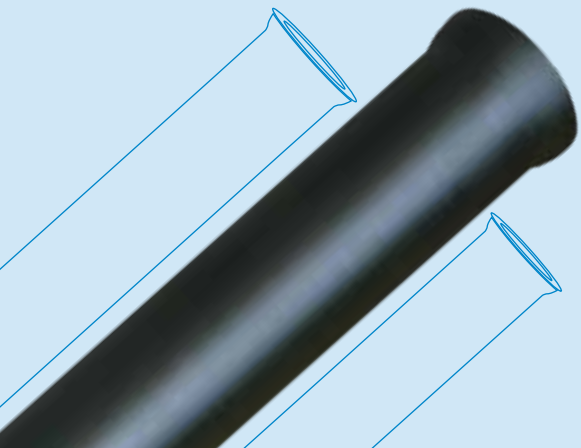
TAKING WATER ACROSS LANDS

Jindal SAW Ductile Iron Pipes



JINDAL SAW LTD.
TOTAL PIPE SOLUTIONS

Water and land, the two prime elements of life, must co-exist in accord. And the chord that keeps them together, to everyone's surprise, is actually the industrial pipes. The robust industrial Ductile Iron Pipes that share the common space and run across the globe like a lifeline to civilizations.

JINDAL SAW LIMITED. THE PIONEER IN THE TUBULAR INDUSTRY.

Jindal SAW Limited is a large-scale trans-regional and multi-industrial enterprise holding a commanding position in India's tubular market. In 1984, Jindal SAW Ltd. became the first company in India to manufacture Submerged Arc Welded (SAW) Pipes using the internationally acclaimed U-O-E technology.

Jindal SAW has integrated facilities based at multiple locations in India and abroad where advanced quality industrial pipes are manufactured. Ductile Iron (DI) Pipes for water and wastewater transportation; large diameter submerged arc welded pipes and spiral pipes for water, oil and gas transportaion as well as seamless pipes and tubes for industrial applications are the prime products exported to numerous countries, including Europe, Middle East, Africa, South America, Australia, and South East Asia.

Jindal SAW has ventured into new businesses in the urban services sector and is surging towards new milestones in its enterprises with respect to water management, waterborne transportation, Waste-to-Energy and rail infrastructure. Likewise, the company's whole-hearted support to Svayam - National Centre for Inclusive Environment, is taking giant strides in making public infrastructure accessible to all.

DUCTILE IRON (DI) PIPES. CONNECTING NECESSITY WITH ABUNDANCE.

Ductile Iron (DI) Pipes' good mechanical properties, in addition to high durability and strength, make them ideal for high-pressure applications. Ductile Iron Pipes are used extensively in systems transporting potable water, industrial water, irrigation water and pressure sewage.

Ductile iron is produced by treating the molten low-sulphur base iron with magnesium under closely controlled conditions. The startling change in the metal is characterized by the free graphite in ductile iron being deposited in the spheroidal or nodular form, leading to maximum continuity of metal matrix thereby forming a stronger and tougher ductile material with high ductility and impact strength.

MANUFACTURING PROCESS.

Ductile Iron Pipes manufactured by Jindal SAW cover the size range from DN 80 to DN 2200, the standard length being 5.5 meters and 6 meters. The product conforms to both Indian Standard IS:8329 and International Standards ISO:2531, ISO:7186, BSEN 545 and BSEN 598 accredited with ISO:9001, ISO:14001 and ISO:45001 certification enabling the company to cater to the domestic and global markets.

Mechanical Properties	Values
Tensile Strength	Min. 4,200 Kg/cm^2 or 420 MPa
Yield Strength	3,000 Kg/cm^2 or 300 MPa
Minimum Elongation	10% Upto DN 1000 7% for diameter > DN 1000
Modulus of Elasticity	1.62 x 10^6 - 1.70 x 10^6 Kg/cm^2 or 162,000 - 170,000 MPa
Hardness	Max. 230 BHN
Density	7,050 Kg per cubic meter
Coefficient of Thermal Expansion	11.5 x 10^{-6} per degree celcius (C) (for temperature range 20^{0}C - 100^{0}C)

Raw material Stack Yard

Liquid metal chemical correction in induction furnace

Magnesium Treatment

Pipe Casting

Annealing Process

Zinc Coating

Hydraulic Testing

Cement Mortar Lining

Bitumen Coating

COMMITTED TO QUALITY, ALWAYS.

