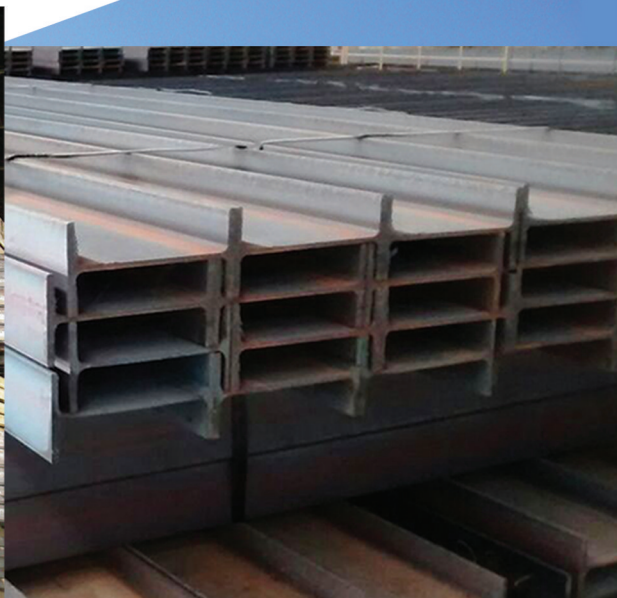




Structural Steel Sections

Rationalised sizes of Beams/Joists, Channels and Angles

Section	Dimensions mm	Sectional Weight kg/m	Length m
Beams/Joists	Durgapur Steel Plant		
	200 x 100 x 5.7	25.4	Standard lengh 11 & above
	Bhilai Steel Plant		
	250 x 125 x 6.9	37.3	12 - 13.5 for all dimensions
	300 x 140 x 7.7	46.1	
	350 x 140 x 8.1	52.4	
	400 x 140 x 8.9	61.6	
	450 x 150 x 9.4	72.4	
	500 x 180 x 10.2	86.9	
	600 x 210 x 12	123.0	
Channels	Bhilai Steel Plant		
	75 x 40 x 4.8	7.14	12 & above
	100 x 50 x 5	9.56	
	Durgapur Steel Plant		
	150 x 75 x 5.7	16.80	Standard length 11 & above
	150 x 76 x 6.5	17.70	
	200 x 75 x 6.2	22.30	
	200 x 76 x 7.5	24.30	
	Bhilai Steel Plant		
	250 x 82 x 9	34.2	12 - 13.5
	300 x 90 x 7.8	36.3	
400 x 100 x 8.8	50.1		

Section	Dimensions mm	Sectional Weight kg/m	Length m
Angles	Bhilai Steel Plant		
	50 x 50 x 5*	3.8	12 & above
	50 x 50 x 6	4.5	
	60 x 60 x 5/6/8*	4.5/5.4/7.0	
	65 x 65 x 5*	4.9	
	65 x 65 x 6/8/10	5.8/7.7/9.4	
	70 x 70 x 5/6*	5.3/ 6.3	
	75 x 75 x 5/ 6/ 8/ 10	5.7/6.8/8.9/11.0	
	80 x 80 x 6/8/10	7.3/9.6/11.8	
	90 x 90 x 6/8/10	8.2/10.8/13.4	
	150 x 150 x 16/ 20*	35.8/44.1	
	Durgapur Steel Plant		
	110 x 110 x 10/12	16.6/19.7	11 & above for all dimensions
	130 x 130 x 10/12	19.7/23.5	
	150 x 150 x 12/16	27.3/35.8	

* Can be produced, if sufficient orders are available.

Below 10m/11.5m length can also be supplied

While standard lengths are mentioned in tables above, BSP can supply material in any fixed length in the range 6-13 m and DSP can supply in any fixed length in the range 5.5-11.5 m

Common grades : IS 2062/2011 and SAILMA

Copper bearing structurals are also rolled as per customer's specifications. High strength light structurals are also available as per the needs of TLT manufacturers.

Structurals are also available in the following **foreign specifications** :

ASTM-A-36, JIS-G-3101-SS400, BS-4360 Grades 40A, 43A, 43B, 43C, 50B, 50C, EN-10025, Grades S-275 JO, JR, S-355 JO, JR, DIN-17100 ST 37.2/44.2 (all in semi-killed quality), if sufficient orders are available.

Rolling tolerance for Structural Steel sections as per IS1852

Beams

Depth	Tolerance	Width of flange	Tolerance
Up to 200 mm	± 2.0 mm	Up to 100 mm	± 2.0 mm
> 200 to 400 mm	± 3.0 mm	> 100 to 125 mm	± 2.5 mm
> 400 to 600 mm	± 4.0 mm	> 125 to 250 mm	± 4.0 mm

Tolerance on weight per metre shall be $\pm 2.5\%$ or alternatively $+4, -1\%$ of the weight per metre. The permissible limits for camber and sweep shall be 0.2% of the length.

