Canada Pipe Company ULC

CANADA PIPE DUCTILE IRON PIPE

Canada Pipe Company Ltd. with head offices in Hamilton, Ontario, is a Canadian subsidiary of McWane Inc. All Ductile Iron Pipe supplied by Canada Pipe is manufactured at one of the McWane facilities and meets or exceeds the requirements of the Standards listed.

HAMILTON OFFICES AND PIPE STORAGE YARD

APPLICABLE STANDARDS

Standard Designation	Subject Covered
ANSI / AWWA C150/A21.50	Design of Ductile Iron Pipe
ANSI / AWWA C151/A21.51	Manufacturing of Ductile Iron Pipe
ANSI / AWWA C111/A21.11	Rubber Gasket Joints
ANSI / AWWA C115/A21.15	Flanged Pipe
ANSI / AWWA C104/A21.4	Cement Mortar Linings
ANSI / AWWA C105/A21.5	Polyethylene Encasement for Ductile Iron Pipe
ANSI / AWWAC600	Installation
ASTM A746	Gravity Sewers
ANSI / AWWA C606	Grooved & Shouldered Joints

APPROVALS AND LISTINGS

Pipe

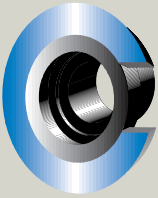
Underwriters Laboratories
National Fire Protection Association
National Sanitation Foundation 61
Factory Mutual – PSCIPCO
ISO 9002
BNQ 3623-085 – Atlantic States
BNQ 3623-085 – Clow Water

Polyethylene Encasement

Japan	JD PL Z2005
Great Britain	BS 6076
International	ISO 8180
Germany	DIN 30674, PT 5
Australia	AS 3680 and AS 3681

MANUFACTURING FACILITIES

Atlantic States Cast Iron Pipe, Phillipsburg, New Jersey
Clow Water Systems, Coshocton, Ohio
Pacific States Cast Iron Pipe, Provo, Utah

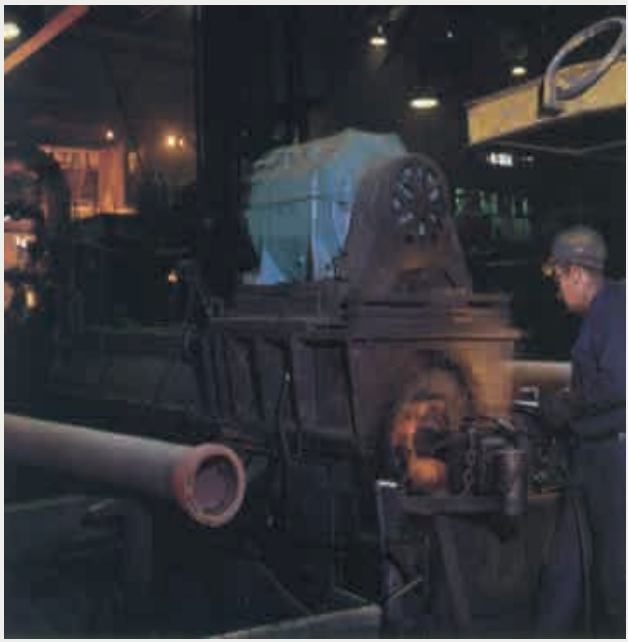


SHORT FORM SPECIFICATIONS

Pipe shall be Ductile Iron Pipe as designed by ANSI/AWWA C150/A21.50 and manufactured to ANSI/AWWA C151/A21.51, supplied with rubber gasket push-on joints in accordance with ANSI/AWWA C111/A21.11. Pipe shall be supplied in minimum Pressure Class 350 for 4" through 12" (100 mm through 300 mm); Pressure Class 250 for 14" through 20" (350 mm through 500 mm); Pressure Class 200 for 24" (600 mm), and Pressure Class 150 for 30" (750 mm) and larger, or to the Pressure Class shown on the drawings. All pipe shall be cement-mortar lined in accordance with ANSI/AWWA C104/A21.4 Standard.

Ductile Iron Pipe Foundry In Action

Casting machines centrifugally force molten iron against the mould to form pipe.



Iron pipe is being prepared for removal from casting mould.

DUCTILE IRON PIPE MANUFACTURING

Ductile Iron Pipe supplied by Canada Pipe is cast centrifugally in metal moulds in accordance with ANSI/AWWA C151/A21.51 Standard. A small but precise amount of magnesium is added to molten iron, which is introduced into a rotating metal mould fitted with a bell core. The centrifugal force evenly distributes and holds the molten iron against the mould until it solidifies. The newly formed pipe is then removed and furnace annealed to obtain the prescribed physical properties.

Ductile Iron Pipe supplied by Canada Pipe meets or exceeds the following acceptance test requirements set forth by the ANSI/AWWA C151.A21.51 Standard.

