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PARALLEL FLANGE BEAMS & STRUCTURALS



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, Structurals, 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.

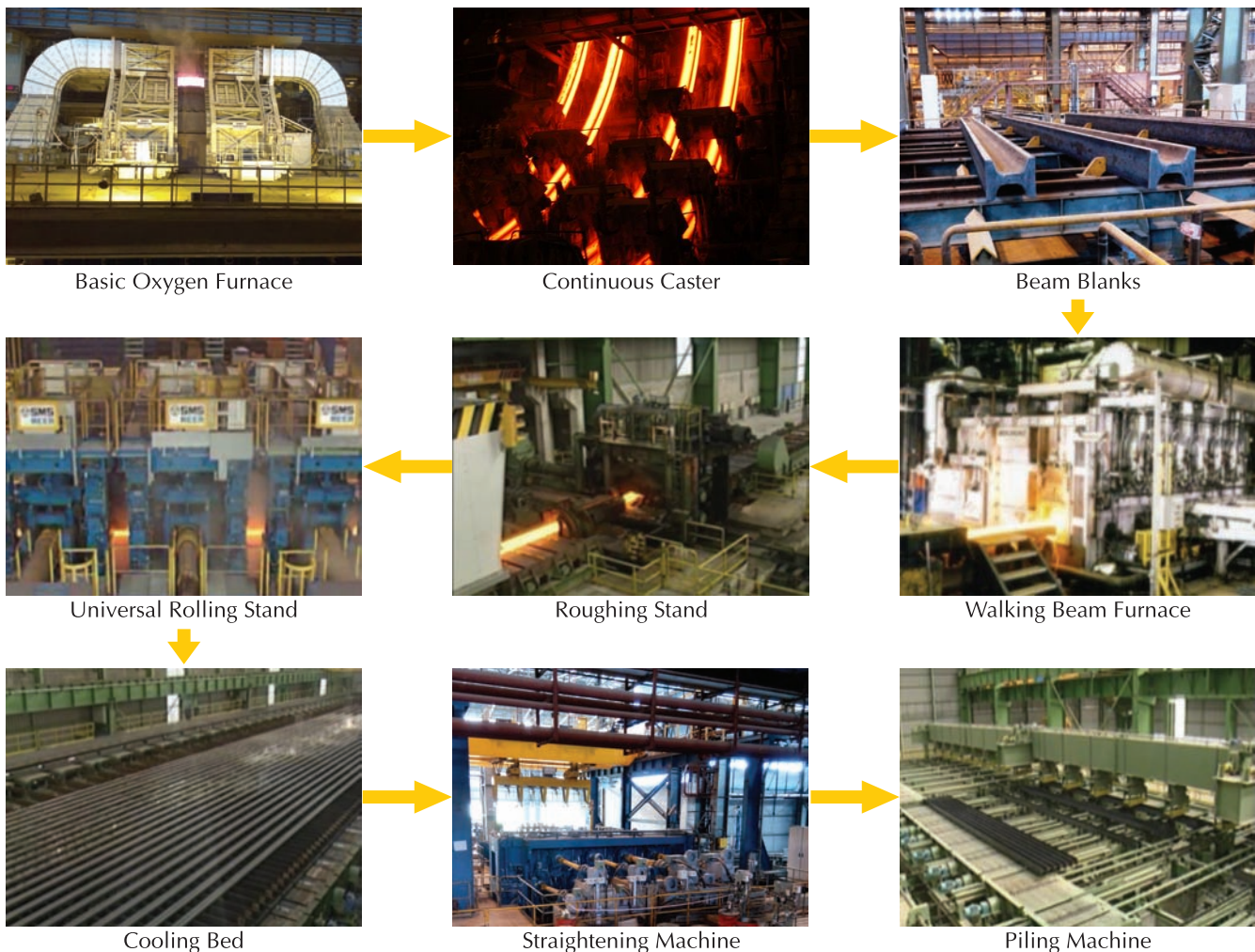
With the recent modernization, SAIL is now in a position to supply a wide range of Heavy and Medium Structural Sections, including Parallel Flange Beams that meet international standards of quality and stringent requirements of the infrastructure and construction industries.



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, RHOB** 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 Universal Mills** supplied by **SMS MEER and SIEMENS-SPA**.

