

# Tata Structura

Rectangular, Square and Circular Steel Hollow Sections





# Profile

Located at Jamshedpur, Tata Steel Ltd. was established in 1907 and was the first Integrated Steel Plant in India. It commenced its operations in 1911, with a capacity of 1,00,000 tonnes per annum of ingots and expanded to a million tonnes per annum of saleable steel by the mid fifties.

Presently it has an annual capacity of 6 million tonnes at its Jamshedpur Plant. The Plant, equipped with the latest steel making facilities such as Basic Oxygen Furnaces, Vacuum Degassing and Continuous Casting Units, presents the very epitome of technological advancement. A whole range of steels addressing the needs of the Construction/Engineering and automotive sector, testify to Tata Steel's capability. These products have found acceptance not only in the domestic market but all over the world.

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# Tata Steel - Tubes Division

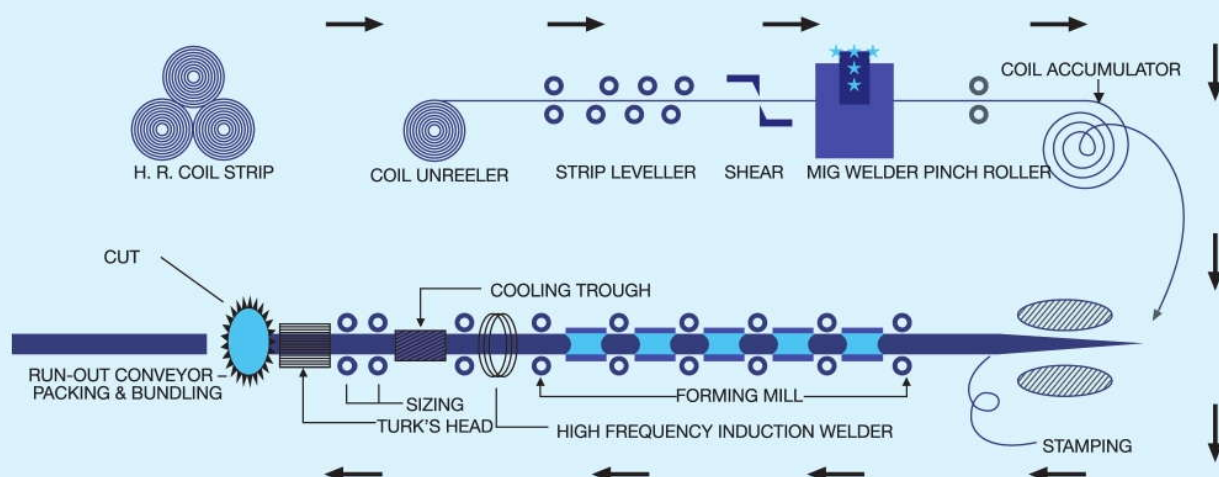
The Tubes Division of Tata Steel came into being in 1985, after the merger of the erstwhile Indian Tube Company with Tata Steel. The Division manufactures commercial and precision tubes at its two plants, namely, the Standard Tubes Plant and the Precision Tubes Plant. The Tubes Strategic Business Unit of Tata Steel today is the largest manufacturer of a variety of steel tubes in India with an annual production capacity of around 4,00,000 tonnes and major expansion plans on the anvil to manufacture higher sizes. The SBU has its plants situated in Jamshedpur and has a network of sales offices across the country with the marketing headquarters in Kolkata to provide better customer service.

Tata Structura – Steel Hollow Section production process begins with the slitting of wide Steel Hot Rolled Coils to the width required for the production of customer specific section dimensions. This slit coil is then fed through the

mill and is shaped into a round tube by a series of forming rolls. The converging strip edges of this round tube are squeezed together and welded using high frequency induction welding. Immediately after this external excess weld bead is removed. The tube then passes through a set of shaping rolls where it is shaped in to its final form either Square, Rectangle or Circular and is exactly sized to the required dimensions. Cutting to the required length and bundling are the final steps in this fully automatic manufacturing process.

Presently Tata Structura Rectangular & Square Steel Hollow Sections can be supplied to IS:4923 upto a maximum of 250 x 250 mm for square sections and 300 x 200 mm for rectangular sections. Circular Sections can be supplied to IS:1161 upto a maximum NB of 300 mm. However, with expansion plans, Tata Steel will be able to augment the size range for all sections.

## The Process



## Quality Control

The quality of our product is controlled during the manufacturing process. It starts with slitting the strip edges, continues with speed, temperature control during the high frequency induction welding and is followed by non destructive eddy current testing directly after welding. Off-line drift and flattening tests were conducted. This is all within our ISO 9000 quality management system.



# Advantages of Tata Structura Steel Hollow Sections

Tata Structura Steel Hollow Sections manufactured by Tata Steel command several techno-economic advantages over Conventional Steel Sections.

1. The raw material used for manufacturing these steel hollow sections comes from Tata Steel's state-of-the-art Hot Strip Mill, which manufactures Hot Rolled Coils, comparable to the best in the world.
2. The excellent distribution of material around the axis of these steel hollow sections, allows for remarkable strength qualities and thus offers decisive advantages as regards application technology.
3. Due to their high torsional rigidity and compressive strength, they behave more efficiently than Conventional Steel Sections.
4. Their higher strength to weight ratio could result in upto 30% savings in steel.
5. The smooth, uniform profile of these sections minimises dust accumulation and facilitates easy, on-site fabrication.
6. Tata Structura Steel Hollow Sections bring about a significant enhancement in the aesthetic appeal of structures.

## Internal Corrosion - a case study



Sample 1



Sample 2

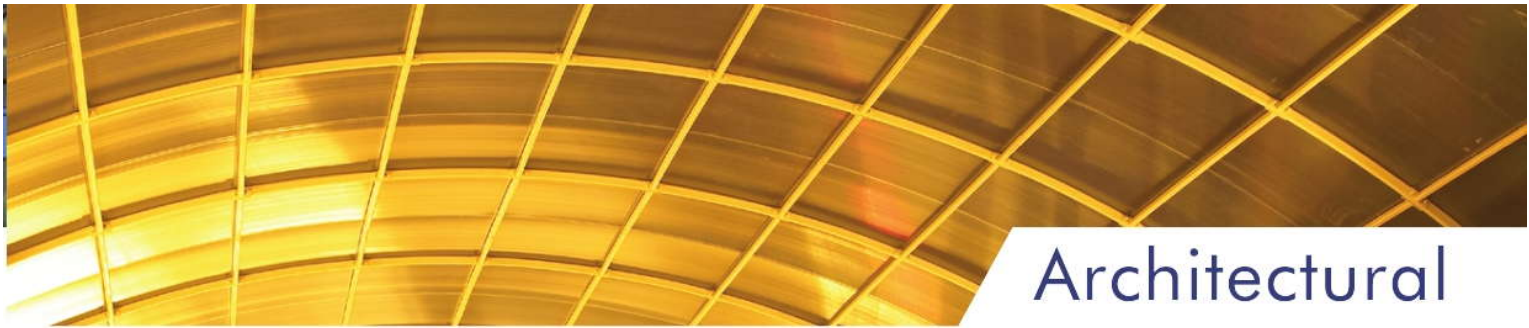
Two of the original 'Tubewrights' erected in 1954 at Stamford Bridge, Chelsea, were replaced in 1975, taken down and the used sections were cut and despatched to the Corby Works of British Steel for examination.

