

For Generations

McWANE DUCTILE IRON PIPE ISO/EN STANDARDS

















Company Profile

For over 90 years, the men and women who make up the McWane family of companies have demonstrated pride and a commitment to excellence in the products they make. Founded in 1921, McWane, Inc. is a family owned business based in Birmingham, Alabama, with 14 iron foundries and related businesses across the United States, Canada, Australia, China, India and Abu Dhabi. McWane's divisions focus on the safe, environmentally friendly manufacturing of ductile iron pipe, soil pipe, soil fittings and utility fittings, waterworks valves and fire hydrants, propane and compressed air tanks and fire extinguishers.

McWane International was created in 1992 to accommodate the growing demand for Kennedy Valve products. This activity eventually grew into full coordination of the international sales efforts of McWane Inc.'s manufacturing across the U.S.A., Canada, Australia, China and, most recently, our new plant in Abu Dhabi ,UAE.

"We recognize a significant opportunity to manufacture and supply water, sewer and plumbing products for the Middle East and North African regions," said Ruffner Page, Jr., CEO of McWane, Inc. "It's our next step towards bringing quality McWane products to even more of the world with our facility in Abu Dhabi."

The growth of the company's international sales during the last two decades required more attention be focused outside the US, and McWane International was strengthened for this purpose.

In addition to our U.S. made AWWA and ISO Standard Ductile Iron Pipe, for many years, McWane International has supplied McWane Branded Quality Certified Ductile Iron Pipe to ISO & EN Standards through OEM manufacturing facilities in China in sizes ranging from 80mm up to 2600mm diameters. Our McWane Ductile facility in Coshocton, Ohio (USA) manufacture both AWWA & ISO pipe.

Today McWane International works as a team to supply waterworks, fire protection and plumbing products to Europe and Central America, as well as our new ductile iron poles. The team is active in South America, the Caribbean, the Middle East and Asia including China and the Pacific Islands.

McWane is proud of our heritage and will continue our tradition of creating world-class quality products through our recognized family of manufacturers. McWane's global footprint has made an impact around the world. Our growing global operations are expanding this footprint to bring water to the world.



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T TYPE PUSH-ON JOINT PIPE K CLASS ISO2531: 1998 (E)



Nominal Diameter DN (mm)	External Diameter DE (mm) *1	Wa	all Thickne e (mm)	ss *2	Weigh	it / 6 meter (Kg) (Iron only)	length	Approx. Weight of Bell (Kg)
		К7	K8	К9	К7	K8	К9	
80	98	6.0	6.0	6.0	77	77	77	3.4
100	118	6.0	6.0	6.0	95	95	95	4.3
125	144	6.0	6.0	6.0	116	116	118	5.7
150	170	6.0	6.0	6.0	138	138	144	7.0
200	222	6.0	6.0	6.3	182	182	194	10.3
250	274	6.0	6.0	6.8	228	228	255	14.0
300	326	6.0	6.4	7.2	274	290	323	18.6
350	378	6.0	6.8	7.7	320	359	403	23.7
400	429	6.3	7.2	8.1	383	433	482	29.3
450	480	6.7	7.6	8.6	459	515	575	36.0
500	532	7.0	8.0	9.0	530	600	669	43.0
600	635	7.7	8.8	9.9	700	792	882	59.3
700	738	8.4	9.6	10.8	891	1009	1123	79.0
800	842	9.1	10.4	11.7	1107	1255	1394	103.0
900	945	9.8	11.2	12.6	1343	1521	1691	130.0
1000	1048	10.5	12.0	13.5	1609	1814	2017	161.0
1100	1152	11.2	12.8	14.4	1893	2133	2372	195.0
1200	1255	11.9	13.6	15.3	2198	2482	2758	238.0
1400	1462	13.3	15.2	17.1	2946	3307	3669	385.0
1500	1565	14.0	16.0	18.0	3361	3768	4175	474.0
1600	1668	14.7	16.8	18.9	3756	4213	4668	526.0
1800	1875	16.1	18.4	20.7			5100	591.0

* Note:

(1) A tolerance of ± 1 mm applies

 (2) The tolerance on nominal iron wall thickness are as follows, e=6mm, tolerance is ± 1.3mm

e > 6 mm, tolerance is $\pm (1.3 + 0.001 DN)$

Remark: The laying length is 6.0 m or for containerized shipment can be provided in 5.7m or 5.5m length



T TYPE PUSH-ON JOINT PIPE C CLASS ISO 2531: 2009 (E)