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 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

* SAILMA is registered Brand name of SAIL



Mechanical Properties IS 2062, 2011

Grade	Quality	Tensile Strength MPa min.	Yield Strength MPa, min.			Percentage Elongation GL=5.65A ₀ 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

Beams (IS 12778)		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, 46.48
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

Angles (IS 808)		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



Beams (IS 12778)		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

Beams (ASTM A6)		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

Channels (IS 808)		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

Beams (IS 808)		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

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

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

IPE / NPB - Narrow Flange Parallel Beams

HE / WPB - Wide Flange Parallel Beams

UPN - Channel (U Section) as per DIN

MC - Indian Standard Medium Channel

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

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

* Product Availability to be checked prior to order booking

PRODUCT RANGE*

ISP Burnpur

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

Bulb Flats (GOST 21937)	Mass (kg/m)
P20a	21.47
P20b	24.60
P22a	25.75
P22b	29.20
P24a	30.42
P24b	34.18

Bulb Flats (IS 1863)	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

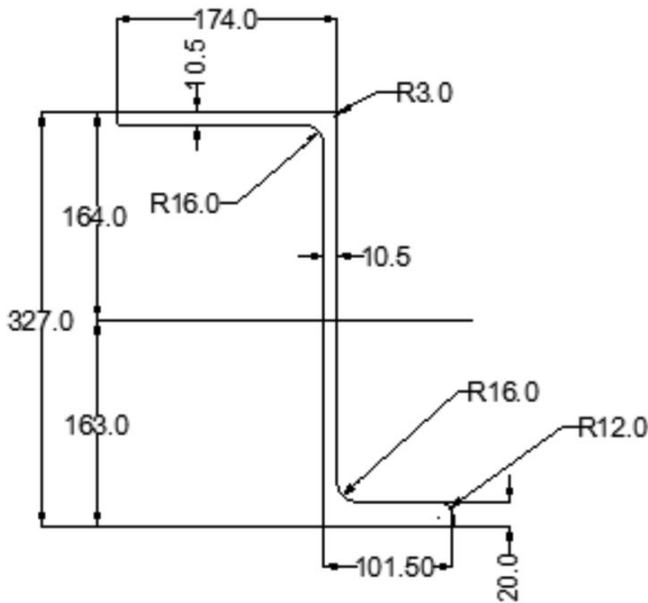


Bulb Flats

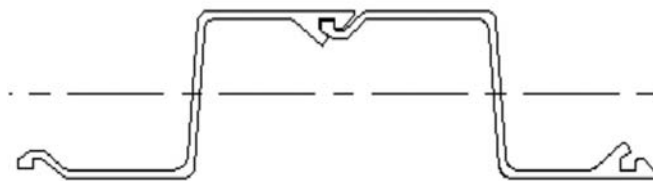
ISPS - Indian Standard Pile Section

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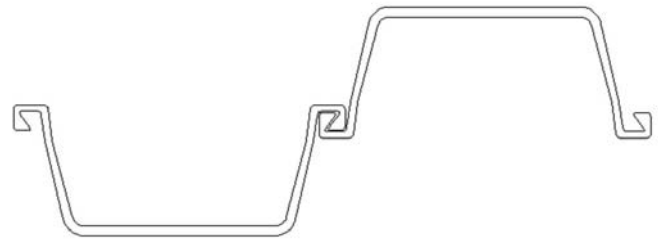
SPECIAL SECTIONS



