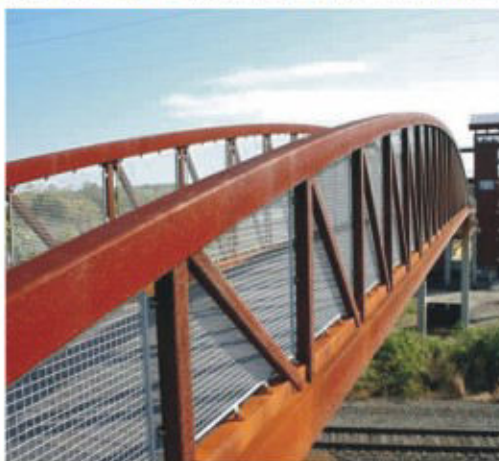


COR-TEN

Weather Resistance Steel

Pioneers in Engineering & Turnkey Projects



Manufacturers of :

COR-TEN Steel APH / Boiler Tubes

Carbon Steel APH / Boiler Tubes

Stainless Steel Tubes / Pipes



PUSHPAK

An ISO 9001 : 2008 Certified Company

Pushpak Steel & Engineering Company is a professionally managed organisation having extensive experience in the field of all Ferrous & Non-Ferrous metals. Pushpak the flagship company of S.M. Bhansali Group is actively involved in manufacturing of Corten Steel ERW APH/ Boiler Tubes, Carbon Steel ERW APH / Boiler Tubes and Stainless Steel ERW Pipes / Tubes. We have an exclusive contract manufacturing agreement for manufacturing Fittings & Flanges. We also have extensive sourcing network to source and supply Nickel Alloys & other Exotic Alloys in the shape of Sheets, Plates, Rods, Angles, Channels etc.

Our Pedigree

S.M. Bhansali Group is a multi dimensional and multi faceted Industrial conglomerate with combined group turnover of 400 crores and is an active player in manufacturing of various Satinless Steel and Carbon steel products. The group is also actively involved in Cement, Poly granules, Copper Tube manufacturing and export & Import of special exotic alloys.

Our Strength

- More than 300 satisfied customers
- First company in our field to get CRISIL rating
- ISO 9001:2008 certified company
- Under the aegis of a well diversified S.M. Bhansali group
- An approved vendor of India's top 10 industrial conglomerates
- Huge stock holding capacity upto 5000MT
- Nurturing talents through sponsoring industry seminars

Products Introduction

COR-TEN is trademarked name owned by United States Steel Corporation (USS)

COR-TEN steel is becoming more popular by roll formed product end users. Its unique look and naturally oxidizing finish make it especially desirable for many architectural projects. weathering steel, best-known under the trademark COR-TEN steel, is a group of steel alloys which were developed to obviate the need for painting, and form a stable rust like appearance if exposed to the weather for several years. Weathering steel has increased resistance to atmospheric corrosion when compared to other steels. COR-TEN resists the corrosive effects of rain, snow, ice, fog and other meteorological conditions by forming a coating of dark brown oxidation over the metal, which inhibits deeper penetrations and negates the need for painting and costly rust prevention maintenance over the years. In simple terms the steel is allowed to rust and that rust forms a protective coating that prevents future corrosion.

United States Steel Corporation (USS) holds the registered trademark on the name COR-TEN. (1) Although USS sold its discrete plate business to International Steel group (now Arcelor Mittal) in 2003, (2) It still sells COR-TEN branded material in strip-mill plate and sheet forms.

The original COR-TEN received the standard designation A 242 ("COR-TEN A") from the ASTM International standards group. Newer ASTM grades are A 588 ("COR-TEN B") and A 606 for thin sheet. In Indian standards is applicable as per IRS M-41. All alloys are in common production and use.

Why COR-TEN

These days common use of COR-TEN Steel ERW APH (Air Pre Heater) / Boiler tubes according to ASTM A 423 Gr.1 in replacement of normal Carbon steel APH / Boiler tubes as per BS-3059, Part-I & Part II / BS-6323, Part -V (which give 4-8 times lasting compared to normal Carbon Steel boiler tubes)

Product Features

Weather Resistance

Because COR-TEN has high weather resistance, it can be used without painting. Unpainted applications not only offer the economic advantage of reducing repairing cost, they also offer aesthetic benefits associated with the calming color of the protective rust. while weather resistance depends on the product and the application environment, COR-TEN's weather resistance is nearly 4-8 times that of ordinary steel.

