CREATING BENCHMARKS

Jindal Line Pipe

JINDAL (INDIA) LIMITED

Electric Welded Line Pipes

Certificate of Authority to use the Official API Monogram

License Number: 5L-0713 **ORIGINAL**

The American Petroleum Institute hereby grants to

M/S JINDAL (INDIA) LIMITED, LINE PIPE DIVISION
NH-6, Jangalpur Village: Andul, Mouri
Howrah, West Bengal
India

the right to use the Official API Monogram® on manufactured products under the conditions in the official publications of the American Petroleum Institute entitled API Spec Q1® and **API Spec 5L** and in accordance with the provisions of the License Agreement.

In all cases where the Official API Monogram is applied, the API Monogram should be used in conjunction with this certificate number: **5L-0713**

The American Petroleum Institute reserves the right to revoke this authorization to use the Official API Monogram for any reason satisfactory to the Board of Directors of the American Petroleum Institute.

The scope of this license includes the following: **Manufacturer of Line Pipe Plain End at PSL 1:** Type of Pipe: HFW / Delivery Condition: R,N,M / Highest Grade: X70; **Manufacturer of Line Pipe Plain End at PSL 2:** Type of Pipe: HFW / Delivery Condition: R,N,M / Highest Grade: X70

QMS Exclusions: Section 7.3, Design and Development; Section 7.5.4, Customer Property

American Petroleum Institute

John D. Modine

Director of Training and Certification Programs

Effective Date: JULY 6, 2009
Expiration Date: JULY 6, 2012

To verify the authenticity of this license, go to www.api.org/compositelist.

American Petroleum Institute®

AMERICAN PETROLEUM INSTITUTE CORPORATE SEAL INCORPORATED 1919

2009-044

The modern Tubes & Pipes industry in India owes its origin to the grand vision of Shri B. C. Jindal. The seed was sown with the incorporation of Jindal (India) Limited on the auspicious day of Makar Sankranti, 14th January 1952. The manufacturing facilities were initially set up for the production of steel pipe fittings. Subsequently, the company installed machinery /equipments to produce ERW pipes in the year 1966 at Belur, District Howrah. The company started producing M.S Black/Galvanized ERW Pipes/Tubes confirming to National and International Standards. The technology and product range was continuously upgraded to cater the growing needs of varying products and quality required by the market in the developing economy. The manufacturing facilities that includes Cold Rolled, Galvanized Sheets Coils & Line Pipes, all units are accredited with ISO: 9001-2008

Since 2007, the organization expanded its activities by initiating pipe manufacturing facility at Jangalpur Works for pipe sizes up to 20" Outside Diameter largely required by Oil and Gas Industry for their ever increasing requirement of Line pipes.

Backed by such long history in production of steel tubular products and constant quest for technology, the manufacturing facilities were modernized with technological improvement as a result of consistent dialogue with customers and user industry. The company is now able to cater the wide segment of Welded Steel Pipes and Tubes, Cold Rolled, Galvanized Sheet & Coils to consumers in India and overseas.

This brochure is to introduce the Line Pipe manufacturing facility for EW/HFW Steel pipes up to 20" (508mm) Outside Diameter at Jangalpur Work with facilities for **3LPE/LPP coating** on pipes.

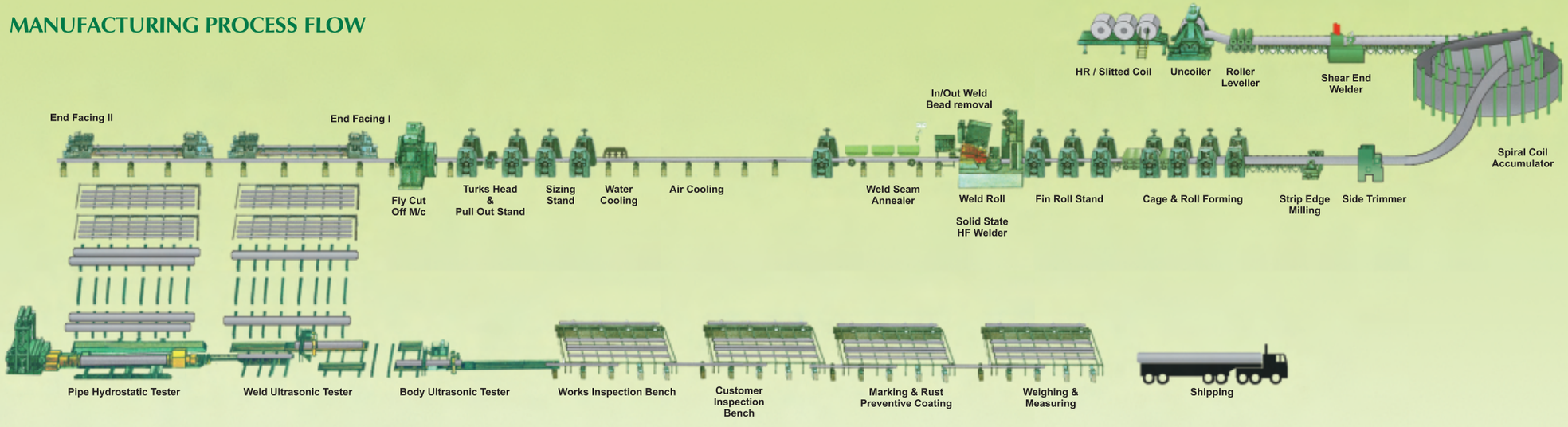
Some of the features are Spiral Accumulator, the first in the country for this size of the mill and Coil Edge Milling machine of latest technology. **The facility is equipped to produce High Strength Steel Line pipes up to Grade X -70 in API 5L PSL 2 considering the requirements of Oil and Gas sector.** Pipes for water wells, water transmission; slurry transportation and structural applications are also catered to various standards.

JINDAL (INDIA) LIMITED as a company is dedicated to quality product and outstanding services. The friendly and knowledgeable staff ensures that the customer's enquiries and orders are dealt with promptly. The low production cycle assists in reliable product deliveries.

The extensive product range reflects our constant endeavor for improved workmanship and procedures. By adaptation of new technologies and maintaining strict quality control, JINDAL (INDIA) LIMITED is able to offer the finest HFW pipe products in the industry.

The Electric Welded pipes in HFW category are increasingly accepted for High Integrity applications in the Oil & Gas sector: For its improved Dimensional Control all along that helps coating/field joint efficiency. Precise control of Mechanical Properties & Surface Quality inherent in HR Coils. No extraneous input of material for welding, besides advantage of latest forming & solid state HF Welding Technology.