Sample No. 1 of the 139.7 mm o.d. CHS was cut lengthwise to expose the internal surfaces for examination. Little evidence of internal corrosion was found other than a discolouration of the surface caused by the oxygen and moisture in the entrapped air, much of the original mill scale was still visible. A light rust in the centre of the sample developed after the tube was cut open for examination.

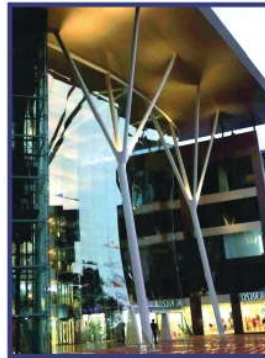
Sample No. 2 of the 139.7 mm o.d. CHS incorporating an intermediate flanged joint was examined and the condition of the internal flange face, which had been enclosed and thus hermetically sealed by welding to the CHS, was still comparatively bright, with the original marking-off lines clearly visible.

The above report is from British Steel Publication No. TD 347/10E/91 titled - CORROSION THE CASE for STRUCTURAL HOLLOW SECTIONS.





# Architectural



Atria Mall, Mumbai

## Applications

- Shopping Malls
- Canopies / Atrium
- Glass Curtain Wall Frames
- Partition Frames
- Space Frames
- Guard Rails & Staircases

## Attributes

- Lightweight
- Flexible and easy to form shapes
- Smooth surface finish
- Appealing aesthetics
- Contemporary



Infosys Building, Pune





# Infrastructural

## Applications

- Airport Terminal Buildings
- Bridges
- Bus Stands
- Sign Supporting Structures
- Pedestrian Walkovers (Footbridge)
- Sports Galleries
- Railways Platforms / Foot Over Bridges

## Attributes

- High strength
- More column free space
- Larger & thicker sections
- Ease of fabrication
- Lightweight



Metro Station, Delhi



Aurangabad Airport





# Industrial

## Applications

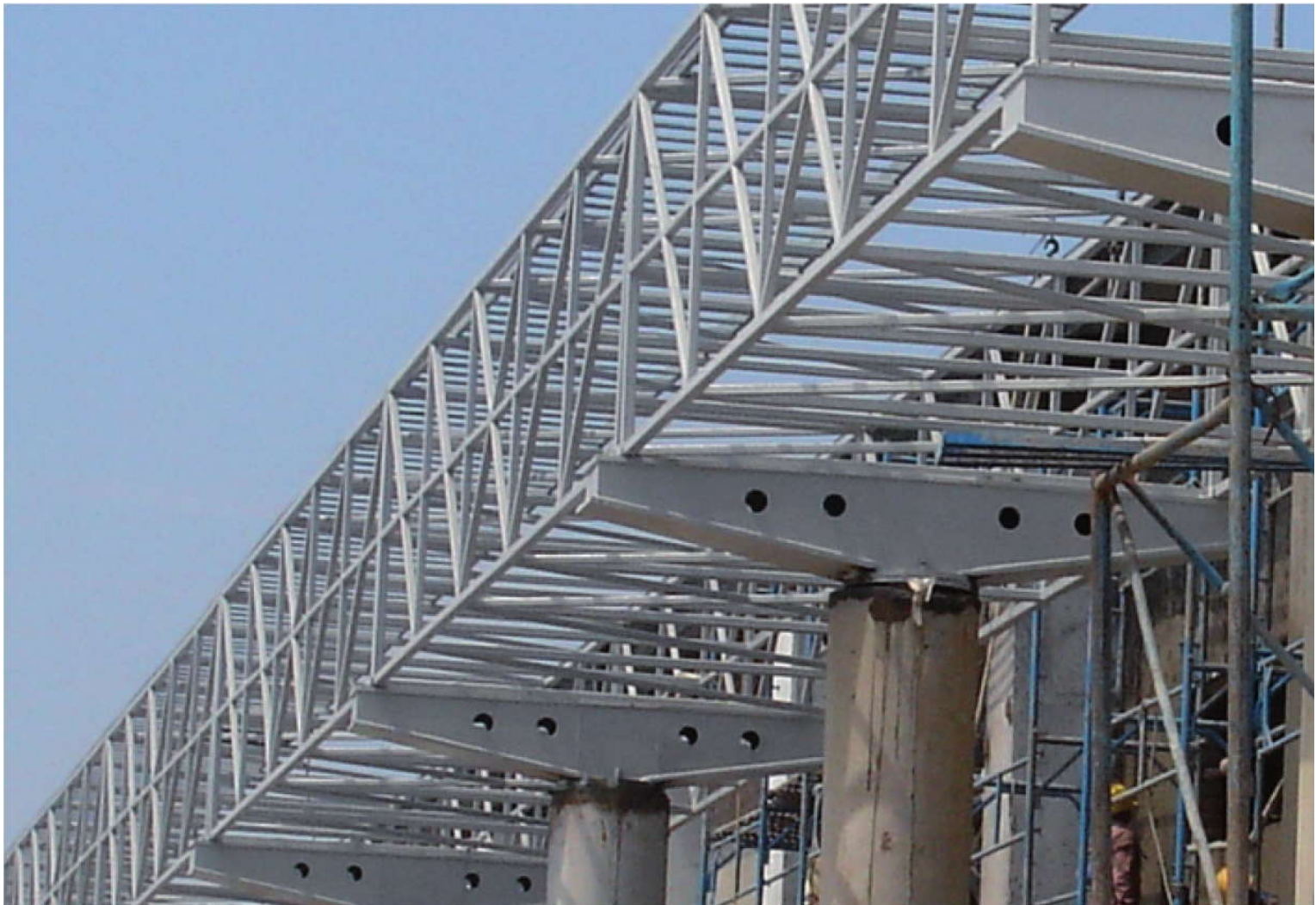
- Industrial Sheds
- Trusses, Columns and Purlins
- Material Storage Racks
- Mine Roof Support Systems (cogs, props)
- Pallets
- Pipe Racks
- Conveyor Gentries, Trestles
- Drilling Rigs

