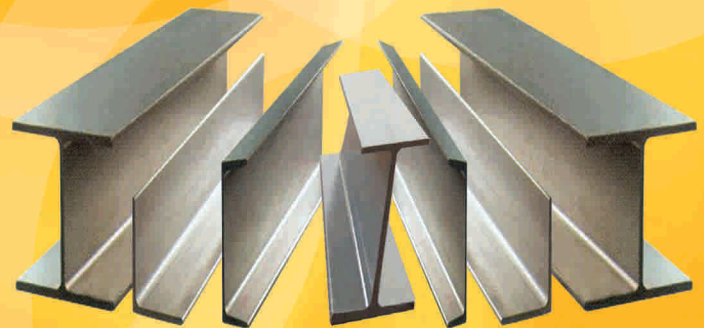




# **PARALLEL FLANGE BEAMS & STRUCTURAL**



---

*SAIL is India's largest steel maker. Its leading role in the Indian steel industry ensures availability of robust knowhow and expertise to produce a wide variety of prime steel products like Plates, Hot and Cold Rolled Sheets/Coils, Bars, Structural, Rails, Pipes, etc., for numerous applications.*

*SAIL has been producing Structural sections at its integrated steel plants at Durgapur, Bhilai and Burnpur since the 1960s. New, state-of-the-art Universal Section Mills, backed by high quality steel production facilities at Durgapur Steel Plant and IISCO Steel Plant provide the cutting edge to SAIL's Structural sections.*

*With the recent modernization, SAIL is now in a position to supply a wide range of Heavy and Medium Structural Sections, including Parallel Flange Beams that meet international standards of quality and stringent requirements of the infrastructure and construction industries.*

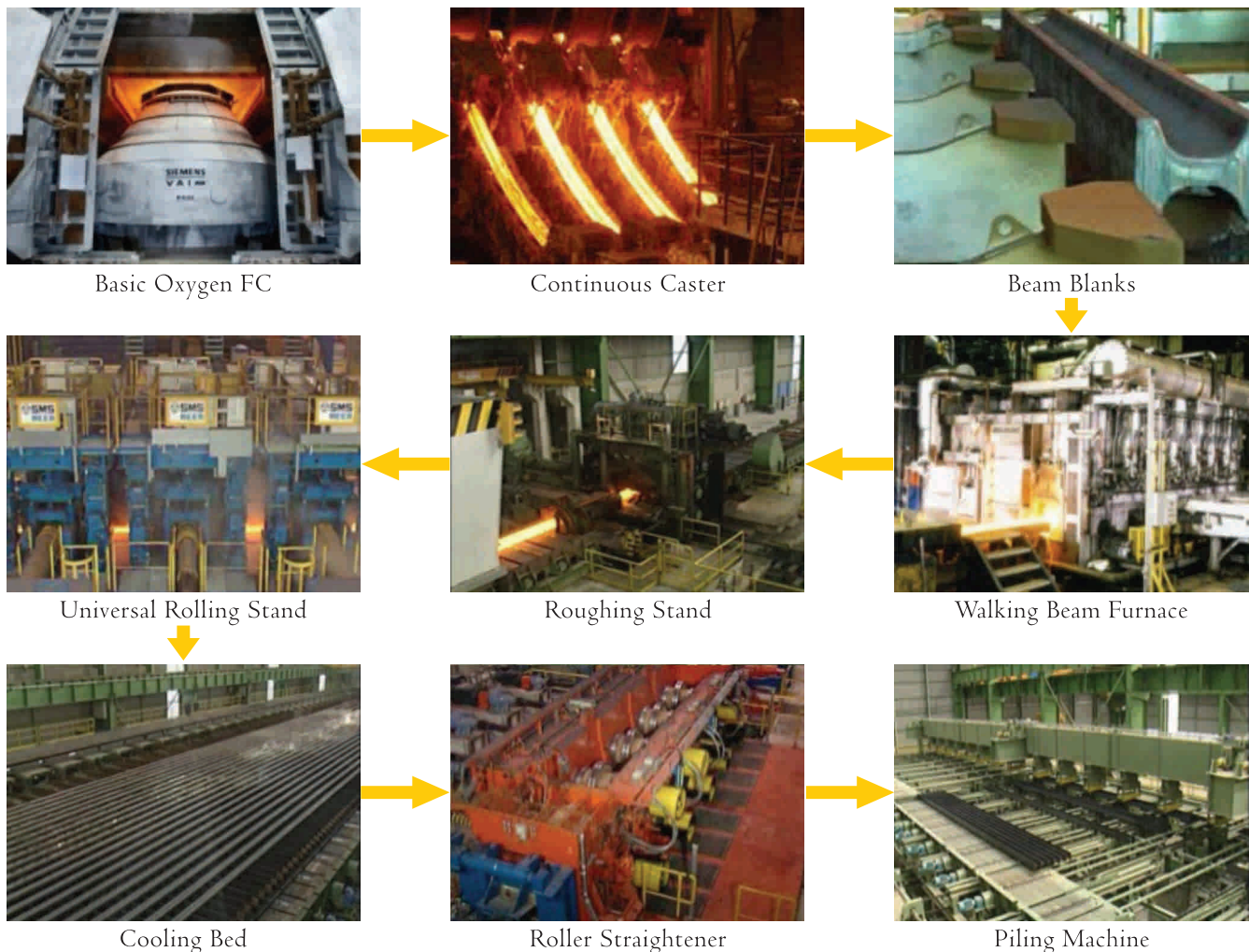
---



## PROCESS ROUTE

The steel is produced at fully integrated SAIL plants using iron ore from SAIL's own iron ore mines and processed through stringent quality control measures through continuous casting route. Special grades are produced with secondary refining facilities like **LF, VAD, VOD** etc. in Steel Melting Shop. These blooms/beam blanks produced with clean steel are charged into **Walking Beam Furnace** for reheating and soaking at required temperature before commencing rolling operation through **Universal Section Mill**. The steel blooms/beam blanks are converted into Parallel Flange Structural Sections (Wide/Narrow flange), passing through the state-of-the-art **SMS MEER and SIEMENS-SPA Universal Mills**.

### Process Layout



Reheated beam blanks/blooms are descaled using high pressure **Descaler** and passed through **Roughing Stand** and **Universal Stands**. While rolling through **Universal Stand** with **Hydraulic Gauge Controller**, precise shapes are produced by roughing, edging and finishing rolls.

