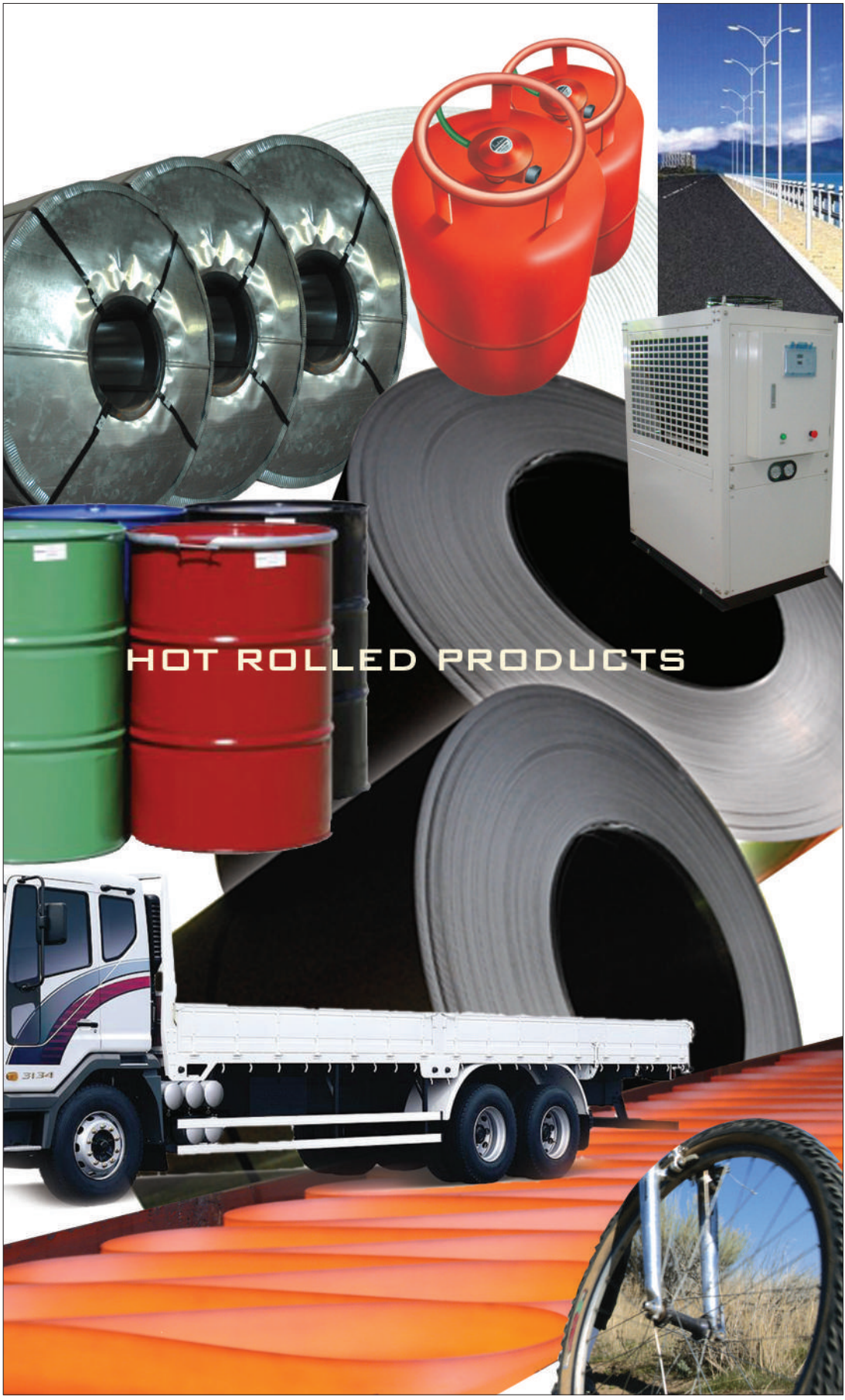
HOT ROLLED PRODUCTS

Hot Rolled Coils, Sheets and Skelp

Rourkela Steel Plant

Rationalised sizes of Hot Rolled Coils

Thickness (mm)	Width (mm)
2.0	930, 1010, 1020, 1040
2.2	930, 1010, 1020, 1030, 1040
2.3	930, 1010, 1020, 1030, 1040
2.5	930, 1010, 1020, 1030, 1040, 1130
2.8	930, 1010, 1020, 1040, 1100, 1130, 1250
3.1	930, 1010, 1020, 1040, 1130, 1250, 1310
3.5	930, 1010, 1020, 1040, 1130, 1250, 1310
3.7	930, 1020, 1030, 1040, 1130, 1250, 1310
4.1	930, 1020, 1030, 1040, 1130, 1250, 1310, 1400
3.8, 4.3, 4.6, 4.8	930, 1020, 1040, 1130, 1250, 1310, 1400
5.0, 5.6, 6.0	930, 1040, 1130, 1250, 1310, 1400
6.6, 7.4	930, 1040, 1130, 1250, 1310, 1380, 1400
7, 8, 9, 10	930, 1040, 1130, 1250, 1310, 1400

Coils can also be supplied in other width/thickness combination, as per mutual agreement.

Inner diameter of coils : 760 mm. Coil weight : 8 -17 tonnes

Bokaro Steel Plant

Rationalised sizes of Hot Rolled Coils

Thickness (mm)	Width (mm)
1.8	930, 1030
2.0	930, 1030, 1130*, 1250
2.2	930, 1030, 1130*, 1250, 1310
2.5	930, 1030, 1130*, 1250, 1310, 1400
2.8	930, 1030, 1130*, 1250, 1310, 1400 1420
3.0	930, 1030, 1130*, 1250, 1310, 1400, 1420
3.5	930, 1030, 1130*, 1250, 1310, 1400, 1420, 1550
3.9	930, 1030, 1130*, 1250, 1310, 1400, 1420
4.3	930, 1030, 1130*, 1250, 1310, 1400, 1420, 1550
4.6	930, 1030, 1130*, 1250, 1310, 1400, 1420, 1550
4.8	930, 1030, 1130*, 1250, 1310, 1400, 1420, 1550
5.0	930, 1030, 1130*, 1250, 1310, 1370, 1400, 1420, 1550, *1730, *1830