Paint Durability

COR-TEN is paintable in the same way as ordinary steel. In addition, even if a painting defect shall occur, COR-TEN suppresses the progress of rust area and accordingly prolongs the service life of the paint, there by reducing repainting costs.

Weldability

While trace amounts of alloying elements such as Copper (Cu) and Chromate (Cr) are added to COR-TEN to ensure high weather resistance, the carbon content is lowered to provide appropriate weldability. Accordingly COR-TEN can be welded using either manual, gas manual, gas-sheild or submerged arc welding. In additions spot welding can be applied to thin-gauge COR-TEN

Workability

COR-TEN possesses workability (cold forming, hot forming and gas cutting) similar to ordinary steels of same strength.

IRSM 41

IRSM 41 steel : Body panel of steel wagons like BOXNHA encounter corrosive environment due to sulphur and other carboric acid components in coal. Use of corrosion resistance steel to IRSM-41 will face the situation better due to formation of an adherent protective oxide film on the surface if it is left undisturbed.

IRSM 41 Steel has following properties:-

- Stronger than mild steel
- Easily weldable
- Develops its own protective layer against corrosion

The preferred dimensions of Air Pre-Heater Tubes / CDW tubes are:-

Outside Diameter : 15.88 mm OD upto 127.0 mm OD

Wall Thickness : 1mm upto 6.5 mm

Length : According to customer specific requirement (max upto 12 mtrs)

General Applications : Boiler applications at Thermal power plants, Sugar mills, Paper Mills, Chemical Plants, Fertilizer Plant, Petrochemicals, refineries etc.

Manufacturing

Raw Material Preparation- HR or CR strips in the form of coil is procured from indigenous steel makers or from import sources and are used in the manufacture of a tube depending on the application.

Manufacturing begins in a separate preparatory section where the strip is slit into required width depending on the diameter of the tube & subjected to acid pickling process to remove all rust and scale in an ultra modern strip pickling plants. separate in-house cold rolling mills also cater to raw material requirements for closer dimensional tolerances and bright surface finish of tubes.

APH (Air Pre Heater) Tube Making (ERW)

Air Pre-Heater tubes are manufactured in a wide range to meet the desired customer specifications. These tubes conform to National and International standards such as ASTM A423, BS-3059 Part-I & Part II (with IBR) / BS-6323, Part -V, SA 214 etc.

Various steps in the manufacturing process according to APH tubes are following desired characteristics:

- Annealing and surface treatment of ERW tubes.
- Straightening and 100% Eddy current testing ensure quality and fitness for required application
- Hydro testing (IBR tubes only) ensures the strong weld strength to withstand required high pressure

Electric Resistance Welded (ERW) tubes are made by forming the steel strip into a tubular round section by progressive movement through a set of specially designed rolls. The butted ends of the strips are welded by high frequency induction welding process without any filler material. The hot weld flash formed due to welding is removed internally (fin-cut) and externally by the deburring units. Turks head and sizing rolls provided at the end of the tube mill ensure straightening and sizing of the tubes into required forms like round, rectangular, square, elliptical and oval. The tubes are cut into required length and undergo annealing, pressure testing, eddy current testing, straightening or cutting depending upon the applications.

Air Pre-Heater Tubes generally comes under noted specifications:-

1. ASTM A 423 Gr. 1. COR-TEN steel ERW Air Pre-heater tubes are also used in sugar mills, Power plants, Fertilize plants and other process oriented plants for outflow of hot air. COR-TEN steel Air Heater tubes are where the atmosphere is highly corrosive.
2. BS- 6323 Part V: Welded steel tubes for automobiles, mechanical and general engineering purposes.
(Presently known as BS EN 10305-5, BS EN 10296-1, BS EN 10305-3 which superseded BS- 6323 Part V)
3. BS 3059 Part 1: Steel boiler and super heater tubes (Specification for low tensile Carbon Steel tubes without specified elevated temperature properties, presently known as BS EN 10217-1 which supersedes BS- 3059 (IBR Approved)
4. IS 1914: Specification for carbon steel boiler tubes and super heater tubes
5. JIS - G3461 : Carbon steel tubes for boilers and heat exchangers
6. ASTM A214: Standard specification for electric-resistance welded carbon steel heat exchanger and condenser tubes.