Channels

Depth	Tolerance	Width of flange	Tolerance
Up to 200 mm	± 2.5 mm	Up to 100 mm	± 2 mm
> 200 to 400 mm	± 3.0 mm		

Tolerance on weight per metre shall be $\pm 2.5\%$ or alternatively $+4, -1\%$ of the standard weight per metre. The permissible limits for camber and sweep shall be 0.2% of the length.

Angles

Leg length	Tolerance	Leg length	Camber
Up to 45 mm	± 1.5 mm	< 100 mm	As per agreement
> 45 mm to 100 mm	± 2.0 mm	≥ 100 mm	0.2% of length
> 100 mm	$\pm 2\%$		

Tolerance on Sectional Weight of Angles

Thickness	Tolerance
Up to 3 mm	$\pm 5\%$
Over 3 mm	$+ 5\%, -3\%$

Structurals with closer tolerance can be supplied by mutual agreement.

Chemical Composition IS: 2062/2011

Grade	Quality	Ladle Analysis, wt % max.					Carbon Equiv. Max	Mode of Deoxidation
		C	Mn	S	P	Si		
E 250	A	0.23	1.50	0.045	0.045	0.40	0.42	Semi killed/killed
	BR, BO	0.22	1.50	0.045	0.045	0.40	0.41	Semi killed/killed
	C	0.20	1.50	0.040	0.040	0.40	0.39	Killed
E 300	A, BR, BO	0.20	1.50	0.045	0.045	0.45	0.44	Semi killed/killed
	C	0.20	1.50	0.040	0.040	0.45	0.44	Killed
E 350	A, BR, BO	0.20	1.55	0.045	0.045	0.45	0.47	Semi killed/killed
	C	0.20	1.55	0.040	0.040	0.45	0.45	Killed
E 410	A, BR, BO	0.20	1.60	0.045	0.045	0.45	0.50	Semi killed/killed
	C	0.20	1.60	0.040	0.040	0.45	0.50	Killed
E 450	A, BR	0.22	1.65	0.045	0.045	0.45	0.52	Semi killed/killed
E 550	A, BR	0.22	1.65	0.020	0.025	0.50	0.54	Semi killed/killed
E 600	A, BR	0.22	1.70	0.020	0.025	0.50	0.54	Semi killed/killed

Total microalloying elements like Nb, V and Ti may be added singly or in combination shall not be more than 0.25%. Cu may be present between 0.25 - 0.35% on mutual agreement.

SAILMA GRADES

Grade	C max	Mn max	S max	P max	Al min	Si max	CE max	MAE max. (Nb + V + Ti)
SAILMA 300	0.20	1.50	0.045	0.045	0.02	0.45	0.44	< 0.25
SAILMA 300 HI	0.20	1.50	0.040	0.040	0.02	0.45	0.43	< 0.25
SAILMA 350	0.20	1.55	0.045	0.045	0.02	0.45	0.46	< 0.25
SAILMA 350 HI	0.20	1.55	0.040	0.040	0.02	0.45	0.45	< 0.25
SAILMA 410	0.20	1.60	0.045	0.045	0.02	0.45	0.48	< 0.25
SAILMA 410 HI	0.20	1.60	0.040	0.040	0.02	0.45	0.48	< 0.25
SAILMA 450	0.20	1.65	0.045	0.045	0.02	0.45	0.50	< 0.25
SAILMA 450HI	0.20	1.65	0.040	0.040	0.02	0.45	0.50	< 0.25
SAILMA 550	0.20	1.65	0.020	0.025	0.02	0.50	0.54	< 0.25
SAILMA 550HI	0.20	1.65	0.015	0.025	0.02	0.50	0.54	< 0.25
SAILMA 600	0.22	1.70	0.015	0.025	0.02	0.50	0.54	< 0.25

Grade	C max.	Mn	S max.	P	Si	Cu min.
HCRS (Cu-P)	0.15	0.25 – 0.8	0.03	0.07 – 0.15	0.28 – 0.50	0.2

Straightening and Despatch

At BSP's Merchant Mill and Rail & Structural Mill every piece of each section is straightened through a straightening machine. Heavy structurals from R&S Mill are despatched piece wise while light structurals from Merchant Mill are clubbed in bundles of 8-12 tonnes in fixed length. Angles from Merchant Mill for TLT manufacturers can be nested and packetted, after piece by piece inspection. Customers are requested to specify this, if required.