MANUFACTURING PROCESS FLOW



MILL FACILITIES:

JINDAL (INDIA) LIMITED, Line Pipe Division is now equipped with modern line pipe production facilities supplied by leading designers & manufacturers of pipe plant equipments all over the world.

UNCOILER, LEVELLER & PINCH ROLL: Double cone type un-coiler, variable type speed five roll leveler and pinch roll.

SHEAR END WELDER

SHEAR END WELDER that improves the production efficiency and welded pipe quality, it has a PLC control method with CO2 gas protection MIG welding. Two nos. of such welder of DC-600 type with current and voltage control gives a smooth butt- weld in an auto control mode in a working cycle of 3 to 8 minutes.

SPIRAL COIL ACCUMULATOR

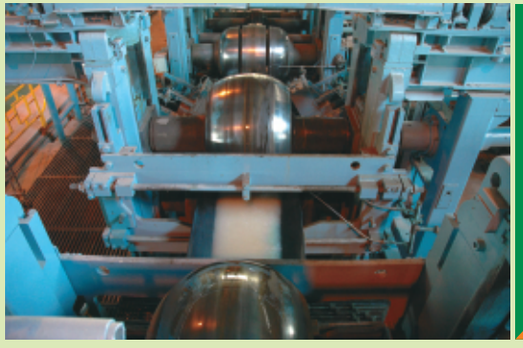
The Modern **SPIRAL COIL ACCUMULATOR** for high speed high frequency straight line welding is designed to store & provide the strip for the mill to ensure continuous welding. The strip comes out of the accumulator without hindrance and feeding strip continuously to the pipe forming line with no stretcher strain, no folded steel material and no partial plastic deformation. It stores strip of different width & thickness without complicated adjustment. The Accumulator out let strip speed is upto 35 mtr/min that synchronizes with the mill speed.

STRIP EDGE MILLING

The side trimming of coils width from 510mm to 1630 mm steel grade upto x70 are carried out online. The EDGE MILLING machine is supplied by M/s Linsinger Maschinenbau GmbH, Austria. This machine prepares the edges for welding with high degree of accuracy of high quality material. This can cut upto a depth of 15 mm on either side. This helps in eliminating cracks and metallurgical problems in high strength materials. A precise profile with close tolerances provides excellent weld edge.

PIPE MILL LINE

The Ø 20″ pipe mill line is designed to manufacture ERW pipes of Out side Diameter 6 5/8″ (168.3mm), 8 5/8″ (219.1mm), 10¾″ (273.1mm), 12¾″(323.9mm), 14″ (355.6mm), 16″ (406.4mm), 18″ (457.0mm) and 20″ (508.0 mm) in the wall thickness range of 3.2 mm to 14.3 mm and lengths up to 18 meters with maximum line speed up to 30 mtr/min. The cage forming stand between No. 3&4, 4&5, forming stand and cage roll at fin pass stand No. 5&6 helps the pipe forming with minimum cold working.



SEAM ANNEALER

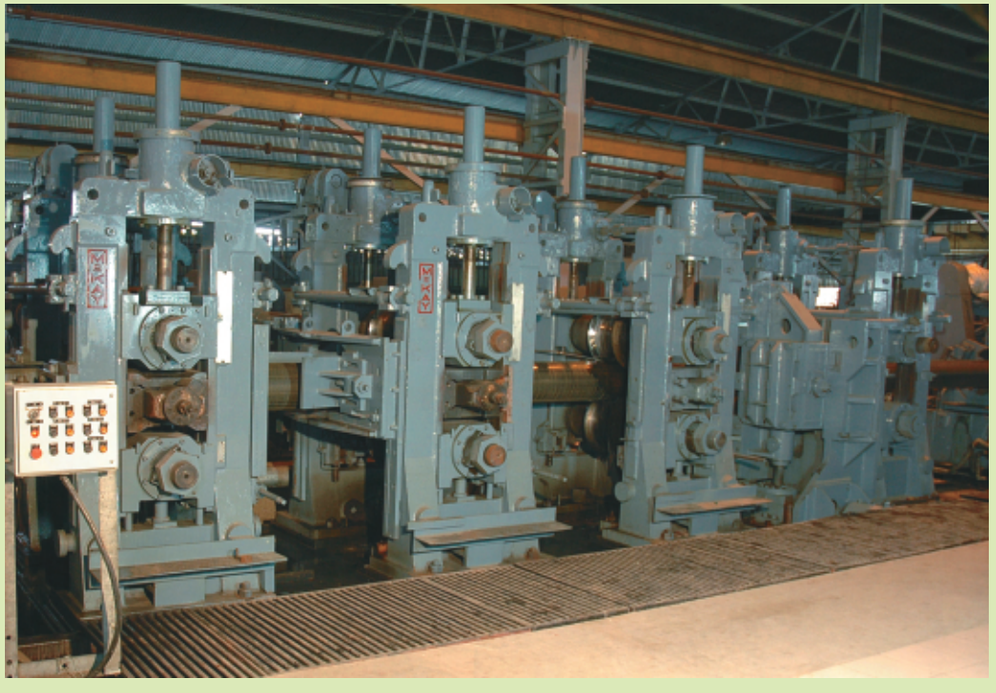
The SEAM ANNEALER with 3 solid state inverters of 500 KW each is used to normalize the weld seam structure immediately after welding. It is equipped with infrared pyrometers for accurate seam temperature monitor and a temperature recorder.

WELDING SECTION

The **welding section** has the latest technology high capacity **1000KW solid-state high frequency welder (Thermatool)** with resistance and induction welding options. This transistorized high frequency power supply system is highly reliable, efficient; with power saving and safety characteristics in comparison to conventional vacuum tube high frequency welding. It is technically superior for reliability and consistency of welding parameters like voltage, current, and weld temperature.

SIZING AND STRAIGHTENING

The dimensions and straightness is controlled on line with sizing stands and Turks head before the pipe is cut into required length.