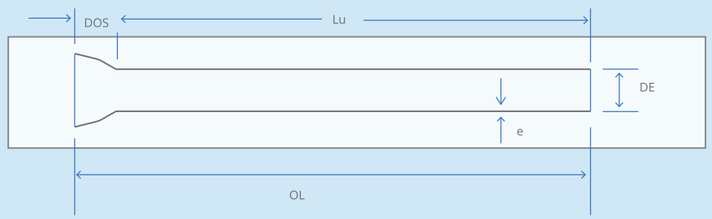
Technical Specifications.

Standard Product	Ductile Iron Pipe suitable for Push-on-Jointing*
Class of Pipe	C20, C25, C30, C40, C50, C64, C100, PP, Class K7,K9, PN20, PN35, FLCL
Size Range	DN 80mm to DN 2200mm
Standard Length (in meters)	5.5 or 6.0
Internal Linings	• Cement* Mortar Lining • Cement Mortar Lining with Epoxy Seal Coat • Cement Mortar Lining with Bituminous Seal Coat • PU Lining *Cement Type: Ordinary Portland Cement/Sulphate Resistant Cement/ Blast Furnace Slag Cement.
Outside Coatings	• Zinc Coating (130 gm/m² or 200 gm/m² or 400 gm/m²) with finishing layer of Bitumen/ Blue Epoxy/Red Epoxy • Alloy of Zinc and Aluminium with or without other metals having a minimum mass of 400 gm/m² with finishing layer of Bitumen/Blue Epoxy/Red Epoxy. • PU Coating/PE Coating
Outside Onsite Protection	• Polyethylene Sleeving
Coating of Joint Area	Bitumen/Epoxy/Polyurethane or as per customer requirement
Conforming Specifications	ISO 2531, BSEN 545, BSEN 598, ISO 7186, IS 8329, BSEN 15655, BSEN 15189, AS/NZS 2280

*JSAW also provides solutions for pipelines subjected to unbalanced thrust forces by customized design and supply of Restrained/Anchor joint alternatives.

PUSH ON JOINTS.

Dimension Details.



Key

OL = overall length in meters;

DOS = depth of socket in meters;

Lu = OL - DOS; standardized length in meters;

e = nominal wall thickness in mm;

DE = nominal external diameter of spigot in mm;

Table 1: Nominal thickness chart for various classes of push on joint Ductile Iron Pipes.

DN (mm)	EXTERNAL DIAMETER, DE (mm)		NOMINAL PIPE WALL THICKNESS, e (mm)									
			VARIOUS CLASSES OF PIPES									
	Nominal	Limit Deviations	C20	C25	C30	C40	C50	C64	C100	As per BSEN-598 (Pressure Pipe)	K7	K9
80	98	+1 / -2.7				**4.4**	4.4	4.4	4.8	4.8	5.0	6.0
100	118	+1 / -2.8				**4.4**	4.4	4.4	5.5	4.8	5.0	6.0
125	144	+1 / -2.8				**4.5**	4.5	4.8	6.5	4.8	5.0	6.0
150	170	+1 / -2.9				**4.5**	4.5	5.3	7.4	4.8	5.0	6.0
200	222	+1 / -3.0				**4.7**	5.4	6.5	9.2	4.9	5.0	6.3
250	274	+1 / -3.1				**5.5**	6.4	7.8	11.1	5.3	5.3	6.8
300	326	+1 / -3.3			5.1	**6.2**	7.4	8.9	12.9	5.6	5.6	7.2
350	378	+1 / -3.4		5.1	**6.3**	7.1	8.4	10.2	14.8	6.0	6.0	7.7
400	429	+1 / -3.5		5.5	**6.5**	7.8	9.3	11.3	16.5	6.3	6.3	8.1
450	480	+1 / -3.6		6.1	**6.9**	8.6	10.3	12.6	18.4	6.7	6.6	8.6
500	532	+1 / -3.8		6.5	**7.5**	9.3	11.2	13.7	20.2	7.0	7.0	9.0
600	635	+1 / -4.0		7.6	**8.7**	10.9	13.1	16.1	23.8	7.7	7.7	9.9
700	738	+1 / -4.3	7.3	**8.8**	9.9	12.4	15.0	18.5	27.5	9.6	9.0	10.8
750	790	+1/ -4.4									9.7	11.3
800	842	+1 / -4.5	8.1	**9.6**	11.1	14.0	16.9	21.0		10.4	10.4	11.7
900	945	+1 / -4.8	8.9	**10.6**	12.3	15.5	18.8	23.4		11.2	11.2	12.6
1000	1048	+1 / -5.0	9.8	**11.6**	13.4	17.1	20.7			12.0	12.0	13.5
1100	1152	+1 / -6.0	10.6	**12.6**	14.7	18.7	22.7			14.4	14.4	14.4
1200	1255	+1 / -5.8	11.4	**13.6**	15.8	20.2				15.3	15.3	15.3
1400	1462	+1 / -6.6	13.1	**15.7**	18.2					17.1		17.1
1500	1565	+1 / -7.0	13.9	**16.7**	19.4					17.9		18.0
1600	1668	+1 / -7.4	14.8	**17.7**	20.6					18.9		18.9
1800	1875	+1 / -8.2	16.4	**19.7**	23.0					20.7		20.7
2000	2082	+1 / -9.0	18.1	**21.8**	25.4					22.5		22.5
2200	2288	+1 / -9.0	19.8	**23.8**								24.3