Z bar section



Z pile section



U pile section



Steel Retaining Wall



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

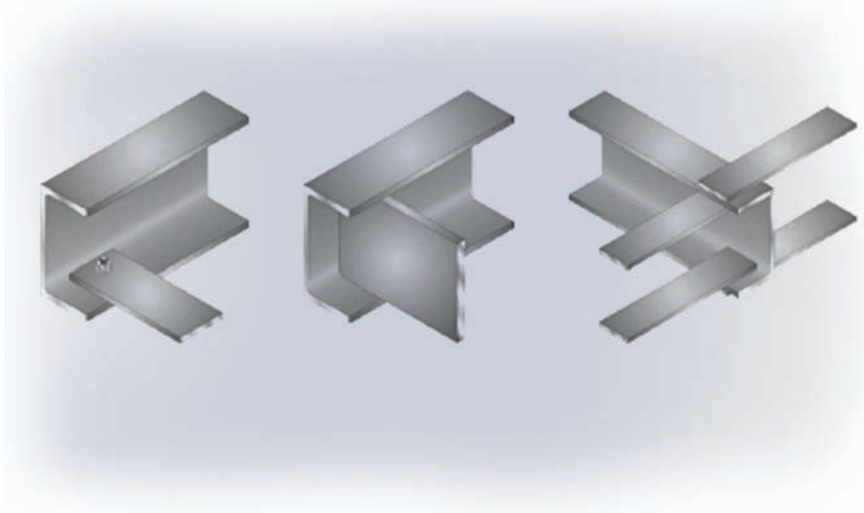
PRODUCT ATTRIBUTES

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



Splices inside makes structures aesthetically more appealing



Bolted connection easier as tapered washers can be avoided

Weight Saving Using High Strength Steel

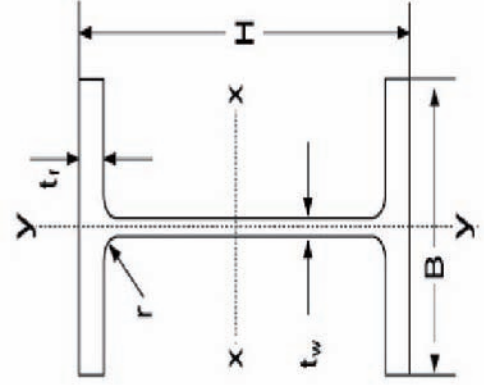
Parallel Flange Beam Section	Weight for 350 MPa (kg/m)	Plastic moment Mp (kNm)	Equivalent IS section	Weight for 250 MPa (kg/m)	Plastic moment (kNm)	Percentage weight saving
NPB 400x180x66.3	66.3	394	ISWB 450	79.4	397	16.5 %
NPB 450x190x77.6	77.6	517	ISWB 500	95.2	531	18.5 %
NPB 500x200x90.7	90.7	671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

Equivalent sections were found by comparing plastic moment capacities

SECTIONAL PROPERTIES

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

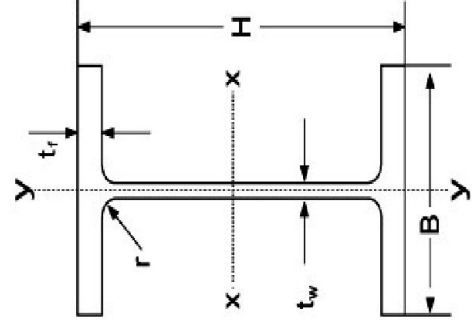
Beam (NPB)	Mass		Dimensions				Sectional Properties								
	M	A	Depth	Width	Web Thick	Flange Thick	Root Rad	Moment of Inertia		Radius of Gyration		Section Modulus		Plastic Section Modulus	
								I_x	I_y	r_x	r_y	Z_x	Z_y	Z_{px}	Z_{py}
kg/m	cm ²	mm	mm	mm	mm	mm	cm ⁴	cm ⁴	cm	cm	cm ³	cm ³	cm ³	cm ³	cm ³
NPB 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
NPB 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
NPB 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
NPB 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
NPB 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
NPB 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
NPB 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
NPB 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
NPB 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
NPB 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
NPB 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
NPB 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
NPB 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
NPB 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
NPB 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
NPB 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



SECTIONAL PROPERTIES

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

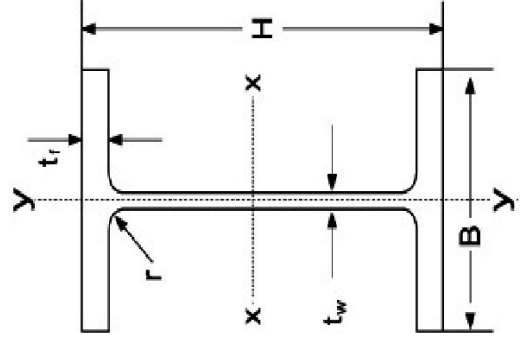
Beam (NPB)	Mass kg/m	Area cm ²	Dimensions				Sectional Properties									
			Depth H mm	Width B mm	Web Thick t _w mm	Flange Thick t _f mm	Root Rad r mm	Moment of Inertia		Radius of Gyration		Section Modulus		Plastic Section Modulus		
								I _x cm ⁴	I _y cm ⁴	r _x cm	r _y cm	Z _x cm ³	Z _y cm ³	Z _{px} cm ³	Z _{py} cm ³	
NPB 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	
NPB 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	
NPB 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	
NPB 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	
NPB 240X120 (IPE 240)	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	
NPB 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	
NPB 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	
NPB 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	
NPB 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	
NPB 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	
NPB 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	
NPB 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	
NPB 270X135 (IPE 270)	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	
NPB 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	