## Attributes

- High strength to weight ratio
- Cost effective
- Ease of fabrication and erection
- Ease of maintenance
- Free from sharp edges



Navneet Publishers, Ahmedabad



Pipe Rack, ITC Haridwar





# General Engineering



Green House

## Applications

- Automobile Chassis
- Green House Structures
- Truck and Bus Body Members
- Hoarding Structures
- Amusement Park & Playground Equipment
- Exhibition Stalls
- Scaffolding
- Furniture

## Attributes

- Lightweight
- Ease of fabrication
- High torsional resistance
- Minimal painting area
- Appealing aesthetics



Butterfly Park, Bangalore





# General Technical Specifications and Tolerances

PERMISSIBLE AXIAL COMPRESSIVE STRESS (Y <sub>st</sub> 310 Grade)																												
I/r	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	300	350	
Ac	186	183	178	169	157	143	128	113	99	87	77	67	60	53	47	42	38	34	31	28	26	23	22	20	18	13	10	

OTHER ALLOWABLE STRESS VALUES (IN Mpa)							
Steel Grade	Minimum Yield Stress	Minimum UTS	Axial Stress in Tension	Bending Stress in Ten. or Compn.	Shear Stress	Bearing Stress	Equivalent Stress
Yst 310	310	450	186	205	140	232	279

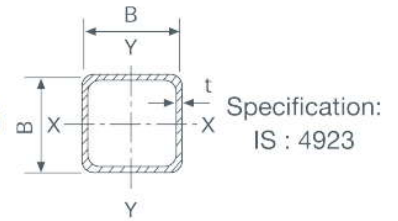
Section Type	Grade	Mechanical Properties				Dimensional Tolerance					
		YST	UTS	% of Elongation		Outside dimension	Thickness	Squareness	Corner radius	Weight	
		Mpa	Mpa	<25.4 mm	>25.4 mm					Individual lengths	On lot of 10 MT
RHS/ SHS IS: 4923	YST 210	210	330	12	20	+/-1% with a minimum of +/- 0.50 mm	+/-10%	90 deg. +/- 2 deg.	3t max	10%, -8%	+/- 7.5%
	YST 240	240	410	10	15						
	YST 310	310	450	8	10						
CHS IS: 1161	YST 210	210	330	12	20	OD upto and Incl 48.3 +0.4/-0.8 mm; Over 48.3 mm +/- 1.0%	+ no limit -10%	NA	NA	L +10%, -8%	L +/- 5%
	YST 240	240	410	12	17					M & H +/-10%	M & H +/-7.5%
	YST 310	310	450	12	14						

<b>Length</b>	6.0 m ± 0.05 m Customized length ranging from 6 m to 11 m may be supplied.
<b>Straightness</b>	Minimum 1 : 200th of any length measured along the centre line (mill straightened condition) unless otherwise specifically arranged.
<b>Twist Tolerance</b>	Maximum 2 mm ± 0.5 mm / m length - measured relative vertical shift of any adjacent corner of the section, measured by keeping one side on flat surface.
<b>End Finish</b>	Plain ended - Mechanically sheared, mill - cut finish without further machining.
<b>Surface Finish</b>	Black without any surface treatment of oiling or varnishing.
<b>Raw Material</b>	Sulphur content : 0.05% max, phosphorus content : 0.05% max, equivalent carbon percentage well within specified weldability limits with matching physical properties. For corrosion resistant steel in Cu-bearing variety, refer to the WRS section of this brochure.
<b>Weldability</b>	Tata Structura Steel Hollow Sections are weldable with standard M. S. Electrodes without any pre-heating.
<b>Packing</b>	Bundled by sealing metal strap, and each bundle is labelled for size, measurement, Lot no. etc. Approximate weight of each bundle is 1.5 Mt (+/- 500 kg).
<b>Identification</b>	Marking of "TATA STRUCTURA" emblem on surface punched/stenciled/sticker pasted on all Steel Hollow Sections. Standard BIS mark is also put on the sections.
<b>NOTE</b>	Tata Structura Hollow Sections in customized size, grade, length, surface finish and end finish may be delivered as per agreed supply conditions.





