

MILLIMETRE - INCH

INTER CONVERSION

mm	in mm	inch	mm	in mm	inch	mm	in mm	inch	mm	in mm	inch
25.4	1	.03937	406.4	16	.62992	787.4	31	1.2205	1168.4	46	1.8110
50.8	2	.07874	431.1	17	.66929	812.8	32	1.2598	1193.8	47	1.8504
76.2	3	.11811	457.2	18	.70866	838.2	33	1.2992	121.2	48	1.8891
101.6	4	.15748	482.6	19	.74803	863.6	34	1.3386	1244.6	49	1.9291
127.0	5	.19685	508.0	20	.78740	889.0	35	1.3779	1270.0	50	1.9685
152.4	6	.23622	533.4	21	.82677	914.5	36	1.4173	1397	51	2.1653
177.8	7	.27559	558.8	22	.86614	939.8	37	1.4567	1524	52	2.3622
203.2	8	.31496	584.2	23	.90551	965.2	38	1.4961	1651	53	2.5590
228.6	9	.35433	609.6	24	.94488	990.6	39	1.5354	1778	54	2.7559
254.0	10	.39370	635.0	25	.98425	1016.0	40	1.5748	1905	55	2.9527
279.4	11	.43307	660.4	26	1.02362	1041.4	41	1.6142	2032	56	3.1496
305.8	12	.47234	685.8	27	1.06299	1066.8	42	1.6535	2159	57	3.3464
330.2	13	.51181	711.2	28	1.10236	1092.2	43	1.6829	2286	58	3.5433
355.2	14	.55118	736.6	29	1.14173	1117.6	44	1.7323	2413	59	3.7401
381.0	15	.59055	762.0	30	1.18110	1143.0	45	1.7716	2540	60	3.9370

METRE - FEET

INTER CONVERSION

Metre	Ft/m	Feet	Metre	Ft/m	Feet	Metre	Ft/m	Feet
.3048	1	3.2808	4.8768	16	52.4933	16.764	55	180.446
.6096	2	6.5617	5.1816	17	55.7742	18.288	60	196.850
.9144	3	9.8425	5.4864	18	59.0550	19.812	65	213.254
1.2192	4	13.1233	5.7912	19	62.3358	21.336	70	229.658
1.5240	5	16.4042	6.0960	20	65.6167	22.860	75	246.062
1.8288	6	19.6850	6.4008	21	68.8975	34.384	80	262.467
2.1386	7	22.9658	6.7056	22	72.1783	25.908	85	278.870
2.4384	8	26.2467	7.0104	23	75.4592	27.432	90	295.275
2.7432	9	29.5275	7.3152	24	78.7400	28.956	95	311.679
3.0481	10	32.8082	7.6200	25	82.0208	30.480	100	328.083
3.3528	11	36.0892	9.1440	30	98.4250	60.960	200	656.167
3.6576	12	39.3700	10.6680	35	114.829	91.440	300	984.250
3.9624	13	42.6508	12.1920	40	131.233	121.92	400	1312.32
4.2627	14	45.9317	12.7160	45	147.637	152.40	500	1640.42
4.5720	15	49.2125	15.2400	50	164.042	304.80	1000	3280.83

RIBBED DEFORMED BARS

**TORSTEEL
TWISTED BARS**



IS-1786

**TISTRONG
BARS**



IS-1139

Ribbed Deformed Bars provided with lugs, ribs or deformation on the surface to minimise the slippage of the Bar in concrete is used in reinforcing purposes by all advanced countries. These Bars provided better protection to the reinforcement from corrosion. Cracks in the tensile zone of these Bars are more evenly distributed and are much smaller in size. With no end hooks, bending, handling and fixing at site is simplified resulting in saving cost of labour, overlapping and joining. Weldable by flash welding or other processes under controlled conditions.

THE BARS WILL BE AVAILABLE IN THE FOLLOWING SECTIONS

Size mm	Area cm ²	Wt. kg/m	Length M/ton	Size mm	Area cm ²	Wt. kg/m	Length M/ton	Size mm	Area cm ²	Wt. kg/m	Length M/ton
6	0.283	0.222	4510	16	2.011	1.578	633	28	6.157	4.830	207
8	0.503	0.395	2532	18	2.545	2.000	500	32	8.042	6.313	159
10	0.785	0.617	1621	20	3.142	2.466	405	36	10.18	7.990	125
12	1.131	0.888	1125	22	3.801	2.980	336	40	12.57	9.864	101
14	1.539	1.208	829	25	4.909	3.854	260	50	19.63	15.41	65

REPLACEMENT DATA

Corresponding replacement of Torsteel or Tistrong II in respect of strength and compression may be considered as follows :

M.S. Bars Plain (mm)	8	10	12	16	20	22	25	28	32	36	40	50
Torsteel considering stress. (mm)	6.25	8	10	12.5	16	18	20	22	25	28	32	38
Torsteel considering compression. (mm)	-	-	10	14	2x12	18	20	22	2x18	2x20	32	40

Chemical and Mechanical properties of relative I.S.S. Specification is given separately under I.S.I. specification heading.



Size mm	Rounds kg/m	Sqrs. kg/m	Hex. kg/m	Oct. kg/m	Size mm	Rounds kg/m	Sqrs. kg/m	Hex. kg/m	Oct. kg/m
5	0.15	0.20	0.17	0.16	42	10.87	13.88	--	--
5.5	0.19	0.24	0.20	0.20	45	12.29	15.90	13.77	13.17
6	0.22	0.28	0.24	0.23	47	13.61	17.34	--	--
6.5	0.26	0.33	0.28	0.27	50	15.41	19.62	17.01	16.26
7	0.30	0.38	0.33	0.32	53	17.31	22.05	--	--
8	0.39	0.50	0.43	0.42	56	19.34	24.62	--	--
9	0.50	0.64	0.55	0.53	60	22.18	28.26	--	--
10	0.62	0.78	0.68	0.65	63	24.47	31.16	--	--
11	0.75	0.95	0.82	0.79	65	25.45	33.17	--	--
12	0.89	1.13	0.98	0.94	67	27.66	35.24	--	--
13	1.04	1.33	1.15	1.10	71	31.08	39.57	--	--
14	1.21	1.54	1.33	1.27	73	33.85	41.83	--	--
16	1.58	2.01	1.74	1.66	75	34.66	44.15	--	--
18	2.00	2.54	2.20	2.11	80	39.46	50.24	--	--
20	2.47	3.14	2.72	2.60	90	49.94	63.58	--	--
22	2.98	3.80	3.29	3.15	100	61.66	78.50	--	--
25	3.85	4.91	4.85	4.06	110	74.60	94.98	--	--
28	4.83	6.15	5.33	5.10	125	96.34	122.66	--	--
30	5.55	7.06	6.12	5.85	140	120.84	153.86	--	--
32	6.31	8.04	6.96	6.66	160	157.84	200.96	--	--
36	7.99	10.17	8.81	8.43	180	199.76	254.34	--	--
38	8.90	11.34	9.82	9.39	200	246.62	324.00	--	--
40	9.86	12.56	10.88	10.40	--	--	--	--	--

The above weight is based on .785 kg. per meter length x sectional area in cm² or mm²/100

Sectional area Rounds 6165539 x (dia)² Hexagon .67987 x (distance between opp. sides)²
 Squares .785 x (thickness)² Octagon .650372 x (distance between opp. sides)²

Specification No.	Materials	Chemical composition percent					Mechanical Properties	
		C	Min	S max	P max	Si	Tensile strength ton/sq.inch	Elongation per cent min
BS-14/42	Structural steel for pressure parts of marine boilers			0.05	0.05		23 when U.T.S. is 26-30 tons per sq. inch	20 when U.T.S. is 28-35 tons per sq. inch
	(a) plates for shells, butt straps and girders					26-35			23
	(b) Plates for flanging or welding and for combustion chambers and furnaces					26-30		
	(c) Screwed stays					26-30	23 for 14" round and below 28 for rounds over 1 inch	
	(d) Longitudinal stays					28-35	20 for 1" round and below 24 for rounds over 1 inch	
	(e) Angles and tee bars					28-32	20	
	(f) Rivet bars					26-30	25 for 1" round and below 30 for rounds over 1 inch.	

EN SPECIFICATION - STEEL

Specification No.	AISI	Chemical composition per cent							
		C max	Si max.	Mn max.	Cr	Ni	S (max.)	P (max.)	Mo
BS-970/55		0.07-0.15	0.10 max	0.80-1.20	--	--	0.20-0.30	0.07	--
EN-1A		0.07-0.15	0.10 max	1.00-1.40	--	--	0.30-0.60	0.06	--
EN-1B		0.20 max	--	0.80 max	--	--	0.06 max	0.06	--
EN-2		0.12 max	--	0.50 max	--	--	0.05 max	0.05	--
EN-2A		0.10 max	--	0.50 max	--	--	0.04 max	0.04	--
EN-2A/1		0.15 max	--	0.50 max	--	--	0.05 max	0.05	--
EN-2B		2.25-0.35	0.05-0.35	0.60-1.00	--	--	0.06 max	0.06	--
EN-5		0.35-0.45	0.05-0.35	0.60-1.00	--	--	0.06 max	0.06	--
EN-8	1040	0.35-0.45	0.25 max	0.90-1.30	--	--	0.12-0.20	0.06	--
EN-8M		0.50-0.60	0.05-0.35	0.50-0.80	--	--	0.06 max	0.06	--
EN-9	1055	0.15 max	0.05-0.35	0.40-0.70	--	--	0.05 max	0.05	--
EN-32A		0.10-0.18	0.50-0.35	0.60-1.00	--	--	0.07 max	0.05	--
EN-32B		0.10-0.18	0.05-0.35	0.60-1.00	--	--	0.05 max	0.05	--
EN-32C		0.05-0.60	1.50-2.00	0.70-1.00	--	--	0.05 max	0.05	--
EN-45		0.55-0.63	1.70-2.00	0.70-1.00	--	--	0.05 max	0.05	--
EN-45A		--	--	--	--	--	--	--	--
EN-19	4140	0.35-0.45	0.10-0.35	0.50-0.80	0.90-1.50	--	--	--	0.20-0.40
EN-24	4340	0.35-0.45	0.10-0.35	0.45-0.70	0.90-1.40	1.30-1.80	--	--	0.20-0.35
EN-31	52100	0.90-1.20	0.10-0.35	0.30-0.75	1.00-1.60	--	--	--	--
EN-36A	3310	0.00-0.15	0.10-0.35	0.30-0.60	0.60-1.10	3.00-3.75	--	--	--
EN-36C		0.12-0.18	0.10-0.35	0.30-0.60	0.60-1.10	3.00-3.75	--	--	0.10-0.25
EN-41B		0.35-0.45	0.10-0.45	0.00-0.65	1.40-1.80	0.00-0.40	--	--	0.10-0.25

TABLE 1 Chemical Requirements

Element	Composition, %				
	Grade 2	Grade 12	Grade 11	Grade 22	Grade 21
Carbon	0.0 - 0.21	0.05 - 0.17	0.05 - 0.17	0.05 - 0.15	0.05 - 0.15
Heat analysis	0.0 - 0.21	0.04 - 0.17	0.04 - 0.17	0.04 - 0.15	0.04 - 0.15
Product analysis	0.0 - 0.21	0.04 - 0.17	0.04 - 0.17	0.04 - 0.15	0.04 - 0.15
Manganese	0.50 - 0.80	0.40 - 0.65	0.40 - 0.65	0.30 - 0.60	0.30 - 0.60
Heat analysis	0.50 - 0.80	0.35 - 0.73	0.35 - 0.73	0.25 - 0.66	0.25 - 0.66
Product analysis	0.50 - 0.80	0.35 - 0.73	0.35 - 0.73	0.25 - 0.66	0.25 - 0.66
Phosphorus max	0.035	0.035	0.035	0.035	0.035
Heat Analysis	0.035	0.035	0.035	0.035	0.035
Product Analysis	0.035	0.035	0.035	0.035	0.035
Sulfur max.	0.035	0.035	0.035	0.035	0.035
Heat analysis	0.035	0.035	0.035	0.035	0.035
Product analysis	0.035	0.035	0.035	0.035	0.035
Silicon	0.15 - 0.40	0.15 - 0.40	0.50 - 0.80	0.50 max	0.50 max
Heat analysis	0.15 - 0.40	0.13 - 0.45	0.44 - 0.86	0.50 max	0.50 max
Product analysis	0.15 - 0.40	0.13 - 0.45	0.44 - 0.86	0.50 max	0.50 max
Chromium	0.50 - 0.80	0.80 - 1.15	1.00 - 1.50	2.00 - 2.50	2.75 - 3.25
Heat analysis	0.46 - 0.85	0.74 - 1.21	0.94 - 1.56	1.88 - 2.50	2.63 - 3.37
Product analysis	0.46 - 0.85	0.74 - 1.21	0.94 - 1.56	1.88 - 2.50	2.63 - 3.37
Molybdenum	0.45 - 0.60	0.45 - 0.60	0.45 - 0.65	0.90 - 1.10	0.90 - 1.10
Heat analysis	0.40 - 0.65	0.40 - 0.65	0.40 - 0.70	0.85 - 1.15	0.85 - 1.15
Product analysis	0.40 - 0.65	0.40 - 0.65	0.40 - 0.70	0.85 - 1.15	0.85 - 1.15

TABLE 2 Tensile Requirements for Class 1 Plates

	Grade 2 and 12	Grade 11	Grade 22, 21, 5, 9, 21L, 22L
	Tensile strength, min, ksi (MP a)	55 to 80 (380 to 550)	60 to 85 (415 to 585)	60 to 85 (415 to 585)
Yield strength, min, ksi (MP a)	33	35	30
Elongation in 8 in. (200mm), min % ^A	18	19	--
Elongation in 2 in. (50mm), min % ^A	22	22	18
Reduction of area, min, %	--	--	45

TABLE 3 Tensile Requirements for Class 2 Plates

	Grade 2	Grade 11	Grade 12	Grade 22, 21, 5, 9	Grade 91	Grades 911
	Tensile strength, min, ksi (MP a)	70 to 90 (485 to 620)	75 to 100 (515 to 690)	65 to 85 (450 to 585)	75 to 100 (515 to 690)	85 to 110 (585 to 760)	90 to 120 (620 to 840)
Yield strength, min, ksi (MP a) (0.2% offset)	45 (310)	45 (310)	40 (275)	45 (310)	60 (415)	64 (440)
Elongation in 8 in. (200mm), min % ^B	18	18	19	--	--	--
Elongation in 2 in. (50mm), min % ^B	22	22	22	18	18	18
Reduction of area, min, %	--	--	--	45	45	40