Nominal Diameter DN (mm)	External Diameter DE (mm) *1	Wall Thickness e (mm) *2			2	We	eight / 6 (H (Iro	meter le <g) n only)</g) 	ngth	Approx. Weight of Bell (Kg)
		C20	C25	C30	C40	C20	C25	C30	C40	
80	98				4.4				70	3.4
100	118				4.4				75	4.3
125	144				4.5				90	5.7
150	170				4.5				110	7.0
200	222				4.7				152	10.3
250	274				5.5				215	14.0
300	326			5.1	6.2			240	290	18.6
350	378		5.1	6.3	7.1		288	335	374	23.7
400	429		5.5	6.5	7.8		360	395	476	29.3
450	480		6.1	6.9	8.6		423	465	577	36.0
500	532		6.5	7.5	9.3		510	566	710	43.0
600	635		7.6	8.7	10.9		725	784	985	59.3
700	738	7.3	8.8	9.9	12.4	815	950	1050	1295	79.0
800	842	8.1	9.6	11.1	14.0	1030	1200	1350	1675	103.0
900	945	8.9	10.6	12.3	15.5	1265	1447	1658	1920	130.0
1000	1048	9.8	11.6	13.4	17.1	1515	1760	2005	2506	161.0
1200	1255	11.4	13.6	15.8	20.2	2123	2483	2842	3555	238.0
1400	1462	13.1	15.7	18.2		2910	3405	3738		385.0
1500	1565	13.9	16.7	19.4		3166	3737	4287		474.0
1600	1668	14.8	17.7	20.6		3650	4290	5320		526.0
1800	1875	16.4	19.7	23.0		3900	5351	5434		591.0

* Note:

(1) A tolerance of ± 1 mm applies

(2) The tolerance on nominal iron wall thickness are as follows,

e=6mm , tolerance is <u>+</u>1.3mm

e > 6mm, tolerance is $\pm(1.3 + 0.001 DN)$

Remark: The laying length is 6.0 m or for containerized shipment can be provided in 5.7m or 5.5m length



COMPARISON BETWEEN K AND C CLASS PIPE WALL THICKNESS TO ISO 2531 / EN 545 STANDARDS



Nominal Dia	Nominal Wall Thickness (e,mm)										
(mm)	K Thicl	kness Class Pip	pe (e, mm)	C Pressure Class Pipe (e, mm)							
	K7	K8	К9	C20	C25	C30	C40				
80	6.0	6.0	6.0				4.4				
100	6.0	6.0	6.0				4.4				
125	6.0	6.0	6.0				4.5				
150	6.0	6.0	6.0				4.5				
200	6.0	6.0	6.3				4.7				
250	6.0	6.0	6.8				5.5				
300	6.0	6.4	7.2			5.1	6.2				
350	6.0	6.8	7.7		5.1	6.3	7.1				
400	6.3	7.2	8.1		5.5	6.5	7.8				
450	6.7	7.6	8.6		6.1	6.9	8.6				
500	7.0	8.0	9.0		6.5	7.5	9.3				
600	7.7	8.8	9.9		7.6	8.7	10.9				
700	8.4	9.6	10.8	7.3	8.8	9.9	12.4				
800	9.1	10.4	11.7	8.1	9.6	11.1	14.0				
900	9.8	11.2	12.6	8.9	10.6	12.3	15.5				
1000	10.5	12.0	13.5	9.8	11.6	13.4	17.1				
1100	11.2	12.8	14.4	10.6	12.6	14.7	18.7				
1200	11.9	13.6	15.3	11.4	13.6	15.8	20.2				
1400	13.3	15.2	17.1	13.1	15.7	18.2					
1500	14.0	16.0	18.0	13.9	16.7	19.4					
1600	14.7	16.8	18.9	14.8	17.7	20.6					
1800	16.1	18.4	20.7	16.4	19.7	23.0					



MECHANICAL JOINT PIPE (K TYPE) TO ISO 2531 / EN 545 STANDARD



Nominal Diameter DN (mm)	External Diameter DE (mm) *1	Wall Thickness e (mm) <mark> </mark> *2			Weight	length	Approx. Weight of Bell (Kg)	
		К7	К8	К9	К7	K8	К9	
600	635	7.7	8.8	9.9	700	792	882	59.3
700	738	8.4	9.6	10.8	891	1009	1123	79.0
800	842	9.1	10.4	11.7	1107	1255	1394	103.0
900	945	9.8	11.2	12.6	1343	1521	1691	130.0
1000	1048	10.5	12.0	13.5	1609	1814	2017	161.0
1100	1152	11.2	12.8	14.4	1893	2133	2372	195.0
1200	1255	11.9	13.6	15.3	2198	2482	2758	238.0
1400	1462	13.3	15.2	17.1	2946	3307	3669	385.0
1500	1565	14.0	16.0	18.0	3361	3768	4175	474.0
1600	1668	14.7	16.8	18.9	3756	4213	4668	526.0
1800	1875	16.1	18.4	20.7	4468	5031	5591	491.0
2000	2082	17.5	20.0	22.5	5428	6107	6784	626.0
2200	2288	18.9	21.6	24.3	6483	7290	8094	784.0
2400	2495	20.3	23.2	26.1	7642	8587	9529	966.0
2600	2702	21.7	24.8	27.9	8900	9997	11088	1174.0

DN100 - DN500 sizes available on request, minimum order length shall apply.