# Section Properties



## Properties of Tata Structura (Square Hollow Sections)

YST 310 Grade

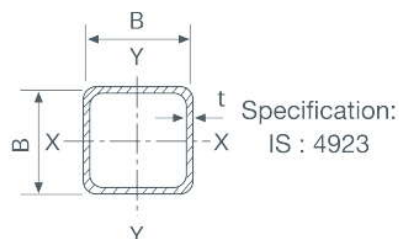
SHS B x B mm	Thickness mm	Sec Area A cm <sup>2</sup>	Unit W kg/m	Moment of Inertia		Radius of Gyration		Elastic Modulus		Torsional Constants		Outer Surface Area per m m <sup>2</sup>
				I <sub>xx</sub> cm <sup>4</sup>	I <sub>yy</sub> cm <sup>4</sup>	r <sub>xx</sub> cm	r <sub>yy</sub> cm	Z <sub>xx</sub> cm <sup>3</sup>	Z <sub>yy</sub> cm <sup>3</sup>	J cm <sup>4</sup>	B cm <sup>3</sup>	
25 x 25	2.00	1.74	1.36	1.48	1.48	0.92	0.92	1.19	1.19	2.29	1.68	0.090
	2.60	2.16	1.69	1.72	1.72	0.89	0.89	1.38	1.38	2.68	1.92	0.087
	3.20	2.53	1.98	1.89	1.89	0.86	0.86	1.51	1.51	2.96	2.07	0.084
32 x 32	2.00	2.30	1.80	3.36	3.36	1.21	1.21	2.10	2.10	5.30	3.05	0.118
	2.60	2.88	2.26	4.02	4.02	1.18	1.18	2.51	2.51	6.45	3.63	0.115
	3.20	3.42	2.69	4.54	4.54	1.15	1.15	2.84	2.84	7.41	4.07	0.112
38 x 38	2.60	3.51	2.75	7.14	7.14	1.43	1.43	3.76	3.76	11.51	5.49	0.139
	3.20	4.19	3.29	8.18	8.18	1.40	1.40	4.30	4.30	13.45	6.28	0.136
	4.00	5.03	3.95	9.26	9.26	1.36	1.36	4.87	4.87	15.67	7.12	0.131
40 x 40	2.60	3.72	2.92	8.45	8.45	1.51	1.51	4.22	4.22	13.63	6.20	0.147
	3.20	4.45	3.49	9.72	9.72	1.48	1.48	4.86	4.86	16.00	7.12	0.144
	4.00	5.35	4.20	11.07	11.07	1.44	1.44	5.54	5.54	18.75	8.12	0.139
50 x 50	2.60	4.76	3.74	17.47	17.47	1.92	1.92	6.99	6.99	28.53	10.37	0.187
	2.90	5.25	4.12	18.99	18.99	1.90	1.90	7.60	7.60	31.15	11.23	0.185
	3.60	6.35	4.98	22.15	22.15	1.87	1.87	8.86	8.86	36.58	12.98	0.181
	4.50	7.67	6.02	25.50	25.50	1.82	1.82	10.20	10.20	41.99	14.68	0.177
60 x 60	2.60	5.80	4.55	31.33	31.33	2.33	2.33	10.44	10.44	50.08	15.52	0.227
	3.20	7.01	5.50	36.94	36.94	2.30	2.30	12.31	12.31	60.02	18.31	0.224
	4.00	8.55	6.71	43.55	43.55	2.26	2.26	14.52	14.52	72.41	21.62	0.219
	4.80	10.01	7.85	49.22	49.22	2.22	2.22	16.41	16.41	83.86	24.51	0.215
72 x 72	3.20	8.54	6.71	66.32	66.32	2.79	2.79	18.42	18.42	106.81	27.47	0.272
	4.00	10.47	8.22	79.03	79.03	2.75	2.75	21.95	21.95	129.85	32.78	0.267
	4.80	12.31	9.66	90.31	90.31	2.71	2.71	25.09	25.09	151.55	37.55	0.263
80 x 80	3.20	9.57	7.51	92.71	92.71	3.11	3.11	23.18	23.18	148.55	34.60	0.304
	4.00	11.75	9.22	111.04	111.04	3.07	3.07	27.76	27.76	181.22	41.49	0.299
	4.80	13.85	10.87	127.58	127.58	3.04	3.04	31.89	31.89	212.26	47.77	0.295
91.5 x 91.5	3.60	12.32	9.67	156.49	156.49	3.56	3.56	34.21	34.21	251.17	51.14	0.347
	4.50	15.14	11.88	187.57	187.57	3.52	3.52	41.00	41.00	306.78	61.40	0.343
	5.40	17.85	14.01	215.68	215.68	3.48	3.48	47.14	47.14	359.76	70.77	0.338
100 x 100	4.00	14.95	11.73	226.35	226.35	3.89	3.89	45.27	45.27	364.75	67.50	0.379
	5.00	18.36	14.41	271.10	271.10	3.84	3.84	54.22	54.22	441.84	80.54	0.374
	6.00	21.63	16.98	311.47	311.47	3.79	3.79	62.29	62.29	511.80	92.06	0.369
113.5 x 113.5	4.80	20.28	15.92	393.30	393.30	4.40	4.40	69.30	69.30	637.45	103.89	0.429
	5.40	22.60	17.74	432.58	432.58	4.38	4.38	76.23	76.23	708.69	114.41	0.426
132 x 132	4.80	23.83	18.71	634.39	634.39	5.16	5.16	96.12	96.12	1018.30	144.11	0.503
	5.40	26.60	20.88	700.11	700.11	5.13	5.13	106.08	106.08	1134.25	159.18	0.500
150 x 150	4.00	22.95	18.01	807.82	807.82	5.93	5.93	107.71	107.71	1273.46	161.38	0.579
	5.00	28.36	22.26	982.12	982.12	5.89	5.89	130.95	130.95	1569.09	196.38	0.574
	6.00	33.63	26.40	1145.91	1145.91	5.84	5.84	152.79	152.79	1856.18	229.44	0.569
	8.00	43.79	34.38	1443.00	1443.00	5.74	5.74	192.40	192.40	2405.78	290.12	0.559
180 x 180	4.00	27.75	21.78	1421.74	1421.74	7.16	7.16	157.97	157.97	2224.31	236.76	0.699
	5.00	34.36	26.97	1736.87	1736.87	7.11	7.11	192.99	192.99	2747.93	289.40	0.694
	6.00	40.83	32.05	2036.52	2036.52	7.06	7.06	226.28	226.28	3259.23	339.65	0.689
	8.00	53.39	41.91	2590.73	2590.73	6.97	6.97	287.86	287.86	4246.16	433.32	0.679
220 x 220	6.00	50.43	39.59	3813.36	3813.36	8.70	8.70	346.67	346.67	6034.53	520.18	0.849
	8.00	66.19	51.96	4894.99	4894.99	8.60	8.60	445.00	445.00	7897.48	668.99	0.839
	10.00	81.43	63.92	5887.19	5887.19	8.50	8.50	535.20	535.20	9549.15	796.48	0.829
	12.00	96.14	75.47	6793.08	6793.08	8.41	8.41	617.55	617.55	11116.96	915.37	0.818
250 x 250	6.0	57.63	45.24	5672.00	5672.00	9.92	9.92	453.76	453.76	8920.44	680.77	0.969
	8.0	75.79	59.50	7315.65	7315.65	9.82	9.82	585.25	585.25	11702.07	879.31	0.959
	10.00	93.43	73.34	8842.29	8842.29	9.73	9.73	707.38	707.38	14248.15	1054.68	0.949
	12.00	110.54	86.77	10254.78	10254.78	9.63	9.63	820.38	820.38	16678.37	1219.59	0.938

\* For availability of size/thickness please refer to page 9.





# Product Range Availability



## Product Range: Square Hollow Sections (SHS)

		Thickness (mm) = t														
Section Size	B	B	2.0	2.6	2.9	3.2	3.6	4.0	4.5	4.8	5.0	5.4	6.0	8.0	10.0	12.0
	25	25														
	32	32														
	38	38														
	40	40														
	50	50														
	60	60														
	72	72														
	80	80														
	91.5	91.5														
	100	100														
	113.5	113.5														
	132	132														
	150	150														
	180	180														
	220	220														
	250	250														