CUTTING MACHINES

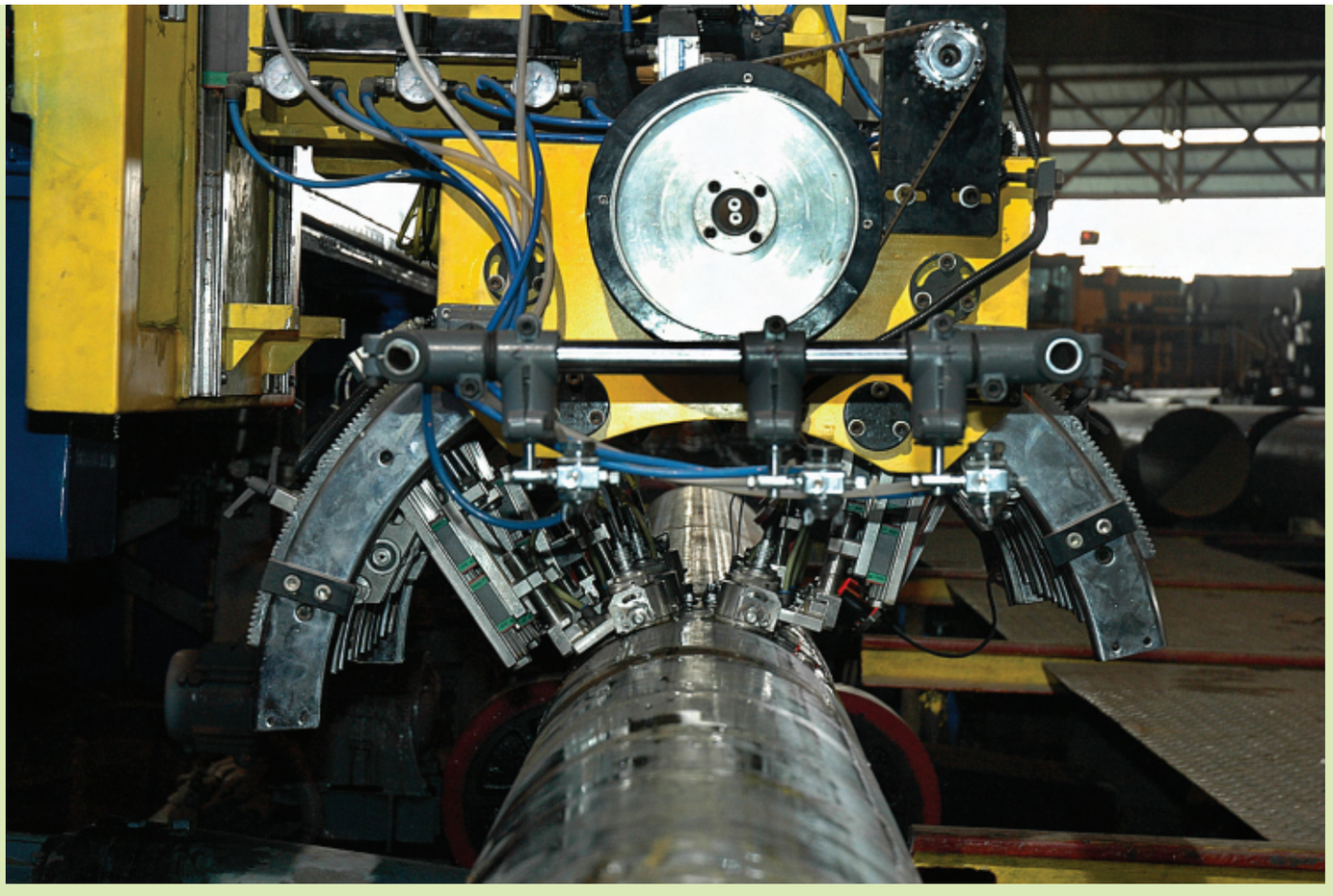
The cutting machines is equipped with rotating pipe cutters that cuts the pipe between 6-18 meters automatically depending on the customer's requirement.

END FACING MACHINES

For end finishing as per customer requirement the line is equipped with two pairs of tool rotating type **end facing machines.**

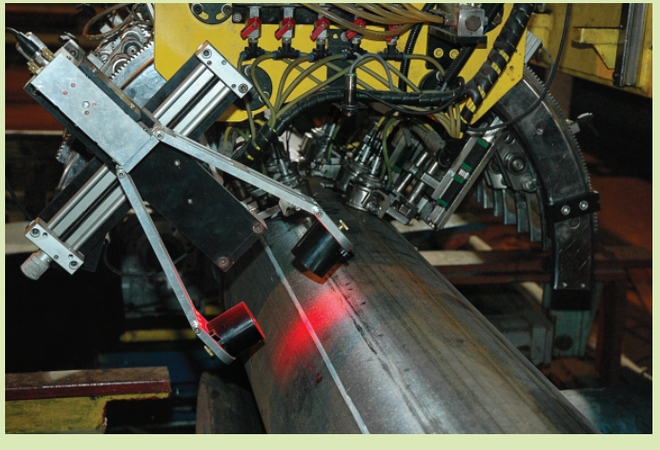
HYDROSTATIC TESTING

The **hydrostatic testing** is equipped to test each length of the pipe to the stipulated test pressure and time with a recording gauge to record test pressure & test duration. It is also equipped with interlocking system, to prevent the pipe from being classified as tested until the test requirements have been met. The inspection test pressures are carried up to 100% of the SMYS when agreed upon.



OFFLINE ULTRASONIC TESTING SYSTEM

The **Automatic Off Line Ultrasonic** ERW Weld Inspection System (Quick Scan-UT) sourced from **M/s Olympus NDT, Canada** supplied by Blue Star Ltd. is equipped with 8 channel UT test configuration of I+I+X and two nos TR Probe for heat affected zone covering 25 mm each side, that tests the weld up to a speed of 25 m/min. with a laser seam sensor and tracking system. An additional station is specially designed to test the **body of the pipe ultrasonically** wherein there are 24 nos. of probe provided for testing the body lamination as per the customer's requirement besides covering the API 5L.



QMS REGISTERED

Certificate of Registration

APIQR® REGISTRATION NUMBER
1086

This certifies that the quality management system of

M/S JINDAL (INDIA) LIMITED, LINE PIPE DIVISION
NH-6, Jangalpur Village: Andul, Mouri
Howrah, West Bengal
India

has been assessed by the American Petroleum Institute Quality Registrar (APIQR®) and found it to be in conformance with the following standard:

ISO 9001:2008

The scope of this registration and the approved quality management system applies to the
Manufacture of Line Pipes

APIQR® approves the organization's justification for excluding:
Section 7.3, Design and Development; Section 7.5.4, Customer Property

Effective Date: July 6, 2009
Expiration Date: July 6, 2012
Registered Since: July 6, 2009

W. Dan Whittaker
Manager of Operations, APIQR

Accredited by Member of the International Accreditation Forum Multilateral Recognition Arrangement for Quality Management Systems

ANAB IAF

This certificate is valid for the period specified herein. The registered organization must continually meet all requirements of APIQR's Registration Program and the requirements of the Registration Agreement. Registration is maintained and regularly monitored through annual full system audits. Further clarifications regarding the scope of this certificate and the applicability of ISO 9001 standard requirements may be obtained by consulting the registered organization. This certificate has been issued from APIQR offices located at 1220 L Street, N.W., Washington, D.C. 20005-4070, U.S.A., it is the property of APIQR, and must be returned upon request. To verify the authenticity of this certificate, go to www.api.org/compositelist.