Sides in	Thickness in mm - Weight in kg per metre											
	mm Equivalent	3	4	5	6	8	10	12	15	16	18	20
20 x 20 mm	0.9	1.1										kg/m
25 x 25 mm	1.1	1.4	1.8									kg/m
30 x 30 mm	1.4	1.8	2.2									kg/m
35 x 35 mm	1.6	2.1	2.6	3.0								kg/m
40 x 40 mm	1.8	2.4	3.0	3.5								kg/m
45 x 45 mm	2.1	2.7	3.4	4.0								kg/m
50 x 50 mm	2.3	3.0	3.8	4.5								kg/m
55 x 55 mm			4.1	4.9	6.4	7.9						kg/m
60 x 60 mm			4.5	5.4	7.0	8.6						kg/m
65 x 65 mm			4.9	5.8	7.7	9.4						kg/m
70 x 70 mm			5.3	6.3	8.3	10.2						kg/m
75 x 75 mm			5.7	6.8	8.9	11.0						kg/m
80 x 80 mm				7.3	9.6	11.8	14.0					kg/m
90 x 90 mm				8.2	10.8	13.4	15.8					kg/m
100 x 100 mm				9.2	12.1	14.9	17.7					kg/m
110 x 110 mm					13.4	16.6	19.7			25.7		kg/m
130 x 130 mm					15.9	19.7	23.5			30.7		kg/m
150 x 150 mm						22.9	27.3			35.8	44.1	kg/m
200 x 200 mm							36.9			48.5	60.0	kg/m

Designation	Sides in mm	Thickness mm & inches, Weight in kg per metre per foot													
		3	4	5	6	8	10	12	15	16	20				
4530	45x30 mm	1.7	2.2	2.8	3.3										kg/m
7550	75x50 mm			4.7	5.6	7.4	9.0								kg/m
9060	90x60 mm				6.8	8.9	11.0	13.0							kg/m
10075	100x75 mm				8.0	10.5	13.0	15.4							kg/m
12575	125x75 mm				9.2	12.1	14.9								kg/m
15075	150x75 mm					13.7	17.0	20.2							kg/m
150115	150x115 mm					16.3	20.1	24.0	31.2						kg/m
200100	200x100 mm						22.9	27.3		35.8					kg/m
200150	200x150 mm						26.9	32.1	42.2	52.0					kg/m

M.S. TEE ANGLE

SIZE IN MM x MM ISNT	THICKNESS	WEIGHT PER METRE/KG.
50 x 50	6 - 6	4.4
75 x 75	10 - 10	10.95
100 x 100	10 - 10	14.9

HIGH ALLOY STAINLESS AND HEAT RESISTING STEELS													
I.S.I. Designation 1570-61	%C MAX	%Mn* MAX	%Si MAX	%P MAX	%S* MAX	%Ni	%Cr	Ni	M	W	Ti	S	Z
07 Cr 13	0.15	5.50-7.50	1.00	0.060	0.030	3.50-5.50	12.0-14.0	.60 max					
15 Cr 13	0.15	5.50-7.50	1.00	0.060	0.030	0.60-1.00	12.0-14.0	1.0 max					
22 Cr 13	0.15	2.00	1.00	0.045	0.030	8.00-10.00	12.0-14.0	1.0 max					
30 Cr 13	0.15	2.00	1.00	0.020	0.150 min	8.00-10.00	12.0-14.0	1.0 max					
22 Cr 13 S 28	0.08	2.00	1.00	0.045	0.030	8.00-12.50	16.0-18.0	0.50 max					
07 Cr 17	0.03	2.00	1.00	0.045	0.030	8.00-22.00	16.0-20.0	1.5-2.5					
20 Cr 18 Ni 2	0.25	2.00	1.00	0.045	0.030	19.00-22.00	18.00-20.00	1.5-2.5					
04 Cr 19 Ni 9 Ti 20	0.08	2.00	1.00	0.045	0.030	10.00-14.00	24.00-26.00	8.0-10.0					
07 Cr 19 Ni 9 Ti 35 05	0.10	2.00	1.00	0.045	0.030	10.00-14.00	16.00-18.00	7.5-9.5					
Cr 18 Ni 11 M 03	0.03	2.00	1.00	0.045	0.030	10.50-13.50	16.00-18.00	10.0-12.0					
10 Cr 25 Ni 18 Ti 40	0.10	2.00	1.00	0.045	0.030	9.00-12.00	17.00-19.00	16.0-20.0					
45 Cr 9 Si 4	0.40	50-60	30-60	3.25-3.75	7.50-9.50	20-1.0	23.0-26.0	50 max	2.20-3.0				
80 Cr 20 Si 2 Ni 1	0.75-85	20-60	1.75-2.25	1.0-2.0	18.0-21.0	1.20-1.70	13.0-15.0	13.0-15.7					
40 Cr Ni 14 W 3 Si 2	0.35-45	40-80	1.0-2.0	1.0-2.0	13.0-15.0								
STAINLESS STEEL - AUSTENITIC STEEL													
Grade	%C MAX	%Mn* MAX	%Si MAX	%P MAX	%S* MAX	%Ni	%Cr	Others	Comparison of International Standard	AISI	DIN	B.S.	JIS
201	0.15	5.50-7.50	1.00	0.060	0.030	3.50-5.50	16.00-18.00	(%Cu=1.50-2.50)	201	1.4312	302S25	SUS201	
201A	0.15	5.50-7.50	1.00	0.060	0.030	0.60-1.00	16.00-18.00	(%Cu=1.50-2.50)	302	1.4305	302S30	SUS302	
303	0.15	2.00	1.00	0.045	0.030	8.00-10.00	17.00-19.00	(%Cu=0.60max)	303	1.4301	303S31	SUS303	
304	0.08	2.00	1.00	0.020	0.150 min	8.00-10.00	17.00-19.00	(%Mo=0.02max)	304	1.4301	304S15	SUS304	
304L	0.03	2.00	1.00	0.045	0.030	8.00-12.50	18.00-20.00	N=10ppm max	304L	1.4306	304S11	SUS304L	
310	0.25	2.00	1.00	0.045	0.030	8.00-22.00	18.00-20.00		310	1.4845	310S24	SUS310	
310S	0.08	2.00	1.00	0.045	0.030	19.00-22.00	24.00-26.00		310S			SUS310S	
316	0.03	2.00	1.00	0.045	0.030	10.00-14.00	16.00-18.00	(%Mo=2.00-3.00)	316	1.4401	316S16	SUS316	
316L	0.03	2.00	1.00	0.045	0.030	10.00-14.00	16.00-18.00	(%Mo=2.00-3.00)(N=10ppm max)	316L	1.4404	316S11	SUS316L	
316Ti	0.10	2.00	1.00	0.045	0.030	10.50-13.50	16.50-18.50	(%Mo=2.00-3.00)(Ti=>5xCmin)	316Ti	1.4571	320S31	SUS316L	
321	0.08	2.00	1.00	0.045	0.030	9.00-12.00	17.00-19.00	(%Ti=>5XCmin)	321	1.4541	321S31	SUS321	
STAINLESS STEEL - FERRITIC STEEL													
Grade	%C MAX	%Mn* MAX	%Si MAX	%P MAX	%S* MAX	%Ni	%Cr	Mech. Prop. (Hardness BHN)	Comparison of International Standard	AISI	DIN	B.S.	JIS
430	0.12	1.00	1.00	0.040	0.15 min	0.75 max	16.00-18.00	262 max	430	1.4016	430S15	SUS430	
430F	0.12	1.25	1.00	0.060	0.15 min	0.75 max	16.00-18.00	262 max	430F	1.4104	---	SUS430F	
STAINLESS STEEL - MARTENSITIC STEELS													
Grade	%C MAX	%Mn* MAX	%Si MAX	%P MAX	%S* MAX	%Ni	%Cr	Mech. Prop. (Hardness BHN)	Comparison of International Standard	AISI	DIN	B.S.	JIS
410	0.15	1.00	1.00	0.040	0.030	---	11.50-13.50	248-292	410	1.4006	410S21	SUS410	
410S	0.08	1.00	1.00	0.040	0.030	---	11.50-13.50	248-292	410S	1.4001	---	SUS410S	
416	0.15	1.25	1.00	0.060	0.150(min)	---	12.00-14.00	262 max	416	1.4005	416S21	SUS416	
420	0.15(min)	1.00	1.00	0.040	0.030	---	12.00-14.00	262 max	420	1.4021	420S37	SUS420J1	
420C	0.28-0.40	1.00	1.00	0.045	0.030	---	12.00-14.00	262 max	420C	1.4028	420S45	SUS420J2	
431	0.20	1.00	1.00	0.040	0.030	1.25-2.50	15.00-17.00	248-292	431	1.4057	431S29	SUS431	

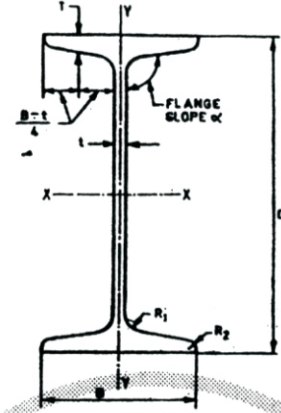
* Maximum unless otherwise indicated

ALLOY STEEL (contd.)

DIE BLOCK STEELS													
I.S.I. Designation	A. S. P. Design	AISI	C	Mn	Si	S	P	Cr	Ni	Mo	V	W	Co
1570-61 (65)													
T55 C 55 Mn75	DB-1		.55	.75	.25	.03	.03	.30 MAX	1.0-1.5				
T60 Ni	DB-2		.55-.65	.50-.80	.10-.35	.03	.03		1.45	.35			
	DB-3		.55	.80	.28	.03	.03		.90	.35	.05		
	DB-4		.55	.80	.28	.03	.03		.90	.35			
	DB-5		.50	.55	.22	.03	.03		1.25-1.75	.25-.35			
T55 Ni2 Cr65 Mn30			.50-.60	.50-.80	.10-.35				1.25-1.75	.20-.35			
T40 Ni2 Cr2 Mo28			.35-.45	.40-.70	.10-.35								
HOT WORKS TOOL STEELS													
T35Cr5MoW1 V 30	HW-1		.30-.40	.25-.50	.80-1.2			4.75-5.25		1.2-1.6	.20-.40	1.2-1.6	
T35Cr5 Mo V1	HW-2A	H-13	.30-.40	.25-.50	.80-1.2			4.75-5.25		1.2-1.6	1.0-1.2		
T33W9Cr3 V 38	HW-3	H-21	.25-.40	.20-.40	.10-.35			2.8-3.3			.25-.50	8.0-10.0	
T35Cr5Mo1 V 30	HW-4	H-11	.30-.40	.25-.50	.80-1.2			4.75-5.25		1.2-1.6	.20-.40		
T110 W2 Cr1.			1.0-1.2	.90-1.3	.10-.35			.90-1.3				1.25-1.75	
COLD WORK TOOL STEELS													
T90 Mn2W5 Cr45	CW-1	D-1	.85-.75	1.00-1.20	.10-.35			.30-.60		.25maxOpt		.40-.60	
T160 Cr 12	CW-3	D-2	1.5-1.7	.25-.50	.10-.35			11.0-13.0		.80maxOpt			
T215 Cr 12	CW-4	D-3	2.0-2.3	.25-.50	.10-.35					.80maxOpt			
SHOCK RESISTING TOOL STEEL													
T55 S12 Mn 90Mo 33	SR-2		.50-.60	.80-1.0	1.5-2.0					.25-.40	.12-.20	1.75-2.25	
T40 W2 Cr1 C18	SR-3		.35-.45	.20-.45	.50-1.0				1.0-1.5		.10-.25	1.75-2.25	
T50 W2 Cr1 V18	SR-4		.45-.55	.20-.40	.50-1.0				1.0-1.5				
T55 S12 Mn 90			.50-.60	.80-1.0	1.5-2.0								
HIGH SPEED STEELS													
T70 W18 Cr4 V1	HS-1	T-1	.65-.75	.20-.40	.10-.35			4.5-4.5		.60maxOpt	1.0-1.5	17.5-19.0	
T75 W18 C06 Cr4	HS-3	T-4	.70-.80	.20-.40	.10-.35			4.0-4.5		.50-1.0	1.0-1.5	17.5-19.0	
V1 Mo 75													
T75 W18 Co10	HS-4	T-5	.70-.80	.20-.40	.10-.35			4.0-4.5		.50-1.0	1.5-2.0	17.5-19.0	9.0-10.0
Cr 4 V2 Mo 75	HS-5		1.25	.40	.35	.025	.025	4.20		.60-Opt	4-0	13.25	
	HS-6		.78	.40	.35	.025	.025	4.5		5.50	1.40	21.50	
T83 Mo Cr4 V2	HS-M2	M-2	.75-.90	.20-.40	.10-.35			3.75-4.5		5.5-6.5	1.75-2.0	5.5-6.5	

OPT = Optional
 Unless otherwise mentioned the percentage of Chemical Composition should be considered as maximum. Since different levels of sulphur and phosphorus are required according to severity of the conditions in service, limits for these elements are not included in this schedule.

BEAMS



Section	Size mm x mm		Weight kg/m	Web thick in mm t	Flange thick in mm T	Sectional Area, a cm ²
	D	B				
MB 100	100	50	8.90	4.70	7.00	11.40
MB 125	125	70	13.30	5.00	8.00	17.00
MB 150	150	75	15.00	5.00	8.00	19.10
MB 175	175	85	19.60	5.80	9.00	25.00
MB 200	200	100	24.20	5.70	10.00	30.80
MB 225	225	110	31.10	6.50	11.80	39.70
MB 250	250	125	37.30	6.90	12.50	47.50
MB 300	300	140	46.00	7.70	13.10	58.60
MB 350	350	140	52.40	8.10	14.20	66.70
MB 400	400	140	61.50	8.90	16.00	78.40
MB 450	450	150	72.40	9.40	17.40	92.20
MB 500	500	180	86.90	10.20	17.20	111.00
MB 550	550	190	104.00	11.20	19.30	132.00
MB 600	600	210	123.00	12.00	20.30	156.00

Parallel Flange Beams

Size mm x mm	H - Beam Section (with relevant Inch size X lbs / ft)	Sectional wt. in Kg / m	Beam Depth (H) in mm	Flange Width (W) in mm	Web thickness (tw) in mm	Flange thickness (tf) in mm	Fillet Radius ⊕ in mm	Sectional Area (A) in cm2
150 X 150	157.6 X 152.9 X 30.0	30	157.6	152.9	6.5	9.4	7.6	38.26
	161.8 X 154.4 X 37.0	37	161.8	154.4	8	11.5	7.6	47.11
200 X 200	203.2 X 203.6 X 46.1	46.1	203.2	203.6	7.2	11	10.2	58.73
	206.2 X 204.3 X 52.0	52	206.2	204.3	7.9	12.5	10.2	66.28
200 X 150	203.2 X 133.2 X 25.1	25.1	203.2	133.2	5.7	7.8	7.6	31.97
250 X 150	251.4 X 146.1 X 31.1	31.1	251.4	146.1	6	8.6	7.6	39.68
	256.0 X 146.4 X 37.0	37	256	146.4	6.3	10.9	7.6	47.17
300 X 150	305.0 X 165.0 X 40.3	40.3	303.1	165	6	10.2	8.9	51.32
	305.0 X 165.0 X 46.0	46	306.6	165.7	6.7	11.8	8.9	58.75
	305.0 X 165.0 X 54.0	54	310.4	166.9	7.9	13.7	8.9	68.77
400 X 180	406.0 X 178.0 X 54.1	54.1	402.6	177.7	7.7	10.9	10.2	68.95
	406.4 X 177.9 X 60.1	60.1	406.4	177.9	7.9	12.8	10.2	76.52
	409.4 X 178.8 X 67.1	67.1	409.4	178.8	8.8	14.3	10.2	94.51
450 X 150	450.0 X 190.0 X 67.2	67.2	447	190	7.6	13.1	21	85.5
500 X 200	500.0 X 200.0 X 90.7	90.7	500	200	10.2	16	21	115.5
600 X 220	600.0 X 220.0 X 122	122.4	600	220	12	19	24	156

ALLOY STEEL (contd.)