**Online Measuring Gauge** ensures perfect profile and online straightening of the product with **Level-2 Automation**. Subsequently, products are cropped by **Hot Saw** and allowed to cool in the **Cooling Bed**. Final desired lengths are cut after straightening operation at horizontal **Roller Straightener**.

Products are neatly piled and packaged with **Automatic Strapping and Labeling Machine** before shipment.

## SPECIFICATION

Chemical Composition (Ladle analysis Maximum Weight %) IS 2062, 2011

Grade	Quality	C	Mn	S	P	Si	CE	Mode of Deoxidation
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
E 650*	A/BR	0.22	1.70	0.015	0.025	0.50	0.55	Semi-killed/killed

\* Can be produced on demand for sufficient quantities

- Micro-alloying elements like Nb, V and Ti may be added singly or in combination. Total micro-alloying element shall not be more than 0.25 wt.%
- Cr, Ni, Mo and B may be added under agreement between purchaser and manufacturer. Cr+Ni < 0.5 for E600; Cr+Ni < 0.6 for E650; Cu may be present between 0.20 and 0.35
- Carbon Equivalent (CE) =  $C + Mn/6 + (Cr+Mo+V)/5 + (Ni+Cu)/15$



SAIL Branded and other Customised grades can also be supplied viz.

**SEISMIC Resistant grade** as per IS 15962:2012 E250S, E300S, E350S, E400S

**SAILMA** 300, 300HI, 350, 350HI, 410, 410HI, 450, 450 HI

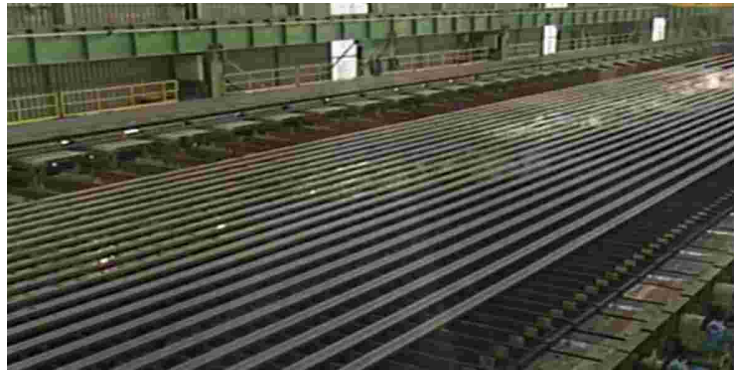
**Corrosion Resistant Steel** (HCRS – Cu P)

C : 0.15 max, Mn : 0.25 - 0.8, P: 0.07 - 0.15, S: 0.03 max, Cu: 0.20 min

Mechanical Properties IS 2062, 2011

Grade	Quality	Tensile Strength MPa min.	Yield Strength MPa, min.			Percentage Elongation GL=5.65A <sub>0</sub> min.	Internal Bend Diameter, max.	
			<20 mm	20-40 mm	>40 mm		<25 mm	>25 mm
E250	A, BR, B0, C	410	250	240	230	23	2t	3t
E275	A, BR, B0, C	430	275	265	255	22	2t	3t
E300	A, BR, B0, C	440	300	290	280	22	2t	-
E350	A, BR, B0, C	490	350	330	320	22	2t	-
E410	A, BR, B0, C	540	410	390	380	20	2t	-
E450*	A, BR	570	450	430	420	20	2.5t	-
E550*	A, BR	650	550	530	520	12	3t	-
E600*	A, BR	730	600	580	570	12	3.5t	-
E650*	A, BR	780	650	630	620	12	4t	-

\* Can be produced on demand for sufficient quantities



Product on Aerosol Cooling Bed

Mechanical Properties of SAILMA & HCRS Grade

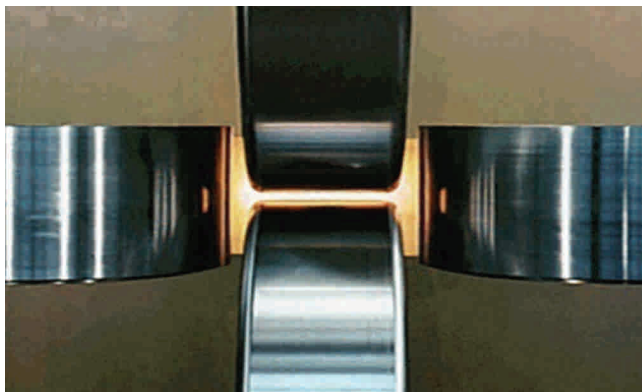
Grade	YS, MPa min	UTS, MPa min	% El min Std GL	Internal Bend Diameter (mm)		Charpy Impact Test	
				<25 mm	>25 mm	Temp °C	J, min
SAILMA 300	300	440	24	2t	-	-	-
SAILMA 300 HI	300	440	24	2t	-	0	40
SAILMA 350	350	490	24	2t	-	-	-
SAILMA 350 HI	350	490	24	2t	-	0 -20	40 30
SAILMA 410	410	540	22	2t	-	-	-
SAILMA 410 HI	410	540	22	2t	-	0 -20	35 25
SAILMA 450	450	570	22	2.5t	-	-	-
SAILMA 450 HI	450	570	22	2.5t	-	0 -20	30 20
HCRS	340	> 480	21	1t			

# PRODUCT RANGE\*

## DSP, Durgapur

Dimension IS 12778 (mm)		Mass (kg/m)
NPB	100x55	8.10
NPB	120x60	10.37
NPB	140x70	12.89
NPB	160x80	15.77
NPB	180x90	15.37, 18.80, 21.27
NPB	200x100	18.42, 22.36, 25.09
NPB	200x130	27.37, 31.55
NPB	200x150	30.45
NPB	200x165	35.68, 42.47, 48
NPB	220x110	22.18, 26.20, 29.35
NPB	240x120	26.15, 30.71, 34.31
NPB	250x125	30.11
NPB	250x150	34.08, 39.78, 40.48
NPB	250x175	43.94
NPB	270x135	30.73, 42.26
NPB	300x150	36.52, 42.24, 49.32
NPB	300x165	39.88, 45.76, 53.46
NPB	300x200	59.56, 66.75, 75.37

Dimension IS 808 (mm)		Mass (kg/m)
ISA	90X6,8,10,12	8.2,10.8,13.4,15.8
ISA	100X 6,8,10,12	9.2,12.1,14.9,17.7
ISA	110X8,10,12,16	13.4 , 16.6,19.7,25.7
ISA	130X8,10,12,16	15.9,19.7,23.5,30.7
ISA	150X10,12,16,20	22.9,27.3,35.8,44.1
ISA	200X12,16,20,25	36.8 ,48.5,60.0,73.9