- Indicates presently rolled section

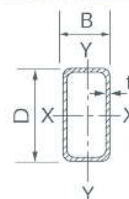


- Under development, please confirm availability before adoption in design





# Section Properties



Specification:  
IS : 4923

## Properties of Tata Structura (Rectangular Hollow Sections)

YST 310 Grade

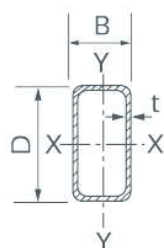
RHS D x B mm	Thickness mm	Sec Area A cm <sup>2</sup>	Unit W kg/m	Moment of Inertia		Radius of Gyration		Elastic Modulus		Torsional Constants		Outer Surface Area per m m <sup>2</sup>
				I <sub>xx</sub> cm <sup>4</sup>	I <sub>yy</sub> cm <sup>4</sup>	r <sub>xx</sub> cm	r <sub>yy</sub> cm	Z <sub>xx</sub> cm <sup>3</sup>	Z <sub>yy</sub> cm <sup>3</sup>	J cm <sup>4</sup>	B cm <sup>3</sup>	
50 x 25	2.00	2.74	2.15	8.38	2.81	1.75	1.01	3.35	2.25	6.79	3.79	0.142
	2.60	3.46	2.71	10.16	3.36	1.71	0.99	4.06	2.69	8.27	4.53	0.137
	3.20	4.13	3.24	11.63	3.80	1.68	0.96	4.65	3.04	9.52	5.12	0.134
	4.00	4.95	3.88	13.13	4.23	1.63	0.92	5.25	3.38	10.86	5.69	0.129
60 x 40	2.60	4.76	3.73	22.76	12.09	2.19	1.59	7.59	6.05	25.59	9.83	0.187
	2.90	5.25	4.12	24.74	13.11	2.17	1.58	8.25	6.56	28.02	10.66	0.185
	3.60	6.35	4.98	28.90	15.23	2.13	1.55	9.63	7.62	33.30	12.41	0.181
	4.50	7.67	6.02	33.31	17.44	2.08	1.51	11.10	8.72	39.34	14.29	0.177
66 x 33	2.60	4.70	3.69	25.15	8.43	2.31	1.34	7.62	5.11	20.75	8.71	0.185
	2.90	5.19	4.07	27.33	9.12	2.29	1.33	8.28	5.53	22.65	9.43	0.183
	3.60	6.28	4.93	31.87	10.52	2.25	1.29	9.66	6.37	26.71	10.90	0.179
	4.50	7.58	5.95	36.64	11.93	2.20	1.25	11.10	7.23	31.21	12.43	0.175
80 x 40	2.60	5.80	4.55	46.58	15.74	2.84	1.65	11.65	7.87	38.50	13.46	0.227
	3.20	7.01	5.50	54.94	18.41	2.80	1.62	13.74	9.21	45.83	15.78	0.224
	4.00	8.55	6.71	64.79	21.49	2.75	1.59	16.20	10.74	54.77	18.49	0.219
	4.80	10.01	7.85	73.22	24.03	2.71	1.55	18.30	12.02	62.81	20.79	0.215
96 x 48	3.20	8.54	6.71	98.61	33.28	3.40	1.97	20.54	13.87	82.13	23.82	0.272
	4.00	10.47	8.22	117.54	39.32	3.35	1.94	24.49	16.38	99.11	28.24	0.267
	4.80	12.31	9.66	134.35	44.55	3.30	1.90	27.99	18.56	114.80	32.14	0.263
122 x 61	3.60	12.32	9.67	232.61	78.83	4.34	2.53	38.13	25.84	193.91	44.50	0.347
	4.50	15.14	11.88	278.94	93.78	4.29	2.49	45.73	30.75	235.39	53.13	0.343
	5.40	17.85	14.01	320.83	107.03	4.24	2.45	52.60	35.09	274.29	60.89	0.338
145 x 82	4.80	20.28	15.92	555.16	228.50	5.23	3.36	76.57	55.73	534.27	94.45	0.429
	5.40	22.60	17.74	610.85	250.59	5.20	3.33	84.26	61.12	592.70	103.81	0.426
172 x 92	4.80	23.83	18.71	917.13	346.91	6.20	3.82	106.64	75.41	826.04	128.85	0.503
	5.40	26.59	20.88	1012.47	381.74	6.17	3.79	117.73	82.99	918.10	142.04	0.500
200 x 100	4.00	22.95	18.01	1199.71	410.78	7.23	4.23	119.97	82.16	991.47	141.46	0.579
	5.00	28.36	22.26	1459.25	496.94	7.17	4.19	145.93	99.39	1216.96	171.53	0.574
	6.00	33.63	26.40	1703.31	576.91	7.12	4.14	170.33	115.38	1434.03	199.68	0.569
	8.00	43.79	34.38	2146.21	719.19	7.00	4.05	214.62	143.84	1843.86	250.68	0.559
220 x 140	4.00	27.75	21.78	1892.62	947.66	8.26	5.84	172.06	135.38	2004.80	223.74	0.699
	5.00	34.36	26.97	2313.45	1155.26	8.21	5.80	210.31	165.04	2468.51	272.71	0.694
	6.00	40.83	32.05	2714.10	1351.70	8.15	5.75	246.74	193.10	2914.71	318.93	0.689
	8.00	53.39	41.91	3456.31	1712.25	8.05	5.66	314.21	244.61	3270.10	378.40	0.679
240 x 120	4.00	27.75	21.78	2110.72	725.35	8.72	5.11	175.89	120.89	1736.39	208.03	0.699
	5.00	34.36	26.97	2579.67	882.47	8.67	5.07	214.97	147.08	2138.48	253.55	0.694
	6.00	40.83	32.05	3025.91	1030.45	8.61	5.02	252.16	171.74	2528.39	296.70	0.689
	8.00	53.39	41.91	3851.84	1299.95	8.49	4.93	320.99	216.66	3272.90	376.29	0.679
260 x 180	6.00	50.43	39.59	4855.87	2763.43	9.81	7.40	373.53	307.05	5619.50	501.05	0.849
	8.00	66.19	51.96	6238.69	3538.10	9.71	7.31	479.90	393.12	6821.23	620.13	0.839
	10.00	81.43	63.92	7509.51	4244.26	9.60	7.22	577.65	471.58	8972.14	760.42	0.834
	12.00	96.14	75.47	8672.42	4884.94	9.50	7.13	667.11	542.77	10150.39	875.12	0.829
300 x 150	6.00	51.63	40.53	6073.51	2079.57	10.85	6.35	404.90	277.28	5034.64	478.20	0.869
	8.00	67.79	53.22	7807.95	2654.12	10.73	6.26	520.53	353.88	6559.05	612.64	0.859
	10.00	83.43	65.49	9403.90	3173.71	10.62	6.17	626.93	423.16	8011.67	736.01	0.848
	12.00	98.54	77.35	10866.10	3641.00	10.50	6.08	724.41	485.47	9110.72	829.98	0.838
300 x 200	6.00	57.63	45.24	7370.23	3962.19	11.31	8.29	491.35	396.22	8186.02	650.85	0.969
	8.00	75.79	59.50	9513.66	5097.04	11.20	8.20	634.24	509.70	10722.83	839.51	0.959
	10.00	93.43	73.34	11507.24	6144.30	11.10	8.11	767.15	614.43	13169.70	1015.43	0.948
	12.00	110.54	86.77	13355.84	7107.43	10.99	8.02	890.39	710.43	15215.03	1160.24	0.938

\* For availability of size/thickness please refer to page 11.