QUALITY REGISTRAR

energy API

REGISTRATION NO. Q1-0898

Certificate of Registration

The American Petroleum Institute certifies that the quality management system of

M/S JINDAL (INDIA) LIMITED, LINE PIPE DIVISION
NH-6, Jangalpur Village: Andul, Mouri
Howrah, West Bengal
India

has been assessed by the American Petroleum Institute and found to be in conformance with the following:

API Specification Q1

The scope of this registration and the approved quality management system applies to the:
Manufacture of Line Pipes

API approves the organization's justification for excluding:
Section 7.3, Design and Development; Section 7.5.4, Customer Property

Effective Date: July 6, 2009
Expiration Date: July 6, 2012
Registered Since: July 6, 2009

Q1 API Spec Q1 Registered

W. Dan Whittaker
Manager of Operations, APIQR

This certificate is valid for the period specified herein. The registered organization must continually meet all requirements of API Spec Q1, Specification for Quality Programs for the Petroleum, Petrochemical and Natural Gas Industry, and the requirements of the Registration Agreement. Registration is maintained and regularly monitored through annual full system audits. This certificate has been issued from API offices located at 1220 L Street, N.W., Washington, D.C. 20005-4070, U.S.A., it is the property of API, and must be returned upon request. To verify the authenticity of this certificate, go to www.api.org/compositelist.

energy API

REGISTRATION NO. TS-0760

Certificate of Registration

The American Petroleum Institute certifies that the quality management system of

M/S JINDAL (INDIA) LIMITED, LINE PIPE DIVISION
NH-6, Jangalpur Village: Andul, Mouri
Howrah, West Bengal
India

has been assessed by the American Petroleum Institute and found to be in compliance with the following:

ISO/TS 29001

The scope of this registration and the approved quality management system applies to the:
Manufacture of Line Pipes

API approves the organization's justification for excluding:
Section 7.3, Design and Development; Section 7.5.4, Customer Property

Effective Date: July 6, 2009
Expiration Date: July 6, 2012
Registered Since: July 6, 2009

API ISO/TS 29001 Registered

W. Dan Whittaker
Manager of Operations, APIQR

This certificate is valid for the period specified herein. The registered organization must continually meet all requirements of ISO/TS 29001, Petroleum, Petrochemical and Natural Gas Industry – Sector Specific Quality Management Systems, and the requirements of the Registration Agreement. Registration is maintained and regularly monitored through annual full system audits. This certificate has been issued from API offices located at 1220 L Street, N.W., Washington, D.C. 20005-4070, U.S.A., it is the property of API, and must be returned upon request. To verify the authenticity of this certificate, go to www.api.org/compositelist.

JINDAL High Test Line Pipe Manufacturing Facilities

Production Capacity	240000 MT per annum
Manufacturing Process	Solid State HF Welding with Seam Annealing
Outside Diameter	6 5/8" (168.3 mm) to 20" (508.0 mm)
Wall Thickness	0.125" (3.2 mm) to 0.562" (14.3 mm)
Pipe Length	5 meters to 18 meters
Specifications	API 5L, ASTM, BS, DIN, JIS, IS
Pipe Ends	Bevelled or Plain
Protective coating	Bare or Rust Preventive coating
End protection	Protected with Plastic/Metallic caps

ADVANCED TECHNOLOGY:

A Quality Management System is incorporated at each level of manufacturing process right from selection of input material to final finished product. Care is taken to see that at each step the exact process and techniques are followed to give the perfect weld tested product. The whole gamut of state of the art quality control instruments and equipments sourced from globally renowned suppliers ensures a Total Quality Management System.

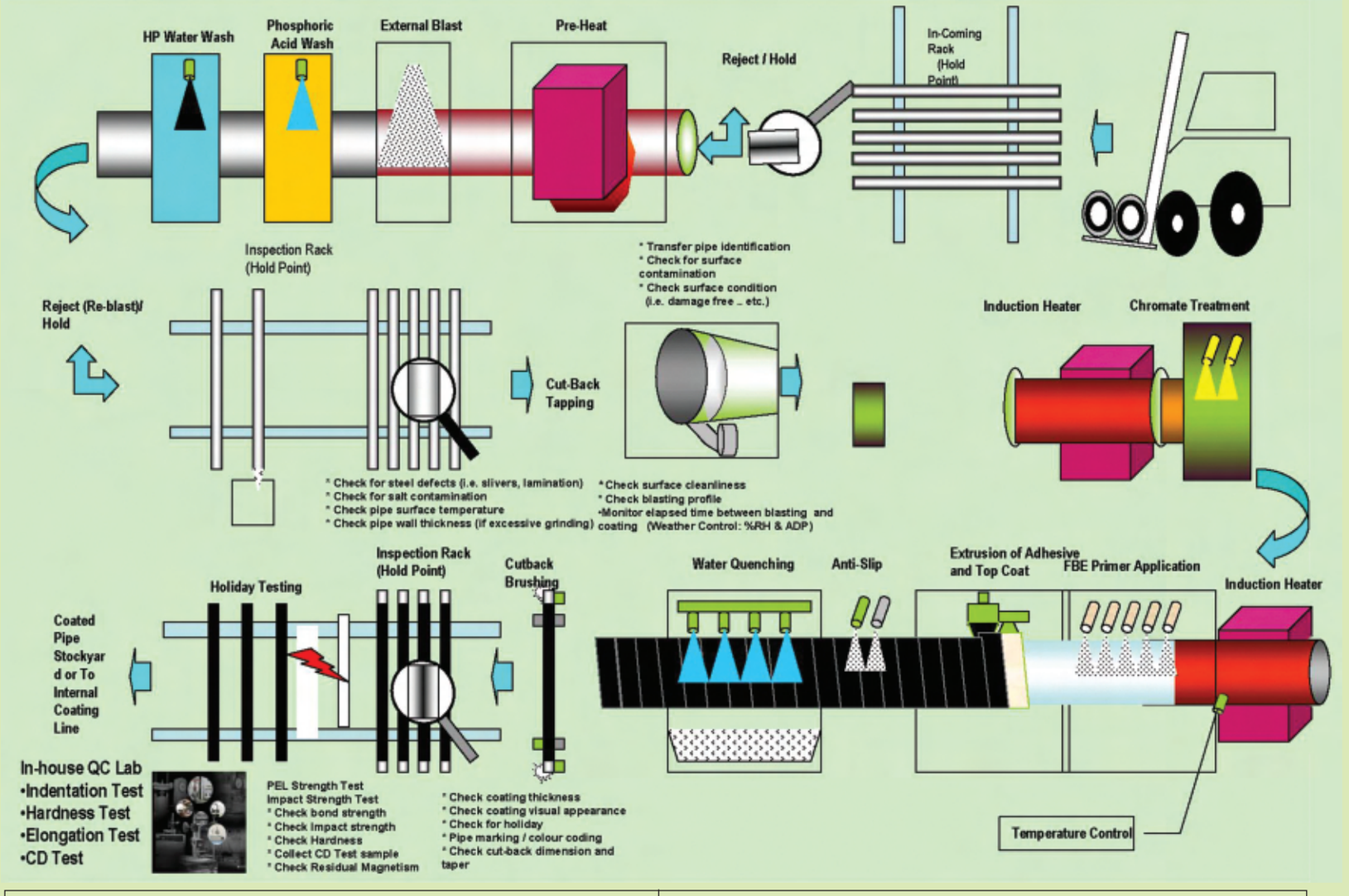
The unit is certified to ISO 9001-2008, TS 29001, API Q1 for its Quality Management System for Manufacture of Line Pipes by AMERICAN PETROLEUM INSTITUTE