SECTIONAL PROPERTIES

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

Beam (NPB)	Mass		Area		Dimensions			Sectional Properties									
	M	kg/m	A	cm ²	Depth	H	mm	Moment of Inertia		Radius of Gyration		Section Modulus		Plastic Section Modulus			
								I _x	I _y	r _x	r _y	Z _x	Z _y	Z _{px}	Z _{py}		
NPB 300X150 (IPE 300)	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
NPB 300X150 (IPE 300)	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
NPB 300X150 (IPE 300)	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
NPB 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
NPB 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
NPB 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
NPB 350X250	79.18		100.87		340	250	9	14	18	21530.29	3650.06	14.61	6.02	1266.49	292.01	1402.36	446.20
NPB 400X180 (IPE 400)	57.38		73.10		397	180	7	12	21	20292.57	1170.59	16.66	4.00	1022.30	130.07	1144.02	202.09
NPB 400X180 (IPE 400)	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
NPB 400X180 (IPE 400)	75.66		96.39		404	182	9.7	15.5	21	26747.02	1564.25	16.66	4.03	1324.11	171.90	1502.29	269.11



SECTIONAL PROPERTIES

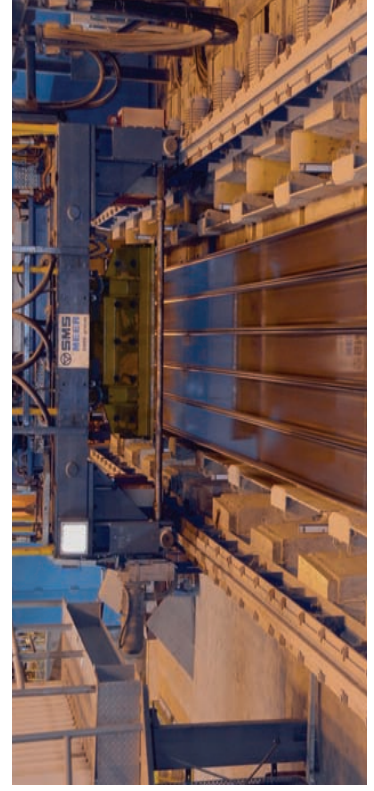
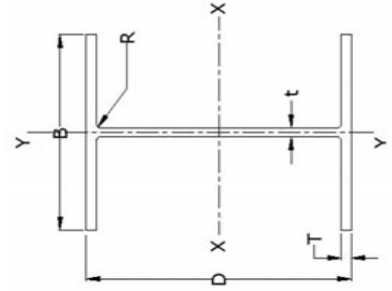
Narrow Parallel Flange Beams as per IS 12778 / (DIN 1025)