Dimension IS 12778 (mm)		Mass (kg/m)
WPB	100x100	12.24, 16.67, 20.44, 41.79
WPB	120x120	14.56, 19.89, 26.69, 52.13
WPB	140x140	18.07, 24.66, 33.72, 63.24
WPB	150x150	22.96, 30.04, 36.98
WPB	160x160	23.83, 30.44, 42.59, 76.19

Dimension ASTM A6 (mm)		Mass (kg/m)
W	100x100	19.3
W	130x130	23.8, 28.1
W	150x150	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	125	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)  
 MB - Indian standard medium Beam,  
 MC - Indian standard medium channel,  
 ISA - Indian standard equal angles

\* Product Availability to be checked prior to order booking

# PRODUCT RANGE\*

ISP, Burnpur

WP Beam (IS 12778) Equivalent to HE (DIN 1025)	Mass (kg/m)
200 A	42.3
200 B	61.3
220 A	50.5
220 B	71.5
240 A	60.3
240 B	83.2
260 A	68.2
260 B	93
280 A	76.4
280 B	103
300 A	88.3
300 B	117
320 A	97.6
320 B	127
340 A	105
340 B	134
360 A	112
360 B	142
400 A	125
400 B	155
450 A	140
450 B	171

Sheet Piles (IS 2314)	Mass (kg/m)
ISPS 1625 U	65.4
ISPS 2222 U	82.7
ISPS 1021 Z	49.2
ISPS 1481 Z	63.8

NP Beam (IS 12778) Equivalent to IPE (DIN 1025)	Mass (kg/m)
240	30.7
270	36.1
300	42.2
330	49.1
360	57.1
400	66.3
450	77.6
500	90.7
550	106
600	122
750	137

Bulb Flats (IS 1252)	Mass (kg/m)
200x9	18.5
200x11.5	22.5
220x10	22.8
220x11.5	25.4
240x10	25.4
240x12	29.3
280x11	33.5
280x12	35.7
300x11	36.7
300x13	41.5
320x12	42.5
320x13	45
340x12	46.1
340x14	51.5

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

Channel (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

Angles (IS 808)	Mass (kg/m)
150X150X10	22.9
150X150X12	27.3
150X150X16	35.8
150X150X20	44.1
160X160X15	36.2
180X180X16	43.5
200X200X12	36.9
200X200X16	48.5
200X200X20	60
200X200X25	73.9

IPE / NPB - Narrow Flange Parallel Beams

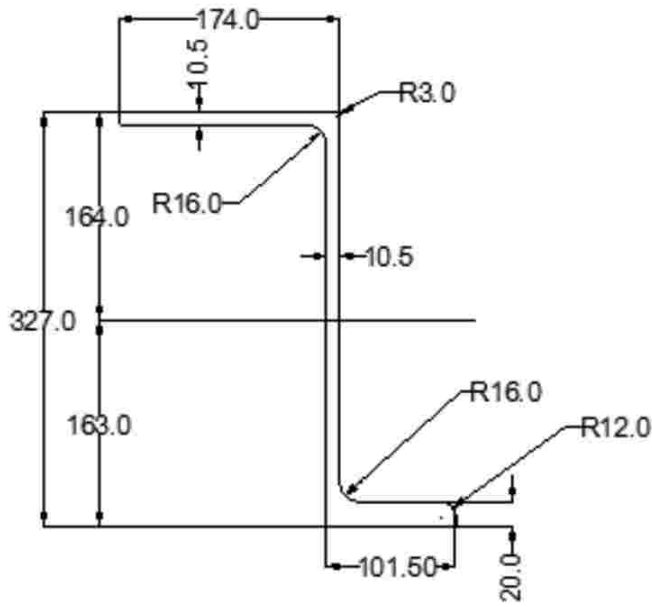
HE / WPB - Wide Flange Parallel Beams

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

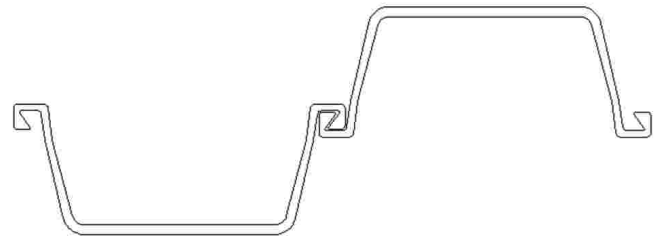
ISPS - Indian Standard Pile Section

\* Product Availability to be checked prior to order booking

## SPECIAL SECTIONS



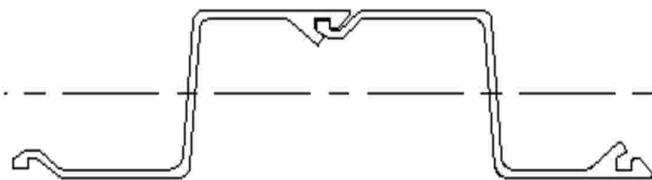
Z bar section



U pile section



Steel Retaining Wall



Z pile section

## FEATURES OF UNIVERSAL MILL

- Universal Mill can produce Parallel Flange Beams (Conventional I beams as well), other structural like Channel, Angle, Special sections like U/Z sheet piles, Bulb bars etc.
- Close dimensional control and Better surface finish achievable
- Ability to compensate the varying lateral spread and shrinkage behavior of different steel grades easily
- Beams of wider flange and thinner webs can be rolled

## PRODUCT ATTRIBUTES

### Parallel Flange Sections V/s Conventional Tapered Flange Section

- Higher axial load bearing capacity, section modulus and bending strength make parallel sections more efficient.
- Economical due to saving in weight
- More convenient to fabricate
- Easier connection joints
- Flexibility of using a wide range of flange width/thickness

### Parallel Flange Sections are also advantageous over Fabricated Sections by way of

- Better quality of finished product
- Residual stress (develops due to welding) are not added
- Reduced construction time
- Economical due to its simple production process
- Quality of fabricated beams are highly dependent on workmanship, welding quality



Bolted connection easier as tapered washers can be avoided



Splices inside makes structures aesthetically more appealing

### Weight Saving Using High Strength Steel

Parallel Flange Beam Section	Weight for 350 MPa (kg/m)	Plastic moment Mp (kNm)	Equivalent IS section	Weight for 250 MPa (kg/m)	Plastic moment (kNm)	Percentage weight saving
NPB 400x180x66.3	66.3	394	ISWB 450	79.4	397	16.5 %
NPB 450x190x77.6	77.6	517	ISWB 500	95.2	531	18.5 %
NPB 500x200x90.7	90.7	671	ISWB 550	112.5	691	19.4 %