5.6	930, 1030, 1130*, 1250, 1310, 1370, 1400, 1420, 1550, *1730
6.0	930, 1030, 1130*, 1250, 1310, 1370, 1400, 1420, 1550, *1730, *1830
6.7	930, 1030, 1130*, 1250, 1310, 1370, 1400, 1420, 1550, *1730, *1830
7.0	930, 1030, 1130*, 1250, 1310, 1370, 1400, 1420, 1550, *1730, *1830
8.0	930, 1030, 1130*, 1250, 1310, 1370, 1400, 1420, 1550, *1730, *1830
8.6	930, 1030, 1130*, 1250, 1310, 1370, 1400, 1420, 1550, *1730, *1830
9.7	930, 1030, 1130*, 1250, 1310, 1370, 1400, 1420, 1550, *1730, *1830
10	930, 1030, 1130*, 1250, 1310, 1370, 1400, 1420, 1550, *1730, *1830
11, 12, 14, 16	930, 1030, 1130*, 1250, 1310, 1370, 1400, 1420, 1550, *1730, *1830

* through cc route

– 1100 mm width as already indicated will be through concast route for which sequential order will be required.

– Coils can also be supplied in other sizes, as per mutual agreement.

Inner diameter of coils : 850 mm

Outer diameter of coils : 2300 mm (max)

Coil weight : 29 tonnes max.

Bokaro Steel Plant

Rationalised sizes of Hot Rolled Sheets

Thickness, mm (gauge)	Width (mm)	Length (mm)
2.00 mm (14)	1000, 1250	2500
2.50 mm (12), 2.90 mm	1000, 1250	2500, 4000
3.15 mm (10), 3.55 mm (9), 4.00 mm (8)	1000, 1250, 1400	

Thickness and width tolerances are as per IS: 1852/1985. Closer tolerances can also be supplied on demand.

Packaging : Bare bundles with cross-wise steel strip. Packet weight : 7 - 18 tonnes. Marking : Paint marked on the top sheet of the bundle OR Sticker/label on top sheet of bundle with required details.