Tensile Test	60,000 psi (min) ultimate strength 42,000 psi (min) yield strength 10% (min) elongation
Impact Test	7 ft.-lb. (min) at 70°F 3 ft.-lb. (min) at -40°F
Hydrostatic Test	500 psi test on every length prior to leaving the foundry
Ball Impression Test	The spigot of every length is tested for ductility prior to leaving the foundry.

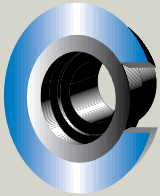
DUCTILE IRON PIPE DESIGN

Ductile Iron Pipe supplied by Canada Pipe is designed to the ANSI/AWWA C150/A21.50 Standard which was originally adopted in 1965. The current revision of this standard recognizes both the Pressure Class and the Special Class (originally called Thickness Class) designations and utilizes the same design criteria, principles and safety factors in their designs. Ductile Iron Pipe is considered a flexible conduit and is therefore designed separately to withstand internal pressure and external loads. Two selection tables have been developed using the design procedures described in ANSI/AWWA C150/A21.50. These tables are provided on the following pages to assist a designer in selecting, rather than calculating, the appropriate Ductile Iron Pipe class.

Ductile Iron is an improvement to the cast irons that have served the water industry with distinction through the centuries. The first Ductile Iron Pipe was produced experimentally in 1948. Minor but significant changes in chemistries and processing result in physical differences at the micro-structure level that result in a vastly improved fracture toughness and ductility making Ductile Iron piping products substantially more resistant to damage from impact or concentrated stresses.

During the solidification stage of the casting process, the carbon, sometimes called graphite, comes out of solution and collects in numerous small pools. The shape of these pools of carbon is a major factor in the mechanical properties of the material.

Although both materials are classified as cast irons, in today's terminology the older material is identified as gray iron and the newer material as Ductile Iron.

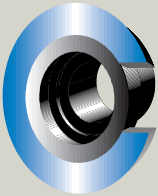


DUCTILE IRON PIPE MANUFACTURING

Cast (Gray) Iron Pipe

Ductile Iron Pipe

These photomicrographs compare the microstructures of gray iron and Ductile Iron. Note the relative continuity of the matrix exhibited by the Ductile Iron (bottom).



DUCTILE IRON PIPE JOINTS AND DIMENSIONS

24" (600mm) diameter TYTON JOINT® Ductile Iron Pipe, on site, Kingston Ontario.

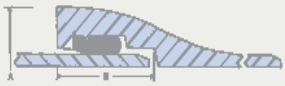
PUSH-ON JOINTS

All Ductile Iron Pipe supplied by Canada Pipe for underground installation is supplied with **TYTON**® joint or **FASTITE**® joint bells. These joints were originally developed in 1956 and are designed to be bottle-tight and easily assembled. They have been tested to 1,000 psi internal pressure, 430 psi external pressure and to 14 psi negative air pressure with no leakage or infiltration. The standard gasket supplied is the Styrene Butadiene (SBR) gasket. Other gasket materials such as EPDM, Nitrile, Neoprene and **VITON**® are also available. Special locking style gaskets can be supplied to provide joint restraint on standard **TYTON**® joint pipe.

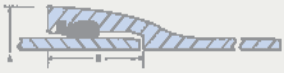
PIPE TAPPING

The Ductile Iron Pipe Research Association (DIPRA) and the pipe manufacturers have conducted extensive testing of direct tapping Ductile Iron Pipe. Based on these tests, the maximum recommended direct tap sizes to ensure a watertight tap are shown below. The old rule of thumb of 3 or 4 threads was based on the much weaker pit-cast pipe. Because of the high strength of ductile iron, the number of threads engaged is less critical. NOTE: DIPRA also recommends the use of two layers of pipe thread sealant tape on all direct taps made on Ductile Iron Pipe to minimize the torque required to effect a watertight tap.

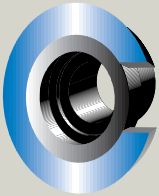
Pressure class Ductile Iron Pipe can be direct tapped within close proximity, unlike old cast iron pipe which required an 18" separation for main stops.