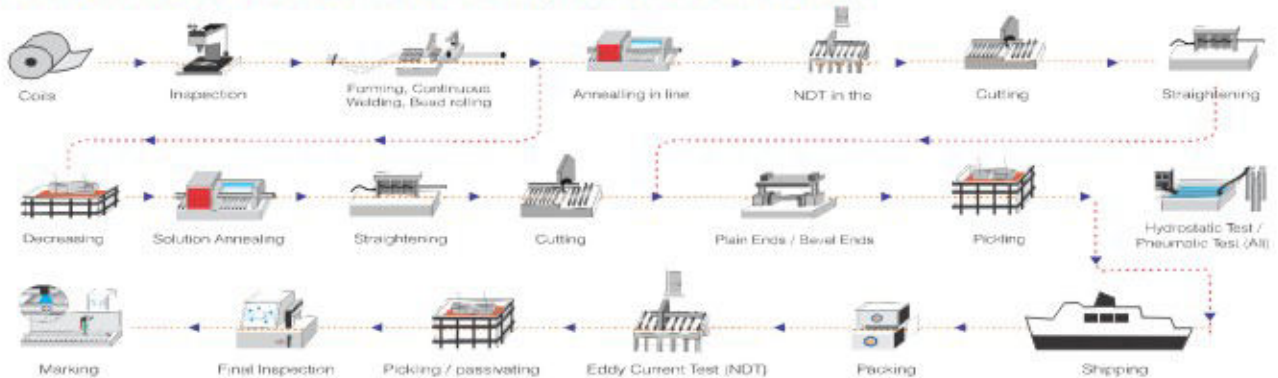
STAINLESS STEEL TUBE / PIPE MANUFACTURING

Welded Pipes & Tubes



Welded Pipes / Tubes making operations are carried out on the tube mill. Cold / Hot stainless steel strip are slitted to the required width as per the diameter of tube to be formed. The strips are then fed to the un-coiler from where it passes through Series of rollers & continuously formed into a tubular shape and welded by tungsten-inert-gas (TIG) welding. It is highly precision complete automated process where the edge of strips are heated and fused together under a protected in atmosphere of argon gas through a non consumable electrode without using a filler metal. The tubes also pass through a series of sizes rolls to ensure ovality, tolerance and then are cut to length. It is then annealed, straightened, hydro-tested, pickled and passivated. The tubes then undergo a 100% visual and dimensional inspection. Then the tubes are marked and suitably packed before dispatch.

PROCESS OF WELDED TUBE STAINLESS STEEL / PIPE MANUFACTURING



Testing Equipments Mandatory Tests We Conduct:-

Heat Treatment (Solution Annealing)

After each process of manufacturing tubes & pipes are subjected to heat treatment in a continuous annealing furnace at the specified temperatures as per grade of materials and followed by rapidly quenching as per the grade to prevent carbide formation.



Hydro Test : 100 % Compulsory Test for each & every Tube / Pipe produced in our plant as per the specifications required by our customers

Visual & Dimension Inspection: 100 % Compulsory Test for each & every Tube / Pipe produced in our plant by well Technically Qualified Engineers to check any type of surface defects or scratches on Tube / Pipe

Mechanical Test: All Mechanical Testing on Tube / Pipe like Hardness Test, Tensile Test, Flattening & Flaring Test, Reverse Bend & Flattening Test as per the specification requirement

Chemical Test: 100 % Compulsory Test for each & every lot of Tube / Pipe produced in our plant

Supplementary Tests we Conduct on Client's requirement

Eddy Current Test: This Test is Carried out to detect Sub surface in homogeneity as per ASTM - 426.

PMI Test: This Test is carried out for the grade confirmation of material at our in house facility.