Besides, company is an authorized user of API Monogram for APL5L PSL1 and 2 Upto X-70.

JINDAL (INDIA) LIMITED is aided by modern process control, inspection and testing facilities, which ensures the supply of quality products conforming to most of the national and international standards of pipes. The laboratory is equipped with instruments and equipments like:

- **100T Servo control electronic Universal Testing Machine with computerized recording system**
- **Electronic Extensometer for accurate determination of tensile properties**
- **Vickers hardness testers 5-50 kg load, for Hardness test in Weld, HAZ, Body**
- **300 Jules capacity ASTM standard Impact testing machine**
- **High resolution metallurgical microscope with related facilities,**
- **OES Spectrometer Equiped with over 20 channels for rapid and accurate chemical analysis of base material**
- **Adequate No of Hand Ultrasonic Testing Machines and Ultrasonic thickness meters for speedy disposal of finished pipes**
- **A 30000 Jules DWTT station for testing full thickness pipe samples as per requirement of customer / API RP5L3 up to -40 Deg C**

3 Layer Poly Ethylene / Poly Propylene Coating Flow Process



Production Rate	:	300 Msq/Hr (External), 250Msq/Hr (Internal)	Specification	:	DIN 30670, APIRP5L2
Manufacturing Process	:	Extrusion Process and Electrostatic Deposition	Pipe Length	:	6 Mtr. to 18 Mtr.
Protective Coating	:	Corrosion protective coating	Outside Diameter	:	168.3mm to 508.0mm
End Protection	:	Plastic or Metallic End Caps			

TABLE: 1 LINE PIPE SIZE RANGE

Diameter			WALL THICKNESS (mm/Inch)																										Diameter		
O.D.	O.D.	N.B.	3.2	3.6	4.0	4.4	4.5	4.8	5.0	5.2	5.4	5.6	5.9	6.0	6.3	6.4	7.0	7.1	7.9	8.0	8.2	8.7	8.8	9.5	10.0	10.3	11.0	11.1	12.7	14.3	O.D.	O.D.	N.B.
mm	inch	mm.	0.125"	0.141"	0.157"	0.173"	0.177"	0.189"	0.196"	0.204"	0.212"	0.220"	0.232"	0.236"	0.248"	0.251"	0.275"	0.279"	0.311"	0.314"	0.322"	0.342"	0.346"	0.374"	0.393"	0.405"	0.433"	0.437"	0.500"	0.562"	mm	inch	mm
168.3	6.625"	150																													168.3	6.625"	150
219.1	8.625"	200																													219.1	8.625"	200
273.1	10.750"	250																													273.1	10.750"	250
323.9	12.750"	300																													323.9	12.750"	300
355.6	14.000"	350																													355.6	14.000"	350
406.4	16.000"	400																													406.4	16.000"	400
457.0	18.000"	450																													457.0	18.000"	450
508.0	20.000"	500																													508.0	20.000"	500

Note: 1) Sizes indicated by ▭ are supplied subject to negotiation.

2) Size other than those shown in the table are also supplied subject to negotiation.

TABLE - 2 : HYDROSTATIC INSPECTION TEST PRESSURE

Outside Diameter (mm)	THK. (inch.)	THK. (mm)	Designation		Density (Plain End)	TEST PRESSURE (K p a x 100)								
			Standard X-Strong	Schedule No.	(Kg/Mtr)	API 5L GRADE								
						A	B	X-42	X-46	X-52	X-56	X-60	X-65	X-70
168.3	0.125	3.2			13.03	59	69	83	90	102	110	118	128	138
	0.141	3.6			14.62	66	77	93	102	115	124	133	144	155
	0.156	4.0			16.21	74	86	103	113	128	138	148	160	172
	0.172	4.4			17.78	81	95	114	124	141	151	162	176	189
	0.188	4.8			19.35	89	103	124	136	154	165	177	192	207
	0.203	5.2			20.91	96	112	134	147	166	179	192	208	224
	0.219	5.6			22.47	103	120	145	158	179	193	208	224	241
	0.250	6.4			25.55	118	137	165	181	205	220	236	256	276
	0.280	7.1	STD	40	28.22	131	153	184	201	227	244	262	283	306
	0.312	7.9			31.25	146	170	204	223	253	272	291	315	340
	0.344	8.7			34.24	161	187	225	246	278	299	321	347	
	0.375	9.5	XS		37.20	175	193	246	268	304	327			
219.1	0.156	4.0			21.22	57	66	79	87	98	106	113	123	132
	0.188	4.8			25.37	68	79	95	104	118	127	136	147	159
	0.203	5.2			27.43	74	86	103	113	128	137	147	159	172
	0.219	5.6			29.48	79	92	111	122	138	148	159	172	185
	0.250	6.4		20	33.57	91	106	127	139	157	169	181	196	212
	0.277	7.0		30	36.61	99	115	139	152	172	185	198	215	231
	0.312	7.9			41.14	112	130	157	171	194	209	224	242	261
	0.322	8.2	STD	40	42.65	116	135	163	178	202	217	232	252	271
	0.344	8.7			45.14	123	144	173	189	214	230	247	267	288
	0.375	9.5			49.10	135	157	189	206	233	251	269	291	314
	0.438	11.1	XS		56.94	157	183	220	241	273	293	315	340	
273.1	0.156	4.0			26.54	45	53	72	79	89	96	103	112	120
	0.188	4.8			31.76	55	64	87	95	107	115	124	134	144
	0.203	5.2			34.35	59	69	94	103	116	125	134	145	156
	0.219	5.6			36.94	64	74	101	111	125	135	144	156	168
	0.250	6.4		20	42.09	73	85	116	126	143	154	165	178	192
	0.279	7.1			46.57	81	94	128	140	159	171	183	198	213
	0.307	7.8		30	51.03	89	103	141	154	174	187	201	218	235
	0.344	8.7			56.72	99	115	157	172	194	209	224	243	262
	0.365	9.3	STD		60.50	106	123	168	184	208	223	240	259	280
	0.438	11.1			71.72	126	147	200	219	248	267	286	314	334
323.9	0.188	4.8			37.77	46	54	73	80	90	97	104	113	122
	0.203	5.2			40.87	50	58	79	87	98	105	113	122	132
	0.219	5.6			43.96	54	63	85	93	106	113	122	132	142
	0.250	6.4		20	50.11	61	71	97	106	121	130	139	150	162
	0.281	7.1			55.47	68	79	108	118	134	144	154	167	180
	0.312	7.9			61.56	76	88	120	131	149	160	172	186	200
	0.330	8.4		30	65.35	81	94	128	140	158	170	183	198	213
	0.344	8.7			67.62	83	97	132	145	164	176	189	205	221
	0.375	9.5	STD		73.65	91	106	145	158	179	192	206	223	241
	0.406	10.3		40	79.65	99	115	157	171	194	209	224	242	261
	0.438	11.1			85.62	106	124	169	185	209	225	241	261	281
	0.500	12.7	XS	80	97.46	122	142	193	211	239	256	276	299	322