# Product Range Availability



Specification:  
IS : 4923

## Product Range: Rectangular Hollow Sections (RHS)

	Wall Thickness (mm) = t															
Section Size	D	B	2.0	2.6	2.9	3.2	3.6	4.0	4.5	4.8	5.0	5.4	6.0	8.0	10.0	12.0
	50	25														
	60	40														
	66	33														
	80	40														
	96	48														
	122	61														
	145	82														
	172	92														
	200	100														
	220	140														
	240	120														
	260	180														
	300	150														
300	200															



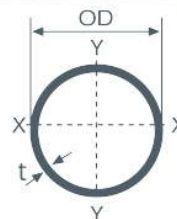
- Indicates presently rolled section



- Under development, please confirm availability before adoption in design



# Section Properties



Specification:  
IS : 1161

## Properties of Tata Structura (Circular Hollow Sections)

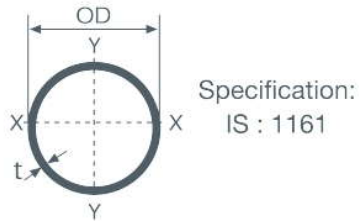
YST 310 Grade

Nominal Bore	Outside Diameter	Thickness	Weight	Area of Cross Section	Outer Surface Area/m	Moment of Inertia	Section Modulus	Radius of Gyration
mm	mm	mm	kg/m	cm <sup>2</sup>	cm <sup>2</sup> /m	cm <sup>4</sup>	cm <sup>3</sup>	cm
15	21.3	2.00	0.95	1.21	669	0.57	0.54	0.69
		2.60	1.21	1.53		0.69	0.64	0.66
		3.20	1.44	1.82		0.75	0.70	0.65
20	26.9	2.30	1.38	1.78	845	1.36	1.01	0.87
		2.60	1.56	1.98		1.48	1.10	0.86
		3.20	1.87	2.38		1.70	1.26	0.84
25	33.7	2.60	1.98	2.54	1059	3.09	1.83	1.10
		3.20	2.41	3.06		3.61	2.14	1.08
		4.00	2.93	3.73		4.19	2.48	1.05
32	42.4	2.60	2.54	3.25	1332	6.47	3.05	1.41
		3.20	3.01	3.94		7.62	3.59	1.39
		4.00	3.79	4.82		8.99	4.24	1.36
40	48.3	2.90	3.23	4.13	1517	10.70	4.43	1.61
		3.20	3.56	4.53		11.59	4.80	1.59
		4.00	4.37	5.56		13.77	5.70	1.57
50	60.3	2.90	4.08	5.23	1895	21.59	7.16	2.03
		3.60	5.03	6.41		25.88	8.59	2.00
		4.50	6.19	7.88		30.90	10.20	1.98
65	76.1	3.20	5.71	7.32	2391	48.79	12.82	2.58
		3.60	6.42	8.20		54.02	14.20	2.57
		4.50	7.93	10.10		65.12	17.10	2.54
80	88.9	3.20	6.72	8.61	2793	79.23	17.82	3.03
		4.00	8.36	10.70		96.36	21.68	3.00
		4.80	9.90	12.70		112.52	25.31	2.98
100	114.3	3.60	9.75	12.50	3591	192.03	33.60	3.92
		4.50	12.20	15.50		234.30	41.00	3.89
		5.40	14.50	18.50		274.50	48.00	3.85
125	139.7	4.50	15.00	19.10	4389	437.20	62.60	4.78
		4.80	15.90	20.30		463.44	66.35	4.77
		5.40	17.90	22.80		514.50	73.70	4.75
150	165.1	4.50	17.80	22.70	5187	732.60	88.74	5.68
		4.80	18.90	24.20		777.32	94.16	5.67
		5.40	21.30	27.10		864.70	105.00	5.65
200	219.1	4.80	25.38	32.33	6886	1856.78	169.49	7.58
		6.00	31.51	40.17		2281.95	208.30	7.54
		8.00	41.67	53.08		2960.82	270.27	7.47
		10.00	51.59	65.72		3599.89	328.61	7.40
		12.00	61.32	78.11		4201.57	383.53	7.33
250	273	6.00	39.51	50.30	8580	4487.08	328.72	9.44
		8.00	52.30	66.63		5854.07	428.87	9.37
		10.00	64.89	82.66		7156.97	524.32	9.31
		12.00	77.27	98.43		8399.52	615.35	9.24
300	323.9	6.30	49.36	62.88	10180	7932.09	489.79	11.23
		8.00	62.35	79.43		9914.07	612.17	11.17
		10.00	77.44	98.65		12163.24	751.05	11.10
		12.00	92.34	117.63		14325.32	884.55	11.04
350	355.6	8.00	68.61	87.40	11176	13206.69	742.78	12.29
		10.00	85.27	108.62		16230.03	912.83	12.22
		12.00	101.73	129.59		19147.18	1076.89	12.16

\* For availability of size/thickness please refer to page 13.



# Product Range Availability



## Product Range: Circular Hollow Sections (CHS)

		Wall Thickness (mm) = t															
Nominal Bore/Outside Diameter (mm)	NB	OD	2.0	2.3	2.6	2.9	3.2	3.6	4.0	4.5	4.8	5.4	6.0	6.3	8.0	10.0	12.0
	15	21.3															
	20	26.9															
	25	33.7															
	32	42.4															
	40	48.3															
	50	60.3															
	65	76.1															
	80	88.9															
	100	114.3															
	125	139.7															
	150	165.1															
	200	219.1															
	250	273															
	300	323.9															
	350	355.6															



- Indicates presently rolled section



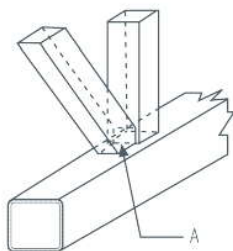
- Under development, please confirm availability before adoption in design





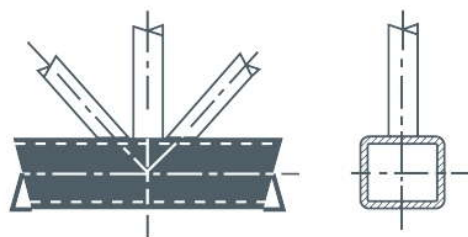
# Fabrication and Connection Details

## OVERLAP JOINTS



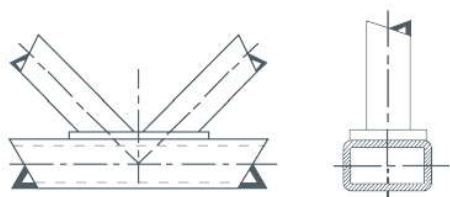
The weld seam 'A' can be omitted without affecting the behaviour of the joint.