Equivalent sections were found by comparing plastic moment capacities



3300 NO.15P-1224

H2  
PH.0  
GAME

H2

1207

SMS  
SIEMAG  
3400 gram

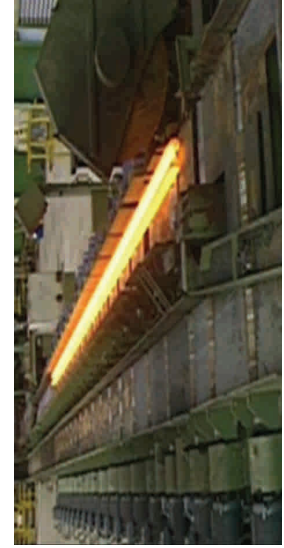
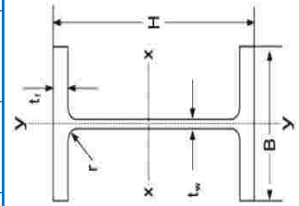
SMS  
SIEMAG  
3400 gram

सुरक्षा संकेतक के तहत  
"DOG HOUSE" के प्रयोग में न  
लानें।

# SECTIONAL PROPERTIES

Wide Parallel Flange Beams as per IS 12778 / (DIN 1025)

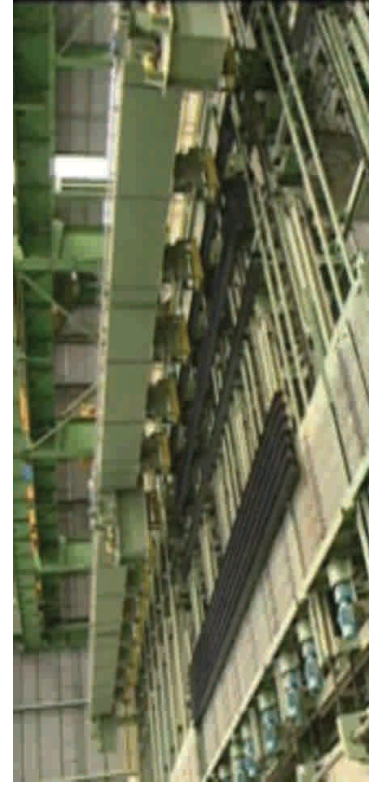
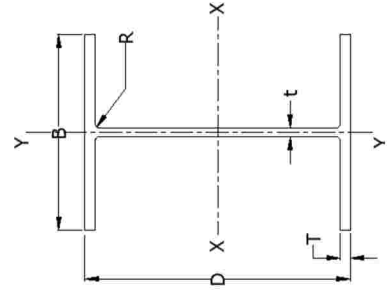
Beam (WPB)	Mass		Area		Dimensions				Sectional Properties								
	M	kg/m	A	cm <sup>2</sup>	Depth	Width	Web Thick	Flange Thick	Root Rad	Moment of Inertia		Radius of gyration		Section modulus		Plastic Section modulus	
										I <sub>x</sub>	I <sub>y</sub>	r <sub>x</sub>	r <sub>y</sub>	Z <sub>x</sub>	Z <sub>y</sub>	Z <sub>px</sub>	Z <sub>py</sub>
HE 200 A	42.26	53.84	190	200	6.5	10	18	3692.15	1335.51	8.28	4.98	388.65	133.55	429.52	203.83		
HE 200 B	61.30	78.09	200	200	9	15	18	5696.17	2003.37	8.54	5.07	569.62	200.34	642.58	305.82		
HE 220 A	50.51	64.35	210	220	7	11	18	5409.69	1954.56	9.17	5.51	515.21	177.69	568.50	270.61		
HE 220 B	71.47	91.05	220	220	9.5	16	18	8090.96	2843.26	9.43	5.59	735.54	258.48	827.09	393.89		
HE 240 A	60.32	76.84	230	240	7.5	12	21	7763.17	2768.81	10.05	6.00	675.06	230.73	744.68	351.71		
HE 240 B	83.20	105.99	240	240	10	17	21	11259.29	3922.66	10.31	6.08	938.27	326.89	1053.20	498.44		
HE 260 A	68.16	86.83	250	260	7.5	12.5	24	10454.94	3667.56	10.97	6.50	836.39	282.12	919.85	430.19		
HE 260 B	92.99	118.45	260	260	10	17.5	24	14919.41	5134.51	11.22	6.58	1147.65	394.96	1282.99	602.27		
HE 280 A	76.36	97.27	270	280	8	13	24	13673.28	4762.64	11.86	7.00	1012.84	340.19	1112.31	518.16		
HE 280 B	103.13	131.37	280	280	10.5	18	24	19270.25	6594.52	12.11	7.08	1376.45	471.04	1534.52	717.60		
HE 300 A	88.34	112.54	290	300	8.5	14	27	18263.47	6309.55	12.74	7.49	1259.55	420.64	1383.39	641.20		
HE 300 B	117.04	149.09	300	300	11	19	27	25165.65	8562.82	12.99	7.58	1677.71	570.85	1868.79	870.18		
HE 320 A	97.64	124.38	310	300	9	15.5	27	22928.56	6985.23	13.58	7.49	1479.26	465.68	1628.22	709.78		
HE 320 B	126.66	161.35	320	300	11.5	20.5	27	30823.51	9238.82	13.82	7.57	1926.47	615.92	2149.37	939.13		
HE 340 A	104.79	133.48	330	300	9.5	16.5	27	27693.07	7435.99	14.40	7.46	1678.37	495.73	1850.62	755.98		
HE 340 B	134.16	170.91	340	300	12	21.5	27	36656.36	9689.93	14.65	7.53	2156.26	646.00	2408.25	985.76		
HE 360 A	112.07	142.77	350	300	10	17.5	27	33089.75	7886.84	15.22	7.43	1890.84	525.79	2088.63	802.32		
HE 360 B	141.81	180.64	360	300	12.5	22.5	27	43193.42	10141.16	15.46	7.49	2399.63	676.08	2683.14	1032.53		
HE 400 A	124.81	158.99	390	300	11	19	27	45069.35	8563.82	16.84	7.34	2311.25	570.92	2561.97	872.90		
HE 400 B	155.26	197.79	400	300	13.5	24	27	57680.48	10819.03	17.08	7.40	2884.02	721.27	3231.91	1104.08		
HE 450 A	139.76	178.04	440	300	11.5	21	27	63721.58	9465.32	18.92	7.29	2896.44	631.02	3216.07	965.57		
HE 450 B	171.12	217.99	450	300	14	26	27	79887.52	11721.32	19.14	7.33	3550.56	781.42	3982.57	1197.70		