* Note:

- (1) A tolerance of ± 1 mm applies
- (2) The tolerance on nominal iron wall thickness are as follows, e=6mm, tolerance is <u>+</u>1.3mm e> 6mm, tolerance is <u>+</u>(1.3 + 0.001 DN)

Remark: The laying length is 6.0 m or for containerized shipment can be provided in 5.7m or 5.5m length

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BOLTED GLAND RESTRAINT JOINT: PIPE (K) CLASS ISO2531: 1998 (E)



Nominal Diameter DN (mm)	External Diameter DE (mm) *1	Wall Thickness e (mm) *2	Gland N-Ф	Bolt Size- Length	Approx. Weight (Kgs/Pcs)
600	635	9.9	20 - 32	M27X130	882
700	738	10.8	24 - 32	M27X135	1233
800	842	11.7	28 - 32	M27X135	1394
900	945	12.6	30 - 32	M27X135	1691
1000	1048	13.5	30 - 32	M27X135	2017
1100	1152	14.4	40 - 32	M27X135	2372
1200	1255	15.3	40 - 32	M27X135	2758
1400	1462	17.1	40 - 34	M30X160	3669
1600	1668	18.9	40 - 34	M30X160	4668

Larger sizes available on request.

* Note:

- (1) A tolerance of ± 1 mm applies
- The tolerance on nominal iron wall thickness are as follows, e=6mm, tolerance is <u>+</u> 1.3mm e> 6mm, tolerance is <u>+</u> (1.3 + 0.001 DN)

Remark: The laying length is 6.0 m or for containerized shipment can be provided in 5.7m or 5.5m length



TIE BAR RESTRAINT FOR T TYPE (PUSH-ON) JOINT



	MATERIALS
Tie Split Flange	Ductile Iron ASTM A536 Grade 65-45-12, FBE Coated
Tie Bars	Carbon Steel, BS EN ISO 898-1 Grade 8.8, Zinc Coated
Heavy Hex Nuts	Carbon Steel, BS4190 Grade 8.0, Zinc Coated
Washers	Carbon Steel, BS4320 Form E, Zinc Coated

DN	Pipe OD	Split Flange	Bolt Circle		Bolt H	lole		Working Pressure
		OD	PCD	Dia.	No.	Length	Size	Bars
200	222	340	308	23	6	345	M20	40
250	274	400	370	28	6	365	M24	30
300	326	455	427	28	6	385	M24	30
350	378	520	482	28	8	390	M24	20
400	429	580	537	31	8	415	M27	20
450	480	640	585	31	10	430	M27	20
500	532	715	650	34	10	445	M30	20
600	635	840	770	37	10	460	M33	20
700	738	910	867	37	12	515	M33	16
800	842	1025	993	40	12	555	M36	16
900	945	1125	1120	40	14	590	M36	16
1000	1048	1255	1207	43	14	625	M39	10
1100	1152	1355	1270	43	16	660	M39	10
1200	1255	1485	1432	49	16	705	M45	10
1400	1462	1685	1590	49	18	760	M45	10
1500	1565	1820	1800	56	18	830	M52	10



FLANGED (FABRICATED) DUCTILE PIPE

FLANGE X PLAIN END PIPE

Nominal		Weig	ht with flar	nge
Diameter DN	۲ *	PN 10 Kg	PN 16 Kg	PN 25 Kg
80	350	7.9	8.0	8.0
100	350	9.6	9.6	10.1
150	400	17.1	17.1	18.1
200	400	24.5	24.0	25.5
250	400	33.0	33.0	35.5
300	450	46.0	45.0	49.0
350	450	58.0	58.0	64.0
400	480	70.0	74.0	83.0
500	520	104.0	117.0	123.0
600	560	144.0	169.0	172.0
700	600	189.0	187.0	225.0
800	600	239.0	250.0	291.0
900	600	272.0	295.0	-
1000	600	328.0	369.0	-
1100	600	394.0	430.0	-
1200	600	456.0	520.0	-
1400	710	664.0	732.0	-
1500	745	812.0	900.0	-
1600	780	922.0	1024.0	-
1800	850	1196.0	1322.0	-
2000	920	1534.0	1687.0	-
2200	990	1948.0	2115.0	-
2400	1060	2409.0	2611.0	-
2600	1130	2918.0	3153.0	-





FLANGE X FLANGE PIPE

	Wei	ght with Flang	e ·	We	Weight with Flange			
Diameter	Effective	length = 250	mm *	Effective	Effective length = 500mm *			
DN	PN 10 kg	PN 16 kg	PN 25 kg	PN 10 kg	PN 16 kg	PN 25 kg		
80	9.6	9.6	9.8	12.9	12.9	13.3		
100	11.5	11.5	12.5	13.4	13.4	16.9		
150	19.0	19.0	21.0	26.0	26.0	28.0		
200	26.5	26.0	29.0	36.5	36.0	39.5		
250	40.5	39.5	45.5	57.0	56.0	62.0		
300	53.0	52.0	59.0	75.0	73.0	80.0		
350	69.0	71.0	83.0	99.0	100.0	112.0		
400	80.0	88.0	106.0	113.0	123.0	141.0		
500	95.0	122.0	157.0	104.0	117.0	138.0		
600	129.0	178.0	201.0	139.0	166.0	215.0		
700	207.0	170.0	265.0	289.0	255.0	350.0		
800	267.0	223.0	352.0	373.0	329.0	458.0		
900	318.0	264.0	426.0	447.0	393.0	556.0		
1000	395.0	340.0	556.0	550.0	495.0	711.0		
1200	-	-	-	549.0	661.0	822.0		

* Length can be supplied from the range of 0.3m to 5.9m. Larger sizes are available upon customer request.