NOTE:1) Tset pressure at 75 % of SMYS for Grade A & B

TABLE - 2 : HYDROSTATIC INSPECTION TEST PRESSURE (Contd.)

Outside Diameter (mm)	THK. (inch.)	THK. (mm)	Designation		Density (Plain End)	TEST PRESSURE (K p a x 100)								
			Standard X-	Schedule		API 5L GRADE								
			Strong	No.	(Kg/Mtr)	A	B	X-42	X-46	X-52	X-56	X-60	X-65	X-70
355.6	0.203	5.2			44.93	45	53	72	79	89	96	103	111	120
	0.210	5.3			45.78	46	54	73	80	91	98	105	114	122
	0.219	5.6			48.33	49	57	78	85	96	103	111	120	129
	0.250	6.4		10	55.11	56	65	89	97	110	118	127	137	148
	0.281	7.1			61.02	62	72	98	108	122	131	141	152	164
	0.312	7.9		20	67.74	69	80	110	120	136	145	156	169	182
	0.344	8.7			74.42	76	88	121	132	149	161	172	186	201
	0.375	9.5	STD	30	81.08	83	97	132	144	163	175	188	203	219
	0.406	10.3			87.71	90	105	143	156	177	190	204	221	238
	0.438	11.1		40	94.30	97	113	154	168	191	205	220	238	256
	0.469	11.9			100.86	104	121	165	180	204	220	236	255	275
	0.500	12.7	XS		107.39	111	129	176	192	219	234	251	272	293
	0.562	14.3			120.36	125	145	198	217	245	264	283	306	330
406.4	0.250	6.4		10	63.13	49	57	78	85	96	102	111	120	129
	0.281	7.1			69.91	54	63	86	94	107	111	123	133	143
	0.312	7.9		20	77.63	60	70	96	105	119	128	137	148	160
	0.344	8.7			85.32	66	77	106	115	131	140	151	163	176
	0.375	9.5	STD	30	92.98	73	85	115	126	143	153	165	178	192
	0.406	10.3			100.61	79	92	125	137	155	166	178	193	208
	0.438	11.1			108.20	85	99	135	147	167	179	192	208	224
	0.469	11.9			115.77	91	106	144	158	179	192	206	223	240
	0.500	12.7	XS	40	123.30	97	113	154	168	191	205	220	238	250
	0.562	14.3			138.27	109	127	173	190	215	231	248	250	250
457.0	0.281	7.1			78.77	48	56	77	84	95	102	109	118	128
	0.312	7.9		20	87.49	54	62	85	93	106	113	122	132	142
	0.344	8.7			96.18	59	69	94	103	116	125	134	145	156
	0.375	9.5	STD		104.84	65	75	102	112	127	136	146	158	171
	0.406	10.3			113.46	70	81	111	121	138	148	159	172	185
	0.438	11.1		30	122.05	75	88	120	131	148	159	171	185	199
	0.469	11.9			130.62	81	94	128	140	159	171	183	198	214
	0.500	12.7	XS		139.15	86	100	137	150	170	182	196	212	
	0.562	14.3			156.11	97	113	154	169	191	205	220		
508.0	0.281	7.1			87.70	43	51	73	80	90	97	104	113	122
	0.312	7.9			97.43	48	56	81	89	100	108	116	125	135
	0.344	8.7			107.12	53	62	89	98	111	119	128	138	149
	0.375	9.5	STD	20	116.78	58	68	98	107	121	130	139	151	163
	0.406	10.3			126.41	63	73	106	116	131	141	151	164	
	0.438	11.1			136.01	68	79	114	125	141	152	163	176	
	0.469	11.9			145.58	73	85	122	134	151	163	175		
	0.500	12.7		30	155.12	78	90	131	143	162	174			
	0.562	14.3			174.10	87	102	147	161	182	196			

NOTE:1) Tset pressure at 75 % of SMYS for Grade A & B

TABLE: 3 INTERNAL DESIGN PRESSURE (Mpa)

API 5L Gr X42 ERW PIPES (Plain End)