# SECTIONAL PROPERTIES

Wide Parallel Flange Beams as per IS 12778, 2004 / (DIN 1025)

Beam Designation ISWPB (Wide Flange)	Mass M kg/m	Area A cm <sup>2</sup>	Dimensions				Sectional Properties								
			Depth D mm	Width B mm	Web Thick t mm	Flange Thick T mm	Root Rad R mm	Moment of Inertia		Radius of Gyration		Section Modulus		Plastic Section Modulus	
								I <sub>x</sub> cm <sup>4</sup>	I <sub>y</sub> cm <sup>4</sup>	r <sub>x</sub> cm	r <sub>y</sub> cm	Z <sub>x</sub> cm <sup>3</sup>	Z <sub>y</sub> cm <sup>3</sup>	Z <sub>px</sub> cm <sup>3</sup>	Z <sub>py</sub> cm <sup>3</sup>
100x100	12.24	15.60	91	100	4.2	5.5	12	236.51	92.06	3.89	2.43	51.98	18.41	58.36	28.45
100x100	16.67	21.24	96	100	5	8	12	349.22	133.81	4.06	2.51	72.76	26.76	83.02	41.14
100x100	20.44	26.04	100	100	6	10	12	449.54	167.27	4.16	2.53	89.91	33.45	104.22	51.43
100x100	41.79	53.24	120	106	12	20	12	1142.61	399.15	4.63	2.74	190.44	75.31	235.82	116.32
120x120	14.57	18.55	109	120	4.2	5.5	12	413.36	158.81	4.72	2.93	75.85	26.47	84.13	40.63
120x120	19.89	25.34	114	120	5	8	12	606.15	230.90	4.89	3.02	106.34	38.48	119.50	58.86
120x120	26.70	34.01	120	120	6.5	11	12	864.37	317.52	5.04	3.06	144.06	52.92	165.22	80.97
120x120	52.13	66.41	140	126	12.5	21	12	2017.57	702.77	5.51	3.25	288.22	111.55	350.62	171.63
140x140	18.08	23.03	128	140	4.3	6	12	719.45	274.83	5.59	3.45	112.41	39.26	123.79	59.94
140x140	24.66	31.42	133	140	5.5	8.5	12	1033.13	389.32	5.73	3.52	155.36	55.62	173.51	84.85
140x140	33.72	42.96	140	140	7	12	12	1509.23	549.67	5.93	3.58	215.60	78.52	245.44	119.79
140x140	63.24	80.56	160	146	13	22	12	3291.36	1144.34	6.39	3.77	411.42	156.76	493.84	240.52
150x150	22.96	29.25	152	152	5.8	6.8	8	1243.48	398.36	6.52	3.69	163.62	52.42	181.56	79.98
150x150	30.11	38.36	158	153	6.5	9.4	8	1761.41	561.58	6.78	3.83	222.96	73.41	248.94	111.77
150x150	36.97	47.09	162	154	8	11.5	8	2213.83	700.81	6.86	3.86	273.31	91.01	308.90	138.91
160x160	23.84	30.37	148	160	4.5	7	15	1282.88	478.73	6.50	3.97	173.36	59.84	190.43	91.37
160x160	30.44	38.78	152	160	6	9	15	1672.97	615.57	6.57	3.98	220.13	76.95	245.17	117.64
160x160	42.59	54.26	160	160	8	13	15	2492.00	889.23	6.78	4.05	311.50	111.15	353.98	169.97
160x160	76.19	97.06	180	166	14	23	15	5098.26	1758.77	7.25	4.26	566.47	211.90	674.58	325.47



# SECTIONAL PROPERTIES

Narrow Parallel Flange Beams as per IS 12778, 2004 / (DIN 1025)

Beam Designation ISNPB	Mass M kg/m	Area A cm <sup>2</sup>	Dimensions				Sectional Properties								
			Depth D mm	Width B mm	Web Thick t mm	Flange Thick T mm	Root Rad R mm	Moment of Inertia		Radius of Gyration		Section Modulus		Plastic Section Modulus	
								I <sub>x</sub> cm <sup>4</sup>	I <sub>y</sub> cm <sup>4</sup>	r <sub>x</sub> cm	r <sub>y</sub> cm	Z <sub>x</sub> cm <sup>3</sup>	Z <sub>y</sub> cm <sup>3</sup>	Z <sub>px</sub> cm <sup>3</sup>	Z <sub>py</sub> cm <sup>3</sup>
100X55	8.10	10.32	100	55	4.1	5.7	7	171.01	15.92	4.07	1.24	34.20	5.79	39.41	9.15
120X60	10.37	13.21	120	64	4.4	6.3	7	317.75	27.67	4.90	1.45	52.96	8.65	60.73	13.58
140X70	12.90	16.43	140	73	4.7	6.9	7	541.22	44.92	5.74	1.65	77.32	12.31	88.35	19.25
160X80	15.77	20.09	160	82	5	7.4	9	869.29	68.31	6.58	1.84	108.66	16.66	123.87	26.10
180X90	15.37	19.58	177	91	4.3	6.5	9	1062.74	81.89	7.37	2.05	120.08	18.00	135.34	27.96
180X90	18.80	23.95	180	91	5.3	8	9	1316.96	100.85	7.42	2.05	146.33	22.16	166.42	34.60
180X90	21.27	27.10	182	92	6	9	9	1505.23	117.29	7.45	2.08	165.41	25.50	189.16	39.91
200X100	18.43	23.47	197	100	4.5	7	12	1591.47	117.17	8.23	2.23	161.57	23.43	181.67	36.54
200X100	22.36	28.49	200	100	5.6	8.5	12	1943.17	142.37	8.26	2.24	194.32	28.47	220.66	44.62
200X100	25.09	31.96	202	102	6.2	9.5	12	2211.05	168.86	8.32	2.30	218.92	33.11	249.44	51.90
200X130	27.37	34.87	207	133	5.8	8.5	12	2665.50	334.05	8.74	3.10	257.54	50.23	288.18	77.47
200X130	31.56	40.20	210	134	6.4	10	12	3153.46	401.92	8.86	3.16	300.33	59.99	337.19	92.46
200X150	30.46	38.80	194	150	6	9	12	2674.64	507.03	8.30	3.62	275.74	67.60	306.78	103.54
200X165	35.69	45.46	201	165	6.2	10	12	3414.20	749.52	8.67	4.06	339.72	90.85	376.80	138.58
200X165	42.48	54.11	205	166	7.2	12	12	4165.96	915.97	8.77	4.11	406.43	110.36	454.30	168.46
200X165	48.00	61.14	210	166	6.5	14.5	12	5024.83	1106.37	9.07	4.25	478.56	133.30	534.68	202.43
220X110	22.18	28.26	217	110	5	7.7	12	2316.51	171.42	9.05	2.46	213.50	31.17	240.23	48.49
220X110	26.20	33.37	220	110	5.9	9.2	12	2771.84	204.89	9.11	2.48	251.99	37.25	285.43	58.11
220X110	29.35	37.39	222	112	6.6	10.2	12	3134.05	239.83	9.16	2.53	282.35	42.83	321.17	66.91
240X120	26.15	33.32	237	120	5.2	8.3	15	3290.46	240.13	9.94	2.68	277.68	40.02	311.61	62.41
240X120	30.71	39.12	240	120	6.2	9.8	15	3891.62	283.63	9.97	2.69	324.30	47.27	366.68	73.93
240X120	34.32	43.72	242	122	7	10.8	15	4369.26	328.54	10.00	2.74	361.10	53.86	410.31	84.40