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FLANGED (FABRICATED) WALL PIECES / ANCHORING PIPES (DOUBLE FLANGE AND FLANGE X PE WITH PUDDLE FLANGE)



Nominal Dia	OD	L*	FD	FD a b		с	Weight of short flange anchoring Pipes with flanges			Weig sp	ht of fla bigot wit flanges	nge h
DN	mm	mm	mm	mm	mm	mm	PN 10 kg	PN 16 kg	PN 25 kg	PN 10 kg	PN 16 kg	PN 25 kg
80	98	600	200	16.0	120	200	17.5	17.5	17.5	15.7	15.7	15.7
100	118	600	220	16.0	120	200	21.0	21.0	22.0	18.9	18.9	19.4
150	170	600	285	18.0	130	200	33.0	33.0	34.5	30.0	30.0	30.5
200	222	600	340	20.0	130	200	44.5	44.6	48.0	39.5	39.5	41.5
250	274	1000	400	20.0	155	300	79.0	80.0	86.0	67.0	68.0	71.0
300	326	1000	455	20.5	155	300	104.0	107.0	118.0	86.0	88.0	94.0
350	378	1000	505	20.5	170	300	130.0	138.0	154.0	109.0	113.0	122.0
400	429	1000	565	20.5	170	300	156.0	167.0	191.0	131.0	135.0	147.0
500	532	1000	670	22.5	190	300	213.0	299.0	277.0	178.0	193.0	206.0
600	635	1000	780	25.0	200	300	286.0	339.0	354.0	237.0	263.0	271.0
700	738	1500	895	27.5	220	300	480.0	586.0		413.0	481.0	
800	842	1500	1015	30.0	240	300	610.0			519.0		
900	945	1500	1115	32.5	260	300	621.0			729.0		
1000	1048	1500	1230	35.0	300	300	745.0			880.0		

* Length and puddle flange location as per customer specification



FLANGE DIMENSIONS



Dimensions in m	nm								
Nominal								Bolts	
Dia DN	D1	D2	D3	DE	С	R	Φd	Size	Nos.
80	200	160	132	98	19.0	6	19	M16	8
100	220	180	156	118	19.0	6	19	M16	8
150	285	240	211	170	19.0	8	23	M20	8
200	340	295	266	222	20.0	8	23	M20	8
250	400	350	319	274	22.0	10	23	M20	12
300	455	400	370	326	24.5	10	23	M20	12
350	505	460	429	378	24.5	10	23	M20	16
400	565	515	480	429	24.5	10	28	M24	16
450	615	565	530	480	24.5	12	28	M24	20
500	670	620	582	532	26.5	12	28	M24	20
600	780	725	682	635	30.0	12	31	M27	20
700	895	840	794	738	32.5	16	31	M27	24
800	1025	950	901	842	35.0	16	34	M30	24
900	1115	1050	1001	945	37.5	16	34	M30	28
1000	1230	1160	1112	1048	40.0	16	37	M33	28
1100	1340	1270	1218	1152	42.5	20	37	M33	32
1200	1455	1380	1328	1255	45.0	20	40	M36	32
1400	1675	1590	1530	1462	46.0	20	43	M39	36
1500	1/85	1/00	1640	1668	47.5	20	43	M39	36
1600	1915	1820	1750	1565	49.0	20	49	M45	40
1800	2115	2020	1950	18/5	52.0	20	49	M45	44
2000	2325	2230	2150	2082	55.0	20	49	M45	48
2200	2550	2440	23/0	2288	59.0	20	56	M52	52
2400	2/50	2650	25/0	2495	62.0	20	56	M52	56
2600	2960	2850	2780	2702	65.0	20	56	M52	60

FLANGE PN 16

Dimensions in mm

Nominal							Bolts		
Dia DN	D1	D2	D3	DE	С	R	Φd	Size	Nos.
80	200	160	132	98	19.0	6	19	M16	8
100	220	180	156	118	19.0	6	19	M16	8
150	285	240	211	170	19.0	8	23	M20	8
200	340	295	266	222	20.0	8	23	M20	12
250	400	355	319	274	22.0	10	28	M24	12
300	455	410	370	326	24.5	10	28	M24	12
350	520	470	429	378	26.5	10	28	M24	16
400	580	525	480	429	28.0	10	31	M27	16
450	640	585	548	480	30.0	12	31	M27	20
500	715	650	609	532	31.5	12	34	M30	20
600	840	770	720	635	36.0	12	37	M33	20
700	910	840	794	738	39.5	16	37	M33	24
800	1025	950	901	842	43.0	16	40	M36	24
900	1125	1050	1001	945	46.5	16	40	M36	28
1000	1255	1170	1112	1048	50.0	16	43	M39	28
1100	1355	1270	1218	1152	53.5	20	43	M39	32
1200	1485	1390	1328	1255	57.0	20	49	M45	32
1400	1685	1590	1530	1462	60.0	20	49	M45	36
1500	1820	1710	1640	1565	62.5	20	56	M52	36
1600	1930	1820	1750	1668	65.5	20	56	M52	40
1800	2130	2020	1950	1875	70.0	20	56	M52	44
2000	2345	2230	2150	2082	75.0	20	62	M56	48
2200	2555	2440	2370	2288	81.0	20	62	M56	52
2400	2765	2650	2570	2495	86.0	20	62	M56	56
2600	2965	2850	2780	2702	91.0	20	62	M56	60