Designation	C	Mn	Si	S	P	Cr	Ni	Mo	V
MEDIUM CARBON ALLOY CONSTRUCTIONAL STEELS									
37 Mn 2	.40	1.10	.35	.03	.03	1.0	1.0-1.5	.20-.35	.10
40 Cr 1	.32-.42	1.3-1.7	.10-.35	.03	.03	.09-1.2	1.0-1.5	.20-.35	.10
35 Cr 60	.35	.70	.30	.03	.03	.45-.75	1.0-1.5	.20-.35	.10
35 Mn 2 Mo 28	.35-.45	.60-.90	.10-.35	.03	.03	.45-.75	1.0-1.5	.20-.35	.10
40 Cr 1 Mo 28	.30-.40	.60-.90	.10-.35	.03	.03	.45-.75	1.0-1.5	.20-.35	.10
40 Ni 2 Cr 1 Mo 28	.30-.40	1.3-1.8	.10-.35	.03	.03	.45-.75	1.0-1.5	.20-.35	.10
40 Ni 3 Cr 65 Mo 55	.42	.60	.30	.03	.03	1.5	1.25-1.75	.15-.25	.25
37 Si 2 Mn 90	.35-.45	.60-.80	.10-.35	.03	.03	.90-1.2	1.25-1.75	.15-.25	.25
	.35-.45	.40-.70	.10-.35	.03	.03	.90-1.3	1.8-2.2	.15-.25	.25
	.36-.44	.40-.70	.10-.35	.03	.03	1.4-1.7	4.1	.15-.25	.25
	.30	.50	.25	.03	.03	1.2			
	.33-.40	.80-1.0	1.5-2.0						
CASE HARDENING STEELS :									
C 10 C 14	.12	.60	.30	.03	.03	.80-1.1	1.65-2.0	.20-.30	
17 Mn 1 Cr 95	.14-.19	1.0-1.3	.10-.35	.03	.03	1.0-1.3	1.65-2.0	.20-.30	
20 Mn Cr 1	.17-.22	1.0-1.4	.10-.35	.03	.03	1.0-1.3	1.65-2.0	.20-.30	
20 Ni 2 Mo 25	.17-.22	.45-.95	.15-.30	.03	.03	.50-.80	60-1.0	.15-.25	
15 Cr 65	.12-.18	.40-.60	.10-.35	.03	.03	.40-.80	60-1.0	.15-.25	
16 Ni C 800 Cr 60	.12-.20	.60-1.0	.10-.35	.03	.03	.40-.60	60-1.0	.15-.25	
20 Ni 55 Cr 50 Mo 20	.18-.23	.70-.90	.20-.35	.03	.03	.40-.60	60-1.0	.15-.25	
13 Ni Cr 80	.10-.15	.40-.70	.10-.35	.03	.03	.30-3.5	1.0-1.5	.08-.15	
15 Ni Cr 1 Mo 12	.12-.18	.60-1.0	.10-.35	.03	.03	.75-1.25	3.4	.20	
16 Ni 2 Cr 1 Mo 15	.16	.50	.30	.03	.03	.80	3.4	.20	
16 Ni Cr 2 Mo	.12-.18	.60-1.0	.10-.35	.03	.03	.75-1.25	1.5-2.0	.15-.25	
20 Mn 2	.16-.24	.40-.70	.10-.35	.03	.03	1.5-1.7	1.8-2.2	.15-.25	
21 Cr 1 Mo 28	.26	.50-.80	.10-.35	.03	.03	.90-1.2	3.0 max	.20-.35	
25 Cr 3 Mo 55	.26-.30	.40-.70	.10-.35	.03	.03	4.0-6.0	3.0 max	.45-.65	
15 Ni 4 Cr 1	.12-.18	.50-.70	.10-.35	.03	.03	1.0-1.4	3.8-4.3	.15-.25	
NITRIDING STEELS :									
40 Cr 2A 11 Mo 18	.35-.45	.40-.70	.10-.35	.03	.03	3.0-3.5	.30 max	.90-1.1	.15-.25
40 Cr Mo 1 V 20	.35-.45	.40-.70	.10-.35	.03	.03	1.5-1.8	.30 max	.10-.25	A1.9-1.3
CREEP RESISTING STEELS :									
07 Cr 90 Mo 55	.12 max	.14-.70	.10-.35	.03	.03	.7-1.1	.30 max	45-65	
10 Cr 2 Mo 1	.12 max	.14-.70	.52 max	.03	.03	2.0-2.5	.30 max	9-1.1	

ALLOY STEEL
IS : 1570-61 as amended in 1965

CARBON CONSTRUCTIONAL AND ALLOY STEEL							
Designation IS 1570-61 (65)	ASP Design.	C	Mn	Design.	ASP Design	C	Mn
C 07		.12 max	.50 max	C 50		.45-.55	.60-.90
C 10		.15 max	.30-.60	C 55 Mn 75	C-55	.50-.60	.60-.90
C 14		.18-.18	.40-.70	C 65		.60-.70	.50-.80
C 15 Mn 75		.10-.20	.60-.90	C 70		.65-.75	.50-.80
C 20	C-20	.15-.25	.60-.90	C 75		.70-.80	.50-.80
C 25 Mn 75		.20-.20	.60-.90	C 80		.75-.85	.50-.80
C 30	C-30	.25-.35	.60-.90	C 85		.80-.90	.50-.80
C 35 Mn 75	C-35	.30-.40	.60-.90	C 98		.90-1.05	.50-.80
C 40	C-40	.35-.45	.60-.90	C 113		1.05-1.20	.50-.80
C 45	C-45	.40-.50	.60-.90				

Since different levels of sulphur and phosphorus are required according to severity of the conditions in service, limits for these elements are not included in this schedule. However, the limitation according to ASP Designation should be considered to Si-.25%, S-.03%, P.03% max.

CARBON & CARBON MANGANESE FREE CUTTING STEEL

IS Design. 1570-61 (65)	C	Mn	Si	S	P	Cr	V
14 Mn IS 14	.10-.18	1.2-1.5	.05-.30	10-18	.06 max		
25 Mn IS 14	.20-.30	1.0-1.5	.25 max	10-18	.06 max		
13 S 25	.08-.18	.80-1.2	.10 max	20-30	.06 max		
40 Mn 2 S 12	.35-.45	1.3-1.7	.25 max	08-15	.06 max		

HIGH CARBON HIGH CHROME BEARING STEELS

IS Design. 1570-61 (65)	ASP Design	C	Mn	Si	S	P	Cr
103 Cr 1	BB 1	1.0	.40	25	.03	.03	1.0
103 Cr 2		.95-1.1	.25-.45	15-.30			.90-1.2
105 Cr 1	BB 2	.95-1.1	.25-.45	15-.30			1.3-1.6
	BB 3	.90-1.2	.20-.40	10-.35			1.0-1.6
		1.0	.70	25	.03	.03	1.6

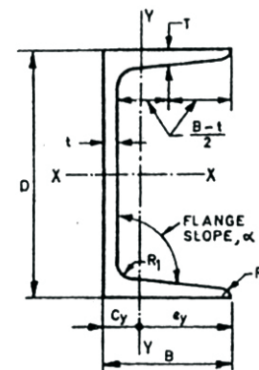
SPRING STEEL

IS Design. 1570-61 (65)	ASP Design	C	Mn	Si	S	P	Cr	V
	SS-2	.78	.70	.30	.03	.03		
	SS-3	1.0	.70	.30	.03	.03		
	SS-4	.50-.60	.80-1.0	1.5-2.0				
55 Si 2 Mn 90	SS-5	.45-.55	.60-.90	10-.35			.90-1.2	
50 Cr 1	SS-6	.45-.55	.50-.80	10-.35			.90-1.2	.15-.30
50 Cr 1 V 23	SS-7	.58	1.0	.30	.03	.03	1-1	1.0

CARBON & ALLOY TOOL STEELS

IS Design. 1570-61 (65)	ASP Design	C	Mn	Si	Cr	V
T. 60		.55-.65	.50-.80	.10-.35		
T. 70	CTS-1	.65-.75	20-.35	.10-.30		
T. 75	CTS-2	.70-.80	50-.80	.10-.35		
T. 80		.75-.85	20-.35	.10-.30		
T. 85	CTS-3	.80-.90	50-.80	.10-.35		
T. 90	CTS-4	.85-.95	20-.35	.10-.30		
T. 103	CTS-5	.95-1.1	20-.35	.10-.30		
T. 118	CTS-6	1.1-1.25	25-.35	.10-.30		
T. 133		1.25-1.4	25-.35	.10-.30		
T. 103 V 23		1.95-1.1	20-.35	.10-.30		
T. 118 Cr 45		1.1-1.25	20-.35	.10-.30		15-.30
T. 55 Cr 70 V 15		.50-.60	60-.80	.10-.30	30-60	30 MAX
T. 133 Cr 45	CTS-7	1.25-1.4	20-.35	.10-.30	30-60	10 MAX
T. 105 Cr 1	BB-2	.90-1.2	20-.40	.10-.35	1.0-1.6	30 MAX

CHANNELS



Section	Size mm x mm	Weight	Web thick in mm	Flange thick in mm	Sectional Area, a
	D B	kg/m	t	T	cm ²
MC 75	75.00 X 40.00	7.14	4.80	7.50	9.10
MC 100	100.00 X 50.00	9.56	5.00	7.70	12.20
MC 125	125.00 X 65.00	13.10	5.30	8.20	16.70
MC 125	125.00 X 66.00	13.70	6.00	8.10	17.50
MC 150	150.00 X 75.00	16.80	5.70	9.00	21.10
MC 150	150.00 X 76.00	17.70	6.50	9.00	22.60
MC 175	175.00 X 75.00	19.60	6.00	10.20	24.90
MC 175	175.00 X 76.00	22.70	7.50	10.20	27.60
MC 200	200.00 X 75.00	22.30	6.20	11.40	28.50
MC 200	200.00 X 76.00	24.30	7.50	11.40	31.00
MC 225	225.00 X 80.00	26.10	6.50	12.40	33.30
MC 225	225.00 X 82.00	30.70	9.00	12.40	39.00
MC 250	250.00 X 80.00	30.60	7.20	14.10	39.00
MC 250	250.00 X 82.00	34.20	9.00	14.10	43.50
MC 250	250.00 X 83.00	38.10	11.00	14.10	48.50
MC 300	300.00 X 90.00	36.30	7.80	13.60	46.30
MC 300	300.00 X 92.00	41.50	10.00	13.60	52.80
MC 300	300.00 X 93.00	46.20	12.00	13.60	58.80
MC350	350.00 X 100.00	42.70	8.30	13.50	54.40
MC 400	400.00 X 100.00	50.10	8.80	15.30	63.80

WIDTH IN MM	THICKNESS IN MILLIMETRE - WEIGHT IN KG. PER METRE																
	3	4	5	6	7	8	9	10	12	15	16	18	20	22	25	32	40
12	.28	.38	.47	.56	-	-	-	-	-	-	-	-	-	-	-	-	-
16	.38	.50	.63	.75	-	-	-	-	-	-	-	-	-	-	-	-	-
20	.47	.63	.79	.94	-	-	-	-	-	-	-	-	-	-	-	-	-
25	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.4	-	-	-	-	-	-	-	-
30	0.7	0.9	1.2	1.4	1.6	1.9	2.0	2.3	2.8	3.8	-	-	-	-	-	-	-
32	0.8	1.0	1.3	1.5	1.7	2.0	2.3	2.5	3.0	4.0	-	-	5.6	-	-	-	-
35	0.8	1.1	1.4	1.6	1.9	2.2	2.5	2.8	3.3	4.4	-	5.0	6.3	-	-	-	-
40	0.9	1.3	1.6	1.9	2.2	2.5	2.8	3.1	3.8	4.7	5.0	5.6	7.1	-	-	-	-
45	1.1	1.4	1.8	2.1	2.5	2.8	3.2	3.5	4.2	5.3	5.6	6.4	7.8	-	8.8	-	-
50	1.2	1.6	2.0	2.4	2.7	3.1	3.5	3.9	4.5	5.6	6.3	7.1	8.6	-	9.8	-	-
55	1.3	1.7	2.2	2.6	3.0	3.5	3.9	4.3	5.2	6.3	6.9	7.8	9.4	-	10.8	-	-
60	1.4	1.9	2.4	2.8	3.3	3.8	4.2	4.7	5.6	6.6	7.5	8.5	9.4	-	11.8	-	-
63	-	-	-	3.0	3.4	4.0	4.5	4.9	5.9	6.6	7.9	8.9	9.9	-	12.4	15.8	-
65	-	-	-	3.1	3.6	4.1	4.6	5.1	6.1	6.6	8.2	9.2	10.2	-	12.8	16.3	-
70	-	-	-	3.3	3.8	4.4	4.9	5.5	6.6	6.6	8.8	9.9	11.0	-	13.7	17.6	-
75	-	-	-	3.5	4.0	4.7	5.3	5.9	7.1	7.1	9.4	10.6	11.8	12.9	14.7	18.8	-
80	-	-	-	3.8	4.4	5.0	5.7	6.3	7.5	7.5	10.0	11.3	12.6	13.8	15.7	20.1	-
90	-	-	-	4.2	4.7	5.4	6.1	6.8	8.5	8.5	11.3	12.7	14.1	14.7	17.7	22.6	-
100	-	-	-	4.7	5.3	6.0	6.8	7.8	9.4	9.4	12.6	14.1	15.7	17.3	19.6	25.1	-
110	-	-	-	5.2	5.9	6.7	7.5	8.6	10.4	10.4	13.8	15.5	17.3	19.0	21.6	27.6	-
120	-	-	-	5.7	6.5	7.4	8.4	9.4	11.3	11.3	15.1	17.0	18.8	20.7	23.6	30.1	-
125	-	-	-	5.9	6.8	7.8	8.8	9.8	11.8	11.8	16.3	18.4	20.4	21.6	24.5	31.4	-
130	-	-	-	-	-	-	-	10.2	12.2	12.2	17.6	19.8	22.0	25.5	32.7	40.8	-
140	-	-	-	-	-	-	-	11.0	13.2	13.2	18.8	21.2	23.6	27.5	35.2	47.1	-
150	-	-	-	-	-	-	-	11.8	14.1	14.1	20.1	22.6	25.1	29.5	37.7	47.1	-
160	-	-	-	-	-	-	-	12.6	15.1	15.1	22.6	25.6	28.3	35.3	45.2	-	-
180	-	-	-	-	-	-	-	14.1	17.0	17.0	25.1	28.3	31.4	39.2	50.2	-	-
200RE*	-	-	-	-	-	-	-	15.7	18.8	18.8	27.6	31.1	34.5	43.2	-	-	-
220RE*	-	-	-	-	-	-	-	17.3	22.3	22.3	31.4	35.3	39.2	49.1	-	-	-
250RE*	-	-	-	-	-	-	-	19.6	23.6	23.6	37.7	42.4	47.4	58.9	-	-	-
300RE*	-	-	-	-	-	-	-	28.3	28.3	28.3	50.2	56.5	62.8	78.5	-	-	-
400RE*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

RE* - ROUND EDGE

COMMON SPECIFICATION (contd.)

