18	18"	28.5
VB-4688-24	24"	33

MARKING TAPE

DETECTABLE TAPE (5.0 MIL)

DETECTABLE TAPE (5.0 MIL)

Solid Aluminum Foil Core • Virgin Clear Polypropylene Film Laminated Top Structure
Virgin Clear Polyethylene Film Laminated Base Structure • Reverse Printed Polypropylene Structure
Acid, Alkali, Chemical, and Oil Resistant • Direct Burial Rated • Made in the USA



Applications and Information

- **Pro-Line's Detectable Marking Tape** is used for detecting, locating, identifying, and protecting buried utility lines for gas, water, sewer, telecommunication, and electrical markets. The width of tape used, is determined by the size of, and depth at which the underground utility line is buried. The depth at which detectable tape is buried, is determined by the width of the tape used.
- **DETECT:** Aluminum core is detected through means of inductive locating.
- **LOCATE:** Line is located and marked after inductive locating is performed.
- **IDENTIFY:** Utility type is identified by both the APWA color-code and utility legend printed on the marking tape.
- **PROTECT:** Detectable tape works 24 hours a day and year round, even if tape is not inductively located during excavation, the tape provides a "stop-sign" effect that is highly visible.

Standards and References

Pro-Line's Detectable Marking Tape meets or exceeds all applicable ASTM specifications.

- ASTM D2103-08: Standard Specification for Polyethylene Films and Sheeting.
- ASTM D882-09: Standard Test Method for Tensile Properties and Elongation of Thin Plastic Sheeting.
- ASTM D2578-08: Standard Test Method for Wetting Tension of Polyethylene and Polypropylene Films.
- ASTM D792-08: Standard Test Methods for Density of Plastics by Displacement.
- ASTM D671-93: Standard Test Method for Flexural Fatigue of Plastics.

Construction

Pro-Line's Detectable Marking Tape consists of a minimum 5.0 mil overall thickness. Construction is 0.8 mil clear virgin polypropylene film, reverse printed and laminated to a 0.35 solid aluminum foil core and then laminated to a 3.75 mil clear virgin polyethylene film. Tape is printed with our APWA Color-Coded, patented "Diagonally Striped" design with big, bold, black lettering to identify a specific buried utility line.

Specifications

DETECTABLE UNDERGROUND MARKING TAPE
Underground marking tape shall be a (2", 3", 4", 6", or 12" width), detectable marking tape, with a minimum 5.0 mil overall thickness. Tape shall be manufactured using a 0.8 mil clear virgin polypropylene film, reverse printed and laminated to a 0.35 mil solid aluminum foil core, and then laminated to a 3.75 mil clear virgin polyethylene film. Tape shall be printed using a diagonally striped design for maximum visibility, and meet the APWA Color-Code standard for identification of buried utilities. Detectable marking tape shall be **Pro-Line Safety Products** or approved equal and made in the USA.

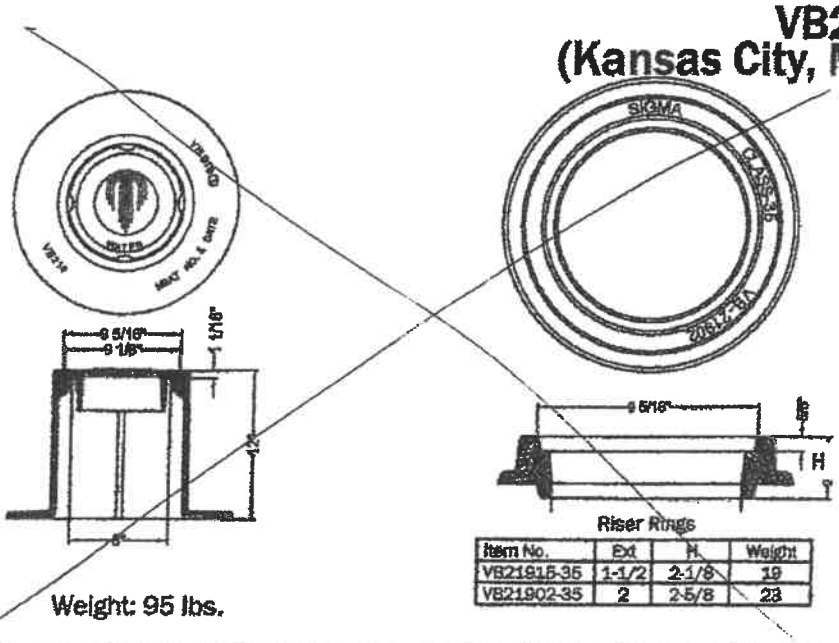
SIGMA

Valve Boxes

Municipal

CASTINGS

VB219
(Kansas City, MO)