FLANGE PN 25

FLANGE PN 10

Nominal							Bolts		S
Dia DN	D1	D2	D3	DE	С	R	Φd	Size	Nos.
80	200	160	132	98	19.0	6	19	M16	
100	235	190	156	118	19.0	6	23	M20	8
150	300	250	211	170	20.0	8	28	M24	
200	360	310	274	222	22.0	8	28	M24	12
250	425	370	330	274	24.5	10	31	M27	
300	485	430	389	326	27.5	10	31	M27	16
350	555	490	448	378	30.0	10	34	M30	
400	620	550	503	429	32.0	10	37	M33	16
450	670	600	548	480	34.5	12	37	M33	
500	730	660	609	532	36.5	12	37	M33	20
600	845	770	720	635	42.0	12	40	M36	
700	960	875	820	738	46.5	16	43	M39	24
800	1085	990	928	842	51.0	16	49	M45	
900	1185	1090	1028	945	55.5	16	49	M45	28
1000	1320	1210	1140	1048	60.0	16	56	M52	
1100	1420	1310	1240	1152	64.5	20	56	M52	32
1200	1530	1420	1350	1255	69.0	20	56	M52	
1400	1/55	1640	1560	1462	/4.0	20	62	M56	36
1600	19/5	1860	1/80	1668	0.18	20	62	M56	
1800	2195	2070	1985	1875	88.0	20	/0	M64	44
2000	2425	2300	2210	2082	95.0	20	/0	1///64	

Flange dimensions to EN1092-2 / ISO 7005-2



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APPENDICES



MECHANICAL PROPERTIES

ISO DUCTILE IRON PIPE

McWane's ISO Ductile Iron Pipe manufacturing companies in the USA and other OEM manufacturing facilities are certified by ISO 9001:2000

Advantages of Ductile Iron Pipe

- High tensile strength, good elastic modulus and excellent ductility, make it suitable for high stress applications.
- High corrosion resistance.
- Excellent hydraulic flow.
- High working pressure compared to other types of pipes.
- Ease of installation.
- Long lifetime.
- Can accommodate ground movement with built-in angular deflection.

1.MECHANICAL PROPERTIES OF DUCTILE IRON PIPE

Nominal Size DN	Minimum tensile strength, Rm Mpa	Minimum 0.2% proof stress,Rp0 ₂ Mpa	Minimum elongation after fracture,A %	Hardness HB	
80-1000	> 420	>300	≥10	≤ 230	
1100-2600			≥7		
NI-L-					

Note :

1. The 0.2 % proof stress [Rp0.2] may be measured by agreement between manufacturer and purchaser. It shall not be less than:

270 mPa when A \geq 12 % for DN 40 to DN 1000 or A \geq 10 % for DN > 1000; 300 mPa in other cases.

2. DN 40 to DN 1000, the minimum elongation after fracture shall be 7% for thickness classes over K12.

2. WORKS TEST PRESSURE

Nominal Size DN	Hydrostatic Works Test Pressure BAR
80 - 300	50
350 - 600	40
700 - 1000	32
1200 - 2000	25
2200 - 2600	18

Note :

For PN Flanged Pipe testing pressure shall be 1.5 times the flange rating.



LINING & COATING FOR DUCTILE IRON PIPE

McWane Ductile Iron pipes are offered with various coatings and linings as detailed below:

Туре	Internal (Lining)	External (Coating)			
Standard	Sulphate resistant cement	Metallic Zinc plus bituminous			
	mortar type V (ISO 4179)	paint (ISO 8179-1)			
Additional Protection	High alumina cement mortar	Polyethylene sleeving			
		(installed on site)			
Other Coatings	Fusion Bonded Epoxy lining (FBE)	Fusion Bonded Epoxy coating			
	Induron Protecto 401 TM ceramic epoxy	Zinc / Aluminum coating			
	Ceramapure PL90™	up to 400mg/sqm (85% / 15%)			
	Seal coat				

a) Cement lining thickness

DN	Nominal Value	Tolerance [*]	Maximum crack width & radial displacement					
80 - 300	3.5	-1.5	0.8					
350 - 600	5	-2	1.0					
700 -1200	6	-2.5	1.2					
1400 - 2000 9 -3 1.5								
* A negative tolerance only is required by the standards.								