# SECTIONAL PROPERTIES

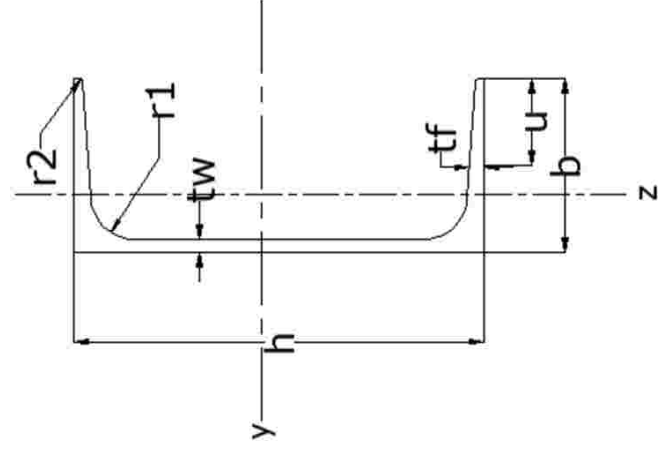
Narrow Parallel Flange Beams as per IS 12778 / (DIN 1025)

Beam Designation ISNFB	Mass		Dimensions				Sectional Properties								
	M kg/m	A cm <sup>2</sup>	Depth D mm	Width B mm	Web Thick t mm	Flange Thick T mm	Root Rad R mm	Moment of Inertia		Radius of Gyration		Section Modulus		Plastic Section Modulus	
								I <sub>x</sub> cm <sup>4</sup>	I <sub>y</sub> cm <sup>4</sup>	r <sub>x</sub> cm	r <sub>y</sub> cm	Z <sub>x</sub> cm <sup>3</sup>	Z <sub>y</sub> cm <sup>3</sup>	Z <sub>px</sub> cm <sup>3</sup>	Z <sub>py</sub> cm <sup>3</sup>
250X125	30.11	38.36	250	125	6	9	15	4138.18	294.32	10.39	2.77	331.05	47.09	373.65	73.63
250X150	34.08	43.41	258	146	6.1	9.2	15	5120.46	478.59	10.86	3.32	396.94	65.56	444.26	101.53
250X150	39.78	50.68	262	147	6.6	11.2	15	6200.00	594.53	11.06	3.43	473.28	80.89	530.17	124.91
250X150	46.49	59.22	266	148	7.6	13.2	15	7381.40	715.21	11.16	3.48	554.99	96.65	625.47	149.41
250X175	43.94	55.98	244	175	7	11	15	6091.39	984.25	10.43	4.19	499.29	112.49	555.60	172.49
270X135	30.74	39.15	267	135	5.5	8.7	15	4917.29	357.97	11.21	3.02	368.34	53.03	412.53	82.35
270X135	36.07	45.95	270	135	6.6	10.2	15	5789.78	419.87	11.23	3.02	428.87	62.20	484.04	96.96
270X135	42.26	53.84	274	136	7.5	12.2	15	6947.04	513.48	11.36	3.09	507.08	75.51	574.69	117.71
300X150	36.53	46.53	297	150	6.1	9.2	15	7173.49	518.97	12.42	3.34	483.06	69.20	541.83	107.33
300X150	42.25	53.82	300	150	7.1	10.7	15	8356.10	603.78	12.46	3.35	557.07	80.50	628.40	125.23
300X150	49.32	62.83	304	152	8	12.7	15	9994.20	745.72	12.61	3.45	657.51	98.12	743.86	152.59
300X165	39.88	50.80	310	165	5.8	9.7	15	8794.62	727.61	13.16	3.78	567.40	88.19	630.54	135.70
300X165	45.76	58.30	313	166	6.6	11.2	15	10210.04	855.57	13.23	3.83	652.40	103.08	727.91	158.77
300X165	53.47	68.11	317	167	7.6	13.2	15	12122.66	1026.84	13.34	3.88	764.84	122.98	857.61	189.65
300X200	59.57	75.88	303	203	7.5	13.1	15	12860.15	1828.55	13.02	4.91	848.85	180.15	940.72	275.19
300X200	66.75	85.03	306	204	8.5	14.6	15	14510.60	2068.50	13.06	4.93	948.41	202.79	1056.85	310.27
300X200	75.37	96.01	310	205	9.4	16.6	15	16676.44	2386.84	13.18	4.99	1075.90	232.86	1204.62	356.48
330X160	49.15	62.61	330	160	7.5	11.5	18	11766.89	788.14	13.71	3.55	713.15	98.52	804.40	153.69
350X170	57.10	72.73	360	170	8	12.7	18	16265.62	1043.45	14.95	3.79	903.65	122.76	1019.22	191.11
400X180	66.31	84.47	400	180	8.6	13.5	21	23128.35	1317.82	16.55	3.95	1156.42	146.42	1307.26	229.02
450X190	77.58	98.83	450	190	9.4	14.6	21	33742.91	1675.86	18.48	4.12	1499.69	176.41	1701.93	276.40
500X200	90.69	115.53	500	200	10.2	16	21	48198.50	2141.68	20.43	4.31	1927.94	214.17	2194.27	335.90
550X210	105.52	134.43	550	210	11.1	17.2	24	67116.46	2667.58	22.34	4.45	2440.60	254.06	2787.22	400.56
600X220	122.45	155.99	600	220	12	19	24	92083.40	3387.34	24.30	4.66	3069.45	307.94	3512.64	485.68
750X270	174.54	222.34	760	270	14.4	21.6	17	206350.6	7106.97	30.46	5.65	5430.28	526.44	6244.16	827.22