TYTON JOINT® Pipe
4”-24” 100mm-600mm



FASTITE® Joint Pipe
30”-36” 750mm-900mm



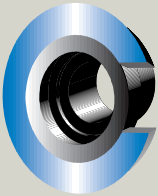
DUCTILE IRON PIPE JOINTS & DIMENSIONS

SIZE		OUTSIDE DIAMETER		INSIDE DIAMETER		BELL DIAMETER ‘A’		BELL DEPTH ‘B’		NOMINAL LAYING LENGTH	
in	mm	in	mm	in	mm	in	mm	in	mm	ft	m
4	100	4.80	121.9	4.18	106.2	6.86	174.2	3.15	80.0	18	5.5
6	150	6.90	175.3	6.28	159.5	8.63	219.2	3.38	85.9	18	5.5
8	200	9.05	229.3	8.43	214.1	10.94	277.4	3.69	93.7	18	5.5
10	250	11.10	281.9	10.46	265.7	13.32	338.3	3.75	95.3	18	5.5
12	300	13.20	335.3	12.52	318.0	15.06	382.5	3.75	95.3	18	5.5
14	350	15.30	388.6	14.55	369.6	17.80	452.1	5.00	127.0	18	5.5
16	400	17.40	442.0	16.61	421.9	19.98	507.5	5.00	127.0	18	5.5
18	450	19.50	495.3	18.69	474.7	22.00	558.8	5.00	127.0	18	5.5
20	500	21.60	548.6	20.75	527.1	24.12	612.6	5.00	127.0	18	5.5
24	600	25.80	655.3	24.95	633.7	28.43	722.1	5.00	127.0	18	5.5
30	750	32.00	812.8	31.07	789.2	34.95	887.7	6.50	165.1	18	5.5
36	900	38.30	972.8	37.29	947.2	41.37	1050.8	6.50	165.1	18	5.5

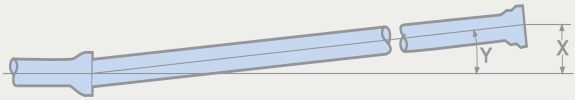
- Inside diameters are based on minimum Pressure Classes available and include standard cement lining.
- Dimensions are subject to manufacturing tolerances.

MAXIMUM RECOMMENDED DIRECT TAP SIZE

SIZE		PRESSURE CLASS				
in	mm	150	200	250	300	350
4	100					3/4"
6	150					1"
8	200					1"
10	250					1"
12	300					1 1/4"
14	350			1 1/4"	1 1/2"	1 1/2"
16	400			1 1/2"	2"	2"
18	450			2"	2"	2"
20	500			2"	2"	2"
24	600		2"	2"	2"	2"



JOINT DEFLECTION

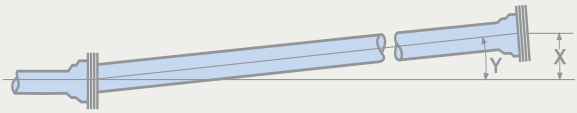


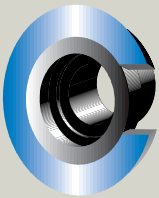
PUSH-ON JOINT

Pipe Size		Y Deg.	Deflection X		Approx. Radius of Curve	
in	mm	deg	in	mm	ft	m
4	100	5°	19	483	206	63
6	150	5°	19	483	206	63
8	200	5°	19	483	206	63
10	250	5°	19	483	206	63
12	300	5°	19	483	206	63
14	350	5°	19	483	206	63
16	400	5°	19	483	206	63
18	450	5°	19	483	206	63
20	500	5°	19	483	206	63
24	600	5°	19	483	206	63
30	750	5°	19	483	206	63
36	900	4°	11	280	260	79

Washout - Amherst, Nova Scotia, 1999.

The pipe stayed in operation despite over deflection of the joints.





MECHANICAL JOINT

Pipe Size		Y Deg.	Deflection X		Approx. Radius of Curve	
in	mm	Deg.	in.	mm	ft.	m
4	100	8° 18'	35*	890	140*	43
6	150	7° 7'	27	690	145	44
8	200	5° 21'	20	510	195	59
10	250	5° 21'	20	510	195	59
12	300	5° 21'	20	510	195	59
14	350	3° 35'	13.5	340	285	87
16	400	3° 35'	13.5	343	285	87
18	450	3° 00'	11	280	340	104
20	500	3° 00'	11	280	340	104
24	600	2° 23'	9	230	450	137

*20 ft. length

Demonstration of the superior flexibilty of Ductile Iron Pipe.