Common grades for Hot Rolled Coils and Sheets : IS 10748/1995 grades I-V, API 5L Grades A, B, X42, X46, X52, X56, X60, SAIL-WTCR, IS: 11513/1985 grades O, D, DD, EDD, IS: 1079/ 1994 grades O, D, DD, EDD, Medium Carbon Strapping Steel, MC-40, MC-5, HCRS, SAE-1040, SAE – 1055, C 30, 40, 50, Medium Silicon Electrical Steel, IS: 6240/1999, SAIL HS LPG, SAILMA, IS: 2062, 2006, IS: 5986/1992 Fe 330, 360, 410, 510, SAILRIM, IS: 2062/2006 Grade with copper, SAILCOR/IRSM-41, SAE 1012, SAE 1541 Auto Chassis Grade: E 34 / E38 / 46 & SAPH 45.

Materials are also available in the following foreign specifications : For structural and general purposes- ASTM-A 36/A 569/A 570 Grades 33/40, JISG 3101 SS400, JISG 3131 SPHC, DIN 17100 ST 37.2/ST 44.2, BS 4360 Grades 40/43A, EN 10025; For Tube-making and other grades : JISG 3132 SPHT 1/2, DIN 1614 Pt. 1/2 ST 22/23/24, SAE 1006, SAE 1018 or equivalents, if sufficient orders are available.

HR Sheets for Conventional LPG Cylinders

Thickness (mm)	Width (mm)	Length (mm)
2.9	1240	2480
2.8	1250	2500

Sheets can also be supplied in the following sizes on mutual agreement : 2.9 x 1360 x 2720 mm, 2.9 x 1270 x 2540 mm, 3.0 x 1360 x 2700 mm

Other sizes of hot rolled coils and sheets can be supplied as per mutual agreement.

HR Coils for LPG Cylinders

Grade	Thickness (mm)	Width (mm)
Conventional (IS: 6240/1999)	2.9	1090, 1160, 1250, 1685
SAIL HS LPG (JIS 3116/EN10120)	2.2 - 4.0	1090, 1160, 1250

Durgapur Steel Plant

Rationalised sizes of Skelp

Width (mm)	Thickness (mm)
147	2.7, 3.0, 3.7
166	2.5, 3.0
181	4.1, 4.3
184	2.5, 2.7, 3.0, 3.3, 3.4, 3.8
196	2.5, 2.8, 3.0
205	2.5, 2.8, 3.0, 3.4, 3.7
210	2.5, 2.8, 3.0, 3.4, 3.7
230	3.0, 3.4, 3.7
232	3.0, 3.4, 3.7
234	3.0, 3.4, 3.7

Any customised dimension of width 147 mm to 252 mm and thickness 2.5 mm to 4.5 mm can be supplied as per mutual agreement.

Coil weight : 0.88 - 1.24 tonnes

Inner diameter : 550 mm **Outer diameter :** 1100 - 1300 mm

Common Grades : Skelp is produced in IS 10748/1995, Grades I, II (Sk), IS 11513/1985 and Medium Carbon.

Packing : Bare packing with 4 steel straps through coil eye.

Tags : Cast details, specifications, etc.

Applications (Hot Rolled Coils, Sheets and Skelp)

Specification	Application
IS 10748/1995, Grades I, II, III, IV, V	Tube making
SAIL-WTCR, IS 11513/1985 Grades O, D, DD, EDD SAIL DRAW (EDD with CBT)	Cold reducing segment
IS 1079/1994 Grades O, D, DD, EDD	General structural applications
SAILRIM	Manufacture of cycle rims
SAE 1012	Manufacture of wheel disc and cold formed products
SAIL PROP (SAE 1020) SAIL PREFAB (SAE 1020 Spl.)	Manufacture of propeller shaft Manufacture of Prefabricated structures
IS 2062/2006, Grade B with Copper SAILCOR/IRSM-41/HCRS	Manufacture of corrosion resistant engineering products
SAILMA, IS 2062/2006, Grades B, C, IS 5986/1992* Fe 330, 360, 410, 510	Fabrication of engineering structurals Manufacture of Hamilton and other poles, flanging applications
Strapping quality (IRS P 41)	Strapping for packaging
SAE 1541	Manufacture of fork and spokes for two wheelers
Medium Carbon Grades (SAIL MC 40/45/50/55/60 SAE 1040, SAE 1045, SAE 1055)	Chains, hair clip, sprocket, clutch plate, hacksaw blade etc.
Medium silicon electrical steel	Manufacture of electrical equipment
IS 6240/2008	Domestic/Auto LPG Cylinders
SAIL HS LPG (JISG 3116, EN 10120)	Export quality LPG Cylinders
SAIL FORM 34, 38, 46 (E 34, E 38, E 46/ BSK 46)	Fabrication of long & cross members for LCV, MCV and HCV
SAIL SUPER FORM 45 HSFQ SAIL FORMING IS: 11513-2011 (JISG 3113, SAPH 45)	Long and cross member of LCV & MCV, wheel disc, wheel rim and other structural components of passenger car
HSFQ 250/350/450/500/550 (Thickness < 8 mm)	Auto Components & Pre Engineered Building (PEB) Sections (For forming at ambient temperature)
SAIL FORMING 250/350/450/550	Auto components (For forming at high temperature – Hot forming)
MnB Steel	Crash Resistant Auto Components (For Simultaneous Forming & Quenching in Die - Hot Stamping)
API 5L, Grades A, B, X42, X46, X52, X56, X60, X65, X70	Manufacture of tubes & pipes mostly for oil and gas sector