## GAP JOINTS



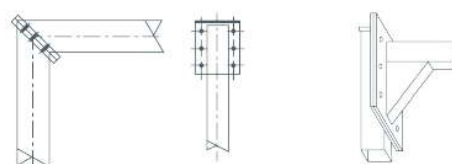
This arrangement is often the simplest and most economical and the joints are sufficiently strong. Joining member alignments should be at  $> 30^\circ$  with respect to the other.

## POSSIBLE REINFORCEMENTS



In certain cases reinforced joints are preferred for improved joint rigidity.

## BOLTED KNEE JOINTS



Type A

Type B

These are simple and economical arrangements offering good strength and rigidity.

## Joining: Workshop & Site Practice

### CUTTING

Tata Structura Steel Hollow Sections can be cut:

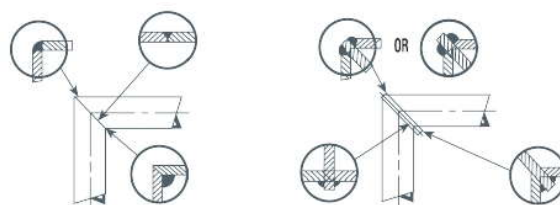
- By means of a heavy duty circular/hand saw
- By flame cutting: either manual or automatic

- The path of the cut can be marked directly on the surface of the section or on a template after shop layout
- For section thicknesses of 5 mm and above, edges may be chamfered for proper welding penetration

### BENDING

- Axial cold bending of Tata Structura Steel Hollow Sections is possible by using an internal mandrel and the roller must be adapted to the shape and size of the section
- Three roll bending machine may be adapted - bend by slow multiple pass, through trial and error method
- Thicker or larger sections are recommended to be pre-heated in a normalising furnace before bending in hot condition for better formation

## WELDED KNEE JOINTS



Type A

Type B

This is simple inexpensive and quite satisfactory, if the connections are not heavily loaded (Type A).

When the sections differ in sizes, or for additional strength, stiffening plates may be used (Type B).

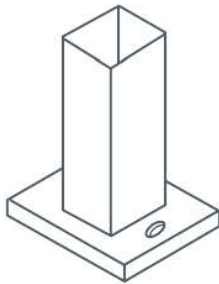
Thickness of stiffening plate  $2 \times$  thickness of Tata Structura Rectangular / Square Steel Hollow Sections used or 6 mm, whichever is maximum.



# Fabrication and Connection Details

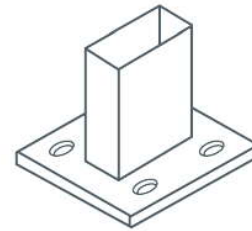
## COLUMN BASES

Type A



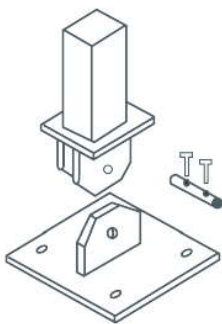
When perfect pin end is not required, (Type A) may be followed and column base with small moment can be made as shown (Type B)

Type B

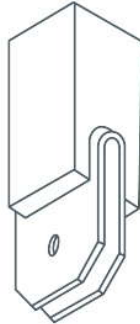


## HINGED COLUMN BASES

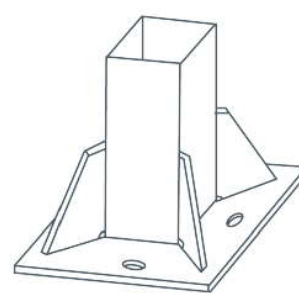
Type A



Type B



Type C



When design assumptions specify an effective hinge in particular plane, this must be implemented by means of an axle or other device imparting rotational freedom as shown (Type A & Type B).

For large axial loads, the column base should be stiffened as shown (Type C) to minimise the thickness of base plate. Stiffener plates at the middle of Tata Structura Rectangular & Square Steel Hollow Sections' sides better be avoided.

## Jointing: Workshop & Site Practice

### WELDING

Technique in principle is similar for that of conventional sections. Follow relevant BIS code of practice and design conditions.

- **Electrodes:** Low hydrogen electrodes are suggested for use.
- **Butt welds:** The throat thickness of the seam:
  - a) Wall thickness of the section when joining members are of equal thickness.
  - b) Wall thickness of thinner section, if thicknesses are different. Backing strip may be provided to ensure total root penetration in case of thicker section design size.
- **Fillet welds:** Various types may be provided. Size of the fillet is guided by the throat thickness as explained above.
- **NOTE:** All free ends of Tata Structura Steel Hollow Sections should be sealed properly by welding, to prevent internal corrosion.
- Normal M. S. electrodes of reputed brands are recommended. Moisture from electrode should be removed by baking before welding.
- **Sequence:** Edges are to be tack welded to maintain uniform gap during welding to minimise residual stress:
  - Transverse weld before longitudinal one
  - Fillet weld following butt weld
  - Starting from inside to outwards.

## TRUSS TO COLUMN CONNECTIONS

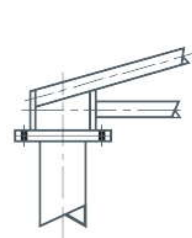


Fig. A

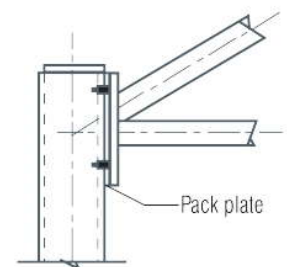


Fig. B

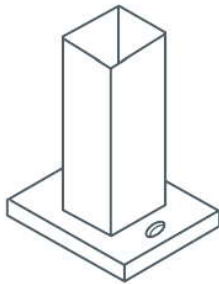
Truss either can rest upon the column as shown (Fig. A) or can be bolted at the face of the column as shown (Fig. B). In the former case the discrepancy in fabrication can be accommodated by providing slotted holes while in the latter the same can be adjusted by packing plates.



# Fabrication and Connection Details

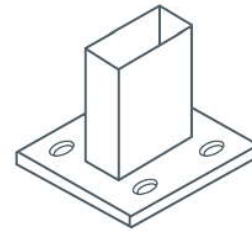
## COLUMN BASES

Type A



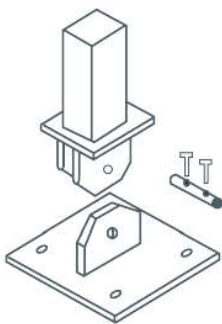
When perfect pin end is not required, (Type A) may be followed and column base with small movement can be made as shown (Type B)

Type B

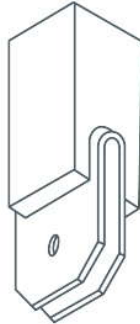


## HINGED COLUMN BASES

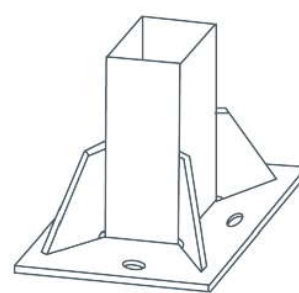
Type A



Type B



Type C



When design assumptions specify an effective hinge in particular plane, this must be implemented by means of an axle or other device imparting rotational freedom as shown (Type A & Type B).