NOMINAL THICKNESS IN MM	OUTSIDE DIAMETER IN MM							
	168.3	219.1	273.1	323.9	355.6	406.4	457.0	508.0
3.2	**P1** =39 **P2** =83							
3.6	**P1** =44 **P2** =93							
4.0	**P1** =49 **P2** =103	**P1** =38 **P2** =79	**P1** =30 **P2** =72					
4.4	**P1** =55 **P2** =114							
4.8	**P1** =60 **P2** =124	**P1** = 46 **P2** =95	**P1** =36 **P2** =87	**P1** =31 **P2** =73				
5.2	**P1** =65 **P2** =134	**P1** =49 **P2** =103	**P1** =40 **P2** =94	**P1** =33 **P2** =79	**P1** =30 **P2** =72			
5.3					**P1** =30 **P2** =73			
5.6	**P1** =70 **P2** =145	**P1** =53 **P2** =111.	**P1** =43 **P2** =101	**P1** =36 **P2** =85	**P1** =33 **P2** =78			
6.4	**P1** =80 **P2** =165	**P1** =61 **P2** =127	**P1** =49 **P2** =116	**P1** =41 **P2** =97	**P1** =37 **P2** =89	**P1** =33 **P2** =78		
7.0		**P1** =67 **P2** =139						
7.1	**P1** =89 **P2** =184		**P1** =54 **P2** =128	**P1** =46 **P2** =108	**P1** =41 **P2** =98	**P1** =36 **P2** =86	**P1** =32 **P2** =77	**P1** =30 **P2** =73
7.8			**P1** =60 **P2** =141					
7.9	**P1** =99 **P2** =204	**P1** =76 **P2** =157		**P1** =51 **P2** =120	**P1** =46 **P2** =110	**P1** =40 **P2** =96	**P1** =35 **P2** =85	**P1** =34 **P2** =81
8.2		**P1** =79 **P2** =163						
8.4				**P1** =54 **P2** =128				
8.7	**P1** =110 **P2** =225	**P1** =84 **P2** =173	**P1** =67 **P2** =157	**P1** =56 **P2** =132	**P1** =51 **P2** =121	**P1** =44 **P2** =106	**P1** =39 **P2** =94	**P1** =37 **P2** =89
9.3			**P1** =71 **P2** =168					
9.5	**P1** =120 **P2** =246	**P1** =92 **P2** =189		**P1** =61 **P2** =145	**P1** =56 **P2** =132	**P1** =49 **P2** =115	**P1** =42 **P2** =102	**P1** =41 **P2** =98
10.3				**P1** =67 **P2** =157	**P1** =61 **P2** =143	**P1** =53 **P2** =125	**P1** =46 **P2** =111	**P1** =44 **P2** =106
11.1		**P1** =108 **P2** =220	**P1** =86 **P2** =200	**P1** =72 **P2** =169	**P1** =65 **P2** =154	**P1** =57 **P2** =135	**P1** =50 **P2** =120	**P1** =48 **P2** =114
11.9					**P1** =70 **P2** =165	**P1** =61 **P2** =144	**P1** =53 **P2** =128	**P1** =51 **P2** =122
12.7				**P1** =83 **P2** =193	**P1** =75 **P2** =176	**P1** =65 **P2** =154	**P1** =57 **P2** =137	**P1** =55 **P2** =131
14.3					**P1** =83 **P2** =198	**P1** =72 **P2** =173	**P1** =64 **P2** =154	**P1** =51 **P2** =147

N.B.: **1)** **P1** = **Allowable** Internal Design Pressure in Mpa at -29 deg to 204 deg C. **P2** = **Inspection** Test Pressure in Mpa as per API 5L Grade X 42

2) While using the table, reference also be made to the codes for more specific details (e.g. ANSI B 31.1, ANSI B 31.3 and relevent codes)

TABLE NO. 4 : PHYSICAL AND CHEMICAL REQUIREMENTS API 5L (44TH EDITION)

STEEL & PIPE GRADE		Product Spec. Level	Pipe Size	Tensile Properties						Chemical Requirements(Heat or Product)				
				Yield Strength(Mpa)		Tensile Strength(Mpa)			Min.Elongation	C	Mn	P	S	Si
				Pipe Body				Weld Seam HFW Pipe	% in 50mm Gauge Length (Approximate)	Max %	Max or Range %	Max %	Max %	Max %
				(Min)	(Max)	(Min)	(Max)	(Min)	(%)					
A L210		PSL-1	6.625"-20"Φ	210	—	335		335	29 - 34	0.22	0.90	0.030	0.030	—
B		PSL-1	6.625"-20"Φ	245	—	415		415	25 - 28	0.26	1.20	0.030	0.030	
L245	M	PSL-2	6.625"-20"Φ	245	450	415	760	415	25 - 28	0.24	1.20	0.025	0.015	0.45
X-42		PSL-1	6.625"-20"Φ	290	—	415		415	24 - 28	0.26	1.30	0.030	0.030	
L290	M	PSL-2	6.625"-20"Φ	290	495	415	760	415	24 - 28	0.24	1.20	0.025	0.015	0.45
X-46		PSL-1	6.625"-20"Φ	320	—	435		435	23 - 27	0.26	1.40	0.030	0.030	
L320	M	PSL-2	6.625"-20"Φ	320	525	435	760	435	23 - 27	0.24	1.40	0.025	0.015	0.45
X-52		PSL-1	6.625"-20"Φ	360	—	460		460	22 - 26	0.26	1.40	0.030	0.030	
L360	M	PSL-2	6.625"-20"Φ	360	530	460	760	460	22 - 26	0.24	1.40	0.025	0.015	0.45
X-56		PSL-1	6.625"-20"Φ	390	—	490		490	20 - 24	0.26	1.40	0.030	0.030	
L390	M	PSL-2	6.625"-20"Φ	390	545	490	760	490	20 - 24	0.24	1.40	0.025	0.015	0.45
X-60		PSL-1	6.625"-20"Φ	415	—	520		520	20 - 22	0.26	1.40	0.030	0.030	
L415	M	PSL-2	6.625"-20"Φ	415	565	520	760	520	20 - 22	0.24	1.40	0.025	0.015	0.45
X-65		PSL-1	6.625"-20"Φ	450	—	535		535	19 - 22	0.26	1.45	0.030	0.030	
L450	M	PSL-2	6.625"-20"Φ	450	600	535	760	535	19 - 22	0.18	1.70	0.025	0.015	0.45
X-70		PSL-1	6.625"-20"Φ	485	—	570		570	19 - 21	0.26	1.65	0.030	0.030	
L485	M	PSL-2	6.625"-20"Φ	485	635	570	760	570	19 - 21	0.18	1.80	0.025	0.015	0.45

NB: 1 Cu,Cr, & Ni should not be added intentionally upto X-52/ L360 Grade.

2 PSL 2: CE-iiw =0.43 max when C≥0.12/ CE-pcm =0.25max when C ≤0.12.

3 Nb,V,Ti & other elements details: Refer Original specification or as agreed upon

4 PSL 2(HFW): (a) Strip for HFW to be thermo-mechanically rolled strip or normallising rolled strip. (b) Pipe heat treatment - weld area only.

