NORWARDS™
tested through time

NORWARDS DUCTILE IRON PIPES

MS1919 : 2013 / BSEN 545 : 2010 / BSEN 598 : 2007 + A1 : 2009 / ISO 2531

DN80 to DN1200

OEM by India
RASHMI GROUP

About Us

NORWARDS INDUSTRIES SDN. BHD. is a company specializing in industry and trading. Incorporated on **August 11, 1997** the company set up a 3.5 hectare factory for ductile iron pipes & fittings and cast iron pipes & fittings in Balakong, Selangor. The company specializes in producing sewerage, water supply, and drainage system pipes and fittings, along with a complete set of accessories.

NORWARDS INDUSTRIES SDN. BHD. is committed to the enterprise policy of **"Quality First, Clients First" and "Honesty and Belief"** together with all staff. We sincerely welcome overseas and domestic partners to the company "Goal" for further cooperation and common development.

Why Ductile Iron

Ductile Iron (DI) Pipes have become the most preferred pipe material for water supply and pressure sewerage applications around the world. Although ductile iron has a chemical composition very similar to cast iron, it is considered superior due to its spheroidal micro structure, which has vast advantages such as higher pressure bearing ability, impact resistance, corrosion resistance, etc., listed below:

- **High Tensile Strength**
- **Corrosion Resistant**
- **Flexible and Leak Resistant**
- **Durable Cement Mortar Lining**
- **Excellent Workability**

Standards & Certifications

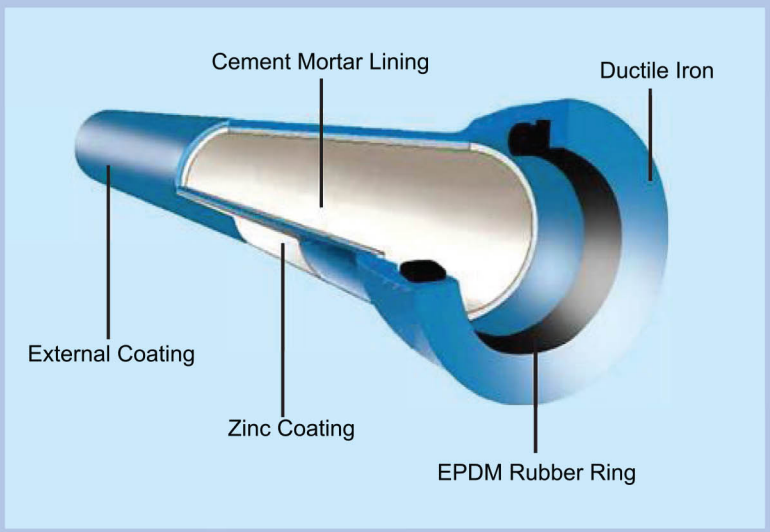
Our products have been tested and certified to conform to the relevant standard specifications and are licensed by SIRIM / SPAN & CIDB to use the top mark for quality. The granting of the top mark also confirms that the company's manufacturing, testing, and quality control systems comply with the stringent licensing requirements, thus ensuring that product quality is consistently maintained.

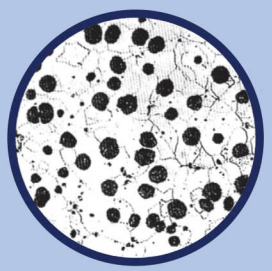
The major standards for the specification of ductile iron pipelines are listed below:

- **MS 1919:2013**
- **BSEN 545:2010 / ISO 2531**
- **BSEN 598:2007+A1:2009**

Technical Specifications

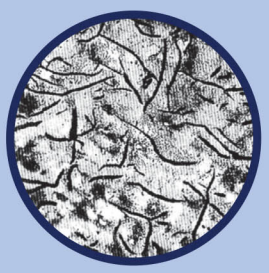
Product	Ductile Iron Pipes suitable for Push-on-joints
Size Range	DN 80 to DN 1200
Class of DI pipes	C25, C30, C40, C50, C64 & C100
Standard Length	5500mm / 5.5 meter
Internal Lining	* Cement Mortar Lining of OPC / SRC / HAC
	* Cement Mortar Lining with Epoxy Seal Coat
	* Cement Mortar Lining with Bituminous Seal Coat
External Coating -1	* Zinc coating (130grm/m2 or 200grm/m2 or 400grm/m2)
	* Alloy of Zinc & Aluminium (ZnAl) with min. mass 400grm/m2)
External Coating -2	* Bitumen Coating
	* Blue Epoxy
	* Red Epoxy
Outside Onsite Protection	Polyethylene Sleeving
Coating of Joint Area	Bitumen / Epoxy as per customer requirement





