



# 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 length 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	16.8	Standard length 11 & above
	150 x 76 x 6.5	17.7	
	200 x 75 x 6.2	22.3	
	200 x 76 x 7.5	24.3	
	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	<b>Bhilai Steel Plant</b>		
	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	
	<b>Durgapur Steel Plant</b>		
	110 x 110 x 10/12	16.6/19.7	11 & above
	130 x 130 x 10/12	19.7/23.5	for all
	150 x 150 x 12/16	27.3/35.8	dimensions

\* 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	$\pm 2.0$ mm	Up to 100 mm	$\pm 2.0$ mm
> 200 to 400 mm	$\pm 3.0$ mm	> 100 to 125 mm	$\pm 2.5$ mm
> 400 to 600 mm	$\pm 4.0$ mm	> 125 to 250 mm	$\pm 4.0$ 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	$\pm 2.5$ mm	Up to 100 mm	$\pm 2$ mm
> 200 to 400 mm	$\pm 3.0$ 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	$\pm 1.5$ mm	< 100 mm	As per agreement
> 45 mm to 100 mm	$\pm 2.0$ mm	$\geq 100$ 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 Equivalent, 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 275	A	0.23	1.50	0.045	0.045	0.40	0.43	Semi Killed/Killed
	BR, BO	0.22	1.50	0.045	0.045	0.40	0.42	Semi Killed/Killed
	C	0.20	1.50	0.040	0.040	0.40	0.41	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

### Notes:

1. New grade designation system based on minimum yield stress has been adopted.
2. For semi-killed steel, silicon shall be less than 0.10 percent. For killed steel, when the steel is killed by aluminium alone, the total aluminium content shall not be less than 0.02 percent. When the steel is killed by silicon alone, the silicon content shall not be less than 0.10 percent. When the steel is silicon-aluminium killed, the silicon content shall not be less than 0.03 percent and total aluminium content shall not be less than 0.01 percent.
3. Steels of qualities A, BR, BO and C are generally suitable for welding processes. The weldability increases from quality A to C for grade designation E 250 and E 275.
4. Carbon equivalent (CE) would be calculated based on ladle analysis, only
 
$$CE = C + \frac{Mn}{6} + \frac{(C+Mo+V)}{5} + \frac{(Ni + Cu)}{15}$$
5. Micro-alloying elements like Nb, V and Ti may be added singly or in combination. Total micro-alloying elements shall not be more than 0.25 percent.

## Chemical Composition IS: 2062/2011

6. Alloying elements such as C, Ni, Mo and B may be added under agreement between the purchaser and the manufacturer. In case of E 600 and E 650 the limit of C and Ni either singly or in combination, shall not exceed 0.50 percent and 0.60 percent respectively.
7. Copper may be present between 0.20 to 0.35 percent as mutually agreed to between the purchaser and the manufacturer. The copper bearing quality shall be designated with a suffix Cu, for example E 250 Cu. In case of product analysis the copper content shall be between 0.17 and 0.38 percent.
8. Incidental element - Elements not quoted in Table 1 shall not be intentionally added to steel without the agreement of the purchaser, other than for the purpose of finishing the heat. All reasonable precautions shall be taken to prevent the addition from scrap or other materials used in manufacturer of such elements which affect the hardenability, mechanical properties and applicability.
9. Nitrogen content of steel shall not exceed 0.012 percent which shall be ensured by the manufacturer by occasional check analysis.
10. The steel, if required, may be treated with calcium based compound or rare earth element for better formability.
11. Lower limits for carbon equivalent and closer limits for other elements may be mutually agreed to between the purchaser and the manufacturer.