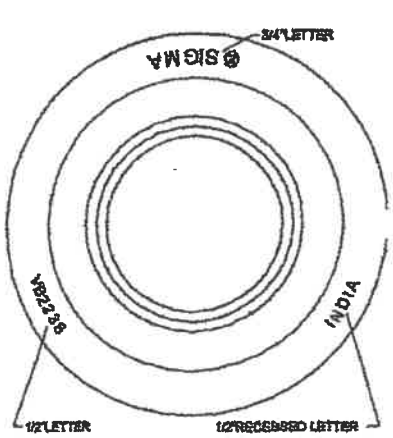


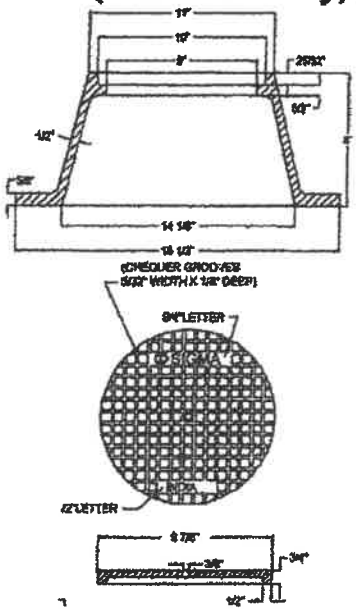
Riser Rings

Item No.	Ext.	H.	Weight
VB21915-35	1-1/2	2-1/8	19
VB21902-35	2	2-5/8	23

Weight: 95 lbs.

VB2238
(Kansas City, MO)





Weight: 75 lbs.

The Kennedy Guardian

Fire hydrants have been used in fire protection for over 100 years. A.W.W.A. C502 was developed in 1913 as a standard for the manufacture and use of dry barrel hydrants. Kennedy has established itself as a leader in the industry with manufacturing experience dating back to 1905. Many of the early hydrants are in use today.
Kennedy's most recent design is the Guardian. Based on a simple design, it is easy to install, maintain and repair. The Guardian sets a standard for quality in the industry and meets or exceeds all requirements for A.W.W.A. C502 latest revision, and is UL listed and FM approved.

[redacted] Meets or exceeds requirements of A.W.W.A. C-502 and is UL listed and FM approved.

K-81A Meets or exceeds requirements of A.W.W.A. C-502.

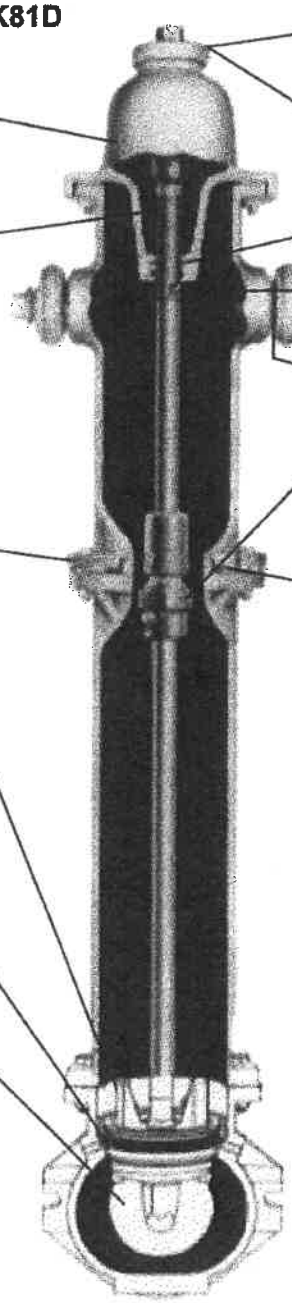
Guardian Features

AWWA
500 psi test pressure
250 psi working pressure

ULFM
500 psi test pressure
***250 psi working pressure**

* As of 01-01-2011

Fig. K81D



Weather Shield
To protect exposed operating area from freezing rain and dirt.