I. R. S. SPECIFICATION (contd.)

Code	Description	10-10	30-50	10 max	0.06max	0.06max	24 min	25	32	40
IRS-M-30/61	Steel Plates, Flanging & Pressing qualities for Carriages & Wagons.	-	-	-	-	-	-	-	-	-
IRS-M-32/57	Carbon Steel Plates for Locomotive Boilers	-	-	-	-	-	-	-	-	-
IRS-M-33/57	Carbon Steel Plates for Locomotive Boilers. (Ordinary Quality)	-	-	-	-	-	-	-	-	-
IRS-M-34/57	Boiler Quality Structural Steel Sheets required for the manufacture of Integral Coach Tenders, Carriages & Wagons	-	-	-	-	-	-	-	-	-
IRS-M-36/63	Steel Tyres for Locomotives	15	50	-	0.05	0.04	37-45	over 3mm 25 upto 3mm 18	-	-
IRS-R-16/51	1. Carriage & Wagon Tyres. 2. Locomotive & Tender Tyres. 3. Elec. Locomotive Tyres	48-53 54-58 62-68	60-70 60-70 60-70	30-35 25-30 30-35	0.05 max 0.05 max 0.05 max	0.05 max 0.05 max 0.05 max	50-55 56-62 63-69	21-17	-	-
IRS-R-16/55	Steel Axles for Carriage & Wagons	36-41	65-70	20-35	0.05 max	0.05 max	28-33	-	-	-
IRS-R-17	Steel Crank Axels for Locomotive	-	-	-	-	-	-	-	-	-
IRS-R-18-53	Steel Straight Axels for Locomotives & Tenders.	36-41	65-70	20-35	0.05 max 0.06max	0.05 max 0.06 max	35-40 50-55	13-11	-	-
IRS-R-19-59	Wheel Steel	-	-	-	-	-	-	-	-	-
IRS-R-21/42	Steel Plates for Flanging Locomotive Boilers	10-14 14-23	30-45 50-75	10-15 10-15	0.04 max 0.05 max	0.05 max 0.06 max	24-28 26-30	-	-	-
IRS-R-29-50	-do- Non Flanging.	-	-	-	-	-	-	-	-	-
IRS-R-32/54	Steel Plates for inside Fire boxes for locomotives (P & F)	10-14 19-23	30-45 70-90	10-15 15-25	0.04 max 0.045 max	0.04 max 0.045 max	23-28 28 tonnes min	-	-	-
IRS-T-1/57	Class-35 Slabs for under Frames	30-42	80 max	15 max	0.06 max	0.06 max	36-42	-	-	-
IRS-T-2	Fish Plates	20-24	50-70	-	0.05 max	0.05 max	25 min	-	-	-
IRS-T-3/56	I. R. S. Dog Spikes	36-40	65-80	-	0.05 max	0.05 max	35-40	-	-	-
IRS-T-4/50	Fish Bolts and Nuts	18-22	50-70	10 max	0.05 max	0.05 max	Not less than 25	tonns	-	-
IRS-T-5/60	Round Spikes for Rail Chairs	18-22	50-70	10 max	0.05 max	0.05 max	24-33	-	-	-
IRS-T-6/54	Bearing Plates	18-22	50-70	10 max	0.05 max	0.05 max	24-33	-	-	-
IRS-T-8/50	Fish Plates combination	30-42	80 max	15 max	0.06 max	0.06 max	36-42	-	-	-
IRS-T-9/59	Tie Bars, Gibs, Collers & Keys for sleepers	-	-	-	-	-	-	-	-	-
IRS-T-12/60	Sleepers (Track & Turnout)	20-24	55-75	0.5 min	0.05 max	0.05 max	26-33	-	-	-
IRS-T-18/52	Rails : 1. Medium manganese 2. Plain Carbon	50-60 55-68	95-125 65-90	0.7-20 0.5-30	0.06 max 0.06 max	0.06 max 0.06 max	72 min 72 min	14 12	-	-
IRS-Y-1/53	Rails : 1. Medium manganese 3. Plain Carbon	40-60 50-70	60-95 60-95	0.3-30 0.3-30	0.06 max 0.06 max	0.06 max 0.06 max	-	-	-	-
IRS-Y-2/49	Files and Rasps.	40-60	90-145	0.3-30	0.06 max	0.06 max	-	-	-	-
IRS-Y-354	Shovels.	40-55	50-80	0.3-30	0.05 max	0.05 max	-	-	-	-
IRS-Y-354	Grade (A to G) Permanent Way Tools.	-	-	-	-	-	-	-	-	-

I. R. S. SPECIFICATION

Specification	Specification	Chemical Composition %				Mechanical properties		
		C	Mn	Si	S	P	Tensile Strength Tools/Sq. inch.	Elongation %
IRS-M-3/49	Forgings, Blooms for Forgings and Billets for re-rolling Class I Special Forgings which will be cases-hardened. Class II Ordinary and Boiler forgings. Class III Special forgings without wearing surfaces. Class IV Special forgings with wearing surfaces. Class I Steel Bars Class III Steel Bars Class IV Steel Bars Class II Bars, Sections and Plates. Carbon Steel Plates for Locomotive Boilers Non-Flanging quality. Class VI Boiler Rivet. Class VII Ordinary Rivet Bars Carbon Spring Steel for laminated Springs. Silico Manganese Spring Steel for Laminated Springs. Gr. 1- Water Quality. Gr. 2- Oil Hardening Quality. M. S. Sheets. Pannel Plates. Class II H. T. Plates, sections and Bars. Carbon Spring Steel of Voluate and Helical Springs. Silico Manganese Spring Steel for Volute & Helical Springs. Blooms for forgings and Bars. Class I Class II Class XII Steel Rivet Bars (High Tensile).	.18 max	.70 max	.10-.20	.05 max	.05 max	24-27	29-25
IRS-M-5/65		.18 max	.70 max	.10-.20	.05 max	.06 max	26-32	28-22
IRS-M-5/54		.10-.28	.30-.75	.10 max	.06 max	.05 max	32-38	26-20
IRS-M-6/59		.20 max	.50-.75	.15-.25	.05 max	.05 max	40-55	20-15
IRS-M-7/47		.12-.16	.40-.60	.15-.25	.05 max	.05 max	38-44	25-22
IRS-M-8/45		.14-.20	.40-.60	.10 max	.05 max	.05 max	50-60	22-17
		.50-.65	.50-.65	.10-.35	.05 max	.05 max	63-71	17-13
		35-.45	.60-1.0	1.6-2.0	.05 max	.05 max	28-33	..
		50-.60	70-1.0	1.5-2.0	.05 max	.05 max	25-30	..
		Replaced by IS 1079 Grade 2	25-.35	.045 max	.05 max	.05 max	25-30	..
		08-.10	1.1-1.25	.20 max	.05 max	.05 max	25-30	..
		.30 max	.45-.70	.30 max	.05 max	.05 max	25-30	..
		9-1.2	.70-1.0	.150-2.0	.05 max	.05 max	25-30	..
		5-.60	..	..	..	..	25-30	..
		..	..	..	..	..	25-30	..
		25 max	.80-.90	..	.05 max	.05 max	25-30	..
								27-22

SHAFTINGS AND BRIGHT BARS

Bright Bars (Round - Square - Hexagonal) are available in cold drawn quality. Bright Bars (Rounds) turned can also be made available on request.

The theoretical weight and sizes available is as under :

Size mm	Round kg/m	Squares kg/m	Hex kg/mm	Size mm	Round kg/m	Squares kg/m	Hex kg/mm
5	.154	.196	.170	25	3.85	4.91	4.25
6	.222	.283	.245	26	4.17	5.31	4.60
7	.302	.385	.333	27	4.49	5.72	4.96
8	.395	.502	.435	28	4.83	6.15	5.33
9	.499	.636	.551	29	5.19	6.60	5.72
10	.617	.735	.680	30	5.55	7.07	6.12
11	.746	.950	.823	35	7.55	9.32	8.33
12	.888	1.13	.979	40	9.86	12.6	10.9
13	1.04	1.33	1.15	45	12.5	15.9	13.8
14	1.21	1.54	1.33	50	15.4	19.6	17.0
15	1.39	1.77	1.53	53	17.31	22.05	..
16	1.58	2.01	1.74	56	19.34	24.62	..
17	1.78	2.27	1.96	60	22.18	28.26	..
18	2.00	2.54	2.20	63	24.47	31.16	..
19	2.23	2.83	2.45	65	25.45	33.17	..
20	2.47	3.14	2.72	70	30.20	38.48	..
21	2.72	3.46	3.00	75	34.66	44.15	..
22	2.98	3.80	3.29	80	39.46	50.24	..
23	3.26	4.15	3.60	90	49.94	63.58	..
24	3.55	4.52	3.92	100	61.66	78.50	..

We can supply the material in any required size and also in British sections.

CHEQUERED PLATES			
Thickness in mm	Weight Per Sq. Mtr.	Thickness in mm	Weight Per Sq. Mtr.
5	45.3	8	68.8
6	53.2	10	84.6
7	61.1	12	100.3

Thick- ness mm	Basic weight kg/m ²	Width in Millimetre											
		900	1000	1100	1200	1250	1400	1500	1600	1800	2000	2200	2500
5	39.2	35.32	39.25	43.18	47.06	49.06	54.95	58.88	62.80	70.65	78.50	86.35	98.12
6	47.1	42.39	47.10	51.81	56.52	58.88	65.94	70.65	75.36	84.78	94.20	103.6	117.7
7	55.0	49.46	54.95	60.45	65.94	68.69	76.93	82.42	87.92	98.91	109.89	120.89	137.37
8	62.8	56.52	62.80	69.08	75.36	78.50	87.92	94.20	100.5	113.0	125.6	138.2	157.0
9	70.6	68.59	70.65	77.71	84.78	88.31	98.91	106.0	113.0	127.2	141.3	155.4	176.6
10	78.5	70.65	78.50	86.35	94.20	98.12	109.9	117.8	125.6	141.3	157.0	172.7	196.3
12	94.2	84.78	94.2	103.6	113.0	117.8	131.9	141.3	150.7	169.6	188.4	207.2	235.5
14	109.9	98.91	109.9	120.9	131.9	137.4	153.9	164.8	175.8	197.8	219.8	241.8	274.8
16	125.6	113.0	125.6	138.2	150.7	157.0	175.8	188.4	201.0	226.1	251.2	276.3	314.0
18	141.3	127.2	141.3	155.4	169.6	176.6	197.8	211.9	226.2	254.3	282.6	310.9	353.2
20	157.0	141.3	157.0	172.2	188.4	196.2	219.8	235.5	251.2	282.6	314.0	345.4	392.5
22	172.7	155.4	172.7	190.0	207.2	215.9	241.8	259.0	276.3	310.9	345.4	379.9	431.7
25	196.2	176.6	196.2	215.9	235.5	245.3	274.7	294.4	314.0	353.2	392.5	431.8	490.6
28	219.8	197.8	219.8	241.8	263.8	274.8	307.7	329.7	351.7	395.6	439.6	483.6	549.5
32	251.2	226.1	251.2	276.3	301.4	314.0	351.7	376.8	401.9	425.2	502.4	552.6	628.0
36	282.6	254.3	282.6	310.9	359.1	353.2	395.6	423.9	452.2	508.7	565.2	621.7	706.4
40	314.0	282.6	314.0	345.4	376.8	392.5	439.6	471.0	502.4	565.2	628.0	690.8	785.0
45	353.2	317.9	353.2	388.5	423.9	441.6	496.6	529.9	565.2	635.8	706.5	777.2	883.1
50	392.5	353.2	392.5	413.7	471.0	490.6	549.5	588.8	628.0	706.5	785.0	863.5	981.2
56	439.6	395.6	439.6	483.6	527.5	549.5	615.4	659.4	703.4	791.3	879.2	967.1	1099
63	494.5	445.1	494.5	544.0	593.5	618.2	692.4	741.8	791.3	890.2	989.0	1088	1236
71	557.4	501.6	557.4	613.1	668.9	696.7	780.3	836.1	891.8	1003	1115	1226	1393
80	628.0	565.2	628.0	690.8	753.6	785.0	879.2	942.0	1005	1130	1256	1382	1570

Weight of Plate = Length in Mtr. x Width in Mtr. x Thickness in mm x 7.85 (kgs.)

SOME IMPORTANT INDIAN STANDARD SPECIFICATIONS WITH SIMILAR FOREIGN SPECIFICATIONS

Sl.	Type	Indian	British	American	Russian	German	JAPANESE	LLOYDS
1.	Structural Steel	IS : 2062	BS:4360	ASTM A36	GOST915	DIN.17100	JISG.3101	
2.	Galvanised Sheets Steel	IS : 277	BS:2989	ASTM A283	GOST.1577			
3.	Cold Rolled Carbon Steel Strips	IS : 4030	BS:3083	ASTM A163		DIN.59231	JISG.3302	
4.	Black Plates for tinning & Tin Plates	IS : 597	BS:1449	ASTM A109		DIN.1624	JISG.3308	
5.	High Tensile Structural Steel	IS : 961	BS:2920	ASTM A625			JISG.3303	
6.	Fusion Weldable Structural Steel	IS : 2062	BS:4360	ASTM A242	GOST.5058	DIN.17100	JISG.5528	
7.	Boiler Quality	IS : 2002	BS:1501	ASTM A440				Lloyd's Register of Shipping Chapter Q
8.	Ship Building Structural Steel	IS : 2041		ASTM A441				Lloyd's Register of Shipping Chapter P
9.	Cold Forming/Deep drawing/Flanging Steel	IS : 2100		ASTM A514				
10.	Hot Rolled Carbon Strips & Sheets for Cold Forming	IS : 3039	BS:1449	ASTM A36	GOST.4637	DIN.17100	JISG.3106	
11.	Hot Rolled Steel for Flanging & Pressing	IS : 2985	BS:1449	ASTM A285	GOST.5520	DIN.17155	JISG.3103	
12.	Hot Rolled Steel Sheets for low Pressure Gas cylinder	IS : 513	BS:1449	ASTM A366	GOST.8596			
13.	Cold Reduced Tin Plate & Cold Reduced Black Plate	IS : 1079	BS:1449	ASTM A569		DIN.1623	JISG.3113	
		IS : 6240	BS:1501	ASTM A621		DIN.1624	JISG.3131	
		IS : 1993	BS:2920	ASTM A624		DIN.1623	JISG.3131	
			BS:1449	ASTM A626		DIN.17100		

GALVANISED SHEETS

PACKING LIST (Plain & Corr.), CLASS III

Thickness & Gauge		Width		Corru- gation	Length of Sheet in mm						No. of Sheet & Wt. per Bundle
mm	G	mm	mm		1800	2200	2500	2800	3000	3600	
Area per sheet in square metre											
1.60	16	900	800	10	1.62	1.98	2.25	2.52	2.70	3.24	No. Kg.
1.25	15	900	800	10	5	4	4	3	3		No. Kg.
1.00	20	900	800	10	6	5	5	4	4		No. Kg.
0.80	22	900	800	10	8	7	6	5	5		No. Kg.
0.63	24	900	800	10	10	8	7	6	6		No. Kg.
1.60	16	750	660	8	12	10	9	8	7		No. Kg.
Area per sheet in square metre											
1.25	18	750	660	8	1.35	1.65	1.875	2.10	2.25	2.70	No. Kg.
1.00	20	750	660	8	6	5	4	4	3		No. Kg.
0.80	22	750	660	3	105.4	107.4	97.6	109.3	87.8		No. Kg.
0.63	24	750	650	8	7	6	5	5	4		No. Kg.
					97.0	101.6	96.2	107.8	92.3		No. Kg.
					100.8	109.6	108.9	104.6	93.4		No. Kg.
					109.0	111.0	113.6	113.0	106.0		No. Kg.
					102.1	108.9	101.2	102.1	97.2		No. Kg.