Ultrasonic Test: This Test is carried out to detect Special Process Flow as per ASTM A 213 / A 450.

Micro & Macro Test: This Test is Carried out to certify microstructure, grain size as per ASTM E 112, to ensure that Carbides are dissolved and corrosion resistance is at Maximum.

Intergranular Corrosion Test: This Test is carried out to determine the materials' intergranular attract and to measure the rate of corrosion as per standard ASTM A-262 Practice "A", "B", "C" OR "E" within our company's own facilities with well equipped laboratory.

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Chemical Composition & Mechanical Properties

COR-TEN STEEL APH TUBES

Specification	Type	Grade	CHEMICAL PROPERTIES								MECHANICAL PROPERTIES				WELD PROPERTIES		
			C%	Mn%	S%	P%	Si%	Cu%	Cr%	Ni%	Hardness HRB	Y.S. Mpa	T.S. Mpa	E%	Rev. Flatten Ing Test	Flattening Test	Flange Test
ASTM A 423	ERW	1	0.15	0.55	0.06	0.06	0.10	0.20	0.24	0.20	87	255	415	25	Free From crack	Distansce b/w plates 20.11 mm	12.50% of OD
			Max.	Max.	Max.	To 0.16	Min.	To 0.60	To 1.31	To 0.70	Max.	Min.	Min.	Min.			

CARBON STEEL APH TUBES

Specification	Type	Grade	Chemical Composition%								Mechanical Properties									
			C		Mn		P	S	Si		Yield Strength		Tensile Strength				% Elongation			
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.				
IS : 2416 Part-IV	ERW	310	0.06	0.25	0.35	1.4	0.05	0.05	-	0.35	-	152	-	-	-	304		-	402	(100-RM / 9.81) / C, C=2.20, RM=Measured T.S
360		0.06	0.25	0.35	1.4	0.05	0.05	-	0.35	-	177	-	-	-	353	-	451			
440		0.08	0.25	0.35	1.4	0.05	0.05	-	0.35	-	201	-	-	-	402	-	500			
IS : 11714 Part-III	ERW	-	0.06	0.18	0.27	0.63	0.048	0.058	-	-	-	-	-	-	-	-	-	-		
IS : 1914 Part-IV	ERW	320	0.06	0.25	0.35	1.4	0.05	0.05	-	0.35	-	176	-	-	-	320	-	480	(100-RM / 9.81) / C, C=2.20, RM=Measured T.S	
		360	0.06	0.25	0.35	1.4	0.05	0.05	-	0.35	-	198	-	-	-	360	-	500		
		440	0.08	0.25	0.35	1.4	0.05	0.05	-	0.35	-	242	-	-	-	440	-	580		
BS-3059 Part-I	ERW	320	-	0.16	0.30	0.70	0.040	0.040	-	0.35	-	195	-	-	-	320	-	480	25	
BS-3059 Part-II	ERW	360	-	0.17	0.4	0.8	0.035	0.035	0.1	0.35	-	235	-	-	-	360	-	500	24	
		440	0.12	0.18	0.9	1.2	0.035	0.035	0.1	0.35	-	245	-	-	-	480	-	580	21	
BS-6323 Part-V	ERW	ERW-1	-	0.13	-	0.6	0.05	0.05	-	-	-	200	-	-	-	300	-	-	10 (D/a<20)	20 (D/a<20)
		ERW-2	-	0.16	-	0.7	0.05	0.05	-	-	-	250	-	-	-	340	-	-	8 (D/a<20)	15 (D/a<20)
		ERW-3	-	0.2	-	0.9	0.05	0.05	-	0.35	-	300	-	-	-	400	-	-	7 (D/a<20)	12 (D/a<20)
ASTM A-178	ERW	A	0.06	0.18	0.27	0.63	0.035	0.035	-	-	26,000	180	-	-	47,000	325	-	-	35	
		C	-	0.35	-	0.8	0.035	0.035	-	-	37,000	255	-	-	60,000	415	-	-	30	
ASTM A-214	ERW	-	-	0.18	0.27	0.63	0.035	0.035	-	-	-	-	-	-	-	-	-	-		
ASTM A-333 & A334	ERW	1	-	0.30	0.40	1.06	0.025	0.025	-	-	30,000	205	-	-	55,000	380	-	-	35	
		5	-	0.30	0.29	1.06	0.025	0.025	0.10	-	35,000	240	-	-	60,000	415	-	-	30	