Thrust Washer
For easy turning operation.

One Piece Bonnet
Newly designed for easier maintenance.

Two O-Rings
To protect operating threads from corrosion.

Sealed Grease Cavity
For easier operation and maintenance.

O-Ring
To seal between brass ferrule and stem.

Nozzle
Tamper resistant.

Breakable Coupling
Minimizes damage from traffic accident. New design makes repairs more efficient.

Traffic Flange
Full 360° adjustment. New Breaking Ring on top for easy replacement and interchangeability on all K-81 models.

O-Ring
For ease of repair and nozzle facing.

Corrosion Resistant
Bronze Drain Valve.

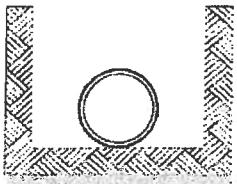
Bronze to Bronze Seating
This standard feature assures easy seat removal.

Full Cover Bottom Plate
Prevents corrosion to the lower stem threads and prevents main valve distortion. Provides a positive stop against the elbow.

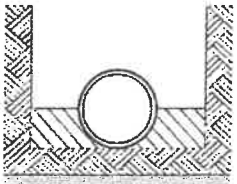
Easy to Install—Even easier to maintain

- **Tamper resistant** quarter turn hose and steamer nozzles. For those who know how, replacement is easy.
- **Easy to use**, short, simple, inexpensive and lightweight seat removal wrench.
- **Unique pressure-activated** drain valve assures positive shut off. The higher the pressure, the tighter the seal. Automatically compensates for wear due to usage. Does not rely on interference fit.
- **Two sizes available**, 5¼" valve opening and 4½" valve opening to best meet your needs.
- **Fully and easily lubricated** operating threads for corrosion protection and ease of operation.
- **The Guardian K-81D Hydrant** meets or exceeds all the latest provisions of AWWA C 502, UL 246 and FM 1510 specifications (options may be limited on UL/FM models)

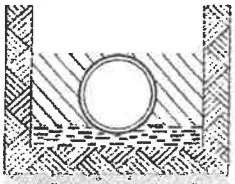
LAYING CONDITIONS



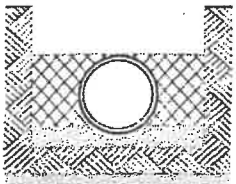
Type 1*
Flat-bottom trench,† Loose backfill.



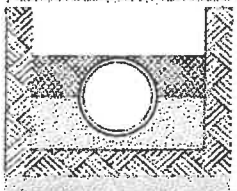
Type 2
Flat-bottom trench,† Backfill lightly consolidated to centerline of pipe



Type 3
Pipe bedded in 4 in. (100 mm) minimum of loose soil.++ Backfill lightly consolidated to top of pipe



Type 4
Pipe bedded in sand, gravel, or crushed stone to depth of 1/8 pipe diameter, 4 in. (100 mm) minimum. Backfill compacted to top of pipe. (Approximately 80 percent Standard Proctor, AASHTO T-99.)



Type 5
Pipe bedded in compacted granular material to centerline of pipe. Compacted granular or select material++ to top of pipe. (Approximately 90 percent Standard Proctor, AASHTO T-99.)

* For 14 in. (355-mm) and larger pipe, 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.

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.

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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 FEDERAL WWP421D, Grade C
DUCTILE IRON PIPE FOR GRAVITY FLOW SERVICE	ANSI/ASTM A746
DUCTILE IRON FITTINGS FOR WATER AND OTHER LIQUIDS	
3 in. through 36 in.	ANSI/AWWA C110/A21.10
DUCTILE IRON COMPACT FITTINGS	
3 in. through 24 in.	ANSI/AWWA C153/A21.53
FLANGED FITTINGS	ANSI/AWWA C110/A21.10 ANSI B16.1
DUCTILE IRON PIPE WITH THREADED FLANGES	ANSI/AWWA C115/A21.15
COATINGS AND LININGS	
Asphaltic	ANSI/AWWA C151/A21.51 ANSI/AWWA C110/A21.10 ANSI/AWWA C153/A21.53
Cement Lining	ANSI/AWWA C104/A21.4
Various Epoxy Linings and Coatings	MANUFACTURER'S STANDARD
Exterior Polyethylene Encasement	ANSI/AWWA C105/A21.5
JOINTS – PIPE AND FITTINGS	
Push-On and Mechanical Rubber-Gasket Joints	ANSI/AWWA C111/A21.11 FEDERAL WWP421D
Flanged	ANSI/AWWA C115/A21.15 ANSI B16.1
Grooved and Shouldered	ANSI/AWWA C606
PIPE THREADS	ANSI B2.1
INSTALLATION	ANSI/AWWA C600