b) Bitumen coating

The mean thickness of bitumen coating shall not be less than 70 μ m and local minimum thickness shall not be less than 50 μ m.

c) Metallic Zinc coating

When metallic zinc spray is applied, the mean mass of the Zinc per unit area shall not be less than 130g/m2, with a local minimum of 110g/m2.

d) Epoxy coating

Fusion Bonded Epoxy coating available internally up to a thickness of 500 μ m. Externally up to 120 μ m in accordance with EN 14901.

e) Ceramic Epoxy Protecto 401[™] lining

Protecto 401^{TM} is applied to the interior of ductile pipe and fittings, utilizing specialized application equipment and stringent specifications. The lining is designed to be applied at a nominal 40-mil (1000 μ m) thickness. A non-destructive pinhole detection test and a thickness test are performed to insure a sound, chemically resistant protective lining for ductile iron pipe and fittings. This lining is not suitable for potable water pipelines.

f) Ceramapure PL90[™] is certified for cold end uses only to NSF/ANSI International Standard 61 for potable water immersion service. Ceramapure[™] PL90 meets or exceeds AWWA C-210.





BACKGROUND

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In 1979, Induron Coatings, Inc. began the two-year research and development process that led to the industry-leading product known as Protecto 401[™] today.

The first Protecto 401[™]-lined ductile iron sewer pipe was placed into service in 1981. Since then, literally thousands of miles of ductile iron sewer pipe have been lined with Protecto 401[™].

PRODUCT QUALITIES

Specifically designed to protect ductile iron sanitary sewer pipe, Protecto 401[™] Ceramic Epoxy Lining provides the reliability of cement mortar lining with the unequaled corrosion protection of novolac epoxy. Its unique qualities have resulted in performance unmatched by any other lining.

PROTECTING YOUR PROJECTS AND YOUR REPUTATION.

Over the years, Protecto 401[™] has been exhaustively tested and evaluated—both by Induron's own Research and Development professionals, and in independent laboratory settings.

To further protect your ductile iron sewer pipe projects, Induron allows no deviations from their strict testing and application specifications without prior written approval. All third party inspections are conducted using Induron's standard Protecto 401[™] Ceramic Epoxy Quality Control Procedures.

APPLICATION AND SPECIFICATION OVERVIEW

Protecto 401[™] is applied to the interior of ductile pipe and fittings, utilizing specialized application equipment and stringent specifications. The lining is designed to be applied at a nominal 40 mils (1000 Microns) thickness. A nondestructive pinhole detection test, and a thickness test, are performed to insure a sound, chemically-resistant protective lining for ductile iron pipe and fittings.

Nothing protects tough sewer pipe applications more effectively than ductile iron pipe and fittings lined with Induron's Protecto 401[™] Ceramic Epoxy. It's been successfully used in hundreds of sanitary sewer applications and proven both in laboratory testing and decades of actual sewer service.

Since 1981, literally thousands of miles of ductile iron sewer pipe have been lined with Protecto 401[™]. Give your projects and your reputation the protection they deserve. Specify ductile iron pipe and fittings lined with Protecto 401[™]. QUALIFIED UNDER: ASTM E-96 ASTM G-95 ASTM B-117 ASTM G-14 ASTM D-714 ASTM D-1308 ASTM G-22 ASTM F1476-95A EPA 1311

Induron Coatings currently maintains a special sales representation agreement with McWane, inc., for ductile iron pipe linings for international markets.



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POLYETHYLENE ENCASEMENT

POLYETHYLENE ENCASEMENT

Polyethylene encasement is offered at site when specified. Loose polyethylene encasement was first used experimentally in the United States for protection of cast iron pipe and fittings in corrosive environments in 1951. The first field installation of polyethylene wrap on cast iron pipe in an operating water system was in 1958. Since that time, thousands of installations have been made throughout the world. Polyethylene encasement has been used as a soil corrosion preventative in Canada, UK, France, Germany, and several other countries since development of the procedure in the United States.

Research by the U.S. Ductile Iron Pipe Research Association (DIPRA) on several severely corrosive test sites has indicated that polyethylene encasement provides a high degree of protection and results in minimal and generally insignificant exterior surface corrosion of grey and ductile iron pipe thus protected.

Further tests have indicated that the dielectric capability of polyethylene provides shielding for grey and ductile pipe against stray direct current at most levels encountered in the field.

Polyethylene encasement is recommended to meet all requirements of ISO 8180 / ASTM A674 and ANSI / AWWA C105 / A21.5 standards.

INSTALLATION METHODS



Method A

In this method, which is preferred by most utilities and contractors, one length of polyethylene tube, overlapped at the joints, is used for each length of pipe.



Method B

A length of polyethylene tube is used for the barrel of the pipe and separate lengths of polyethylene tube or sheets are used for the joints. Note: Method B is not recommended for bolted-type joints unless an additional layer of polyethylene is provided over the joint area as in Methods A and C.



Method C Each section of pipe is completely wrapped with a flat polyethylene sheet.