Beam (NPB)	Mass kg/m	Area cm ²	Dimensions				Sectional Properties								
			Depth H mm	Width B mm	Web Thick t _w mm	Flange Thick t _f mm	Root Rad r mm	Moment of Inertia		Radius of Gyration		Section Modulus		Plastic Section Modulus	
								I _x cm ⁴	I _y cm ⁴	r _x cm	r _y cm	Z _x cm ³	Z _y cm ³	Z _{px} cm ³	Z _{py} cm ³
NPB 400X200	67.28	85.71	400	200	8	13	21	24223.63	1738.37	16.81	4.50	1211.18	173.84	1355.08	269.29
NPB 450X190 (IPE 450)	67.15	85.55	447	190	7.6	13.1	21	29758.80	1502.40	18.65	4.19	1331.49	158.15	1494.42	245.76
NPB 450X190 (IPE 450)	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
NPB 450X190 (IPE 450)	92.36	117.66	456	192	11	17.6	21	40923.40	2085.36	18.65	4.21	1794.89	217.23	2046.40	341.01
NPB 500X200 (IPE 500)	79.36	101.10	497	200	8.4	14.5	21	42933.41	1939.22	20.61	4.38	1727.70	193.92	1946.16	301.64
NPB 500X200 (IPE 500)	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
NPB 500X200 (IPE 500)	107.31	136.71	506	202	12	19	21	57777.26	2621.75	20.56	4.38	2283.69	259.58	2613.13	408.55
NPB 550X210 (IPE 550)	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
NPB 600X220 (IPE 600)	107.56	137.03	597	220	9.8	17.5	24	82918.80	3116.28	24.60	4.77	2777.85	283.30	3141.42	442.09
NPB 600X220 (IPE 600)	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
NPB 600X220 (IPE 600)	154.46	196.77	610	224	15	24	24	118302.06	4520.75	24.52	4.79	3878.76	403.64	4471.27	640.11
NPB 750X270 (IPE 750)	145.29	185.08	750	265	13.2	16.6	17	161957.86	5165.33	29.58	5.28	4318.88	389.84	5009.90	616.68
NPB 750X270 (IPE 750)	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
NPB 750X270 (IPE 750)	202.48	257.95	770	270	15.6	26.6	17	249536.79	8752.39	31.10	5.83	6481.48	648.33	7431.05	1016.07

SECTIONAL PROPERTIES

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

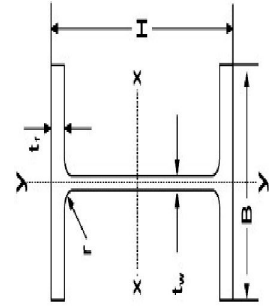
Beam (WPB)	Mass kg/m	Area cm ²	Dimensions				Sectional Properties										
			Depth H mm	Width B mm	Web Thick t _w mm	Flange Thick t _f mm	Root Rad r mm	Moment of Inertia		Radius of Gyration			Section Modulus			Plastic Section Modulus	
								I _x cm ⁴	I _y cm ⁴	r _x cm	r _y cm	Z _x cm ³	Z _y cm ³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



SECTIONAL PROPERTIES

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

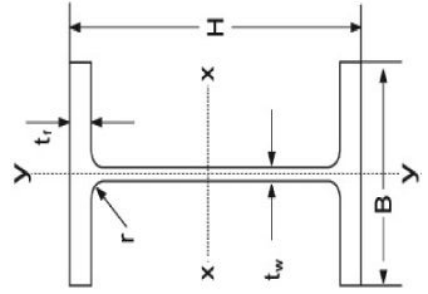
Beam (WPB)	Mass kg/m	Area cm ²	Dimensions				Sectional Properties									
			Depth H mm	Width B mm	Web Thick t _w mm	Flange Thick t _f mm	Root Rad r mm	Moment of Inertia		Radius of Gyration		Section Modulus		Plastic Section Modulus		
								I _x cm ⁴	I _y cm ⁴	r _x cm	r _y cm	Z _x cm ³	Z _y cm ³	Z _{px} cm ³	Z _{py} cm ³	
WPB 200x200 (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	
WPB 200x200 (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	
WPB 220x220 (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	
WPB 220x220 (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	
WPB 240x240 (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	
WPB 240x240 (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	
WPB 260x260 (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	
WPB 260x260 (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	
WPB 280x280 (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	
WPB 300x300 (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	
WPB 300x300	100.84	128.47	294	300	10	16	27	21046.24	7211.39	12.80	7.49	1431.72	480.76	1584.33	733.49	
WPB 300x300 (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	
WPB 300x300	237.92	303.09	340	310	21	39	27	59200.98	19403.07	13.98	8.00	3482.41	1251.81	4077.79	1913.22	



SECTIONAL PROPERTIES

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

Beam (WPB)	Mass M kg/m	Area A cm ²	Dimensions				Sectional Properties								
			Depth H mm	Width B mm	Web Thick t _w mm	Flange Thick t _f mm	Root Rad r mm	Moment of Inertia		Radius of Gyration		Section Modulus		Plastic Section Modulus	
								I _x cm ⁴	I _y cm ⁴	r _x cm	r _y cm	Z _x cm ³	Z _y cm ³	Z _{px} cm ³	Z _{py} cm ³
WPB 320x300 (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
WPB 320x300 (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
WPB 340x300 (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
WPB 340x300 (HE 340)	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
WPB 360x300 (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
WPB 360x300 (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
WPB 400x300 (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
WPB 400x300 (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
WPB 450x300 (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
WPB 450x300 (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