Ductile Iron

Graphite shows as isolated Spheroids in a continuous matrix

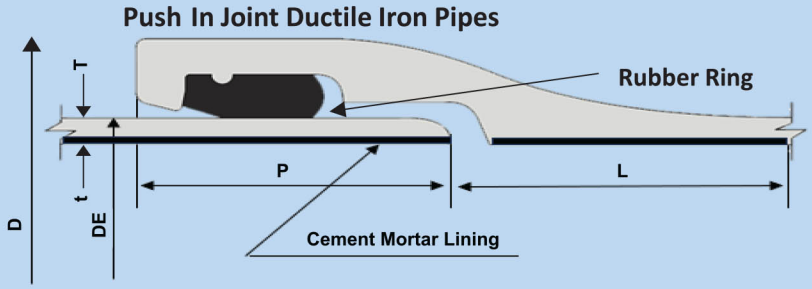


Gray Cast Iron

Graphite shows as a semi-continuous network of flake

Nominal Wall Thickness Charts for various class of DI Pipes Push On Joint

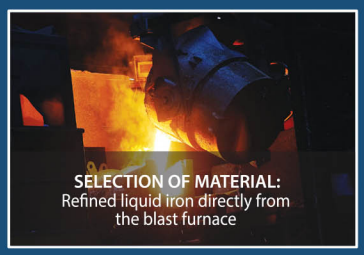
DN 80 to DN 1200



Dimension For All Pipes (In mm)

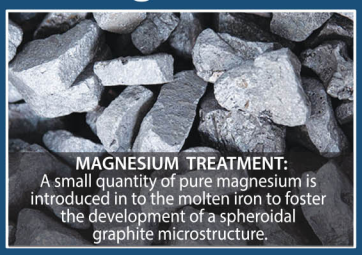
Nominal Diameter DN	DE Nominal Outer Diameter	D Outer Diameter of Socket + / - 5mm	P Depth of Socket + / - 5mm	T Minimum Wall Thickness (Barrel)						t Thickness of Cement Mortar Lining	L Laying Length +70mm -30mm
				C25	C30	C40	C50	C64	C100		
80	98	148	85			3.0	3.5	4.0	4.7	4.0	5500
100	118	168	88			3.0	3.5	4.0	4.7	4.0	5500
150	170	221	94			3.0	3.5	4.0	5.9	4.0	5500
200	222	278	100			3.1	3.9	5.0	7.7	4.0	5500
250	274	333	105			3.9	4.8	6.1	9.5	4.0	5500
300	326	390	110			4.6	5.7	7.3	11.2	4.0	5500
350	378	444	110		4.7	5.3	6.6	8.5	13.0	5.0	5500
400	429	493	110		4.8	6.0	7.5	9.6	14.8	5.0	5500
450	280	553	120		5.1	6.8	8.4	10.7	16.6	5.0	5500
500	532	597	120		5.6	7.5	9.3	11.9	18.3	5.0	5500
600	635	704	120		6.7	8.9	11.1	14.2	21.9	5.0	5500
700	738	820	150	6.8	7.8	10.4	13.0	16.5		6.0	5500
800	842	938	160	7.5	8.9	11.9	14.6	18.8		6.0	5500
900	945	1046	175	8.4	10.0	13.3	16.6			6.0	5500
1000	1048	1150	185	9.3	11.1	14.8	18.4			6.0	5500
1100	1152	1242	202	10.2	12.2	16.2	20.2			6.0	5500
1200	1255	1349	219	11.1	13.3	17.7	22.0			6.0	5500

Ductile Iron Pipe Casting Process

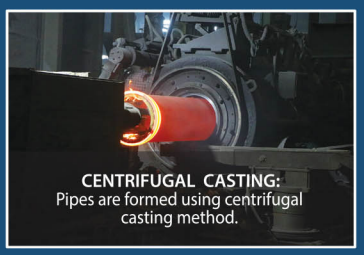


SELECTION OF MATERIAL:
Refined liquid iron directly from the blast furnace

COMPOSITION ADJUSTMENT:
If the molten iron composition deviates from established standards, it is rectified by introducing alloy and other elements.



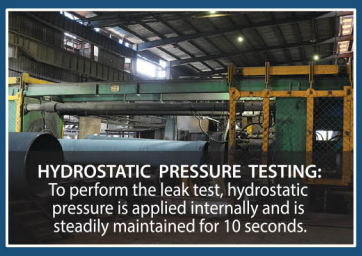
MAGNESIUM TREATMENT:
A small quantity of pure magnesium is introduced in to the molten iron to foster the development of a spheroidal graphite microstructure.