For all grades the number of sheets per bundle remain constant, but the weight will vary according to grade specified for Zinc coating. The weight can be found with the aid of previous table. The weight of thinner sheets should be calculated on the basis of zinc coating added to the weight of Black sheets, with a variation of 15 to 20 grams per sq. metre.

WEIGHT IN KILOGRAMS PER SQUARE METRE

Grade of Coating	Min. Avg. Coating Triple Spot Test g/m ²	Min. Coating Single Spot Test g/m ²
(1)	(2)	(3)
600	600	510
450	450	380
350	350	300
275	275	235
220	220	190
200	200	170
180	180	155
120	120	100

LENGTH : 1800 to 3000 mm
 WIDTH BEFORE CORRUGATION : 750, 900, 1000 mm
 NO. OF CORRUGATION : 8, 10, 11
 WIDTH AFTER CORRUGATION : 660, 800, 885 mm

• Minimum individual value obtained in triple spot test.

Specification No.	Material	Chemical Composition					Mechanical Properties	
		C max	Mn	S max	P max	Si max	Tensile Strength Kgf/mm ² min.	Elongation per cent min. gauge length 5.65√SO
IS : 3039/65	Structural steel (ship building quality) Grade-A Grade-D	*	—	0.050	0.050	—	41.50	22
		**0.21	**0.60	0.050	0.050	0.35	41.50	22

* For Grade A in thickness over 12.5 mm the manganese shall not be less than 2.5 times the carbon content

** For Grade D the sum of Carbon content plus 1/6th of Manganese content shall not exceed 0.40 per cent.

Specification No.	Materials	Chemical Composition per cent				
		C	Si	Mn	S	P
**IS: 3885/69	Steel for the manufacture of laminated springs (Railways Rolling Stock) Rib and Groove Sections Grade I: C 55 Water hardening	0.50	0.10	0.50	0.050	0.050
Part II	2: C75 Oil hardening	- 0.60	- 0.35	- 0.65		
	2: C75 Oil hardening	0.70	0.10	0.50	0.050	0.050
	2: C75 Oil hardening	- 0.80	- 0.35	- 0.80		
	*3: 40 Si 2 Mn 90 Water hardening	0.35	1.50	0.80	0.050	0.050
	4: 55 Si 2 Mn 90 Oil hardening	- 0.45	- 2.00	- 1.00		
	4: 55 Si 2 Mn 90 Oil hardening	0.50	1.50	0.80	0.050	0.050
		- 0.60	- 2.00	- 1.00		

* For flat sections this grade will be as per Grade 3 of IS : 3885/66 Part I as amended in April 1968.

** This supersedes IRS : M 10/65 and IRS : M 11/65 specifications.

Specification No.	Materials	Chemical Composition per cent					Mechanical Properties			
		C	Si	Mn	S	P	UTS	EL%	Bond Test	GR
IS : 3502	Steel M. S. Plate Chequered type for journal purpose	0.25 Max	0.032	0.450	0.07 Max	0.07 Max	310	20	OK	WT

Remarks : UTS & Elongation values are in minimum

Specification No.	Materials	Chemical Composition per cent max.			Mechanical Properties				
		C	Mn	S & Peach	Tensile Strength N/mm ² (kgf/mm ²) min	Yield Stress N/mm ² (kgf/mm ²) min	Elongation Properties		
							Lo=80 mm b=20 mm upto 3 mm thickness	Gauge Length	
								5.65√S0 over 3 mm thickness	200 mm
IS-1079/73	HR Carbon Steel Sheet and Strip Gr. 0-1079	--	--	0.06	--	--	--	--	--
	D-1079	0.12	0.50	0.05	--	--	--	--	--
	DD-1079	0.10	0.50	0.04	260-390 (27-40)	--	17	23	16
	EDD-1079	0.10	0.45	0.035	260-380 (27-39)	--	18	25	17
	St 34-1079	0.15	--	0.05	330-410 (34-42)	205 (21)	18	25	18
	St 42-1079	0.25	--	0.05	410-490 (42-50)	235 (24)	16	22	15
	St 50-1079	0.30	--	0.05	490-590 (50-60)	295 (30)	16	20	13
	St 52-1079	0.25	--	0.05	510-610 (52-62)	355 (36)	16	20	1

* For designing purposes, the tensile shall be taken as 260N/mm² (27 kgf/mm²) minimum.

MECHANICAL PROPERTIES AT ROOM TEMPERATURE IN AS DELIVERED CONDITION FOR ANNEALED SKIN PASSED SHEETS AND STRIPS (CUT LENGTHS AND COILS)

Grade	Tensile Strength MPa	Yield Stress MPa (max.)	Elongation Percent 80 mm Gauge Length (Min.)	Hardness HBS	max. HR (30T)
IS : 513/1986					
Ordinary (O)	--	--	--	--	--
Drawing (D)	270-410	280	28	65	60
Deep Drawing (DD)	270-370	250	32	57	55
Extra Deep Drawing (EDD)	270-350	220	36	50	50

NOTE : 1. Tensile test values apply to transverse specimen in case of strips wider than 250 mm. Strips having a width of 250 mm and below shall be tested longitudinally.
 2. Cupping test shall be applicable only for sheets and strips of D, DD and EDD grades having thickness from 0.5 mm upto 2.00 mm.
 3. Cupping test shall be carried out in accordance with IS : 10175 - 1982 and the minimum Erichson cupping test values shall be as given in figure 1.

Grade	Material	Chemical Composition per cent			
		C	Mn	S	P
IS : 597/62	Black plate for tinning and tinplate				
	Deep Stamping	0.14	0.50	0.060	0.090
	Deep Drawing	0.10	0.40	0.050	0.060

NOTE : For similar foreign specifications, please see at end of mild steel specs.

WIRE

Gauge	Diameter		Weight 100M	Length Per 1 Kg	Gauge	Diameter		Weight 100M	Length Per 1 kg
	Inch	mm				Inch	mm		
	Inch	mm	kg	M	swg	Inch	mm	kg	M
7/0	.500	112.7000	99.2264	-	9	.144	3.6576	8.2302	12.150
6/0	.464	11.7856	85.4521	-	9.1/4	.140	3.5560	-	-
5/0	.432	10.9728	74.0721	1.350	9.1/2	.136	3.4544	-	-
4/0	.400	10.1600	63.5049	1.574	9.3/4	.132	3.3528	-	-
3/0	.372	9.4488	54.9254	1.802	10	.128	3.2512	6.5029	15.375
2/0	.348	8.8392	48.0668	2.080	10.1/4	.125	3.1760	-	-
1/0	.324	8.2296	41.6655	-	10.1/2	.122	3.0988	-	-
1	.300	7.6200	35.7215	2.800	10.3/4	.119	3.0226	-	-
1.1/2	.288	7.3152	-	-	11	.116	2.9464	5.3408	18.72
2	.276	7.0104	30.2347	3.308	11.1/4	.113	2.8702	-	-
2.1/4	.270	6.8580	-	-	11.1/2	.110	2.7940	-	-
2.1/2	.264	6.7056	-	-	11.3/4	.107	2.7178	-	-
2.3/4	.258	6.5532	-	-	12	.104	2.6416	4.2929	22.48
3	.252	6.4008	25.2051	3.967	12.1/4	.101	2.5654	-	-
3.1/4	.247	6.2738	-	-	12.1/2	.098	2.4892	-	-
3.1/2	.242	6.1468	-	-	13	.092	2.3358	3.3594	29.77
3.3/4	.237	6.0198	-	-	13.1/2	.086	2.1844	-	-
4	.232	5.8928	21.3631	4.681	14	.080	2.0320	2.5402	39.37
4.1/4	.227	5.7658	-	-	14.1/2	.076	1.9304	2.2925	-
4.1/2	.222	5.6388	-	-	15	.072	1.8288	2.0575	48.65
4.3/4	.217	5.5118	-	-	15.1/2	.068	1.7272	1.8353	-
5	.212	5.3848	17.8385	5.606	16	.064	1.6256	1.6257	61.51
5.1/4	.207	5.2578	-	-	16.1/2	.060	1.5240	1.4288	-
5.1/2	.202	5.1608	-	-	17	.056	1.4224	1.2447	80.37
5.3/4	.197	5.0038	-	-	17.1/2	.052	1.3208	1.0732	-
6	.192	4.8768	14.6315	6.834	18	.048	1.2192	0.9145	109.3
6.1/4	.188	4.7752	-	-	18.1/2	.044	1.1176	0.7684	-
6.1/2	.184	4.6736	-	-	19	.040	1.0166	0.6350	157.4
6.3/4	.180	4.5720	-	-	19.1/2	.088	0.9652	0.5731	-
7	.176	4.4704	12.2945	8.134	20	.036	0.9144	0.5144	194.4
7.1/4	.172	4.3688	-	-	20.1/2	.034	0.8636	0.4688	-
7.1/2	.168	4.2672	-	-	21	.032	0.8128	0.4064	246.0
7.3/4	.164	4.1656	-	-	22	.028	0.7112	0.3112	331.6
8	.160	4.0640	10.1608	9.845	23	.024	0.6096	0.2286	-
8.1/4	.156	4.9624	-	-	23	.022	0.5583	0.1921	501.0
8.1/2	.152	3.8608	-	-	25	.020	0.5080	0.1587	-
8.3/4	.148	3.7592	-	-	26	.018	0.4572	0.1286	802.4
					28	.014	0.3759	-	-

**Ship Building Quality Specifications-
Lloyds/American Bureau of Shipping.**

Specification No.	Material	Chemical Composition per cent				Mechanical Properties		
		C	Mn	S Max	P Max	Tensile Strength kg/mm ² min	Elongation per cent min	
Lloyds Specn. Steel for Hull								
ABS Structures								
Grade A	See Note 1	See Note 1	--	0.05	0.05	41.50	22	
Grade B	0.21 max	0.80 min.	See Notes 2 & 3	0.05	0.05	41.50	22	
Grade C	0.23 max	0.60-1.40	0.15-0.30	0.05	0.05	41.50	22	
Grade D	0.21 max	0.60-1.40	0.35 max	0.05	0.05	41.50	22	
Grade E	0.18 max	0.70-1.50	0.10-0.35	0.05	0.05	41.50	22	

NOTE : 1. For Grade A in the thickness over 12.5 mm the manganese content shall not be less than 2.5 times the carbon content.
 2. For Grade B, when the silicon content is 0.15 per cent or more (killed steel) the minimum manganese content may be reduced to 0.60 per cent.
 3. For Grade B, C, D and E, the sum of carbon content plus 1/8th of the manganese content shall not exceed 0.40 per cent.

Specification	Material	Chemical Composition per cent					Mechanical Properties		
		C max.	Mn.	Si	S max.	P max.	Tensile Strength kgf/mm ²	Yield Strength kgf/mm ²	Elongation per cent
IS : 6240/71	HR Sheet for LPG Cylinders.								
	GR.-A	.17	.3 to .6	.1 to .35	.045	.045	34 to 42	22 Min.	22 Min.
	Gr-B	.20	.9 max	.1 to .35	.045	.045	36 to 46	25 Min.	25 Min.

CHEMICAL COMPOSITION

NOTE : 1 When the steel is Al-Killed Nitrogen content shall be limited to 0.01% max.
 When steel is not fully killed by Al. alone Nitrogen content shall be limited to 0.007% max.
 2 When Al. or combination of Al & Si is used for killing the requirements regarding Min, Si, content do not apply.