Note: The K-7 pipes of higher thickness as per the respective national standard can be supplied.

WHERE VISIONS TAKE SHAPE.

Manufacturing Facilities.

The Integrated Greenfield Project of Ductile Iron Pipe and pig iron unit is located at Samaghogha in Mundra, close to Mundra and Kandla ports in Gujarat. This port-based facility includes:

- **Coke oven battery plant**
- **Sintering plant**
- **Blast furnace**
- **DI pipe manufacturing facility**

Jindal SAW has enhanced its production capacity for manufacturing DI pipes from 300,000 MT to 500,000 MT per annum, by installation of a state-of-the-art Small Diameter Plant (SDP), with size range DN 80 to DN 200.

Further, Jindal SAW has installed a Ductile Iron Pipe manufacturing plant at Abu Dhabi, United Arab Emirates. This facility is capable to manufacture DI pipes in size range of DN 100 to DN 2200, with an installed capacity of 350,000 MT per annum.

In line to its vision to serve the global market, Jindal SAW has also acquired a DI pipe manufacturing plant at (Sertubi), Italy, namely Jindal Saw Italia (Sertubi) having installed capacity of 80,000 MT per annum. The plant will cater to the requirements of European countries.

GOING THE DISTANCE TO ENSURE.

Quality Measures.

Quality is the essence of Jindal SAW brand and therefore quality checks are done at every stage of the manufacturing process to create a product conforming to International Standards. The plant having its own Blast Furnace Manufacturing unit (MBF) provides for a steady and continuous feed of raw material to the casting unit. The facility is established with an advanced pollution control system that makes the unit completely environment-friendly, maintaining natural ecology of the area.

The pipes manufactured by the company are energy-efficient, reduce dependence on fossil fuels, and help conserve natural resources like water.

MAKING PRESENCE FELT.