CENTRIFUGAL CASTING:
Pipes are formed using centrifugal casting method.

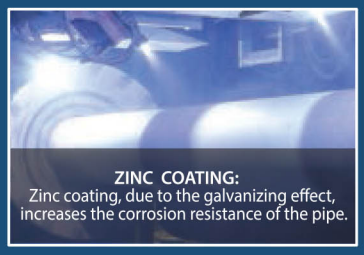
ANNEALING:
The heat treatment process is employed to enhance the mechanical properties of the pipes.

CUTTING AND GRINDING:
Pipes are subjected to spigot end cutting and grinding to attain the required end chamfer. (Applicable for sampling)



HYDROSTATIC PRESSURE TESTING:
To perform the leak test, hydrostatic pressure is applied internally and is steadily maintained for 10 seconds.

CEMENT MORTAR LINING:
The lining thickness is 3 mm for DN 80 – DN 300, 5 mm for DN 350 – DN 600 and 6 mm for DN 700 – DN 1200 pipes and 9 mm for DN 1400 - DN 2000 pipes.



ZINC COATING:
Zinc coating, due to the galvanizing effect, increases the corrosion resistance of the pipe.

BITUMINOUS COATING:
Bituminous paint is applied uniformly by a spraying machine. The mean thickness of the coating is 70 µm.

QUALITY TESTING:
The pipes are rigorously tested on all predefined parameters to ensure the highest quality standards.

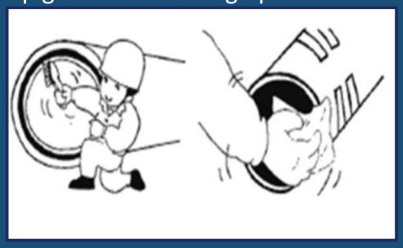
STORAGE:

METHOD OF STATEMENT FOR DUCTILE IRON SOCKET-SPIGOT JOINT

Preparation for Installation

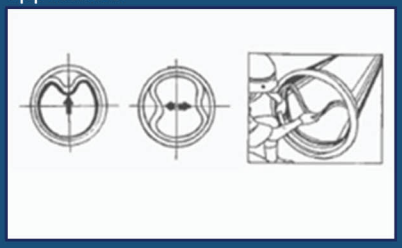
Machinery and Tool · ✔ Excavator ✔ Earth carriage/ Trolley ✔ Pump ✔ Gradiometer & leveling instrument ✔ Pick, scoop, ladder ✔ Vibratory compactor ✔ Needle vibrator ✔ Concrete cutting machine ✔ Hollow burner& Butane bottle Adhesive, wiper & brush

Step 1
Chamfered spigot, cleaned socket & spigot without foreign particle



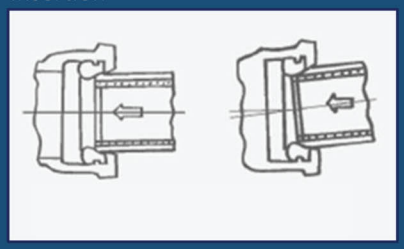
Step 2
Cleaned rubber ring in good condition

Step 3
Looped rubber ring prior to application

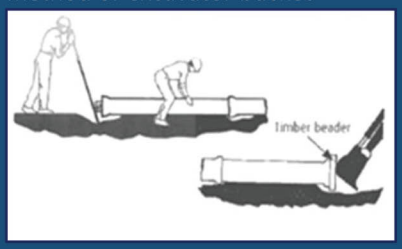


Step 4
Lubricated rubber ring surface and spigot

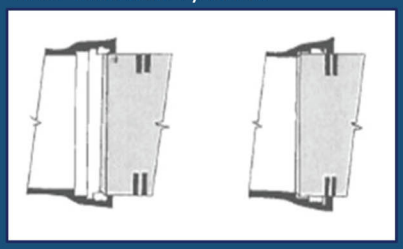
Step 5
Proper alignment prior to insertion



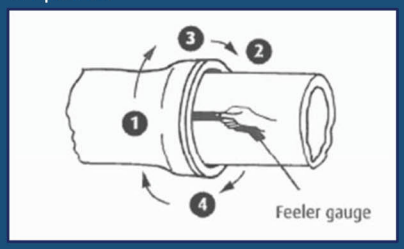
Step 6
Assembly by using either crowbar method or excavator bucket



Step 7
Before insertion /
After insertion by visual



Step 8
Insertion check by feeler gauge at 04 points



Authorised Distributor

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