**STANDARD FLAT BOTTOM RAILS
WEIGHT & DIMENSIONS OF RAILS**

Sections

One tonne equal to

KG/ METERS	LBS/ YARD	A HEIGHT	B BOTTOM	C TOP	D WEB	METRE
9.92	20	63.49 mm	63.49 mm	35.00 mm	6.00 mm	100.80
11.91	24	69.00 mm	70.00 mm	38.00 mm	7.00 mm	84.02
14.88	30	76.20 mm	76.20 mm	41.20 mm	7.54 mm	67.20
20.50	40	88.05 mm	82.07 mm	47.06 mm	11.51 mm	56.00
24.802	50	93.66 mm	93.76 mm	50.80 mm	10.72 mm	40.30
29.76 RBS	60	114.30 mm	109.50 mm	57.20 mm	11.10 mm	33.59
29.76 BS	60	109.54 mm	109.54 mm	57.15 mm	11.51 mm	33.59
37.13 BS	75	122.24 mm	122.24 mm	61.91 mm	13.89 mm	26.89
37.13 RBS	75	128.60 mm	122.20 mm	61.90 mm	13.100 mm	26.89
44.61 BS	90	136.52 mm	136.52 mm	66.68 mm	14.29 mm	22.40
44.61 RBS	90	142.90 mm	136.50 mm	66.70 mm	13.90 mm	22.40
52.09 RBS	105	156.00 mm	146.00 mm	71.00 mm	15.50 mm	19.20

CRANE RAILS

29.85	CR-50	90.00 mm	90.00 mm	50.00 mm	20.00 mm	33.40
40.03	CR-60	105.00 mm	105.00 mm	60.00 mm	24.00 mm	25.00
63.89	CR-80	130.00 mm	130.00 mm	80.00 mm	32.00 mm	15.60
88.96	CR-100	150.00 mm	150.00 mm	100.00 mm	38.00 mm	11.25
118.10	CR-120	170.00 mm	170.00 mm	120.00 mm	44.00 mm	8.50
122.00	CR-140	152.00 mm	140.00 mm	140.00 mm	64.00 mm	8.20

Steel Tubes and Tubulars (Light, Medium, Heavy)

Nominal Bore	Outside Diameter				Thickness		Plain End		
	max.		min.						
	in	in	mm	in	mm	in	mm	kg/ft	kg/mtr
Light	³ / ₈	.671	17.1	.656	16.7	.072	1.8	.205	.674
	½	.841	21.4	.825	21.0	.080	2.0	.290	.952
	¾	1.059	26.9	1.041	26.4	.092	2.35	.428	1.41
	1	1.328	33.8	1.309	33.2	.104	2.65	.612	2.01
	1¼	1.670	42.5	1.650	41.9	.104	2.65	.785	2.58
	1½	1.903	48.4	1.882	47.8	.116	2.9	.993	3.25
	2	2.370	60.2	2.347	59.6	.116	2.9	1.25	4.11
	2½	2.991	76.0	2.960	75.2	.128	3.25	1.77	5.80
Medium	³ / ₈	.686	17.5	.660	16.7	.092	2.35	2.260	.852
	½	.856	21.8	.831	21.0	.104	2.65	.373	1.22
	¾	1.072	27.3	1.047	26.5	.194	2.65	.481	1.58
	1	1.346	34.2	1.316	33.3	.128	3.25	.744	2.44
	1¼	1.387	42.9	1.657	42.0	.128	3.25	.957	3.14
	1½	1.919	48.8	1.889	47.9	.128	3.25	1.10	3.61
	2	2.094	60.8	2.334	59.7	.144	3.25	1.55	5.10
	2½	3.014	76.6	2.969	75.3	.144	3.65	1.99	6.61
Heavy	³ / ₈	.685	17.5	.660	16.7	.116	2.9	.311	1.02
	½	.856	21.8	.831	21.0	.128	3.25	.443	1.45
	¾	1.072	27.3	1.047	26.5	.128	3.25	.576	1.90
	1	1.346	34.2	1.316	33.3	.160	4.05	.907	2.97
	1¼	1.687	42.9	1.657	42.0	.160	4.05	1.17	3.84
	1½	1.919	48.8	1.889	47.9	.160	4.05	1.35	4.43
	2	2.394	60.8	2.354	59.7	.176	4.5	1.39	6.17
	2½	3.014	76.6	2.969	75.3	.176	4.5	2.41	7.90
3	3.524	89.5	3.469	88.0	.192	4.85	3.07	10.1	
4	4.524	115.0	4.459	113.1	.212	5.4	4.40	14.4	
5	5.534	140.8	5.459	138.5	.212	5.4	5.44	17.8	
6	6.539	166.5	6.459	163.9	.212	5.4	6.49	21.2	

GRADE	Chemical Composition % max.		UTS		YS	% Elongation GI=5.65 (min)	* Impact value (***) Bend charpy V Notch joules (Min.) AT 20°C
	C	Mn.	MPA	MPA (Min)			
SAILMA 300	0.25	1.50	0.055	440-560	300	20	3 x T.
SAILMA 300 HI	0.25	1.50	0.040	440-560	300	21	40 3 x T.
SAILMA 350	0.25	1.50	0.055	490-610	350	20	40 3 x T.
SAILMA 350 HI	0.25	1.50	0.055	490-610	350	21	40 3 x T.
SAILMA 410	0.25	1.50	0.055	540-660	410	19	40 3 x T.
SAILMA 410 HI	0.25	1.50	0.055	540-660	410	20	35 3 x T.
SAILMA 450	0.25	1.50	0.055	570-720	450	18	30 3 x T.
SAILMA 450 HI	0.25	1.50	0.055	570-720	450	19	30 3 x T.

SEMI-KILLED

General Grade: C 0.14, Mn 0.70, P 0.04, S 0.04

Special Grade: C 0.10, Mn 0.60, P 0.04, S 0.04

PHYSICAL PROPERTIES

* It is carried out normally for sections having thickness 12mm & above. The values shown above are for normalised plates from 12mm to 20mm. For sections 10mm and above and for plates thicker than 20mm, These will be as per negotiation between customers and producers.

(**) Plates with 2T bend can be supplied against special order.

Note : HI-Denotes imported notch ductility. Tmpa = 0.1020 kgf/mm², Joule = 0.1020 kgf. M.

Material	Chemical Composition (sk) Percent		Mechanical Properties	
	C Min	P Max	Yield Strength Kg/mm ² Min	Elongation percent Min
High yield Strength deformed Bars for Concrete reinforcement	0.40	0.06	42.5	11

**IS : 2062 as amended in 1999
Chemical Composition**

Materials	GRADE	C max %	Mn max %	S max %	P max %	Si max %	CE max %
Structural Steel Fusion Welding Quality, Plates, Flats, Bar Round Square & Hexagonal	A	0.23	1.50	0.050	0.050	0.40	0.42
	B	0.22	1.50	0.045	0.045	0.40	0.41
	C	0.20	1.50	0.040	0.040	0.40	0.39
Note : CE based on ladle analysis = $C + \frac{Mn}{6} + Cr + \frac{Mo+V}{5} + \frac{Ni+Cu}{15}$							

Mechanical Properties

GRADE	UTS (MPA) Min	Y.S. (MPA) Min. <20 mm 20-40 mm >40 mm	El. % Min 5.65 V50	Bend Test	Charpy V Notch Energy J mm
A	410	250 240 230	23	3t	--
B	410	250 240 230	23	2t & 3t*	27
C	410	250 240 230	23	2t	27
Note : t is the thickness of the material. *2t - less than 25 mm. *3t - more than 25 mm.					

**STANDARD SIZES AND WEIGHTS
ASTM A106-68 Carbon Seamless Steel Pipe**

Normal Size	Outside Diameter		Wall Thickness		Class	Sched No.	Plain End							
							Nominal Weight		Test Pressure min.					
									Butt Weight		Grade A		Grade B	
in	in	mm	in	mm		kg / ft	kg / m	psi	kg / cm ²	psi	kg / cm ²	psi	kg / cm ²	
1/8	.405	10.3	.068	1.7	std	40	.11	.36	700	49.2	700	49.2	700	49.2
			.095	2.4	xs	80	.14	.46	850	59.8	850	59.8	850	59.8
1/4	.540	13.7	.088	2.2	std	40	.19	.63	700	49.2	700	49.2	700	49.2
			.119	3.0	xs	80	.24	.80	850	59.8	850	59.8	850	59.8
3/8	.675	17.1	.091	2.3	std	40	.26	.85	700	49.2	700	49.2	700	49.2
			.126	3.2	xs	80	.34	1.10	850	59.8	850	59.8	850	59.8
1/2	.840	21.3	.109	2.8	std	40	.39	1.26	700	49.2	700	49.2	700	49.2
			.147	3.7	xs	80	.49	1.62	850	59.8	850	59.8	850	59.8
			.294	7.5	xxs	...	.78	2.54	1000	70.3	1000	70.3	1000	70.3
			.113	2.9	std	40	.51	1.68	700	49.2	700	49.2	700	49.2
3/4	1.050	26.7	.154	3.9	xs	80	.67	2.19	850	59.8	850	59.8	850	59.8
			.308	7.8	xxs	...	1.11	3.63	1000	70.3	1000	70.3	1000	70.3
1	1.315	33.4	.133	3.4	std	40	.78	2.50	700	49.2	700	49.2	700	49.2
			.179	4.5	xs	80	.98	3.23	850	59.8	850	59.8	850	59.8
1 1/4	1.660	42.2	.353	9.1	xxs	...	1.66	5.45	1000	70.3	1000	70.3	1000	70.3
			.140	3.6	std	40	1.03	3.38	1000	70.3	1000	70.3	1100	77.3
1 1/2	1.900	48.3	.191	4.9	xs	80	1.36	4.46	1300	91.4	1500	105.5	1600	112.5
			.382	9.7	xxs	...	2.36	7.75	1400	98.4	1800	126.6	1900	133.6
2	2.375	60.3	.145	3.7	std	40	1.23	4.05	1000	70.3	1000	70.3	1100	77.3
			.200	5.1	xs	80	1.65	5.40	1300	91.4	1500	105.5	1600	112.5
			.400	10.2	xxs	...	2.91	9.54	1400	98.4	1800	126.6	1900	133.6
			.154	3.9	std	40	1.66	5.43	1000	70.3	2300	161.7	2500	175.8
2	2.375	60.3	.218	5.5	xs	80	2.28	7.47	1300	91.4	2500	175.8	2500	175.8
			.344	8.7	...	160	3.38	11.10	...	...	2500	175.8	2500	175.8
2	2.375	60.3	.436	11.1	xxs	...	4.10	13.44	1400	98.4	2500	175.8	2500	175.8

Cont.....

**STANDARD SIZES AND WEIGHTS
ASTM A106-68 Carbon Seamless Steel Pipe**

Normal Size	Outside Diameter		Wall Thickness		Class	Sched No.	Plain End							
							Nominal Weight		Test Pressure min.					
									Butt Weight		Grade A		Grade B	
in	in	mm	in	mm		kg / ft	kg / m	psi	kg / cm ²	psi	kg / cm ²	psi	kg/cm ²	
2½	2.875	73.0	.203	5.2	std	40	2.63	8.62	1000	70.3	2500	175.8	2500	175.8
			.276	7.0	xs	80	3.47	11.40	1300	91.4	2500	175.8	2500	175.8
			.375	9.5	...	160	4.54	14.90	1400	98.4	2500	175.8	2500	175.8
3	3.500	88.9	.552	14.0	xxs	...	6.21	20.39	1400	98.4	2500	175.8	2500	175.8
			.188	4.8	...	...	3.01	9.87	1000	70.3	...	...	...	...
			.216	5.5	std	40	3.44	11.28	1000	70.3	2200	154.7	2500	175.8
3½	4.000	101.6	.300	7.6	xs	80	4.65	15.25	1300	91.4	2500	175.8	2500	175.8
			.438	11.1	160	...	6.49	21.30	...	...	2500	175.8	2500	175.8
			.600	15.2	xxs	...	8.43	27.65	...	...	2500	175.8	2500	175.8
4	4.500	114.3	.188	4.8	...	...	3.46	11.35	1200	84.4	...	...	...
			.226	5.7	std	40	4.13	13.56	1200	84.4	2000	140.6	2400	168.7
			.318	8.1	xs	80	5.67	18.62	1700	119.5	2800	196.9	2800	196.9
5	5.563	141.3	.156	4.0	...	...	3.29	10.79	1000	70.3	...	...	...
			.188	4.8	...	...	3.92	12.86	1200	84.4	...	...	...
			.219	5.6	...	...	4.54	14.88	1200	84.4	...	...	...
5	5.563	141.3	.237	6.0	std	40	4.89	16.06	1200	84.4	1900	133.6	2200	154.7
			.337	8.6	xs	80	6.79	22.29	1700	119.5	2700	189.8	2800	196.9
			.438	11.1	...	120	8.61	28.25	...	...	2800	196.9	2800	196.9
5	5.563	141.3	.531	13.5	...	160	10.21	33.51	...	...	2800	196.9	2800	196.9
			.674	17.1	xxs	...	12.49	40.98	...	...	2800	196.9	2800	196.9
			.258	6.6	std	40	6.63	21.76	...	...	1700	119.5	1900	133.6
5	5.563	141.3	.375	9.5	xs	80	9.43	30.92	...	...	2400	168.7	2800	196.9
			.500	12.7	...	120	12.27	40.24	...	...	2800	196.9	2800	196.9
			.625	15.9	...	160	14.95	49.05	...	...	2800	196.9	2800	196.9
5	5.563	141.3	.750	19.0	xxs	...	17.49	57.37	...	...	2800	196.9	2800	196.9

Note : 1) Marks as standard, XS and XXS indicate standard weight, extra strong and double extra strong, respectively. 2) Please refer to size, range of products for negotiation.

Specification No.	Material	Chemical Composition per cent				Mechanical Properties			
		C Max	S Max	P Max	Cu Max	Nominal thickness/dia (min.)	Tensile Strength kgf/mm ² min.	Yield Stress kgf/mm ² min.	Elongation % min.
IS : 1977/75	Structural steel- Ordinary Quality Plates, Sections angles, tees, beams, channels etc. and flats.	0.070	0.070	0.35					
						(where so desired)			
Fe-310.0	}				Below 6	Bend test only shall be required			
					6 and over	32-44 --		26	
Fe-410.0	}				Below 10	Bend test only shall be required			
					10 and over	32-44 --		26	
					Below 6	Bend test only shall be required			
					6 and over	42-54 26		23	
Fe-410.0	}				Below 10	Bend test only shall be required			
					10 and over	42-54 26		23	

NOTE : 1. In case of plates, sections and flats below 6 mm, the yield stress shall be assumed to be at least the same as that for thickness 6 mm. and over.
2. In case of bars below 10 mm, the yield stress shall be assumed to be at least the same as that for diameter 10 mm and over.

Specification No.	Material	Chemical Composition per cent				Mechanical Properties		
		C Max	Si	S Max	P Max	Tensile Strength mpa (kgf/mm ² /min)	Yield strength min percent of tensile strength	Elongation per cent min $\frac{5.65}{\sqrt{S_0}}$
IS : 2002/82 As amended in Nov.82	Steel Plates for Boilers Grade-1	0.18	0.15-0.35	0.040	0.035	360-440 (37-45)	55	26
Grade-2						410-490 (42-50)	50	25
Grade-3						510-610 (52-62)	50	20

NOTE : 1. For Plates over 25mm thickness the carbon content shall be as agreed to between the suppliers and the purchaser.
2. Aluminium Content should not exceed 225g per tonne.

Specification	Grade	Chemical Composition %				0.2 % Present Proof Stress/ Y.S.N./mm ² min	Tensile Strength kg/mm ² Min	Elongation Min
		C	S	P	S & P			
IS/1786/85	415	0.30	0.060	0.060	0.110	415	10% more than actual y.s. but not less than 485.0 N/mm ²	14.5
	500	0.30	0.055	0.055	0.105	500	8% more than actual y.s. but not less than 545.0 N/mm ²	12.0
	550	0.30	0.055	0.050	0.100	550	6% more than actual y.s. but not less than 585.0 N/mm ²	8.0

Bend Test : The bend test shall be performed in accordance with the requirements of IS : 1599-1974* and the mandrel diameter shall be as specified in Table. The specimen shall be considered to have passed the test if there is no transverse crack in the bent portion.

* Method for bend test for steel products other than sheet, strip, wire and tube.

Rebend Test : The test piece shall be bent to an included angle of 135° using a mandrel of appropriate diameter. The bent piece shall be aged by keeping in boiling water (100°C) for 30 minutes and then allowed to cool. The piece shall then be bent back to have an included angle of 157½°. The specimen shall be considered to have passed the test if there is no fracture in the bent portion.

The diameter of the mandrel shall be as given below :

Nominal Size of Specimen Dia of Mandrel for Fe 415 and Fe 500 Dia of Mandrel for Fe 550

Up to and including 10 mm 5 φ 7 φ

Over 10 mm 7 φ 8 φ

where φ is the nominal size in mm of test piece.