Manufacturing Plants	JINDAL SAW LIMITED (INDIA)	JINDAL SAW GULF L.L.C (ABU DHABI)	JINDAL SAW ITALIA SPA (ITALY)
Annual Capacity	**500,000 MT**	**350,000 MT**	**80,000 MT**
Size Range	80 mm-1200 mm	100 mm-2200 mm	80 mm-1000 mm
Class of Pipes	C Class & K Class	C Class & K Class	C Class & K Class
Joints	Push on Socket and Spigot (TJ), Restrained Joint, Flanged Joint, JSAW Lock	Push on Socket and Spigot Joint (TJ), Restrained Joint, Mechanical Restrained Joint (MRJ), JSAW Lock	Standard Socket and Spigot Joint (AJ), Push on Socket and Spigot Joint to DIN 28603 (TJ), Self-anchored Restrained Joint (RAJ & RTJ) Mechanical Restrained Joint (MRJ)
Conforming Standards	ISO 2531 BSEN 545 BSEN 598 ISO 7186 IS 8329 AS/NZS 2280	ISO 2531 BSEN 545 BSEN 598 ISO 7186 AS/NZS 2280	ISO 2531 BSEN 545 BSEN 598
Type of Linings	OPC, BFSC, SRC, HAC*, Epoxy/Bituminous Seal Coat, PU	OPC, BFSC, SRC, HAC, Epoxy/Bituminous Seal Coat, PU	BFSC, SRC, HAC
Type of Coatings	Zn & Zn-Al Coatings as per National & International Standards, PU, PE	Zn & Zn-Al Coatings as per National & International Standards, PU	Zinc Coating: 200 gm/m^2 Zn-Al: 400 gm/m^2
Finishing Layer	Blue/Red Epoxy or Black Bitumen	Blue/Red Epoxy or Black Bitumen	Blue/Red Epoxy or Black Synthetic Paint
Special Coatings	External and Internal Polyurethane Coatings as per BSEN 15189 and BSEN 15655 respectively for DN 150 to 1200 mm.	External and Internal Polyurethane Coatings as per BSEN 15189 and BSEN 15655 respectively for DN150 to 2200 mm.	

* OPC - Ordinary Portland Cement
BFSC - Blast Furnace Slag Cement
SRC - Sulphate Resistant Cement
HAC - High Alumina Cement
PU - Polyurethane
PE - Polyethylene

ACKNOWLEDGED FOR ITS EXCELLENCE.

International Accreditations.

Accreditation By	Type of Accreditation	Standards Covered	Plant Accredited
Bureau Veritas	Quality Management System IMS	ISO 9001:2008 ISO 14001 ISO 45001	Jindal SAW - India, Jindal SAW Gulf LLC - Abu Dhabi, Jindal SAW Italia (Sertubi)
Bureau Veritas	Management System	ISO 14001:2004	Jindal SAW - India
TUV NORD CERT GmbH	Management System	BS OHSAS 18001:2007	Jindal SAW - India
British Standards Institute (BSI), UK	Certification and Quality Label (BSI Kitemark)	BSEN 545, BSEN 598, ISO 2531	Jindal SAW - India
Bureau Veritas, Italy	Product Certification (Conformity to standards)	BSEN 545, BSEN 598, ISO 2531, ISO 7186	Jindal SAW - India, Jindal SAW Gulf LLC, Jindal SAW Italia (Sertubi)
Drinking Water Inspectorate (DWI), UK	Regulation 31	Regulation 31 and BSEN 545	Jindal SAW Italia (Sertubi)
	Approval for supply in UK		Jindal SAW - India, Jindal SAW Italia (Sertubi)
Wrc (UK)	WRAS Scheme	Ordinary Portland Cement Sulphate Resistant Cement	Jindal SAW - India, Jindal SAW Gulf LLC.
	(Certification of materials in contact with potable water)	Blast Furnace Slag Cement	Jindal SAW Gulf LLC, Jindal SAW Italia (Sertubi)
		OPC with Epoxy Seal Coat	Jindal SAW - India
DVGW (Germany)	Product Certification (Conformity to standards)	BSEN 545, BSEN 598	Jindal SAW Italia (Sertubi), Jindal SAW - India
ZIK (Croatia)			
IGQ Product Certifications (Italy)	Product Certification (Conformity to standards)	BSEN 545	Jindal SAW Italia (Sertubi)
Canal De Provence (France)			
ZAG (Slovenia)			
Bulgarkontrola (Bulgaria)			
OKTVF (Ungheria)			
Consilium Technic Permanent Pentru Constructii (Romania)			
Technicky Skusobny Ustav Piestany (Slovakia)			
Narodowy Instytut Zdrowia Publicznego (Poland)			
Strojirensky Zkusebni Ustav S.P (Czech Republic)			
SSIGE (Switzerland)			
Belgaqua /Copro (Belgium)			
AGBAR Sociedad General De Aguas De Barcelona S.A (Spain)			
Jordonian Water Authority (Jordan)			
DNV GL (Australia & New Zealand)	Product Cont.	AS/NZ 2280	Jindal SAW - India, Jindal SAW Gulf LLC.
TUV (Singapore)	Product Approval		Jindal SAW - India, Jindal SAW Gulf LLC.
ACS (France)	Approval		Jindal SAW - India, Jindal SAW Gulf LLC.
COMIE (Italy)	Approval		Jindal SAW - India, Jindal SAW Gulf LLC.