5 Refer to original Spec API 5L (44th Edition) for details.

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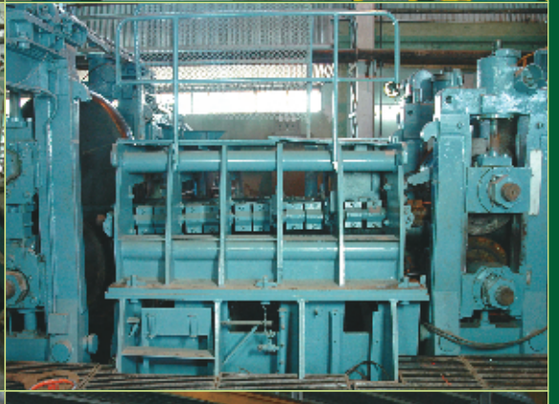
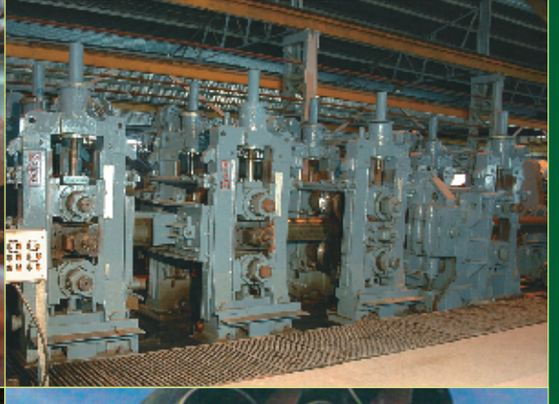
TABLE - 5 : PIPE SPECIFICATION - PHYSICAL AND CHEMICAL REQUIREMENTS

Sl No	Specification	Application & recommendation	Grade	Pipe Size	Tensile Properties			Chmical Requirements (percent)						End Finish	Surface Finish
					Yield Strength Mpa (Min.)	Tensile Strength Mpa (Min.)	Min Eln. % in 50 mm.	C (Max.)	Mn (max or range)	P (Max.)	S (Max.)	Si (Max.)	Others		
1	AWWA C200	Steel Water Pipe 6 Inches and Larger	ASTM A 53 Gr: A	6" - 20"	205	330	23	0.25	0.95	0.05	0.05		—	1) Plain Bevel End - bevelled to 30 degrees with a root face of 1.6 mm	Black - pipe has a protective lacquor finish unless
			ASTM A 53 Gr: B		240	415	19	0.3	1.2	0.05	0.05		—	2). Plain square cut end - when agreed	agreed upon
2	ASTM A 53	General purpose pipe suitable for welding, forming and operations involving bending and flanging	A	NPS 6 - 16	205	330	23	0.25	0.95	0.05	0.05		—	1) Plain Bevel End - bevelled to 30 degrees with a root face of 1.6 mm	1) Black - pipe has a protective lacquer finish on the outside
			B	NPS 6 - 16	240	415	19	0.3	1.2	0.05	0.05		—	2). Plain square cut end - when agreed	
3	ASTM A 500	Cold formed welded Structural Tubing for Bridges, Buildings & General Structural	Gr A	NPS 6 - 20	230	310	25	0.26	1.35	0.035	0.035		Cu:0.20	Square cut ends	Bare
			Gr B	NPS 6 - 20	290	400	23	0.26	1.35	0.035	0.035		if agreed		
4	IS: 1161	Steel Tubes for Structural Purpose	Yst - 210	168.3 - 355.6 mm	210	330	20	0.120	0.60	0.04	0.040		—	Plain square cut end	Black - pipe has a protective lacquor finish unless agreed upon
			Yst - 240	& Class - L /M / H	240	410	17	0.160	1.20	0.04	0.040		—		
			Yst - 310		310	450	14	0.250	1.30	0.04	0.040		—		
5	IS: 3589	Steel pipes for Water & Sewage.	Fe 330	168.3 - 508.0 mm	195	330	20	0.160	1.20	0.04	0.040		—	1) Plain Bevel End (when agreed) & 2). Plain square cut end	Black - pipe has a protective lacquor finish unless agreed upon
			Fe 410	168.3 - 508.0 mm	235	410	18	0.200	1.30	0.04	0.040		—		
			Fe 450	168.3 - 508.0 mm	275	450	15	0.250	1.20	0.04	0.040		—		
6	IS: 4270	Steel Tubes used for water wells (Plain End Casing Pipes)	Fe 410	168.3 - 457.2 mm	235	410	15	—	—	0.04	0.040		—	1) Plain Bevel End (ends as agreed) & 2). Plain square cut end	Black - pipe has a protective anti corrosive coating as specified
			Fe 450	168.3 - 457.2 mm	275	450	13	—	—	0.04	0.040		—		
7	IS: 1978	Welded Line Pipe for conveying Gas, Water & Oil	Yst 170	168.3 - 508.0 mm	170	310	As	0.21	0.30-0.60	0.045	0.060	—	—	Plain End ERW Pipe	Mill coating for rust prevention are there
			Yst 210	168.3 - 508.0 mm	210	330	per	0.22	0.90	0.045	0.050	—	—		
			Yst 240	168.3 - 508.0 mm	240	410	Spec	0.27	1.15	0.045	0.050	—	—		
8	JIS G 3452	Carbon Steel Pipes for ordinary piping	SGP	355.6 - 508.0 mm	-	290	25	—	—	0.04	0.04	—	—	Plain Bevel End - bevelled to 30 degrees with a root face of 1.6 mm	Black - pipe has a protective lacquor finish unless agreed upon
9	DIN 17172	Steel Pipes For Pipe Lines For The Transport Of Combustable Fluids And Gases (As Rolled or Normalised Steel)	StE210.7	168.3 - 508.0 mm OD	205	325 - 440	26	0.17	0.35 min	0.04	0.035	0.45	—	1) Plain Bevel End - bevelled to 30 degrees with a root face of 1.6 mm	Unless specified as bare, pipe has a protective rust preventive finish on the outside.
			SteE240.7	168.3 - 508.0 mm OD	235	372 - 490	24	0.17	0.40 min	0.04	0.035	0.45	—		
			StE290.7	168.3 - 508.0 mm OD	275	422 - 540	23	0.22	0.50 - 1.10	0.04	0.035	0.45	—		
			StE320.7	168.3 - 508.0 mm OD	325	460 - 580	21	0.22	0.70 - 1.30	0.04	0.035	0.45	—		
			StE360.7	168.3 - 508.0 mm OD	360	510 - 630	20	0.22	0.90 - 1.50	0.04	0.035	0.55	—	2). Plain square cut end - when agreed	
			StE385.7	168.3 - 508.0 mm OD	380	530 - 680	19	0.23	1.0 - 1.5	0.04	0.035	0.55	—		
			StE415.7	168.3 - 508.0 mm OD	410	550 - 770	18	0.23	1.0 - 1.5	0.04	0.035	0.55	—		



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