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SITE HANDLING INSTRUCTIONS

Joint Assembly

PUSH-ON joints have no accessories other than a rubber gasket. Assembly is easily accomplished by pushing the pipe spigot into the socket. For small pipe, a hand held rack and lever machine is adequate, for larger pipe a back hoe or track hoe is generally used.

Clean any sand, dirt, grease or debris from the socket end and gasket. Insert the gasket into the socket, making sure the retainer bead on the gasket fits completely into the groove of the socket. Apply a coating of joint lubricant to the exposed surfaces of the gasket and to the first 100mm of the beveled (spigot) end of the pipe.

Assemble the pipes by pushing the spigot of one pipe into the bell socket of another. Keep the two pipes in as straight alignment as possible during assembly. If the joint is difficult to assemble separate the joint and inspect the gasket position. Make sure the gasket is seated.

The desired deflection of the joint may now be set. Do not deflect the joint farther than the recommended amount.







Kirkuk Iraq Job Installation Sites

Backfilling:

All backfill material must be free from cinders, ashes, frozen soil, or other unsuitable material. Organic material left in the backfill may cause accelerated corrosion of the pipe.

The backfill should be compacted according to the trench type and conditions required by the pipeline design specifications.

Field Testing, Flushing and Disinfection:

The usual procedure for leakage testing is to fill the pipe or pipe section slowly with water. Air must be allowed to escape through air valves, corporation cocks or by some other means. When the pipe is full of water and as much air has been purged as possible, the line may be pressurized to the required test pressure. A typical test pressure of 1.5 times the operating pressure is typical but may vary according to the design requirements of the line. When the desired pressure is reached the line can be sealed and the pressure monitored for loss and leakage.

Before the line can be put into service it must be flushed and disinfected. Flushing is necessary to remove any dirt or foreign material from the pipeline. After flushing the pipeline should be disinfected with a solution of chlorine and water.

APPENDIX F

INSTALLATION

Installation Guidelines

Proper installation procedures are essential for successful performance of all pipe line products.

Trench Alignment and Grade

Pipelines must be laid and maintained to the lines and grades established by the plans and specifications for the project.

Fittings, valves, tapped or bossed outlets, and hydrants must be installed at the required locations unless field conditions warrant otherwise and such changes are approved in accordance with the specifications. Valve operating stems must be oriented to allow proper operation.

PUSH-ON Joint (T-Type)



Wire rope A Sling Chain

[DN500-600MM] 3 Ton hand pulley



[DN700-1000MM] (2) x 3 Ton hand pulley Wire rope Sling Chain

Trench Construction

Trenches can be excavated in several ways either by hand or machine. The depth of the trench must be deep enough to provide protection from surface traffic, frost and future changes in the ground elevation. The width of the trench must be sufficient to permit the pipe to be laid and joined properly and allow the backfill to be placed as specified. Trenches should be shored and braced as required to keep the trench from collapsing. The bottom of the trench should form a continuous and even bed for the pipe. Where rock is encountered the trench should be excavated deeper, backfill added and compacted to grade with a bedding material such as sand, gravel or clean soil.

Pipe Installation

All materials must be carefully examined for damage and defects prior to being placed in the trench. Remove all foreign materials from the pipe, trench and backfill. The trench should be dewatered before pipe installation

Pipe, fittings, valves, and hydrants must be carefully lowered into the trench with suitable equipment to prevent damage to the protective coatings and linings. Under no circumstances should these items be dropped or dumped into the trench.

Pipes for potable water should not be laid in the same trench with a sewer or non-potable water line. For added protection water lines should be laid higher than sewer lines. When a water line crosses a railway line, the water line should be laid inside a culvert pipe or casing that is at least 150mm larger than the water line so as to protect it from vibration.

For ease of installation the socket pipe is normally placed with the sockets facing in the direction of laying. Joints should not be deflected beyond the permissible limit or pipe damage and leakage may ensue. All joints should be installed carefully and without using excessive force. All tees, bends, caps, plugs, hydrants or other fittings that change the direction of flow or stop the flow should be restrained or blocked to prevent joint separation when pressurized.

When pipe installation is not in progress, the open ends of pipe should be closed with a plug or other means as required to keep contamination out of the line. The plug should allow venting and remain in place until the trench is pumped dry prior to starting installation. Care must be taken to prevent pipe floatation in case the trench fills with water. If the plug is watertight, any air or water pressure in the pipeline must be released before removing the plug.





PIPE DEFLECTION & CUTTING OF PIPES

Pipe Deflection

One advantage of the PUSH-ON joint is that it permits angular deflection and thus allow:

- Ground movement accommodation within certain limits as shown in the diagrams below,
- Allows some path adjustment during installation.
- A reduced number of bends or fittings.

DN 80-150	DN 200 -300	DN 350 -600	DN 700 -800	DN 900 -1600
5 degrees	4 degrees	3 degrees	2 degrees	1.3 degrees

Ground level





Cutting of pipe at site

Pipe can be cut on site using an abrasive disc cutter or any suitable equipment.