For large axial loads, the column base should be stiffened as shown (Type C) to minimise the thickness of base plate. Stiffener plates at the middle of Tata Structura Rectangular & Square Steel Hollow Sections' sides better be avoided.

## Joining: Workshop & Site Practice

### WELDING

Technique in principle is similar for that of conventional sections. Follow relevant BIS code of practice and design conditions.

- **Electrodes:** Low hydrogen electrodes are suggested for use.
- **Butt welds:** The throat thickness of the seam:
  - a) Wall thickness of the section when joining members are of equal thickness.
  - b) Wall thickness of thinner section, if thicknesses are different. Backing strip may be provided to ensure total root penetration in case of thicker section design size.
- **Fillet welds:** Various types may be provided. Size of the fillet is guided by the throat thickness as explained above.
- **NOTE:** All free ends of Tata Structura Steel Hollow Sections should be sealed properly by welding, to prevent internal corrosion.
- Normal M. S. electrodes of reputed brands are recommended. Moisture from electrode should be removed by baking before welding.
- **Sequence:** Edges are to be tack welded to maintain uniform gap during welding to minimise residual stress:
  - Transverse weld before longitudinal one
  - Fillet weld following butt weld
  - Starting from inside to outwards.

## TRUSS TO COLUMN CONNECTIONS

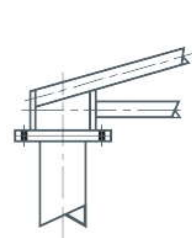


Fig. A

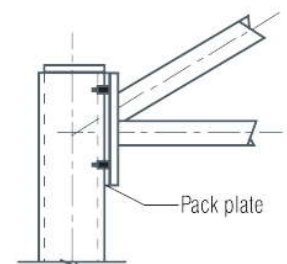


Fig. B

Truss either can rest upon the column as shown (Fig. A) or can be bolted at the face of the column as shown (Fig. B). In the former case the discrepancy in fabrication can be accommodated by providing slotted holes while in the latter the same can be adjusted by packing plates.

# Contact Details

## WORKS

Burma Mines, Jamshedpur-831 007, Telephone: 0657 2270561, Fax: 0657 2270304

## MARKETING HEADQUARTERS

Tata Centre, 43, J. L. Nehru Road, Kolkata-700 071, Telephone: 2288-7051/9251/3061/1851, Fax: 2288-6996

### East zone

#### Bhubaneswar

Tata Steel – Tubes Division  
C/o. Rungta Agencies Pvt. Ltd.  
Cuttack Puri Road, P.O. Rasulgarh,  
Bhubaneswar – 751 010  
Tel: 0674 6450611 Fax: 0674 2580968

#### Kolkata

Tata Steel – Tubes Division  
Eastern Regional Sales Office  
52, J. L. Nehru Road, 2nd Floor,  
Kolkata – 700 071  
Tel: 033 2282 4299/6550 8020/21/23/24  
Fax: 033 2282 4325

#### Guwahati

Tata Steel – Tubes Division  
C/o. Rungta Agencies Pvt. Ltd.  
Meena Bhawan, Kanchan Road,  
Ulubari, Guwahati – 781 007  
Tel: 0361 252 6582 Fax: 0361 252 6582

#### Jamshedpur

Tata Steel – Tubes Division  
P.O. Burma Mines,  
Jamshedpur – 831 007  
Tel: 0657 651 2063 Fax: 0657 227 938

#### Patna

Tata Steel – Tubes Division  
C/o. Jai Basukinath Traders Pvt. Ltd.  
House of Advocate Mr. K.P. Verma  
Near Gasolene Petrol Pump,  
Boring Road, Patna – 800 001  
Tel: 0612 222 8663

#### Siliguri

Tata Steel – Tubes Division  
Sky Star Building, 6th Floor,  
Sevoke Road, Siliguri – 734 401  
Tel: 0353 253 0419 Fax: 0353 253 3527

### West zone

#### Ahmedabad

Tata Steel – Tubes Division  
Premchand House Annexe  
High Court Way, 172/2, Ashram Road,  
Ahmedabad – 380 009  
Tel: 079 6661 2600/01/09  
Fax: 079 6661 2608

#### Indore

Tata Steel – Tubes Division  
316 & 317 City Centre  
570, M. G. Road, Indore-452 001  
Tel: 0731 645 0691/253 8595  
Fax: 0731 2535951

#### Mumbai

Tata Steel – Tubes Division  
Orient House, 3rd Floor, Adi Marzban Path,  
Ballard Estate, Mumbai – 400 038  
Tel: 022 6638 4511/12  
Fax: 022 2269 5963

#### Nagpur

Tata Steel – Tubes Division  
Museum Road, Civil Lines  
Nagpur – 440 001  
Tel: 0712 645 7677/252 2209  
Fax: 0712 253 7078

#### Pune

Tata Steel – Tubes Division  
The Orion, Office No. 202B, 2nd Floor,  
5 Korigaon Park, Opp. St. Mira's College,  
Pune – 411 001  
Tel: 020 6401 0607  
Fax: 020 6604 8828

### North zone

#### New Delhi

Tata Steel – Tubes Division  
Jeevan Tara Building, 1st Floor,  
5, Sansad Marg, New Delhi – 110 001  
Tel: 011 2374 8294/8169  
Fax: 011 2334 3196

#### Faridabad

Tata Steel – Tubes Division  
33B, N I T  
Faridabad - 121 001 (Haryana)  
Tel: 0129 409 8314  
Fax: 0129 409 8221

#### Jaipur

Tata Steel – Tubes Division  
C/o. Vijayshree Properties Pvt. Ltd.  
C-84, Prithviraj Road, "C" Scheme,  
Jaipur – 302 001  
Tel: 0141 222 4725  
Fax: 0141 511 2906

#### Kanpur

Tata Steel – Tubes Division  
Navroz Building, M.G. Road,  
Kanpur – 208 001  
Tel: 0512 231 2870/2298/234 8979  
Fax: 0512 231 6631

#### Ludhiana

Tata Steel – Tubes Division  
B-30, 1858/1, Focal Point,  
Ludhiana – 141 010  
Tel: 0161 267 0504  
Fax: 0161 503 1286

#### Chandigarh

Tata Steel – Tubes Division  
SCO 16, 1st Floor  
Sector 26, Madhya Marg  
Chandigarh – 160 019  
Tel: 0172 2791047/2790932

### South zone

#### Bangalore

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