At DSP's Section Mill 100% products are straightened.

Grade Designation	Quality	Tensile Strength Rm Min Mpa	Yield Stress			Percentage Elongation A, at Gauge Length, L=5.65 √S Min	Internal Bend Diameter Min (See Note 2)	Charpy Impact Test (See Note 3 & 4)		
			t<20	20-40	>40		<25	>25	Temp °C	J, Min
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
E-250	A	410	250	240	230	23	2t	3t	—	—
	BR								RT	27
	BO								0	27
	C								(-) 20	27
E-300	A	440	300	290	280	22	2t	—	—	—
	BR								RT	27
	BO								0	27
	C								(-) 20	27
E-350	A	490	350	330	320	22	2t	—	—	—
	BR								RT	27
	BO								0	27
	C								(-) 20	27
E-410	A	540	410	390	380	20	2t	—	—	—
	BR								RT	25
	BO								0	25
	C								(-) 20	25
E-450	A	570	450	430	420	20	2.5t	—	—	—
	BR								RT	20
E-550	A	650	550	530	520	12	3.0t	—	—	—
	BR								RT	15
E-600	A	730	600	580	570	12	3.5t	—	—	—
	BR								RT	15

Mechanical Properties

SAILMA Grade

Grade	YS, MPa, min			UTS, MPa, min	% EI min, Std GL	Internal Bend Diameter, min		Charpy Impact Test	
	<25 mm	25-40 mm	>40 mm			<25 mm	>25 mm	Temp °C	J, min
SAILMA 300	300	290	280	440	24	2t	—	—	—
SAILMA 300 HI	300	290	280	440	24	2t	—	0	40
SAILMA 350	350	330	320	490	24	2t	—	—	—
SAILMA 350 HI	350	330	320	490	24	2t	—	0 - 20	40 30
SAILMA 410	410	390	380	540	22	2t	—	—	—
SAILMA 410 HI	410	390	380	540	22	2t	—	0 - 20	35 25
SAILMA 450	450	430	420	570	22	2.5t	—	—	—
SAILMA 450 HI	450	430	420	570	22	2.5t	—	0 - 20	30 20
SAILMA 550	550	530	520	650	14	3t	—	—	—
SAILMA 550 HI	550	530	520	650	14	3t	—	0 - 20	*
SAILMA 600	600	580	570	730	14	3.5t	—	—	—

*Mutually agreed.

Impact will be given for any one temperature. For 450 HI & above impact is for > 10 mm.

For < 12 mm impact to be given only if specified.

Specification	Grade	YS, MPa, min	UTS, MPa, min	% El in GL $5.65 \sqrt{S_0}$ min	Charpy Impact Value, Joules min	Bend Test
HCRS (Cu-P)	—	340	480	21		1T

Crane Rails

Profile	Sectional Wt, kg/m	Standard Length, m	Mill
CR - 80*	64.2	13	Rail & Structural Mill, Bhilai
CR - 100*	89.0	13	Rail & Structural Mill, Bhilai
CR -120*	118.0	13	Rail & Structural Mill, Bhilai

* Denotes head width in mm.

Chemical Composition

Specification	Ladle Analysis %					
	C	Mn	P Max	S Max	Si	Hydrogen
Crane Rails	0.65-0.75	1.0 to 1.3	0.040	0.040	0.10 to 0.50	Less than 3 ppm

Properties

UTS : 850 MPa min

Elongation : 8% min

Hardness : 250 BHN min

Micro Structure : Pearlitic

Inclusion rating : 3.0 max (worst field) Sulphide, Alumina, Silicate & Globular oxide individually