TABLE : MANDREL DIAMETER FOR BEND TEST
Mandrel Diameter for Different Grades

Nominal Size mm	Fe 415 (2) 3 φ 4 φ	Fe 500 (3) 4 φ 5 φ	Fe 550 (4) 5 φ 6 φ
Up to and including 22 Over 22			

STANDARD SIZES AND WEIGHTS
ASTM A106 Carbon Seamless Steel Pipe

Normal Size	Outside Diameter		Wall Thickness		Class	Sched No.	Plain End								
							Nominal Weight		Test Pressure min.						
									Grade A		Grade B				
in	in	mm	in	mm		kg/ft	kg/m	psi	kg/cm ²	psi	kg/cm ²				
6	6.625	168.3	.280	71	std	40	8.60	28.23	1 500	105.5	1 800	126.6			
			.432	11.0	xs	80	12.96	42.52	2 300	161.7	2 700	189.8			
			.562	14.3	...	120	16.52	54.20	2 800	196.9	2 800	196.9			
			.719	18.3	...	160	20.57	67.47	2 800	196.9	2 800	196.9			
			.864	21.9	xxs	...	24.11	79.11	2 800	196.9	2 800	196.9			
			8	8.625	219.1	.250	6.4	...	20	10.14	33.28	1 000	70.3	1 200	84.4
						.277	7.0	...	30	11.20	36.76	1 200	84.4	1 300	91.4
						.322	8.2	std	40	12.95	42.49	1 300	91.4	1 600	112.5
						.406	10.3	...	60	16.18	53.07	1 700	119.5	2 000	140.6
						.500	12.7	xs	80	19.68	64.57	2 100	147.7	2 400	168.7
.594	15.1	...				100	23.10	75.79	2 500	175.8	2 800	196.9			
.719	18.3	...				120	27.53	90.32	2 800	196.9	2 800	196.9			
.812	20.6	...				140	30.75	100.88	2 800	196.9	2 800	196.9			
.875	22.2	xxs				...	32.85	107.77	2 800	196.9	2 800	196.9			
.906	23.0	...				160	33.89	111.18	2 800	196.9	2 800	196.9			
10	10.750	273.0	.250	6.4	...	20	12.72	41.73	850	59.8	1 000	70.3			
			.279	7.1	...	...	14.15	46.43	950	66.8	1 100	77.3	
			.307	7.8	...	30	15.53	50.95	1 000	70.3	1 200	84.4			
			.365	9.3	std	40	13.36	60.24	1 200	84.4	1 400	98.4			
			.500	12.7	xs	60	24.83	81.48	1 700	119.5	2 000	140.6			
			.594	15.1	...	80	29.21	95.84	2 000	140.6	2 300	161.7			
			.719	18.3	...	100	34.93	114.59	2 400	168.7	2 800	196.9			
			.844	21.4	...	120	40.49	132.85	2 800	196.9	2 800	196.9			
			1.000	25.4	xxs	140	47.23	154.96	2 800	196.9	2 800	196.9			
			1.125	20.6	...	160	52.48	172.11	2 800	196.9	2 800	196.9			

Cont.....

**STANDARD SIZES AND WEIGHTS
ASTM A106 Carbon Seamless Steel Pipe**

Normal Size	Outside Diameter		Wall Thickness		Class	Sched No.	Plain End								
							Nominal Weight		Test Pressure min.						
									Grade A		Grade B				
in	in	mm	in	mm		kg/ft	kg/m	psi	kg/cm ²	psi	kg/cm ²				
12	12.750	323.8	.250	6.4	...	20	15.14	49.74	700	49.2	800	56.2			
			.330	8.4	...	30	19.85	65.18	950	66.8	1 100	77.3			
			.375	9.5	std	...	22.48	73.75	1 100	77.3	1 200	84.4			
			.406	10.3	...	40	24.29	79.70	1 100	77.3	1 300	91.4			
			.500	12.7	xs	...	29.67	97.43	1 400	98.4	1 600	112.5			
			.562	14.3	...	60	33.21	108.92	1 600	112.5	1 900	133.6			
			.688	17.5	...	80	40.17	132.04	1 900	133.6	2 300	161.7			
			.844	21.4	...	100	48.67	159.80	2 400	168.7	2 800	196.9			
			1.000	25.4	xxs	120	56.92	186.91	2 800	196.9	2 800	196.9			
			1.125	28.6	...	140	63.96	208.00	2 800	196.9	2 800	196.9			
			1.312	33.3	...	160	72.72	238.68	2 800	196.9	2 800	196.9			
			14	14.000	355.6	.250	6.4	...	10	16.65	54.69	650	45.7	750	52.7
						.312	7.9	...	20	20.72	67.90	800	56.2	950	66.8
						.375	9.5	std	30	24.75	81.25	950	66.8	1 100	77.3
						.438	11.1	...	40	28.74	94.55	1 100	77.3	1 300	91.4
						.500	12.7	xs	...	32.70	107.39	1 300	91.4	1 300	105.5
.594	15.1	...				60	38.56	126.71	1 500	105.5	1 500	126.6			
.750	19.0	...				80	48.14	158.10	1 900	133.6	2 800	161.7			
.938	23.8	...				100	59.33	194.96	2 400	168.7	2 800	196.9			
1.094	27.8	...				120	68.38	224.65	2 800	196.9	2 800	196.9			
1.250	31.8	...				140	77.21	253.56	2 800	196.9	2 800	196.9			
16	16.000	406.4	.250	6.4	...	10	19.07	62.64	550	38.7	650	45.7			
			.312	7.0	...	20	23.75	77.83	700	49.2	800	56.2			
			.375	9.5	std	30	28.39	93.17	850	59.8	1 000	70.3			
			.500	12.7	xs	40	37.54	123.30	1 100	77.3	1 300	91.4			
			.656	16.7	...	60	48.78	160.12	1 500	105.5	1 700	119.5			
			.844	21.4	...	80	61.95	203.53	1 900	133.6	2 200	154.7			
			1.031	26.2	...	100	74.78	245.56	2 300	161.7	2 700	189.8			
			1.219	31.0	...	120	87.27	286.64	2 700	189.8	2 800	196.9			
			1.438	36.5	...	140	101.41	332.71	2 800	196.9	2 800	196.9			
			1.594	40.5	...	160	111.23	364.93	2 800	196.9	2 800	196.9			

Note : If the item you need is not found in this catalogue, please do write to us we can supply with your special requirements in Pipes and Tubes size 6 mm to 12 mm wall thickness.

Specification	Materials	Chemical Composition %						Mechanical Properties		
		C	S	P	Si	Cu	Nominal Size	Tensile Strength kg/mm ² Min	Yield Stress kg/mm ² Min	Elongation Min
IS-432/66 Part I	Mild Steel and Medium Tensile Steel Bars and hard Drawn Steel Wire for Concrete Reinforcement Mild Steel Grade I	0.25	0.055	0.055	..	.20-.35	All sizes Upto 20 mm	42	26	20
		C upto 20 mm 0.23 max.	0.07	0.07	..	where so desired	Over 20 mm Under 10 mm 10 & over	..	24	23
IS/1139/66 as amended in August, 68	Grade II Medium Tensile Steel H. R. Mild Steel Medium Tensile & High Yield Stress Deformed Bars concrete Reinforcement Mild Steel Medium Tensile High Yield	0.2	0.055	0.055	0.10	..	All sizes Upto 20 mm Over 20 to 40 mm Over 40 mm Below 10 mm 10 & over	58	36 34.5 33	17 20
		0.25 0.20 ..	0.055 0.055 0.055	0.055 0.055 0.055	.. 0.10 ..	20-.35 where so desired ..	Upto 20 mm Over 20 mm Upto 20 mm 20 mm to 40 mm Over 40 mm All Sizes 15% greater than the measured Yield stress Elongation gauge length 5.65 V _{So}	42 24 55 ..	26 24 36 35.5 33	23 20 14.5

Specification No.	Material	Chemical Composition per cent				Mechanical Properties		
		C	Mn	S & P each Max	Si Max	Tensile Strength kgf/mm ² min	Yield Stress kgf/mm ² min	Elongation % 105.65 $\sqrt{S_0}$
IS : 1875/71	Carbon steel billets, blooms, slabs & bars for forgings							
Class 1	C 14	0.10 -0.18	0.40 -0.70	0.050	0.15 -0.35	37	20	26
Class 2	C 20	0.15 -0.25	0.60 -0.90	0.050	0.15 -0.35	44	24	24
Class 3A	C 30	0.25 -0.35	0.60 -0.90	0.050	-0.15 -0.35	50	27.5	21
Class 4	C 35 Min 75	0.30 -0.40	0.60 -0.90	0.050	-0.15 -0.35	55	29	20
Class 5	C 45	0.40 -0.50	0.60 -0.90	0.050	0.15 -0.35	63	33	15
Class 6	C 55 Mn 75	0.50 -0.60	0.60 -0.90	0.050	0.15 -0.35	72	36	13
	C 65	0.60 -0.70	0.50 -0.80	0.050	0.15 -0.35	75	37.5	10

NOTE : The properties given in the table refer to rolling section upto 100 mm in the as-rolled (as in the case of rolled bars upto 50 mm size) or asforged and normalised condition and are applicable to test samples taken along the direction of grain flow. For higher section, the properties shall be as agreed to between the purchaser and the supplier.

DIMENSIONS & TOLERANCES OF E. R. W. STEEL PIPES TO IS : 3589-1981

N. B. mm	O. D. mm	Wall Thickness mm	Weight kg./metre	N. B. mm	O. D. mm	Wall Thickness mm	Weight kg./metre		
175	193.70	4.00	18.70	250	273.00	7.00	46.43		
		4.50	21.00			8.00	52.30		
		4.80	22.60			9.50	61.70		
		5.00	23.30			300	323.90	4.00	31.60
		6.00	27.80					4.60	37.10
		7.00	32.20					4.80	38.20
200	219.10	8.00	36.60	350	355.60	5.00	39.30		
		9.50	43.20			5.20	41.25		
		4.00	21.20			6.00	47.00		
		4.60	24.80			6.35	49.68		
		4.80	25.60			7.00	54.70		
		5.00	26.65			8.00	62.30		
		5.20	27.60			9.50	73.70		
		6.00	31.83			6.35	54.63		
		6.35	33.28			7.10	61.82		
		7.00	36.60			7.94	67.98		
		8.00	41.60			9.50	81.21		
		9.50	49.10			6.35	62.58		
250	273.00	4.00	26.50	400	406.40	7.14	70.27		
		4.60	31.20			7.94	77.92		
		4.80	32.10			9.52	93.13		
		5.00	33.00			450	457.2	6.35	70.33
		5.20	34.67					7.14	79.20
		6.00	39.50					7.92	87.85
		6.35	41.73			9.52	105.14		

TOLERANCES

Thickness - The tolerance on specified wall thickness shall be as follows :

ERW pipe	± 10 percent
EFW pipe	+ 15 percent
	- 10 percent

The hydraulic test pressure shall be the pressure calculated from the following formula, except that the maximum test pressure shall not exceed 5 MPa.

$$P = \frac{2St}{D}$$

- P = test pressure in MPa
S = stress in MPa which shall taken as 40 percent of specified minimum tensile strength
t = specified thickness in mm
D = specified outsides diameter in mm

RECTANGULAR / SQUARE HOLLOW TUBES

HSS D x B mm	Thickness t mm	Sec. Area A cm ²	Unit Wt. w kg/m	SHS D x B mm	Thickness t mm	Sec. Area A cm ²	Unit Wt. w kg/m
50 x 25	2.0	2.74	2.15	25 x 25	1.6	1.43	1.12
	2.6	3.46	2.71		2.0	1.74	1.36
	3.2	4.13	3.24		2.6	2.16	1.69
	4.0	4.95	3.88		3.2	2.53	1.98
60 x 40	2.6	4.76	3.73	32 x 32	2.0	2.30	1.80
	2.9	5.25	4.12		2.6	2.88	2.26
	3.6	6.35	4.98		3.2	3.42	2.69
	4.5	7.67	6.02				
66 x 33	2.6	4.70	3.69	38 x 38	2.0	2.78	2.18
	2.9	5.19	4.07		2.6	3.51	2.75
	3.6	6.28	4.93		3.2	4.19	3.29
	4.5	7.58	5.95		4.0	5.03	3.95
80 x 40	2.6	5.80	4.55	40 x 40	2.6	3.72	2.92
	2.9	6.41	5.03		2.9	4.09	3.21
	3.2	7.01	5.50		3.2	4.45	3.49
	4.0	8.55	6.71		4.0	5.35	4.20
96 x 48	3.2	8.54	6.71	49.5 x 49.5	2.6	4.70	3.69
	4.0	10.47	8.22		2.9	5.19	4.07
	4.8	12.31	9.66		3.6	6.28	4.93
122 x 61	3.6	12.32	9.67	60 x 60	4.5	7.58	5.95
	4.5	15.14	11.88		2.6	5.80	4.55
	5.4	17.85	14.01		2.9	6.41	5.03
120 x 60	3.2	10.85	8.51	72 x 72	3.2	7.01	5.50
	3.6	12.11	9.5		4.0	8.55	6.71
	4.5	14.87	11.67		4.8	10.01	7.85
145 x 82	4.8	20.28	15.92	80 x 80	3.2	8.54	6.71
	5.4	22.60	17.74		4.0	10.47	8.22
	6.0	26.59	20.88		4.8	12.31	9.66
172 x 92	4.8	23.83	18.71	91.5 x 91.5	3.2	9.57	7.51
	5.4	26.59	20.88		4.0	11.75	9.22
	6.0	30.44	23.83		4.8	13.85	10.87
200 x 100	4.0	22.95	18.01	113.5 x 113.5	3.6	12.32	9.67
	5.0	28.36	22.26		4.5	15.14	11.88
	6.0	33.63	26.40		5.4	17.85	14.01
220 x 140	4.0	27.75	21.78	132 x 132	4.8	20.28	15.92
	5.0	34.36	26.97		5.4	22.60	17.74
	6.0	40.83	32.05		6.0	28.36	22.26
240 x 120	7.0	47.18	37.03	150 x 150	7.0	38.78	30.44
	8.0	53.39	41.91		8.0	43.79	34.38
	9.0	59.47	46.69		4.0	27.75	21.78
	10.0	65.42	51.36		5.0	34.36	26.97
					6.0	40.83	32.05
					7.0	47.18	37.03
260 x 180	4.0	34.15	26.81	180 x 180	4.0	27.75	21.78
	5.0	42.36	33.25		5.0	34.36	26.97
	6.0	50.43	39.59		6.0	40.83	32.05
	7.0	58.38	45.83		7.0	47.18	37.03
300 x 150	4.0	34.95	27.43	220 x 220	8.0	53.39	41.91
	5.0	43.36	34.03		4.0	34.15	26.61
	6.0	51.63	40.53		5.0	42.36	33.25
	7.0	59.78	46.93		6.0	50.43	39.59
	8.0	67.79	53.22		7.0	58.38	45.83
	9.0	75.67	59.40		8.0	66.19	51.96
300 x 200	4.0	38.95	30.57	250 x 250	4.0	38.95	30.57
	5.0	48.36	37.96		5.0	48.36	37.96
	6.0	57.63	45.24		6.0	57.63	45.24
	7.0	66.78	52.42		7.0	66.78	52.42
	8.0	75.79	59.50		8.0	75.79	59.50
	10.0	93.42	73.34				