MAXIMUM DEPTH OF COVER

SIZE		PRESSURE / SPECIAL CLASS		NOMINAL WALL THICKNESS		MAXIMUM DEPTH OF COVER LAYING CONDITIONS (Refer to section on 'Ductile Iron Pipe Installation')									
						TYPE 1		TYPE 2		TYPE 3		TYPE 4		TYPE 5	
in	mm	PC	SC	in	mm	ft	m	ft	m	ft	m	ft	m	ft	m
4	100	350	-	.25	6.4	53	16	61	19	69	21	85	26	100+	30+
			52	.29	7.4	100+	30+	100+	30+	100+	30+	100+	30+	100+	30+
6	150	350	50	.25	6.4	26	7.9	31	9.4	37	11.0	47	14.0	65	20.0
			52	.31	7.9	67	20.0	77	23.0	86	26.0	100+	30+	100+	30+
8	200	350	-	.25	6.4	16	4.9	20	6.1	25	7.6	34	10.0	50	15.0
			50	.27	6.9	25	7.6	30	9.1	36	11.0	46	14.0	64	20.0
			52	.33	8.4	47	14.0	54	16.0	62	19.0	77	23.0	99	30.0
10	250	350	-	.26	6.6	11	3.4	15	4.6	19	5.8	28	8.5	45	14.0
			50	.29	7.4	19	5.8	24	7.3	29	8.8	38	12.0	55	17.0
			52	.35	8.9	35	11.0	41	12.0	47	14.0	59	18.0	79	24.0
12	300	350	-	.28	7.1	10	3.0	15	4.6	19	5.8	28	8.5	44	13.0
			50	.31	7.9	17	5.2	22	6.7	27	8.2	36	11.0	52	16.0
			52	.37	9.4	30	9.1	35	11.0	41	12.0	53	16.0	71	22.0
14	350	250	-	.28	7.1			11	3.4	15	4.6	23	7.0	36	11.0
		300	-	.30	7.6			13	4.0	17	5.2	26	7.9	42	13.0
		350	-	.31	7.9			14	4.3	19	5.8	27	8.2	44	13.0
			50	.33	8.4	TYPE 1		19	5.8	24	7.3	33	10.0	49	15.0
			52	.39	9.9			29	8.8	34	10.0	44	13.0	62	19.0
16	400	250	-	.30	7.6			11	3.4	15	4.6	24	7.3	34	10.0
		300	-	.32	8.1			13	4.0	17	5.2	26	7.9	39	12.0
		350	50	.34	8.6	LAYING		15	4.6	20	6.1	28	8.5	44	13.0
			52	.40	10.2			25	7.6	30	9.1	40	12.0	57	17.0
18	450	250	-	.31	7.9			10	3.0	14	4.3	22	6.7	31	9.4
		300	-	.34	8.6			13	4.0	17	5.2	26	7.9	36	11.0
			50	.35	8.9	CONDITIONS		14	4.3	18	5.5	27	8.2	39	12.0
		350	-	.36	9.1			15	4.6	19	5.8	28	8.5	41	12.0
			52	.41	10.4			22	6.7	27	8.2	36	11.0	53	16.0
20	500	250	-	.33	8.4			10	3.0	14	4.3	22	6.7	30	9.1
		300	50	.36	9.1	NOT		13	4.0	17	5.2	26	7.9	35	11.0
		350	-	.38	9.7			15	4.6	19	5.8	28	8.5	38	12.0
			52	.42	10.7			20	6.1	25	7.6	34	10.0	50	15.0
24	600	200	-	.33	8.4			8	2.4	12	3.7	17	5.2	25	7.6
		250	-	.37	9.4			11	3.4	15	4.6	20	6.1	29	8.8
			50	.38	9.7	RECOMMENDED		12	3.7	17	5.2	23	7.0	31	9.4
		300	-	.40	10.2			13	4.0	17	5.2	24	7.3	32	9.8
		350	-	.43	10.9			15	4.6	19	5.8	28	8.5	37	11.0
			52	.44	11.2			17	5.2	21	6.4	30	9.2	41	12.5
30	750	150	-	.34	8.6	FOR		-	-	9	2.7	14	4.3	22	6.7
		200	-	.38	9.7			8	2.4	12	3.7	16	4.9	24	7.3
			50	.39	9.9			10	3.0	14	4.3	18	5.5	25	7.6
		250	-	.42	10.7			11	3.4	15	4.6	19	5.8	27	8.2
		300	-	.45	11.4	THESE		12	3.7	16	4.9	21	6.4	29	8.8
			52	.47	11.9			14	4.3	19	5.8	24	7.3	33	10.0
		350	-	.49	12.4			15	4.6	19	5.8	25	7.6	33	10.0
36	900	150	-	.38	9.7			-	-	9	2.7	14	4.3	21	6.4
		200	-	.42	10.7	SIZES		8	2.4	12	3.7	15	4.6	23	7.0
			50	.43	10.9			10	3.0	13	4.0	17	5.2	25	7.6
		250	-	.47	11.9			10	3.0	14	4.3	18	5.5	25	7.6
		300	-	.51	13.0			12	3.7	16	4.9	20	6.1	28	8.5
			52	.53	13.5			15	4.6	19	5.8	24	7.3	32	9.8
		350	-	.56	14.2			15	4.6	19	5.8	24	7.3	32	9.8

- Maximum depths for Pressure Classes are as per AWWA C150.
- Maximum depths for Special Classes are as per AWWA C150.
- Dimensions are subject to manufacturing tolerances.
- Contact Canada Pipe for availability of other Special Classes and larger sizes.