## Mechanical Properties : 2062/2011

Grade Designation	Quality	Tensile Strength R <sub>m</sub> Min MPa	Yield Stress Min MPa			Percentage Elongation A, at Gauge Length, L=5.65 √S <sub>0</sub> Min	Internal Bend Diameter Min		Charpy Impact Test	
			≤ 20	20-40	> 40		<25	> 25	Temp °C	J, Min
E-250	A	410	250	240	230	23	2t	3t	-	-
	BR								RT	27
	BO								0	27
	C								(-) 20	27
E-275	A	430	275	265	256	22	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

1. In case of product thickness/diameter more than 100 mm, lower minimum limit of tensile strength may be mutually agreed to between the purchaser and the manufacturer/supplier

## Chemical Composition : SAILMA Grades

Grade	C max.	Mn max.	S max.	P max.	Al min.	Si max.	CE max.	MAE (Nb+V+Ti) max.
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 450 HI	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 550 HI	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

For Hot Rolled coils, S is maintained below 0.030%

## Mechanical Properties : SAILMA Grades

Grade	YS, MPa min			UTS Mpa, min	% EI min Std GL	Internal Bend Diameter, min		Charpy Impact Test	
	≤25mm	>25 mm	>40 mm			Temp <sup>0</sup> C	J, min		
	<25 mm	25-40 mm	>40 mm						
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 450 HI	550	530	520	650	14	3t	-	0 -20	25 15
SAILMA 600	600	580	570	730	14	3.5t	-	-	-

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.



## Chemical Composition : HCRS (Cu-P)

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

## Mechanical Properties : HCRS (Cu-P)

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

## 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 packeted, after piece by piece inspection. Customers are requested to specify this, if required.

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

# 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 Supply condition	:	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

Beams (IS 12778)	Mass (kg/m)	Equivalent (DIN 1025)
NPB 240x120	30.71	IPE 240
NPB 270x135	36.07	IPE 270
NPB 300x150	36.52, 42.24, 49.32	IPE 300
NPB 300x200	59.56, 66.75, 75.37	---
NPB 330x160	49.15	IPE 330
NPB 350x170	57.09	IPE 360
NPB 350x250	79.18	---
NPB 400x180	57.38, 66.3, 75.66	IPE 400
NPB 400x200	67.28	---
NPB 450x190	67.15, 77.57, 92.36	IPE 450
NPB 500x200	79.36, 90.68, 107.31	IPE 500
NPB 550x210	105.52	IPE 550
NPB 600x220	107.56, 122.45, 154.46	IPE 600
NPB 750x270	145.29, 174.54, 202.48	IPE 750

Beams (IS 12778)	Mass (kg/m)	Equivalent (DIN 1025)
WPB 200X200	42.26	HE 200 A
	61.30	HE 200 B
WPB 220X220	50.51	HE 220 A
	71.47	HE 220 B
WPB 240X240	60.32	HE 240 A
	83.20	HE 240 B
WPB 260X260	68.16	HE 260 A
	92.99	HE 260 B
WPB 280X280	76.36	HE 280 A
	103.13	HE 280 B
WPB 300X300	88.34	HE 300 A
	100.84	---
	117.04	HE 300 B
	237.92	---
WPB 320X300	97.64	HE 320 A
	126.66	HE 320 B
WPB 340X300	104.79	HE 340 A
	134.16	HE 340 B
WPB 360X300	112.07	HE 360 A
	141.81	HE 360 B
WPB 400X300	124.81	HE 400 A
	155.26	HE 400 B
WPB 450X300	139.76	HE 450 A
	171.12	HE 450 B

Channels (DIN 1026)	Mass (kg/m)	Angles (IS 808)	Mass (kg/m)
UPN 200	25.3	150x150x10	22.9
UPN 220	29.4	150x150x12	27.3
UPN 240	33.2	150x150x16	35.8
UPN 260	37.9	150x150x20	44.1
UPN 280	41.8	160x160x15	36.2
UPN 300	46.2	180x180x16	43.5
UPN 320	59.5	200x200x12	36.9
UPN 350	60.6	200x200x16	48.5
UPN 400	71.8	200x200x20	60
		200x200x25	73.9

Channels (IS 808)	Mass (kg/m)
MC 200	22.3, 24.3
MC 250	30.6, 34.2, 38.1
MC 300	36.3, 41.5, 46.2
MC 350	42.7

IPE/NPB - Narrow Flange Parallel Beams

HE/WPB - Wide Flange Parallel Beams

UPN - Channel (U Section) as per DIN

MC - Indian Standard Medium Channel

\* Product Availability to be checked prior to order booking

# 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, 46.49
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.