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

Pipe Size In.	Thickness Class	Nominal Thickness In.	OD* In.	Wt. of Barrel Per Ft. † Lb.	Tyton® Joint		
					Wt. of Bell Lb.	Wt. Per Lgth.† Lb.	Avg. Wt. Per Ft.‡ Lb.
3	52	0.26	3.96	9.9	7	185	10.3
3	54	0.34	3.96	11.8	7	220	12.2
3	56	0.40	3.96	13.7	7	255	14.1
4	51	0.26	4.80	11.3	9	210	11.8
4	52	0.29	4.80	12.6	9	235	13.1
4	53	0.32	4.80	13.8	9	255	14.3
4	54	0.35	4.80	15	9	280	15.5
4	56	0.41	4.80	17.3	9	320	17.8
6	50	0.25	6.90	16	11	300	16.6
6	51	0.28	6.90	17.8	11	330	18.4
6	52	0.31	6.90	19.6	11	365	20.2
6	53	0.34	6.90	21.4	11	395	22.0
6	54	0.37	6.90	23.2	11	430	23.8
6	55	0.40	6.90	25	11	460	25.6
6	56	0.43	6.90	26.7	11	490	27.3
8	50	0.27	9.05	22.8	17	425	23.7
8	51	0.30	9.05	25.2	17	470	26.1
8	52	0.33	9.05	27.7	17	515	28.6
8	53	0.36	9.05	30.1	17	560	31.0
8	54	0.39	9.05	32.5	17	600	33.4
8	55	0.42	9.05	34.8	17	645	35.7
8	56	0.45	9.05	37.2	17	685	38.1
10	50	0.29	11.10	30.1	24	565	31.4
10	51	0.32	11.10	33.2	24	620	34.5
10	52	0.35	11.10	36.2	24	675	37.5
10	53	0.38	11.10	39.2	24	730	40.5
10	54	0.41	11.10	42.1	24	780	43.4
10	55	0.44	11.10	45.1	24	835	46.4
10	56	0.47	11.10	48	24	890	49.3
12	50	0.31	13.20	38.4	29	720	40.0
12	51	0.34	13.20	42	29	785	43.6
12	52	0.37	13.20	45.6	29	850	47.2
12	53	0.40	13.20	49.2	29	915	50.8
12	54	0.43	13.20	52.8	29	980	54.4
12	55	0.46	13.20	56.3	29	1040	57.9
12	56	0.49	13.20	59.9	29	1105	61.5
14	50	0.33	15.30	47.5	45	900	50.0
14	51	0.36	15.30	51.7	45	975	54.2
14	52	0.39	15.30	55.9	45	1050	58.4
14	53	0.42	15.30	60.1	45	1125	62.6
14	54	0.45	15.30	64.2	45	1200	66.7
14	55	0.48	15.30	68.4	45	1275	70.9
14	56	0.51	15.30	72.5	45	1350	75.0
16	50	0.34	17.40	55.8	54	1060	58.8
16	51	0.37	17.40	60.6	54	1145	63.6
16	52	0.40	17.40	65.4	54	1230	68.4
16	53	0.43	17.40	70.1	54	1315	73.1
16	54	0.46	17.40	74.9	54	1400	77.9
16	55	0.49	17.40	79.7	54	1490	82.7
16	56	0.52	17.40	84.4	54	1575	87.4
18	50	0.35	19.50	64.4	59	1220	67.7
18	51	0.38	19.50	69.8	59	1315	73.1
18	52	0.41	19.50	75.2	59	1415	78.5
18	53	0.44	19.50	80.6	59	1510	83.9
18	54	0.47	19.50	86	59	1605	89.3
18	55	0.50	19.50	91.3	59	1700	94.6
18	56	0.53	19.50	96.7	59	1800	100.0
20	50	0.36	21.60	73.5	74	1395	77.6
20	51	0.39	21.60	79.5	74	1505	83.6
20	52	0.42	21.60	85.5	74	1615	89.6
20	53	0.45	21.60	91.5	74	1720	95.6
20	54	0.48	21.60	97.5	74	1830	101.6
20	55	0.51	21.60	103.4	74	1935	107.5
20	56	0.54	21.60	109.3	74	2040	113.4
24	50	0.38	25.80	92.9	95	1765	98.2
24	51	0.41	25.80	100.1	95	1895	105.4
24	52	0.44	25.80	107.3	95	2025	112.6
24	53	0.47	25.80	114.4	95	2155	119.7
24	54	0.50	25.80	121.6	95	2385	126.9
24	55	0.53	25.80	128.8	95	2415	134.1
24	56	0.56	25.80	135.9	95	2540	141.2
30	50	0.39	32.00	118.5	139	2270	126.2
30	51	0.43	32.00	130.5	139	2490	138.2
30	52	0.47	32.00	142.5	139	2705	150.2
30	53	0.51	32.00	154.4	139	2920	162.1
30	54	0.55	32.00	166.3	139	3130	174.0
30	55	0.59	32.00	178.2	139	3345	185.9
30	56	0.63	32.00	190.0	139	3560	197.7
36	50	0.43	38.30	156.5	184	3000	166.7
36	51	0.48	38.30	174.5	184	3325	184.7
36	52	0.53	38.30	192.4	184	3645	202.6
36	53	0.58	38.30	210.3	184	3970	220.5
36	54	0.63	38.30	228.1	184	4290	238.3
36	55	0.68	38.30	245.9	184	4610	256.1
36	56	0.73	38.30	263.7	184	4930	273.9