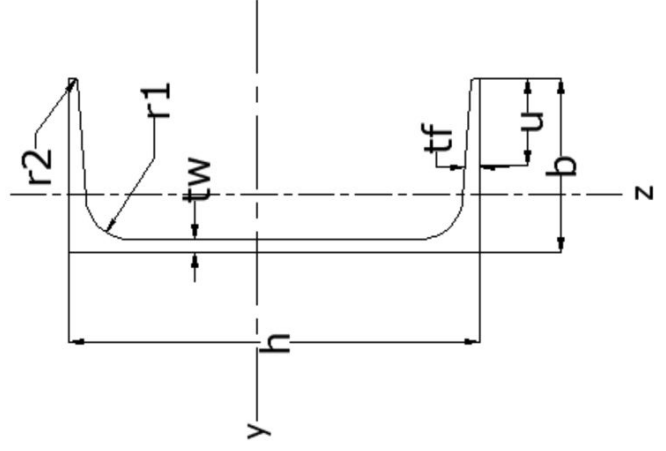
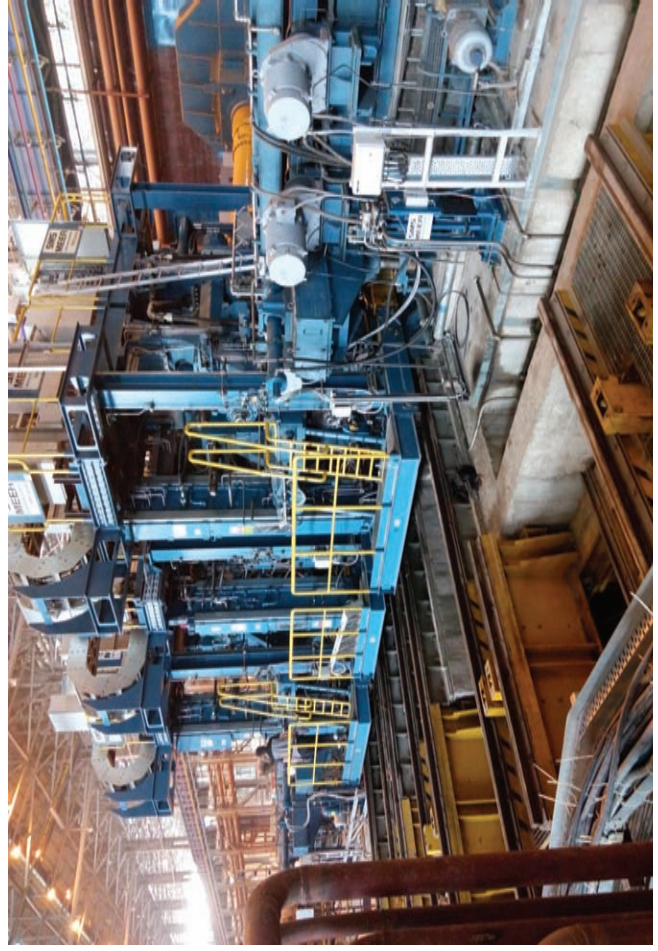
W Beam Section ASTM A6