Size (Nominal)		Outside Diameter		Pressure & Special Class		Nominal Wall Thickness		Pressure Rating	
in	mm	in	mm	PC	SC	in	mm	p.s.i.	kPa
4	100	4.80	121.9	350	-	.25	6.4	350	2410
					52	.29	7.4	350	2410
					53*	.32	8.1	350	2410
					54*	.35	8.9	350	2410
6	150	6.90	175.3	350	50	.25	6.4	350	2410
					52	.31	7.9	350	2410
					53*	.34	8.6	350	2410
					54*	.37	9.4	350	2410
8	200	9.05	229.9	350	-	.25	6.4	350	2410
					52	.33	8.4	350	2410
					53*	.36	9.2	350	2410
					54*	.39	9.9	350	2410
10	250	11.10	281.9	350	-	.26	6.6	350	2410
					50	.29	7.4	350	2410
					52	.35	8.9	350	2410
					53*	.38	9.7	350	2410
					54*	.41	10.4	350	2410
12	300	13.20	335.3	350	-	.28	7.1	350	2410
					50	.31	7.9	350	2410
					52	.37	9.4	350	2410
					53*	.40	10.2	350	2410
					54*	.43	10.9	350	2410
14	350	15.30	388.6	250	-	.28	7.1	250	1720
				300	-	.30	7.6	300	2070
				350	-	.31	7.9	350	2410
					50	.33	8.4	350	2410
					52	.39	9.9	350	2410
					53*	.42	10.7	350	2410
					54*	.45	11.4	350	2410
16	400	17.40	442.0	250	-	.30	7.6	250	1720
				300	-	.32	8.1	300	2070
				350	50	.34	8.6	350	2410
					52	.40	10.2	350	2410
					53*	.43	10.9	350	2410
					54*	.46	11.7	350	2410
18	450	19.50	495.3	250	-	.31	7.9	250	1720
				300	-	.34	8.6	300	2070
					50	.35	8.9	350	2410
				350	-	.36	9.1	350	2410
					52	.41	10.4	350	2410
					53	.44	11.2	350	2410
					54*	.47	11.9	350	2410
20	500	21.60	548.6	250	-	.33	8.4	250	1720
				300	50	.36	9.1	300	2070
				350	-	.38	9.7	350	2410
					52	.42	10.7	350	2410
					53	.45	11.4	350	2410
					55*	.51	12.7	350	2410
24	600	25.80	655.3	200	-	.33	8.4	200	1380
				250	-	.37	9.4	250	1720
					50	.38	9.7	250	1720
				300	-	.40	10.2	300	2070
				350	-	.43	10.9	350	2410
					52	.44	11.2	350	2410
					53	.47	11.9	350	2410
					56*	.56	14.2	350	2410
30**	750	32.00	812.8	150	-	.34	8.6	150	1030
				200	-	.38	9.7	200	1380
					50	.39	9.9	200	1380
				250	-	.42	10.7	250	1720
				300	-	.45	11.4	300	2070
					52	.47	11.9	300	2070
				350	-	.49	12.4	350	2410
					53	.51	13.0	350	2410
					56*	.63	16.0	350	2410
36**	900	38.30	972.8	150	-	.38	9.7	150	1030
				200	-	.42	10.7	200	1380
					50	.43	10.9	200	1380
				250	-	.47	11.9	250	1720
				300	-	.51	13.0	300	2070
					52	.53	13.5	300	2070
				350	-	.56	14.2	350	2410
					53	.58	14.7	350	2410
					56*	.73	18.6	350	2410

AVAILABLE PIPE CLASSES

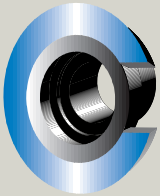
SELECT FOR WORKING PRESSURE

The most commonly used classes of Ductile Iron Pipe and their rated working pressures are shown in the adjacent table. All ratings have an additional 100 psi (690 kPa) allowance for surge. A safety factor of 2:1 is then applied to the working pressure and surge allowance.

SELECT FOR DEPTH OF COVER

The most commonly used classes of Ductile Iron Pipe for underground installation and their maximum depth of cover are shown in the preceding table. The table is based on single H-20 truckload with a 1.5 impact factor. All classes of Ductile Iron Pipe shown are capable of withstanding loads created under a minimum of 1 ft. (.3 m) of cover, providing a Type 5 laying condition is used. For information on other laying conditions and depths of cover, please contact Canada Pipe.

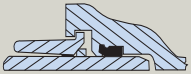
- Pressure ratings shown have an additional 100 p.s.i. (690 kPa) surge allowance.
- Dimensions are subject to manufacturing tolerance, OD spigot end
  - 3-12" ± 0.06 in.
  - 14-24" + 0.05 in. - 0.08 in.
  - 30-36" + 0.08 in. - 0.06 in.
- * - Recommended classes for grooving.
- Contact Canada Pipe for availability of other Special Classes and larger sizes.
- **Fastite® Joint



DUCTILE IRON PIPE RESTRAINED JOINTS

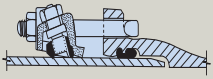
GROOVED

FLANGED



THRUST-LOCK®

TR-FLEX®



MJ / TJ JOINT WITH WEDGE RESTRAINER

CONTACT CANADA PIPE FOR DETAILED INFORMATION WHENEVER RESTRAINED JOINTS ARE BEING CONSIDERED

GROOVED & FLANGED JOINTS

Canada Pipe Ductile Iron Pipe for above-ground mechanical piping installations can be supplied with either Grooved or Flanged Joints, both which provide complete thrust restraint.