†Including bell; calculated weight of pipe rounded off to the nearest 5 lb.
‡Including bell; average weight per foot, based on calculated weight of pipe before rounding.
*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.

INDURON
PROTECTIVE COATINGS

Look Beneath the Surface.

PROTECTO 401™ Ceramic Epoxy

STANDARD SPECIFICATION FOR LINING DUCTILE IRON PIPE FOR SEWER SERVICE

I. CONDITION OF DUCTILE IRON PRIOR TO SURFACE PREPARATION

All ductile pipe and fittings shall be delivered to the application facility without asphalt, cement lining, or any other lining on the interior surface. Because removal of old linings may not be possible, the intent of this specification is that the entire interior of the ductile iron pipe and fittings shall not have been lined with any substance prior to the application of the specified lining material and no coating shall have been applied to the first six inches of the exterior of the spigot ends.

II. LINING MATERIAL

The standard of quality is Protecto 401™ Ceramic Epoxy. The material shall be an amine cured novolac epoxy containing at least 20% by volume of ceramic quartz pigment. Any request for substitution must be accompanied by a successful history of lining pipe and fittings for sewer service, a test report verifying the following properties, and a certification of the test results.

A. A permeability rating of 0.00 when tested according to Method A of ASTM E-96-66, Procedure A with a test duration of 30 days.

B. The following test must be run on coupons from factory lined ductile iron pipe:

* ASTM B-117 Salt Spray (scribed panel) - Results to equal 0.0 undercutting after two years.
* ASTM G-95 Cathodic Disbondment 1.5 volts @ 77°F. Results to equal no more than 0.5 mm undercutting after 30 days.
* Immersion testing rated using ASTM D-714-87.
  —20% Sulfuric acid—No effect after two years.
  —140°F 25% Sodium Hydroxide—No effect after two years.
  —160°F Distilled Water—No effect after two years.
  —120°F Tap Water (scribed panel)—0.0 undercutting after two years with no effect.
* ASTM G-22 90 Standard practice for determining resistance of Synthetic Polymeric materials to bacteria. The test should determine the resistance to growth of Acidithiobacillus Bacteria and should be conducted at 30 degrees centigrade for a period of 7 days on a minimum of 4 panels. The growth must be limited only to trace amounts of bacteria.