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

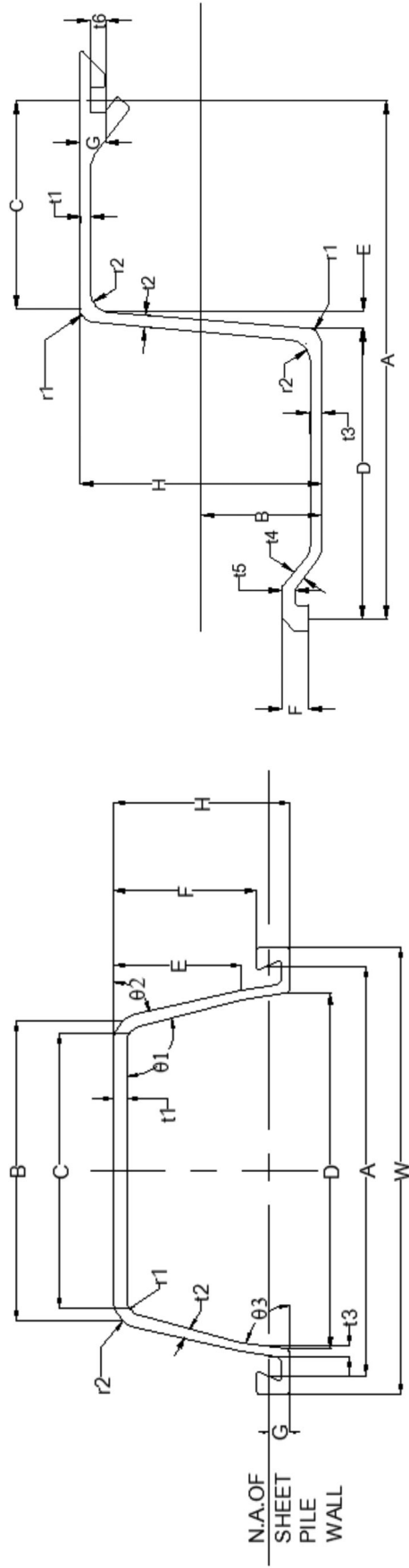
SECTIONAL PROPERTIES

Channels UPN as per DIN 1026-1

Dimensions	Dimensions							slope	Area	Mass	axis y-y					axis z-z				
	h	b	t _w	t _f	r ₁	r ₂	u				%	A	G	I _y	W _{el,y}	W _{pl,y}	i _y	A _{yz}	I _z	W _{el,z}
mm	mm	mm	mm	mm	mm	mm	mm		mm ²	kg/m	mm ⁴ ×10 ⁴	mm ³ ×10 ³	mm ³ ×10 ³	mm	mm ²	mm ⁴ ×10 ⁴	mm ³ ×10 ³	mm ³ ×10 ³	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	



PILING SECTIONS - DIMENSIONS



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 ₁	t ₂	t ₃	t ₄	t ₅	t ₆	r ₁	r ₂
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 ₁	t ₂	t ₃	t ₄	t ₅	t ₆	r ₁	r ₂
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

THE SAIL NETWORK



CORPORATE OFFICE		UNITS		CONSIGNMENT AGENCY YARD		BRANCH SALES OFFICES	
INTEGRATED STEEL PLANTS		CMO HEAD QUARTERS		SALES RESIDENT MANAGER		1. NORTHERN REGION	
ALLOY AND SPECIAL STEEL PLANTS		REGIONAL OFFICES		CUSTOMER CONTACT OFFICE		2. EASTERN REGION	
FERRO ALLOY PLANT		STEEL PROCESSING UNIT		SAIL REFRACTORY UNIT (SRU)		3. WESTERN REGION	
		DEPARTMENTAL WAREHOUSE		TRANSPORT & SHIPPING OFFICE		4. SOUTHERN REGION	

There's a little bit of SAIL in everybody's life

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Branches: • **Mumbai** 022-25235268, bmbomlp@sail-steel.com; • **Ahmedabad** 079-27473538, bmahmlp@sail-steel.com; • **Nagpur** 0712-2524276, bmnag@sail-steel.com; • **Kota** 0744-2428219, bmkot@sail-steel.com; • **Jaipur** 0141-5106640, bmjailp@sail-steel.com; • **Jabalpur** 0761-2410144, bmjab@sail-steel.com; • **Indore** 0731-4066441, bmind@sail-steel.com; • **Bhilai** 0788-2224447, bmbhilp@sail-steel.com; • **Pune** 020-25653673, bmpun@sail-steel.com; • **Gwalior** 0751-2467141, bmgwa@sail-steel.com; • **Baroda** 0265-2352395, bmbar@sail-steel.com

DELIVERY CONDITIONS

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 2 T to 10 T with proper nesting
Test Certificate	As per grade, size and cast number
Branding/ Marking	On Product/Tag with details of cast no., size, grade etc

For Technical Enquiry

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

Application Engineering Group
Ispat Bhawan 40, Jawaharlal Nehru Road,
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स्टील अथॉरिटी ऑफ इण्डिया लिमिटेड
STEEL AUTHORITY OF INDIA LIMITED
केन्द्रीय विपणन संगठन
CENTRAL MARKETING ORGANISATION
Government of India Enterprise

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