Grooved Joints are based on **VICTAULIC®** Style 31 and conform to ANSI / AWWA C606 Standard. Flanged Joints incorporate threaded flanges drilled and faced to ANSI B16.1 and conform to ANSI / AWWA C115/A21.15 Standard. Both these joints should only be provided on heavier classes of Ductile Iron Pipe. Canada Pipe recommends Special Class 54 for 4" (100 mm) through 18" (450 mm), Special Class 55 for 20" (500 mm) and Special Class 56 for 24" (600 mm) for grooved pipe fabrication.

THRUST-LOCK® RESTRAINED JOINT

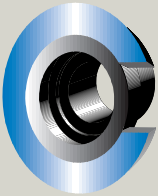
The **THRUST-LOCK®** joint is a flexible, boltless, positive lock restrained joint system designed for internal working pressures of up to 350 psi (2,410 kPa) and is available in sizes 6" (150 mm) through 36" (900 mm). The **THRUST-LOCK®** joint utilizes either the **TYTON®** or **FASTITE®** gasket for joint seal within an extended slotted bell. A ductile iron locking ring, positioned behind a retainer weldment on the spigot, is inserted into the slotted bell and rotated to provide restraint.

TR-FLEX® RESTRAINED JOINT

The **TR-FLEX®** joint is a flexible restrained push-on joint for 4” (100 mm) through 36” (900 mm) designed to have a working pressure equivalent to the working pressure of the parent pipe with a maximum working pressure rating of 350 psi for 4” (100 mm) through 24” (600 mm) and 250 psi for 30” (750 mm) through 36” (900 mm). The **TR-FLEX®** joint utilizes the **TYTON®** gasket

MJ / TJ JOINT WITH WEDGE RESTRAINER

The MJ/TJ joint is a flexible, bolted, positive lock restrained joint system designed for internal working pressures of up to 350 psi (2,410 kPa) and is available in sizes 6" (150 mm) through 24" (600 mm). The MJ / TJ joint utilizes a **TYTON®** gasket for joint seal within a **TYTON®** bell which has an MJ bell flange cast on to it. A ductile iron wedge restrainer is secured on the spigot and matched up with the MJ bell flange. The wedge restainer is secured to the MJ bell flange with T-head bolts and nuts to provide restraint.

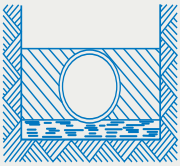


DUCTILE IRON PIPE INSTALLATION

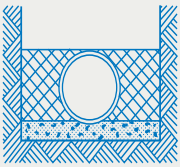
TYPE 1 Flat-bottom trench. Loose backfill.

TYPE 2 Flat-bottom trench. Backfill lightly consolidated to centreline of pipe.

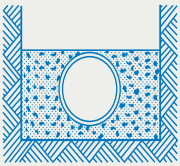
TYPE 3 Pipe bedded in 4-inch loose soil. Backfill lightly consolidated to top of pipe.



TYPE 4 Pipe bedded in sand, gravel or crushed stone to depth of 1/8 pipe diameter, 4-inch minimum. Back-fill compacted to top of pipe (Approx. 80% Standard Proctor AASHO T-99).



TYPE 5 Pipe bedded in compacted granular material to centreline of pipe. Compacted granular or select material to top of pipe. (Approx. 90% Standard Proctor AASHO T-99).



"Flat-bottom" is defined as undisturbed earth.
"Loose soil" or "Select" is defined as native soil excavated from the trench, free of rocks, foreign materials and frozen earth.

REFER TO THE SECTION ON 'MAXIMUM DEPTH OF COVER' TO OPTIMIZE TRENCH TYPE, DEPTH OF COVER AND PIPE CLASSIFICATION, WHEN DESIGNING WATERMAIN PROJECTS.

DUCTILE IRON PIPE INSTALLATION

Small pipe can be assembled with the use of a long bar, while larger pipe will require additional power, such as a jack or come-along. A backhoe may be used to assemble pipe of intermediate and large size. The plain end of the pipe should be carefully guided by hand into the bell of the previously assembled pipe. The bucket of the backhoe may then be used to push the pipe until fully seated.
A timber header should be used between the pipe and backhoe bucket to avoid damage to the pipe.

STEP 1

STEP 2

STEP 3A

STEP 3B

STEP 4

Completed Installation

PUSH-ON PIPE JOINT ASSEMBLY

STEP 1 Thoroughly clean out the bell with special attention to the gasket recess. Remove any foreign material or excess paint. Clean the spigot or bevelled plain end and remove any sharp edges with a standard file.

STEP 2 After making sure that the correct gasket is being used, insert it into the recess in the bell with the small end of the gasket facing the bell face. Ensure that the gasket seats properly.

STEP 3A, 3B Apply lubricant to the ***inside*** surface only of the gasket, making sure that the entire surface is coated. Apply a generous coating of lubricant to the bevelled portion of the plain end.

STEP 4 Guide the plain end into the bell and, ***while maintaining straight alignment***, push the plain end into the bell socket. Once the joint is assembled, necessary deflection can be accomplished. When assembly is complete, the bell face should be aligned between the two white depth rings.