STAINLESS STEEL TUBES / PIPES

PIPE SPECIFICATION	C%	Mn%	CHEMICAL PROPERTIES						MECHANICAL PROPERTIES				OTHERS
			P% (Max)	S% (Max)	Si%	Cr%	Ni%	Mo%	U.T.S. (Min) Mpa	Y.S. (Min) Mpa	ELONG. (Min)		
ASTMA 312 Gr. TP 304	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-11.0	-	515	205	35	25	-
ASTMA 312 Gr. TP 304L	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-13.0	-	485	170	35	25	-
ASTMA 312 Gr. TP 304H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-11.0	-	515	205	35	25	-
ASTMA 312 Gr. TP 304LN	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-12.0	-	515	205	35	25	N%=0.10-0.16
ASTMA 312 Gr. TP 309S	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	22.0-24.0	12.0-15.0	0.75 Max	515	205	35	25	-
ASTMA 312 Gr. TP 310S	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	24.0-26.0	19.0-22.0	0.75 Max	515	205	35	25	-
ASTMA 312 Gr. TP 316	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	11.0-14.0	2.00-3.00	515	205	35	25	-
ASTMA 312 Gr. TP 316L	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	10.0-14.0	2.00-3.00	485	170	35	25	-
ASTMA 312 Gr. TP 316H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	11.0-14.0	2.00-3.00	515	205	35	25	-
ASTMA 312 Gr. TP 316LN	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	11.0-14.0	2.00-3.00	515	205	35	25	N%=0.10-0.16
ASTMA 312 Gr. TP 317	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	11.0-14.0	3.00-4.00	515	205	35	25	-
ASTMA 312 Gr. TP 317L	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	11.0-15.0	3.00-4.00	515	205	35	25	-
ASTMA 312 Gr. TP 321	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-12.0	-	515	205	35	25	Ti%=(5XC)-0.70
ASTMA 312 Gr. TP 321H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-12.0	-	515	205	35	25	Ti%=(4XC)-0.60
ASTMA 312 Gr. TP 347	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-13.0	-	515	205	35	25	Cb%=(10XC)-1.00
ASTMA 312 Gr. TP 347H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-13.0	-	515	205	35	25	Cb%=(8XC)-1.10
ASTMA 358 Gr. TP 304	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	18.0-20.0	8.0-10.5	-	515	205	40	40	N%=0.10 Max, HRB=92 Max
ASTMA 358 Gr. TP 304L	0.035 Max	2.00 Max	0.045	0.030	0.75 Max	18.0-20.0	8.0-12.0	-	485	170	40	40	N%=0.10 Max, HRB=92 Max
ASTMA 358 Gr. TP 309S	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	22.0-24.0	12.0-15.0	-	515	205	40	40	HRB=95 Max
ASTMA 358 Gr. TP 310S	0.080 Max	2.00 Max	0.045	0.030	1.50 Max	24.0-26.0	19.0-22.0	-	515	205	40	40	HRB=95 Max
ASTMA 358 Gr. TP 316	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	16.0-18.0	10.0-14.0	2.00-3.00	515	205	40	40	N%=0.10 Max, HRB=95 Max
ASTMA 358 Gr. TP 316L	0.035 Max	2.00 Max	0.045	0.030	0.75 Max	16.0-18.0	10.0-14.0	2.00-3.00	485	170	40	40	N%=0.10 Max, HRB=95 Max
ASTMA 358 Gr. TP 321	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	17.0-19.0	9.0-12.0	-	515	205	40	40	N%=0.10 Max, Ti%=(5XC)-0.70, HRB=95 Max
ASTMA 358 Gr. TP 347	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	17.0-19.0	9.0-13.0	-	515	205	40	40	Cb%=(10XC)-1.00, HRB=92 Max



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Nickel Base Alloys / Seamless / ERW Pipes,
Coils / Sheets / Plates & Complete Range of
Pipe Fittings & Flanges etc.

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