# SECTIONAL PROPERTIES

Channels UPN as per DIN 1026-1

Dimensions	Dimensions										slope	Area	Mass	axis y-y					axis z-z				
	h	b	t <sub>w</sub>	t <sub>f</sub>	r <sub>1</sub>	r <sub>2</sub>	u	slope		A				G	I <sub>y</sub>	W <sub>el,y</sub>	W <sub>pl,y</sub>	i <sub>y</sub>	A <sub>yz</sub>	I <sub>z</sub>	W <sub>el,z</sub>	W <sub>pl,z</sub>	i <sub>z</sub>
	mm	mm	mm	mm	mm	mm	mm	%	mm <sup>2</sup>	kg/m				mm <sup>4</sup> ×10 <sup>4</sup>	mm <sup>3</sup> ×10 <sup>3</sup>	mm <sup>3</sup> ×10 <sup>3</sup>	mm	mm <sup>2</sup>	mm <sup>4</sup> ×10 <sup>4</sup>	mm <sup>3</sup> ×10 <sup>3</sup>	mm <sup>3</sup> ×10 <sup>3</sup>	mm	
UPN 200	200	75	8.5	11.5	11.5	6	37.5	8	3220	25.3	1910	191	228	77	1771	148	27	51.8	21.4				
UPN 220	220	80	9	12.5	12.5	6.5	40	8	3740	29.4	2690	245	292	84.8	2062	197	33.6	64.1	23				
UPN 240	240	85	9.5	13	13	6.5	42.5	8	4230	33.2	3600	300	358	92.2	2371	248	39.6	75.7	24.2				
UPN 260	260	90	10	14	14	7	45	8	4830	37.9	4820	371	442	99.9	2712	317	47.7	91.6	25.6				
UPN 280	280	95	10	15	15	7.5	47.5	8	5330	41.8	6280	448	532	109	2928	399	57.2	109	27.4				
UPN 300	300	100	10	16	16	8	50	8	5880	46.2	8030	535	632	117	3177	495	67.8	130	29				
UPN 320	320	100	14	17.5	17.5	8.75	43	5	7580	59.5	10870	679	826	121	4711	597	80.6	152	28.1				
UPN 350	350	100	14	16	16	8	43	5	7730	60.6	12840	734	918	129	5084	570	75	143	27.2				
UPN 400	400	110	14	18	18	9	48	5	9150	71.8	20350	1020	1240	149	5855	846	102	190	30.4				

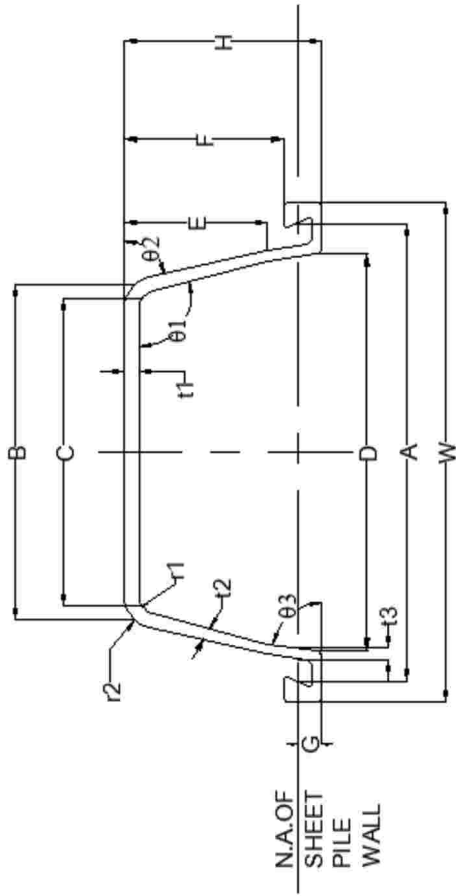


# SECTIONAL PROPERTIES

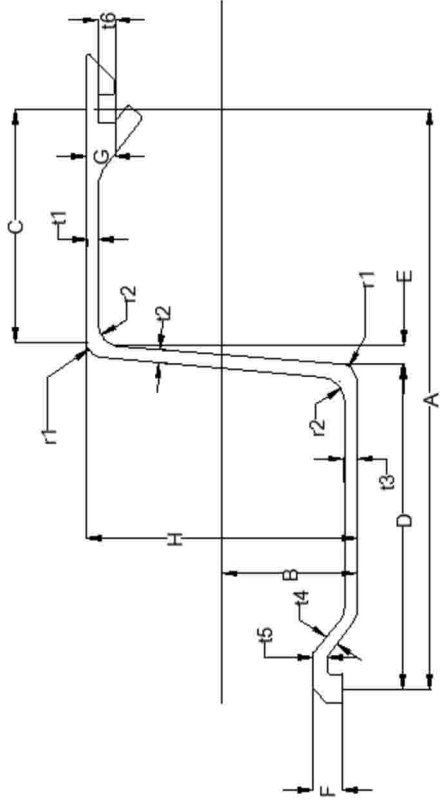
Other parallel flange sections

	Mass	Area	Dimensions				Geometrical Properties								
			Depth	Width	Web Thick	Flange Thick	Root Rad	Moment of Inertia		Radius of gyration		Section modulus		Plastic Section modulus	
								l <sub>x</sub>	l <sub>y</sub>	r <sub>x</sub>	r <sub>y</sub>	Z <sub>x</sub>	Z <sub>y</sub>		Z <sub>px</sub>
	M	A	D	B	t	T	R	cm <sup>4</sup>	cm <sup>4</sup>	cm	cm	cm <sup>3</sup>	cm <sup>3</sup>	cm <sup>3</sup>	cm <sup>3</sup>
IPM 350	57.23	72.91	350	170	8	13	18	15517.51	1067.97	14.59	3.83	886.71	125.64	998.73	195.28
IPW 300	57.20	72.87	300	200	8	12	18	11860.23	1603.28	12.76	4.69	790.68	160.33	880.88	246.66
IPW 350	80.40	102.42	350	250	9	14	20	23113.99	3651.03	15.02	5.97	1320.80	292.08	1463.13	447.12
IPW 400	107.52	136.96	400	300	10	16	22	40896.09	7207.85	17.28	7.25	2044.80	480.52	2256.29	733.34
IPW 450	124.42	158.49	450	300	11	18	24	58933.40	8111.42	19.28	7.15	2619.26	540.76	2904.01	827.92