ASSEMBLY OF FIELD CUT PIPE

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

The ANSI/AWWA Standard for Ductile Iron Pipe requires only factory gauging of the bell and spigot ends. ***Accordingly, pipe selected for field cutting should also be field gauged in the location of the cut.*** In the field, a mechanical joint gland or an O.D. tape can be used as a gauging device. Canada Pipe supplies, with each load, pipe that has been "tape gauged full length" at the plant. These lengths are marked with paint on the bell face and can be used for cutting.

SUITABLE PIPE DIAMETERS FOR FIELD CUTS

Nominal Pipe Size	Min. Pipe Diameter	Max. Pipe Diameter	Min. Pipe Circum.	Max. Pipe Circum.
in	in	in	in	in
4	4.74	4.86	14 29/32	15 9/32
6	6.84	6.96	21 1/2	21 7/8
8	8.99	9.11	28 1/4	28 5/8
10	11.04	11.16	34 11/16	35 1/16
12	13.14	13.26	41 9/32	41 21/32
14	15.22	15.35	47 13/16	48 7/32
16	17.32	17.45	54 13/32	54 13/16
18	19.42	19.55	61	61 13/32
20	21.52	21.65	67 19/32	68
24	25.72	25.85	80 13/16	81 7/32
30	31.94	32.08	100 11/32	100 25/32
36	38.24	38.38	120 1/8	120 9/16

Diameters and Circumferences to be determined using an O.D. tape.

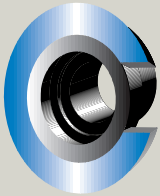
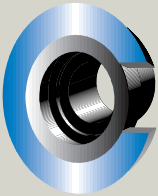


Figure 1

NOTE: IN NO CASE SHOULD PIPE BE CUT WITHIN 2 1/2 FEET (.75 m) OF THE BELL FACE WITHOUT FIRST GAUGING THE PIPE.



ENVIRONMENTAL PROTECTION

ENVIRONMENTLY FRIENDLY

Ductile Iron Pipe is manufactured using recycled iron and steel.
During the course of a year, our facilities will recycle more than 750,000 tons of scrap iron, the equivalent of 800,000 automobiles, while continually exploring and implementing cutting-edge environmental practices. “We are working toward our commitment to being best in class, and operating in a manner that protects the health and safety of our employees and the well-being of our communities and the public.”

INTERNAL COATING

Unless otherwise specified, all Ductile Iron Pipe is furnished with cement-mortar lining conforming to ANSI / AWWA C104/A21.4. The application of a seal coat to the cement-mortar lining is standard. If not required, it is special order.

The cement-mortar lining prevents tuberculation of the pipe by creating a high pH condition at the pipe wall. The seal coat provides a barrier between soft or acidic waters and the cement-mortar lining.

Additionally, cement-mortar linings create a hydraulically smooth flow surface inside the pipe, resulting in less friction and thus, less head loss. Cement-mortar lined Ductile Iron Pipe provides a Hazen William's flow coefficient, or "C" value of 140 - a realistic value that is maintained over the life of the pipe.

Please contact your Canada Pipe office for optional internal coatings.

ENVIRONMENTAL PROTECTION

There is no doubt that the life expectancy of Ductile Iron Pipe is a direct function of its environment. Fortunately, the majority of soil/trench environments are not harmful to iron pipe as has been witnessed over centuries. Most water departments now have the experience and expertise to identify aggressive soil conditions. This is a major step in determining the locations, where it is necessary, to protect Ductile Iron Pipe. Polyethylene encasement is a very reliable and cost effective method of protection, which has been used successfully for over 40 years.

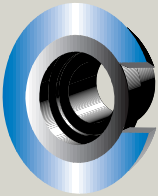
EXTERNAL COATING

All Ductile Iron Pipe is supplied with a water-based asphaltic shop coating which is sufficient for the majority of installations. There are, however, certain areas where highly aggressive soil conditions are encountered, and the use of additional external corrosion protection is warranted. In these cases, 8 mil-thick polyethylene encasement, in accordance with ANSI / AWWA C105/A21.5, is recommended. This standard also includes, in the appendix, the 10 point soil evaluation procedure recommended to be used to determine potentially corrosive environments.

The polyethylene encasement prevents corrosion by acting as an unbonded film, preventing direct contact of the pipe with the corrosive soil. It also effectively reduces the electrolyte available to support corrosion activity to the moisture that might be present in the thin annular space between the pipe and the polyethylene film. Once the corrosive nature of this moisture is depleted, it enters a state of equilibrium and a uniform, non-corrosive environment remains around the pipe.

Cement-mortar lining in 24" (600mm) diameter pipe.

Ductile Iron Pipe installed with 8 mil polyethylene encasement in aggressive soil conditions.



DUCTILE IRON PIPE BENEFITS

FLOW

The larger than nominal diameters and internal lining smoothness (C140) of Ductile Iron Pipe significantly reduces pumping costs. The comparisons of actual flow areas of commonly used pipe is shown on the table. The fact that more water can be moved through a Ductile Iron Pipe for a given amount of energy, may make it possible to specify a smaller nominal diameter to accomplish a required flow, or result in significantly reduced pumping costs.