- Mark a cutting line. The pipe should be placed on level ground or square timbers and the cutting line laid to produce a square cut pipe end.
- While cutting, the pipe should be cut through at one point, and then cut along the marked line in a single operation.
- Any sharp edges at the cut end must be removed. Before inserting the cut spigot into the socket, the spigot bevel should be restored with a grinder.
- Recoat the bare metal surface with bitumen. With careful cutting, the cement lining should not be damaged. If necessary, guidelines for repair are available upon request.

A - Rubber Pad B - Jack C - Timber

Ovality Correction

When large sizes ductile pipes of DN 450 or above are cut, the release of stress may cause the pipe to become out of round. This can be corrected by the use of a jack and timber strut as shown. Once the joint has been made, then the jack can be removed.



APPENDIX H

LAYING CONDITIONS & ISO STANDARDS



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

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 please refer to the standards.

GENERAL SPECIFICATIONS FOR ISO PIPES

- ISO 2531 Ductile iron pipes, fittings and accessories for pressure pipelines.
- ISO 7186 Ductile iron products for sewage applications.
- ISO 4179 Ductile iron pipes for pressure and non pressure pipelines - centrifugal cement mortar lining general requirements.
- ISO 8179 Ductile iron pipes - external zinc coating.
- ISO 4633 Rubber seals-joint rings for water supply, drainage and sewerage pipelines -Meets the specification for materials.
- ISO 8180 Ductile iron pipes - Polyethylene sleeving.
- ISO 7005-2 Metallic flanges - Part 2 cast iron flanges. Hexagon head bolts - produced grades A and B.
- ISO 4032 Hexagon nuts, style 1 - Produced grades A and B.
- ISO 14901 Epoxy coating (heavy duty) of ductile iron fittings and accessories
- Requirements and testing methods for Ductile iron pipes, fittings and **BSEN 545** accessories and their joints for water pipelines.
- **BSEN 598** Requirements and testing methods for Ductile iron pipes, fittings and accessories and their joints for sewerage applications.
- BS 4027 Requirements for composition, strength, physical and chemical properties of three strength classes of Specification for sulfate-resisting Portland cement.
- BS 3416 Specification for bitumen based coatings for cold application, suitable for use in contact with potable water.
- BS 2494 Specification for elastomeric seals for joints in pipe work and pipelines.



APPROXIMATE SHIPPING WEIGHT & VOLUME FOR DI PIPES

Nominal	Volume per 6m	Approx.	Appro	n pipe length	Approx . Weight per 5.5m pipe length					
Diameter DN	length CBM	Weight of Bell Kg		Iron Kg/pcs		Cement Lining Kg/pcs		Iron Kg/pcs		Cement Lining Kg/pcs
			K7	K8	К9		K7	K8	К9	
DN080	0.092	3.4	77	77	77	10.2	71	71	71	9.4
DN100	0.124	4.3	95	95	95	12.6	86	86	86	11.6
DN125	0.162	5.7	116	116	118	16.5	107	107	106	15.1
DN150	0.232	7.1	138	138	144	19.2	127	127	127	17.6
DN200	0.386	10.3	182	182	194	25.2	168	168	176	23.1
DN250	0.574	14.2	228	228	255	31.2	210	210	235	28.6
DN300	0.797	18.6	274	290	323	37.8	255	268	290	34.7
DN350	1.050	23.7	320	359	403	73.8	296	331	371	67.7
DN400	1.326	29.3	382	433	482	84.0	354	399	445	77.0
DN450	1.651	36.0	459	515	575	94.3	425	475	532	86.5
DN500	1.983	42.8	530	600	669	105.0	491	554	616	96.3
DN600	2.790	59.3	700	792	882	125.4	648	731	814	115.0
DN700	3.763	79.1	891	1009	1123	175.8	826	931	1036	161.2
DN800	4.923	102.6	1107	1255	1394	200.0	1026	1156	1286	183.3
DN900	6.174	129.9	1343	1521	1691	225.6	1247	1404	1561	206.8
DN1000	7.544	161.3	1609	1814	2017	250.2	1488	1675	1862	229.4
DN1100	8.631	194.7	1893	2133	2372	278.0	1752	1971	2196	254.8
DN1200	10.787	237.7	2198	2482	2758	300.0	2040	2295	2548	275.0
DN1400	14.638	385.8	2946	3307	3669	525.6	2733	3065	3395	481.8
DN1500	16.229	474.4	3361	3768	4175	567.5	3120	3494	3867	520.2
DN1600	19.000	526.2	3756	4213	4668	600.6	3487	3906	4323	550.6

Notes

· Weight and volume data of PUSH-ON (T TYPE) Joints and Mechanical Joints (K TYPE) are the same

in sizes DN 100 – DN 1500. For larger diameter please call for weight & volume.

- DN80 DN300 are shipped in bundles.
- DN400 DN2600 are shipped by bulk freight only.
- · Special shipping protection and requirements are available upon request.

Remarks:

The specificasstion in the brochure are subject to revision without prior notice based on our product modification and sourcing programme. While we make every effort to generate the correct information in the catalog, we do notguarantee taht the information is complete and accurate,



INSTALLATION ON SITE















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