A 'YES' IS ALWAYS THE ANSWER.

Jindal SAW's Current Approvals / Credentials.

Name of the Country	Name of the Entity
UK	DWI, Anglian Water, Veolia Water
Qatar	KAHRAMAA, ASHGHAL
Oman	PAW, Hayawater, MOD, Sultanate of Oman
Kingdom of Saudi Arabia (KSA)	Saudi Arabian Standards Organization (SASO)
Iraq	Ministry of Water Resources, MOCHPMW
Spain	ACUANORTE, ACUAMED, AGUAS DE CASTELLÓN, AGUAS DE TXINGUDI, AGUAS DE VALENCIA, ALJARAFESA, AQUALIA, AQUALOGY, CH GUADALQUIVIR, CONSORCIO AGUAS BILBAO, EMALSA, EMASESA, EMAYA, EMUASA, ...
Sri Lanka	National Water Supply and Drainage Board
Morocco	ONEE (Office National de l'Electricité et de l'Eau Potable)
Bhutan	Standards and Quality Control Authority
Australia	WASA
Egypt	NOPWASD, CWC, AWCO, GWC, AWWCO
Singapore	TUV, SUD, PSB Pte. Ltd.
Bahrain	EWA
Tunisia	SONEDE
Brazil	SABESP, SANEPAR, COPASA, CORSANA, COMP CAESP, CAGEGE, EMBASA, AGESPISA, SANEA, CASAN
South Africa	DWAF
Senegal	SONES
Cyprus	WDD, SALA

AMONGST OUR SATISFIED CUSTOMERS.

Country	Water Authority / End User
Algeria	ANBT (L'Agence Nationale des Barrages et Transferts), ONID (Office National de l'Irrigation), DHW's (Directions de l'Hydraulique des wilayas)
Morocco	ONEE (Office National de l'Electricité et de l'Eau Potable) REDAL-Veolia Maroc
United Kingdom	DWI, Anglian Water, Veolia Water, South East Water
Oman	PAW, MOD
Saudi Arabia	NWC (National Water Company), MOWE (Ministry of Water & Electricity)
Spain	ACUANORTE, ACUAMED, AGUAS DE CASTELLÓN, AGUAS DE TXINGUDI, AGUAS DE VALENCIA, ALJARAFESA, AQUALIA, AQUALOGY, CH GUADALQUIVIR, CONSORCIO AGUAS BILBAO, EMALSA, EMASESA, EMAYA, EMUASA, ...
Sri Lanka	NWSDB (National Water Supply & Drainage Board)
Seychelles	PUC (Public Utilities Corporation)
Bhutan	Standards & Quality Control Authority
UAE	FEWA (Federal Electricity & Water Authority), ADWEA (Abu Dhabi Water and Electricity Authority), MOPW
Jordan	WAJ (Water Authority of Jordan)
Bahrain	EWA
Italy	ASSOFOND (AQUAGS)
France	IGQ

Country	Water Authority / End User
Germany	DVGW
Belgium	BELGAQUA
Poland	PZH
Czech Republic	SZU
Hungary	VITUKI
Slovakia	TSU
Croatia	ZIK
Romania	ICECON SA
Bulgaria	BULGARKONTROLA S.A
Switzerland	SSIGE
Cyprus	WAPP
Peru	SEDAPAL
Turkey	ILLERBANKASI, ESKI, ISKI DESKI, GASKI
Georgia	GWA
Kuwait	MEW
Iraq	MMPW, KWA
Vietnam	BIWASE, VIWASUPCO
Panama	IDAAN
Brazil	SABESP, SANEPAR
Egypt	CWC, AWCO
Tunisia	SOMEOE
Australia	Sydney Water
Qatar	ASHGHAL, KRAHMAH
Singapore	PUB

LEAVING A MARK.

Jindal SAW: Presence of Ductile Iron Pipes.

JINDAL SAW LTD.
TOTAL PIPE SOLUTIONS

• LSAW • HSAW • Ductile Iron Pipes • Seamless Tubes • Coatings • Hot Induction Bends

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