C. An abrasion resistance of no more than 3 mils (.075 mm) loss after one million cycles using European Standard EN 598: 1994 Section 7.8 Abrasion Resistance.

III. APPLICATION

Applicator

The lining shall be applied by a certified firm with a successful history of applying linings to the interior of ductile iron pipe and fittings. All applicators must be independently inspected at least two times per year to insure compliance with the requirements of this specification. This inspection must be coordinated and reviewed by the manufacturer of the lining material and any deviation from the application and/or quality requirements shall be corrected by the applicator. All inspections shall be in writing and a permanent record maintained.

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Surface Preparation

Prior to abrasive blasting, the entire area to receive the protective compound shall be inspected for oil, grease, etc. Any areas with oil, grease, or any substance that can be removed by solvent, shall be solvent cleaned to remove those substances. After the surface has been made free of grease, oil or other substances, all areas to receive the protective compounds shall be abrasive blasted using sand or grit abrasive media. The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, etc., are removed from the surface. Only slight stains and tightly adhering oxide may be left on the surface. Any area where rust reappears before lining must be re-blasted.

Lining

After surface preparation and within 12 hours of surface preparation, the interior of the pipe shall receive 40 mils nominal dry film thickness. No lining shall take place when the substrate or ambient temperature is below 40°F. The surface also must be dry and dust free. If flange pipe or fittings are included in the project, the lining shall not be used on the face of the flange.

Coating of Bell Sockets and Spigot Ends

Due to the tolerances involved, the gasket area and spigot end up to 6 inches back from the end of the spigot end must be coated with 6 mils nominal, 10 mils maximum using Protecto 401™ Joint Compound. The Joint Compound shall be applied by brush to ensure coverage. Care should be taken that the Joint Compound is smooth without excess buildup in the gasket seat or on the spigot ends. Coating of the gasket seat and spigot ends shall be done after the application of the lining.

Number of Coats

The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied above the dry thickness per coat recommended by the lining manufacturer in printed literature. The maximum or minimum time between coats shall be that time recommended by the lining material manufacturer. To prevent delamination between coats, no material shall be used for lining which is not indefinitely recoatable with itself without roughening of the surface.

Touch-Up and Repair

Protecto 401™ Joint Compound shall be used for touch-up or repair in accordance with manufacturer's recommendations.

IV. INSPECTION AND CERTIFICATION

Inspection

All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC PA-2 Film Thickness Rating.

The interior lining of all pipe barrels and fittings shall be tested for pinholes with a non-destructive 2,500 volt test. Any defects found shall be repaired prior to shipment.

Each pipe joint and fitting shall be marked with the date of application of the lining system along with its numerical sequence of application on that date and records maintained by the applicator of his work.

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Certification

The pipe or fitting manufacturer must supply a certificate attesting to the fact that the applicator met the requirements of this specification, and that the material used was as specified.

V. HANDLING

Lined pipe and fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc. shall be placed inside the pipe and fittings for lifting, positioning, or laying. The pipe shall not be dropped or unloaded by rolling.

Care should be taken not to let the pipe strike sharp objects while swinging or being off loaded. Ductile iron pipe should never be placed on grade by use of hydraulic pressure from an excavator bucket or by banging with heavy hammers.

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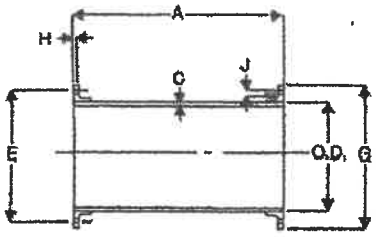
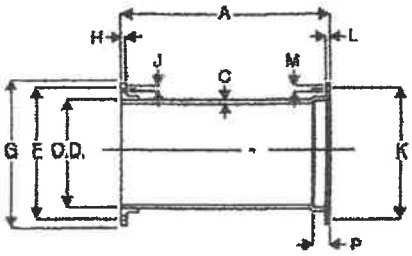
Foundry Services Co.

Kempf Holdings, LLC

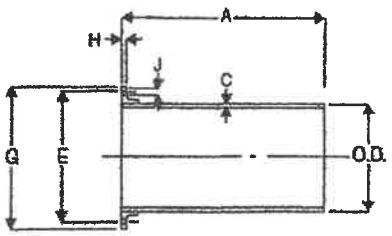
FABRICATED FLANGE PIPES



FLG. x FLG.