CR 80, 100 : Straightened

CR 120 : Unstraightened

Structural Steel Sections from new Universal Section Mill of ISP

WP Beam (IS 12778) Equivalent to HE (DIN 1025)	Mass (kg/m)	NP Beam (IS 12778) Equivalent to IPE (DIN 1025)	Mass (kg/m)	Channels DIN (1026)	Mass (kg/m)				
				UPN 200	25.3				
				UPN 220	29.4				
				UPN 240	33.2				
				UPN 260	37.9				
				UPN 280	41.8				
				UPN 300	46.2				
				UPN 320	59.5				
				UPN 350	60.6				
				UPN 400	71.8				
200 A	42.3	240	30.7	Channel (IS 808)	Mass (kg/m)				
200B	61.3	270	36.1						
220A	50.5	300	42.2						
220 B	71.5	330	49.1						
240 A	60.3	360*	57.1						
240 B	83.2	400	66.3						
260 A	68.2	450	77.6						
260 B	93	500	90.7						
280 A	76.4	550	106						
280 B	103	600	122						
300 A	88.3	750	137	MC 200	22.3, 24.3				
300 B	117	Bulb Flats (IS 1252)	Mass (kg/m)	MC 250	30.6, 34.2, 38.1				
320 A	97.6			200 x 9	18.5	MC 300	36.3, 41.5, 46.2		
320 B	127			200 x 11.5	22.5	MC 350	42.7		
340 A	105			220 x 10	22.8	Angles (IS 808)	Mass (kg/m)		
340 B	134			220 x 11.5	25.4			150 x 150 x 10	22.9
360 A	112			240 x 10	25.4			150 x 150 x 12	27.3
360 B	142			240 x 12	29.3			150 x 150 x 16	35.8
400 A	125			280 x 11	33.5			150 x 150 x 20	44.1
400 B	155			280 x 12	35.7			160 x 160 x 15	36.2
450 A	140			300 x 11	36.7			180 180 x 16	43.5
450 B	171	300 x 13	41.5	200 x 200 12	36.9				
Sheet Piles (IS 2314)	Mass (kg/m)	320 x 12	42.5	200 x 200 16	48.5				
		320 x 13	45	200 x 200 x 20	60				
		340 x 12	46.1	200 x 200 25	73.9				
		340 x 14	51.5						

* Equivalent not available in IS 12778, 2004.

IPE/NPB - narrow Flange Parallel Beams.

HE/WPB - Wide Flange Parallel Beams.

UPN - Parallel flange Channel (U Section) as per DIN.

ISPS - Indian Standard Pile Section.

Structural Steel Sections from new Medium Structural Mill of DSP

Dimension IS 12778 (mm)		Mass (kg/m)
NPB	100 x 55	8.10
NPB	120 x 60	10.37
NPB	140 x 70	12.89
NPB	160 x 80	15.77
NPB	180 x 90	15.37, 18.80, 21.27
NPB	200 x 100	18.47, 22.36, 25.09
NPB	200 x 130	27.37, 31.55
NPB	200 x 150	30.45
NPB	200 x 165	35.68, 42.47, 48
NPB	220 x 110	22.18, 26.20, 29.35
NPB	240 x 120	26.15, 30.71, 34.31
NPB	250 x 125	30.11
NPB	250 x 150	34.03, 39.78, 40.48
NPB	250 x 175	43.94
NPB	270 x 135	30.73, 42.26
NPB	300 x 150	36.52, 42.24, 49.32
NPB	300 x 165	39.88, 45.76, 53.46
NPB	300 x 200	59.56, 66.75, 75.37

Dimension IS 808 (mm)		Mass (kg/m)
ISA	90 x 6, 8, 10, 12	8.2, 10.8, 13.4, 15.8
ISA	100 x 6, 8, 10, 12	9.2, 12.1, 14.9, 17.7
ISA	110 x 8, 10, 12, 16	13.4, 16.6, 19.7, 25.7
ISA	130 x 8, 10, 12, 16	15.9, 19.7, 23.5, 30.7
ISA	150 x 10, 12, 16, 20	22.9, 27.3, 35.8, 44.1
ISA	200 x 12, 16, 20, 25	36.8, 48.5, 60.0, 73.9

Dimension IS 12778 (mm)		Mass (kg/m)
WPB	100 x 100	12.24, 16.67, 20.44, 41.79
WPB	120 x 120	14.56, 19.89, 26.69, 52.13
WPB	140 x 140	18.07, 24.66, 33.72, 63.24
WPB	150 x 150	22.96, 30.04, 36.98
WPB	160 x 160	23.83, 30.44, 42.59, 76.19

Dimension ASTM A6 (mm)		Mass (kg/m)
W	100 x 100	19.3
W	130 x 130	23.8, 28.1
W	150 x 150	13, 13.5, 18.0, 22.5, 24, 29.8, 37.1

Dimension IS 808 (mm)		Mass (kg/m)
MC	100	9.6
MC	125	13.1, 13.7
MC	150	16.8, 17.7
MC	175	19.6, 22.7
MC	200	22.3, 24.3
MC	225	26.1, 30.7
MC	250	30.6, 34.2, 38.1
MC	300	36.3, 41.5, 46.2

Dimension IS 808 (mm)		Mass (kg/m)
MB	100	8.9
MB	124	13.3
MB	150	15.0
MB	175	19.6
MB	200	24.2
MB	225	31.1
MB	250	37.3
MB	300	46.0

NPB - Narrow flange parallel beams.

WPB - Wide flange parallel beams.

W - Wide flange beam (ASTM)

BM - Indian standard medium Beam.

MC - Indian standard medium channel.

ISA - Indian standard equal angles.