PIG IRON

Specification	Grade	Chemical Composition %				
		Si	P max	S max	C	Mn
IS/224/65	Foundry Pig Iron (Coke) for General purposes. Foundry 1 Foundry 2 Foundry 3 Foundry 4	High Manganese - 1.00 to 1.50	Low Manganese - 0.50 to under 1.00	0.05 0.05 0.05 0.05	3.25 max 3.25 min 2.50-3.25 3.0 min 3.0 min	0.50-1.00 0.58-1.00 0.50 max 0.35 max 1.00 to 1.50 0.50 to Under 1.00 1.0 to 1.50 0.50 to Under 1.00
		2.75 to under 3.25	0.40			
		2.25 to under 2.75	0.40			
		1.75 to under 2.25	0.40			
		1.25 to under 1.75	0.40			
IS/225/57	Charcol Pig Iron for use in blast or Electric smelting furnace High Silicon A High Silicon B No. 1 No. 2 No. 3 No. 4 No. 5	High Manganese - 1.00 to 1.05	Low Manganese - 0.40 to under 1.00	Intermediate Phosphorus - 0.20 max Low Phosphorus - 0.15 max	3.25 max 3.25 min 2.50-3.25 3.0 min 3.0 min	0.50-1.00 0.58-1.00 0.50 max 0.35 max 1.00 to 1.50 0.50 to Under 1.00 1.0 to 1.50 0.50 to Under 1.00
		2.50 & over	As above as the case may be			
		2.00 to under 2.50				
		1.65 to under 2.00				
		1.25 to under 1.65				
IS/2841/64	Pig Iron for Special purpose Low Phosphorus. Br 1-2 1-2 1-3 1-4 1-5 High Silicon 2 HM 2 LM High Silicon 3HM 3LM	1.75-2.75	0.15	0.02 0.02 0.02 0.02 0.02 0.02	3.25 max 3.25 min 2.50-3.25 3.0 min 3.0 min	0.50-1.00 0.58-1.00 0.50 max 0.35 max 1.00 to 1.50 0.50 to Under 1.00 1.0 to 1.50 0.50 to Under 1.00
		1.75-2.25	0.10			
		1.25-1.75	0.15			
		1.50 MAX	0.02			
		1.50 MAX	0.04			
IS/2842/63	Basic Pig Iron (Coke) for Steel making purpose :- Standard Basic Low Silicon Basic	3.75 MIN UNDER 3.25 TO 3.75	0.40 0.40 0.40	0.05 0.05 0.05 0.05 0.05	3.25 max 3.25 min 2.50-3.25 3.0 min 3.0 min	0.50-1.00 0.58-1.00 0.50 max 0.35 max 1.00 to 1.50 0.50 to Under 1.00 1.0 to 1.50 0.50 to Under 1.00
		High Manganese - 1.00 to 1.50	0.40			
		Low Manganese - 0.50 to under 1.00	0.40			
		0.75 - 1.25	0.40			
		Under 0.75	0.40			

**Rolling and Cutting Tolerance for HR Sheets
as per IS : 1852**

Width in mm	Tolerance	Length in mm	Tolerance
Upto 1250	+ 6 mm, - 0	Upto 2500	+ 25 mm, - 0
>1250 to 1550	+ 0.5%, - 0	Over 2500	+ 1% of the length (Max, 70 mm), - 0

Thickness tolerance for sheets as per the table of HR Coils.

TOLERANCE ON WEIGHT

Thickness in mm	Tolerance
Upto 1.25	± 9%
1.25 to 1.6	± 8%
1.6 to 4.0	± 7%

Note : Cutting tolerance for all lengths for all products except plate, strips and sheet shall be +100 mm, -0 mm

**Rolling tolerance for Structural Steel
Sections as per IS : 1852**

ANGLES

Length in mm	Tolerance	Leg length	Chamber
Upto 45	± 1.5 mm	< 100 mm	As per aggrement
> 45 to 100	± 2.0 mm	≥ 100 mm	2% of length
> 100	± 2%		

TOLERANCE ON WEIGHT

Thickness	Tolerance
Upto 3 mm	± 5%
Over 3 mm	+ 5% - 3%

BEAMS

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

Tolerance on weight per metre shall be ± 2.5% of the weight per metre. The permissible limits for Chamber and Sweep shall be 0.2% of the length.

CHANNELS

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

Tolerance on weight per metre shall be ± 2.5% of the weight per metre. The permissible limits for Chamber and Sweep shall be 0.2% of the length.

**Rolling Tolerance for Rounds & Reinforcement Bars
as per IS : 1852 & IS : 1786**

BARS IN STRAIGHT LENGTH

Diameter in mm	Tolerance in mm
Upto 25	± 0.5
> 25 to 35	± 0.6
> 35 to 50	± 0.8
> 50 to 80	± 1.0
The permissible ovality for round bars measured as the difference between the maximum and minimum diameters shall be 75% of total tolerance specified on the size	

TOLERANCE ON WEIGHT

Diameter	Tolerance
Upto 10 mm	± 7%
> 10 to 16 mm	± 5%
> 16 mm	± 3%

REINFORCEMENT BARS IN CTD AND TMT CATEGORY

Length	Tolerance
Specified length	+ 75 mm - 25 mm
Minimum lengths	+ 50 mm - 0 mm

NOMINAL MASS

Nominal size (mm)	Tolerance on the nominal mass, %
Upto 10	± 7
Over 10 and upto 16	± 5
Over 16	± 3

**Rolling Tolerance for Plates & Flats
as per IS : 1852**

PLATES

Thickness in mm	Tolerance in % of Nominal Thickness
Upto 8	+ 12.5 - 5.0
> 8 to 12	+ 7.5 - 5.0
Over 12	± 5.0
Tolerance on Weight	+ 5.0 - 2.5 %

FLATS

Width in mm	Tolerance in mm
Upto 50	± 1.0
> 50 to 75	± 1.50
> 75 to 100	± 2.00
Over 100	± 2.00% subject to a maximum of 6.00 mm

Thickness in mm	Tolerance
Upto and including 12 mm	+ 0.5 mm
Over 12	± 4% subject to a maximum of 1.0 mm

Weight Tolerance	Tolerance
Below and including 3 mm thickness	± 5%
Over 3 mm thickness	+5% - 3%

SQ. FT. AND SQ. METRE

INTER CONVERSION

Sq. Metres	Sq. Ft.	Sq. Ft.	Sq. Metres	Sq. Ft.	Sq. Ft.	Sq. Metres	Sq. Ft.	Sq. Ft.
	Sq. Metres			Sq. Metres			Sq. Metres	
0.09290	1	10.764	3.53032	38	409.029	6.9677	75	807.29
0.16541	2	21.723	3.62322	39	419.792	7.0606	76	818.06
0.27871	3	52.292	3.71612	40	430.556	7.1535	77	828.82
0.37161	4	43.056	3.80902	41	441.320	7.2464	78	839.58
0.46452	5	53.820	3.90193	42	452.084	7.3393	79	850.35
0.55742	6	64.583	3.99483	43	462.848	7.4322	80	861.11
0.65032	7	75.347	3.08773	44	473.612	7.5251	81	871.88
0.74322	8	86.111	4.18064	45	484.376	7.6180	82	882.64
0.83613	9	95.875	4.27354	46	495.140	7.7110	83	893.40
0.92903	10	107.639	4.36644	47	505.900	7.8029	84	904.17
1.02193	11	118.403	4.45935	48	516.670	7.8968	85	914.93
1.11484	12	129.167	4.55225	49	527.430	7.9897	86	925.70
1.20774	13	139.931	4.64515	50	538.200	8.0826	87	936.46
1.30064	14	150.695	4.73806	51	548.960	8.1755	88	947.22
1.39355	15	161.459	4.83096	52	559.720	8.2687	89	957.99
1.48645	16	172.223	4.92386	53	570.490	8.3613	90	968.75
1.57935	17	182.986	5.01608	54	581.250	8.4542	91	979.52
1.67225	18	193.750	5.01907	55	592.020	8.5471	92	990.28
1.76516	19	204.514	5.20206	56	602.780	8.6400	93	1001.04
1.85806	20	215.278	5.29505	57	613.540	8.7329	94	1011.81
1.95096	21	226.042	5.38804	58	624.310	8.8258	95	1022.57
2.04387	22	236.806	5.48103	59	635.070	8.9187	96	1033.34
2.13677	23	247.570	5.57402	60	645.830	9.0116	97	1044.10
2.22967	24	258.334	5.66710	61	556.600	9.1045	98	1054.86
2.32258	25	269.098	5.76000	62	667.360	9.1974	99	1065.63
2.41548	26	279.862	5.85290	63	678.130	9.2903	100	1076.39
2.50838	27	290.626	5.94580	64	688.890	18.5806	200	2152.78
2.60129	28	301.389	6.03870	65	699.650	27.8709	300	3229.17
2.69419	29	312.153	6.13160	66	710.420	37.1612	400	4305.56
2.78709	30	322.917	6.22450	67	721.180	46.4515	500	5382.00
2.87999	31	333.681	6.31740	68	731.950	55.7420	600	6458.30
2.97290	32	344.445	6.41030	69	742.710	65.0320	700	7537.70
3.06580	33	355.209	6.50320	70	753.470	74.3220	800	8611.10
3.15870	34	365.973	6.59610	71	764.240	83.6130	900	9687.50
3.25161	35	376.787	6.68900	72	775.000	92.9030	1000	10763.90
3.34451	36	387.501	6.78190	73	785.770			
3.43741	37	398.265	6.87480	74	796.530			


1 Metre=3.28084 feet
1 Foot=0.3048 metre

0.25m=0.82 ft. = about 10"
0.50m=1.64 ft. = about 1'-5"

1. Equivalent Price in foot and metre
2. Equivalent foot and metre

nP. m	nP. ft.	nP. m	nP. ft.	nP. m	nP. ft.	nP. m	nP. ft.
1	3.28	102	334.65	184	603.67	355	1164.70
2	6.56	104	341.21	186	610.24	360	1181.10
3	9.84	106	347.77	188	616.80	365	1197.51
4	13.12	108	354.33	190	623.36	370	1213.91
5	16.40	110	360.9	192	629.92	375	1230.31
10	32.80	112	367.45	194	636.48	380	1246.72
15	49.21	114	374.02	196	643.04	385	1263.12
20	65.62	116	380.58	198	649.61	390	1279.53
25	82.02	118	387.14	200	656.17	395	1295.93
30	98.43	120	393.70	202	662.73	400	1312.34
35	114.83	122	400.26	204	669.29	410	1345.14
40	131.23	124	406.82	206	675.85	420	1377.95
42	137.80	125	410.11	208	682.41	430	1410.76
44	144.36	126	413.39	210	688.98	440	1443.57
46	150.92	128	419.95	215	705.38	450	1476.38
48	157.48	130	426.51	220	721.78	460	1509.19
50	164.04	132	433.07	225	738.19	470	1541.99
52	170.60	134	439.63	230	754.59	480	1574.80
54	177.16	136	446.19	235	771.00	490	1607.61
56	183.73	138	452.76	240	787.40	500	1640.42
58	190.29	140	459.32	245	803.81	525	1722.44
60	196.85	142	465.88	250	820.21	550	1804.45
62	203.41	144	472.44	255	836.61	575	1886.48
64	209.96	146	479.00	260	853.02	600	1968.50
66	216.54	148	485.56	265	869.42	625	2050.52
68	223.10	150	492.13	270	885.83	650	2132.55
70	229.66	152	498.69	275	902.23	675	2214.57
72	236.22	154	505.25	280	918.64	700	2296.59
74	242.78	156	511.81	285	935.04	725	2378.61
76	249.34	158	518.37	290	951.44	750	2460.63
78	255.91	160	524.93	295	967.85	775	2542.65
80	262.47	162	531.50	300	984.25	800	2624.67
82	269.03	164	538.06	305	1000.66	825	2706.69
84	275.60	166	544.62	310	1017.06	850	2788.71
86	282.15	170	557.74	315	1033.46	875	2870.73
88	288.71	172	564.30	320	1049.87	900	2952.76
90	295.28	174	570.87	325	1066.27	925	3034.78
92	301.84	175	574.15	330	1082.68	950	3116.80
94	308.40	176	577.43	335	1099.08	975	3198.82
96	314.97	178	584.00	340	1115.49	1000	3280.84
98	321.52	180	590.55	345	1131.89		
100	328.08	182	597.11	350	1148.29		

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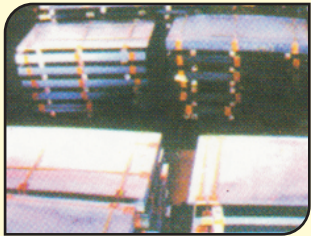
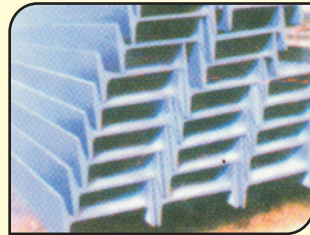
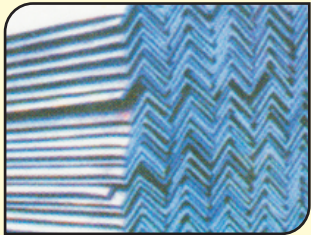
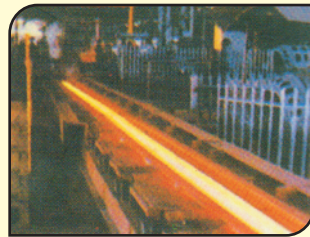
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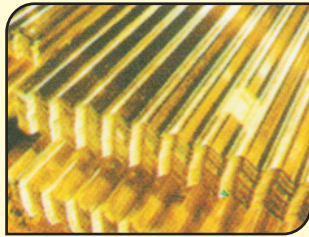
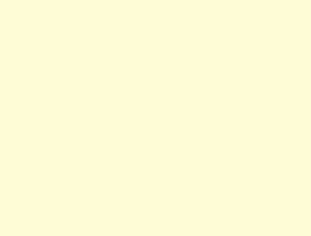
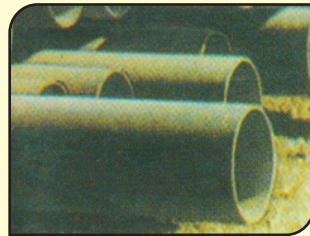
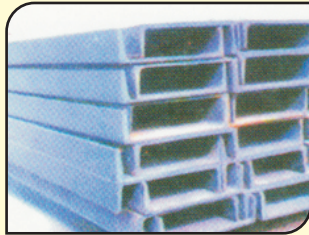
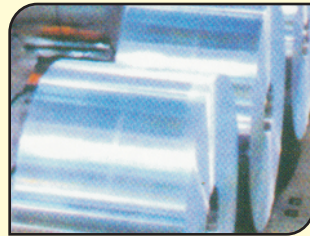
138, Nagdevi Street, Mumbai - 400 003.
Tel.: 2341 4204 • Telefax: 2342 2825 • Res.: 2612 1812
E-mail: deepjyot@vsnl.com
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