FLG. x M.J.



[redacted]

SIZE	A	B	C	O.D. MIN.	O.D. MAX.	E	G	H MIN.	H MAX.	NO. OF FLG'D BOLT HOLES	J	K MIN.	K MAX.	L MIN.	L MAX.	NO. OF M.J. BOLT HOLES	M MIN.	M MAX.	P
[redacted]	•	•	0.31	3.90	4.02	6.00	7.50	0.63	0.87	4	0.75	6.13	6.25	0.88	0.94	4	0.75	0.81	2.50
[redacted]	A	A	0.32	4.74	4.86	7.50	9.00	0.82	1.06	8	0.75	7.44	7.56	0.94	1.00	6	0.875	0.935	2.50
[redacted]	S	S	0.34	6.84	6.96	9.50	11.00	0.88	1.12	8	0.875	9.44	9.56	1.00	1.06	6	0.875	0.935	2.50
[redacted]	•	•	0.36	8.99	9.11	11.75	13.50	1.00	1.24	8	0.875	11.69	11.81	1.04	1.12	6	0.875	0.935	2.50
[redacted]	•	•	0.38	11.04	11.16	14.25	16.00	1.07	1.31	12	1.00	13.94	14.06	1.11	1.19	8	0.875	0.935	2.50
[redacted]	R	R	0.40	13.14	13.26	17.00	19.00	1.13	1.37	12	1.00	16.19	16.31	1.17	1.25	8	0.875	0.935	2.50
[redacted]	E	E	0.42	15.22	15.35	18.75	21.00	1.19	1.57	12	1.125	18.69	18.81	1.19	1.31	10	0.875	0.935	3.50
[redacted]	Q	Q	0.43	17.32	17.45	21.25	23.50	1.25	1.63	16	1.125	20.94	21.06	1.26	1.38	12	0.875	0.935	3.50
[redacted]	U	U	0.44	19.42	19.55	22.75	25.00	1.37	1.75	16	1.25	23.19	23.31	1.32	1.44	12	0.875	0.935	3.50
[redacted]	I	I	0.45	21.52	21.65	25.00	27.50	1.50	1.88	20	1.25	25.44	25.56	1.38	1.50	14	0.875	0.935	3.50
[redacted]	R	R	0.47	25.72	25.85	29.50	32.00	1.69	2.07	20	1.375	29.94	30.06	1.50	1.62	16	0.875	0.935	3.50
[redacted]	E	E	0.51	31.94	32.08	36.00	38.75	1.87	2.37	28	1.375	36.82	36.94	1.69	1.81	20	1.125	1.185	4.00
[redacted]	D	D	0.58	38.24	38.38	42.75	46.00	2.13	2.63	32	1.625	43.69	43.81	1.88	2.00	24	1.125	1.185	4.00
[redacted]	•	•	0.65	44.44	44.58	49.50	53.00	2.37	2.87	36	1.625	50.56	50.68	1.88	2.00	28	1.375	1.435	4.00
[redacted]	•	•	0.72	50.74	50.88	56.00	59.50	2.50	3.00	44	1.625	57.44	57.56	1.88	2.00	32	1.375	1.435	4.00
[redacted]	•	•	0.81	57.40	57.64	62.75	62.75	2.75	3.25	44	1.875	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

1. Tolerance on length of FLG. X FLG. X MJ. Pipe shall be ± 0.125".
2. Tolerance on length of FLG. X P.E. shall be ± 0.25"/
3. Above material shall meet all applicable sections of ANSI A21.10, A21.15, A21.51, 82. 1.816.11 AWWA, C110, C115, C150, C151, and all revisions.
4. Flanged pipe shall be ductile iron pipe with ductile iron flanges threaded on.
5. Linings, if required, shall be in accordance with ANSI A21.4.
6. The mechanical joint bell for 30" & 36" sizes of ductile iron pipe have thicknesses different from those shown in ANSI A21.11, which are based on gray iron pipe. These reduced thicknesses provide a lighter-weight bell which is compatible with the wall thickness of ductile iron pipe
7. Submitted material only. Consult engineer for application.
8. 250 lb. faced and drilled flanges available upon request.