FLOW AREA COMPARISON COMMONLY USED PRESSURE PIPE (Sq. In.)

Diameter		Cement Lined D.I.	DR 18 PVC	DR 25 PVC	Series 160 HDPE	Series 100 HDPE	0.25" Wall Steel	Conc. Cyl. Pres.
in	mm							
8	200	56	51	54	38	45	52	-
12	300	123	108	116	83	98	118	-
18	450	274	236	253	164	194	240	254
24	600	489	413	443	293	345	458	452
36	900	1092	-	973	680	780	990	1018

LOW MAINTENANCE COSTS

Design engineers can predict ordinary earth loads, traffic loads and internal pressures to be encountered by underground pipe. But there are unpredictable influences on pipe loadings: swell pressures in certain clay soils, subsidence of support soil, uneven settlement, excessive water hammer, adjacent construction influences, vibrations, seismic activity, and frost penetration loads. Ductile Iron Pipe, because of its unusually high strength, ductility and impact resistance, has a proven history of handling all of these factors better than any other underground pipe material, thereby greatly reducing maintenance costs.

HIGH PRESSURE APPLICATIONS

Since 1975, 12" (300mm) Ductile Iron Pipe has been serving Manti, Utah, at an internal pressure of 1,100 psi without a single failure. This is more than three times the rated working pressure of 350 psi stated in ANSI/AWWA C150/A21.50 Standard. For high pressure applications, please contact Canada Pipe for information on maximum allowable pressures. In most cases, pressure capacity will greatly exceed pressure rating in the standard tables. For example, a 12" (300mm) Class 50 Ductile Iron Pipe with a nominal wall thickness of .31 inches, can withstand internal pressures up to 1,610 psi (based on minimum yield strength with all minus tolerances removed from the thickness).
This 12" (300mm) pipe would not actually fail until the internal pressure exceeded 2,300 psi (based on minimum ultimate strength of 60,000 psi).

CUTTING AND TAPPING

Ductile Iron Pipe is completely field efficient. It can be cut to fit without loss of joint tightness and tapped safely and securely for residential services without the use of tapping saddles, which means even greater savings (see “Suitable Pipe Diameters for Field Cuts” chart on page 15).

LOCATING

Underground Ductile Iron Pipe can be easily located with standard pipe locating equipment - an advantage in emergency situations.

IRON PIPE - THE HISTORY AND THE FACTS

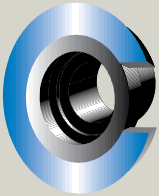
- In 1664, King Louis XIV of France commissioned the construction of a cast iron watermain, which lasted more that 330 years in service.
- Cast iron watermain pipe was first used in North America, circa 1800, in the Philadelphia water systems.
- There are currently over 23 cities in America with cast iron pipe still in service after 150 years (before the invention of electricity and the automobile).
- There are over 622 towns/cities in North America with cast iron watermain in service after 100 years.
- Nine or more reasons for watermain failure are related to strength. Ductile iron pipe is the strongest watermain pipe available, by a very large margin.
- Ductile iron is machined for engine parts such as crankshafts and connecting rods, plus various brake and steering components, due to its strength and reliability.
- Ductile iron pipe has the largest available inside diameters vs. all other watermain pipe products currently available, and therefore has the greatest hydraulic capabilities in the industry.
- In 1922, cement mortar lining of cast iron watermain was first used to protect the interior wall of the pipe and improve water quality.
- Cast or ductile iron pipe corrodes only as a function of its underground environment, hence the extremely long life in so many installations.
- Soil evaluation technology today can determine whether or not ductile iron pipe requires special corrosion protection.
- Since 1958, polyethylene encasement has been used successfully to prevent the corrosion of iron watermains in some of the most corrosive locations in North America.
- The success of polyethylene encasement has created the adoption of standards by ANSI, AWWA & ASTM (U.S.), plus ISO 8180 (International) and individual standards for Great Britain, Japan, Germany and Australia.

There are hundreds of water departments in Canada and the United States who continue to select Ductile Iron Pipe as the watermain material of choice. The performance of iron watermain, over the last two centuries, has continued to exceed expectations. Today, many municipalities have recognized the additional benefits of Ductile Iron Pipe. By adopting polyethylene encasement, where necessary, as the standard protection method, water departments are ensuring life expectancy, even in the most undesirable soil conditions.

Internal pressures, surge and cyclic loads, thrust restraint, earth, prism and beam loads, service taps, construction handling, re-excavation etc., all demand a strong pipe. "TOUGH" is an understatement when Ductile Iron Pipe is selected as the watermain material of choice.

The Ductile Iron Pipe Research Association (DIPRA), founded in 1915, publishes additional technical information and investigative reports pertaining to Ductile Iron Pipe. This source material is currently available at:

www.dipra.org



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