	Mass	Area	Dimensions				Geometrical Properties								
			Depth	Width	Web Thick	Flange Thick	Root Rad	Moment of Inertia		Radius of gyration		Section modulus		Plastic Section modulus	
								l <sub>x</sub>	l <sub>y</sub>	r <sub>x</sub>	r <sub>y</sub>	Z <sub>x</sub>	Z <sub>y</sub>		Z <sub>px</sub>
	M	A	D	B	t	T	R	cm <sup>4</sup>	cm <sup>4</sup>	cm	cm	cm <sup>3</sup>	cm <sup>3</sup>	cm <sup>3</sup>	cm <sup>3</sup>
HEM 200	103.06	131.29	220	206	15	25	18	10641.90	3651.21	9.00	5.27	967.45	354.49	1135.18	543.23
HEM 220	117.32	149.45	240	226	15.5	26	18	14604.83	5012.05	9.89	5.79	1217.07	443.54	1419.49	678.57
HEM 240	156.68	199.59	270	248	18	32	21	24289.49	8152.62	11.03	6.39	1799.22	657.47	2117.00	1005.95
HEM 260	172.43	219.65	290	268	18	32.5	24	31306.84	10448.58	11.94	6.90	2159.09	779.74	2523.69	1192.50



U - TYPE PILING SECTIONS



Z - TYPE PILING SECTIONS

NOMINAL DIMENSIONS OF U - TYPE PILING SECTIONS

Designation	W	H	A	B	C	D	E	F	G	t <sub>1</sub>	t <sub>2</sub>	t <sub>3</sub>	t <sub>4</sub>	t <sub>5</sub>	t <sub>6</sub>	r <sub>1</sub>	r <sub>2</sub>
ISPS 1625 U	437	172	402.5	295.7	275.8	347.5	124.5	139.2	20.9	13	9	8.2	105	77	82.5	17	28
ISPS 2222 U	458	194.5	420	304	282	364.5	147.2	161	21.8	14	9.5	8.5	105	77	82.5	28	35

NOMINAL DIMENSIONS OF Z - TYPE PILING SECTIONS

Designation	H	A	B	C	D	E	F	G	t <sub>1</sub>	t <sub>2</sub>	t <sub>3</sub>	t <sub>4</sub>	t <sub>5</sub>	t <sub>6</sub>	r <sub>1</sub>	r <sub>2</sub>
ISPS 1021 Z	185	400	92.5	165	221	14	20	20	8.5	7.5	8.5	9.5	9.5	9.5	12	16
ISPS 1481 Z	210	400	105	165	220	15	23	23	11.5	8.5	11.5	12.5	12.5	12.5	14	18

All dimensions are in millimeter

Designation		Dimensions				Weight (kg/m)	Static Parameters		
		Depth (mm)	Width (mm)	Web Thickness (mm)	Sectional Area (cm <sup>2</sup> )		Moment of Inertia		Section Modulus
Metric	(mm x mm x kg/m)					I <sub>x</sub> (cm <sup>4</sup> )	I <sub>y</sub> (cm <sup>4</sup> )	W <sub>x</sub> (cm <sup>3</sup> )	W <sub>y</sub> (cm <sup>3</sup> )
W 100 x 100 x 19.3	106	103	7.1	24.7	19.3	475.9	160.6	89.9	31.2
W 130 x 130 x 23.8	127	127	6.1	30.4	23.8	885.5	311	139.5	49
W 130 x 130 x 28.1	131	128	6.9	35.9	28.1	1099	381.4	167.7	59.6
W 150 x 100 x 13.0	148	100	4.3	16.3	13	622.8	83.0	83.2	16.7
W 150 x 100 x 13.5	150	100	4.3	17.3	13.5	685.5	91.8	91.4	18.4
W 150 x 100 x 18.0	153	102	5.8	22.9	18	915.9	125.9	122.1	25.4
W 150 x 100 x 24.0	160	102	6.6	30.6	24	1342	182.6	167.8	35.8
W 150 x 150 x 22.5	152	152	5.8	28.6	22.5	1206	386.6	158.6	50.9
W 150 x 150 x 29.8	157	153	6.6	37.9	29.8	1714	555.5	218.4	72.6

## DELIVERY CONDITION

Standard Length	12 m (-0/+50mm); Customised length on mutual agreement
Dimension	As per IS:12778/ IS:808
Tolerances	As per IS:12779/ IS:1852
Packing	Bundles of 2T to 10T,
Test Certificate	As per grade, size and cast number
Branding/ Marking	On Product Body/ Tag

## CONTACT

For commercial information

**Central Marketing Organisation, SAIL  
Northern Region**  
Regional Manager  
17th Floor, North Tower  
Scope Minar Distt. Centre  
Laxmi Nagar- 110092  
Phone: 011-22441825/ 22421701  
Fax : 011-2244595

**Central Marketing Organisation, SAIL  
Western Region**  
Regional Manager  
The Metropolitan, 8th & 9th Floor,  
Bandra Kurla Complex, Bandra (E)  
Mumbai - 400051  
Phone: 022-26572788, 26571836  
Fax : 022-26571996

**Central Marketing Organisation, SAIL  
Eastern Region**  
Regional Manager  
42C, Jawaharlal Nehru Road,  
Kolkata – 700 071  
Phone: 033 – 22880634, 22888608  
Fax: 033 – 22880519

**Central Marketing Organisation, SAIL  
Southern Region**  
Regional Manager, Ispat Bhawan  
5, Kodambakkam, High Road,  
Chennai – 600034  
Phone: 044-28257164, 28274105  
Fax : 044-28271602

For further technical clarification

Application Engineering Centre  
R&D Centre for Iron and Steel  
Ispat Bhawan, Ranchi – 834002  
Phone: 0651 – 2411148  
Fax: 0651 – 2410503  
E-mail: aec@sail-rdcis.com

Central Marketing Organisation  
Application Engineering Group  
Ispat Bhawan 40, Jawaharlal Nehru Road,  
Kolkata – 700 071  
Phone: 033 – 2288 3810/12/14/17/17/18/  
22884023  
Fax: 033 – 2288 6183  
E-mail: aehq@sail-steel.com



स्टील अथॉरिटी ऑफ इण्डिया लिमिटेड  
STEEL AUTHORITY OF INDIA LIMITED  
केन्द्रीय विपणन संगठन  
CENTRAL MARKETING ORGANISATION