Rolling and Cutting Tolerance as per IS:1852 - 1985

Tolerance on Width of Strip Supplied with as Rolled Edges

Width (mm)	Tolerance (mm)
Up to 250	+ 4, - 0
> 250 to 600	+ 6, - 0
> 600 to 800	+ 10, - 0
> 800 to 1250	+ 30, - 0
> 1250 to 1550	+ 35, - 0
> 1550 to 1850	+ 40, - 0

Tolerance on Thickness of Strip up to and including 500 mm width

Width (mm)	Tolerance on thickness (mm)
Upto 200	± 0.20
> 200 to 320	± 0.23
>320 to 400	± 0.25
> 400 to 500	± 0.30

Tolerance on Thickness for Strip above 500 mm width

Width (mm)	Tolerance on thickness (mm)				
	> 1.6 to 2	> 2 to 3	> 3 to 5	> 5 to 8	> 8 to 10
500 to 1250	± 0.18	± 0.20	± 0.25	± 0.30	± 0.35
1250 to 1550	± 0.20	± 0.25	± 0.30	± 0.35	± 0.40
1550 to 1850	± 0.22	± 0.28	± 0.35	± 0.40	± 0.40

Rolling and Cutting Tolerance for HR Sheets
as per IS: 1852 - 1985

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

Thickness tolerance for sheets as per table of HR Coils

Tolerance on Weight

Thickness (mm)	Tolerance
Up to 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, strip and sheet shall be + 100 mm, - 0 mm.

Closer tolerances can be supplied on mutual agreement.

Chemical Composition

Specification	Grade	C % max	Mn % max	P % max	S % max	Si % max
IS: 10748/1995	1	0.10	0.50	0.040	0.040	For semi killed Quality Si content shall be 0.08% max
	II	0.12	0.60	0.040	0.040	
	III	0.16	1.20	0.040	0.040	
	IV	0.20	1.30	0.040	0.040	
	V	0.25	1.30	0.040	0.040	
	CE: 0.45 max for grades IV and V					
SAIL WTCR	-	0.06	0.25	0.025	0.025	0.04
SAIL SOFT	-	0.06	0.25	0.025	0.04	0.05

Chemical Composition: IS 1079/2009

Quality			Constituent, Percent, Max				
Designation	Old Designation	Name	Carbon	Manganese	Phosphorus	Sulphur	Micro-alloy
HR0	(New)	Ordinary	0.25	1.70	0.05	0.045	–
HR1	O	Commercial	0.15	0.60	0.05	0.035	–
HR2	D	Drawing	0.10	0.45	0.040	0.035	–
HR3	DD	Deep Drawing	0.08	0.40	0.035	0.030	–
HR4	EDD	Extra Deep Drawing	0.08	0.35	0.030	0.030	–
HR5	(New)	Micro-alloyed	0.16	1.6	0.020	0.020	0.20 Si = 0.4 max

NOTES:

1. Steel of these grades can be supplied with the addition of micro-alloying elements like Boron, Titanium, Niobium and Vanadium. The micro-alloying elements shall not exceed 0.008 percent in case of Boron and 0.20 percent in case of other elements.
2. The Nitrogen content of the steel shall not be more than 0.007 percent. For Aluminium killed or Silicon-Aluminium killed, the Nitrogen content shall not exceed 0.012 percent. This has to be ensured by the manufacturer by occasional check analysis.
3. Grade HR4 and HR5 shall be supplied in fully Aluminium killed condition or Aluminium with stabilising elements.
4. When the steel is Aluminium killed, the total Aluminium content shall not be less than 0.02 percent. When the steel is Silicon killed, the Silicon content shall not be less than 0.10 percent. When the steel is Aluminium-Silicon killed, the Silicon content shall not be less than 0.03 percent and total Aluminium content shall not be less than 0.01 percent.
5. When Copper bearing steel is required the Copper content shall be between 0.20 and 0.35 percent. In case of product analysis, the Copper content shall be between 0.17 and 0.38 percent.
6. Restricted chemistry may be mutually agreed to between the purchaser and the supplier.
7. IF denotes Interstitial Free and IF-HS denotes High Strength Interstitial Free.
8. * denotes that dual phase steel may also content Cr and Mo up to 1.0 percent.

Specification	Grade	C % max	Mn % max	P % max	S % max	Si % max
SAIL DRAW	EDD (CBT)	0.04	0.15	0.015	0.015	0.03 Al: 0.025-0.06
SAIL RIM		0.07-0.11	0.30-0.45	0.040	0.040	
SAE 1012		0.10-0.15	0.30-0.60	0.030	0.035	0.10 max
SAIL PROP	SAE 1020	0.17-0.23	0.32-0.6	0.04	0.03	
SAIL PREFAB	SAE 1020 spl	0.23 max	1.35 max	0.04	0.03	Nb: 0.005-0.05

Chemical Composition: IS 2062/2011

Grade Designation	Quality	Ladle Analysis, Percent, Max					Carbon Equivalent (CE), Max	Method of Deoxidation
		C	Mn	S	P	Si		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
E 250	A	0.23	1.50	0.045	0.045	0.40	0.42	Semi killed/killed
	BR	0.22	1.50	0.045	0.045	0.40	0.41	Killed
	BO							
	C	0.20	1.50	0.040	0.040	0.40	0.39	Killed
E 300	A	0.20	1.30	0.045	0.045	0.45	0.40	Semi Killed/Killed
	BR							Killed
	BO							
	C							
E 350	A	0.20	1.50	0.045	0.045	0.45	0.42	Semi Killed/Killed
	BR							Killed
	BO							
	C							
E 410	A	0.20	1.60	0.045	0.045	0.45	0.46	Semi Killed/Killed
	BR							Killed
	BO							
	C							
E 450	A	0.22	1.60	0.045	0.045	0.45	0.48	Semi Killed/Killed
	BR							Killed
E 550	A	0.22	1.65	0.020	0.025	0.50	0.50	Semi Killed/Killed
	BR							Killed
E 600	A	0.22	1.70	0.020	0.025	0.50	0.50	Semi Killed/Killed
	BR							Killed
E 650	A	0.22	1.70	0.015	0.025	0.50	0.52	Semi Killed/Killed
	BR							Killed

Specification	Grade	C % max	Mn % max	P % max	S % max	Si % max
SAIL COR	IRSM 41	0.10	0.25-0.45	0.75-0.140	0.030	0.28-0.72
	Cr 0.35-0.60, Ni 0.20-0.47, Cu 0.30-0.60, Al 0.03 max					
HCRS (Cu-P)		0.15	0.25-0.8	0.07-0.15	0.03	0.28-0.50 (Cu 0.20 min)
IS 5986	Fe 330	0.17	1.00	0.045	0.045	
*	Fe 360	0.17	1.20	0.045	0.045	
	Fe 410	0.20	1.30	0.045	0.045	
	Fe 510	0.20	1.50	0.045	0.045	
	CE 0.42 max for Fe 410 and 0.45 max for Fe 510					

Chemical Composition

Specificaion	Grade	C max	Mn max	S max	P max	Al min	Si max	CE max.	MAE max.
SAILMA	300	0.20	1.50	0.045	0.045	0.02	0.45	0.44	≤ 0.25
	300 HI	0.20	1.50	0.040	0.040	0.02	0.45	0.43	≤ 0.25
	350	0.20	1.55	0.045	0.045	0.02	0.45	0.46	≤ 0.25
	350 HI	0.20	1.55	0.040	0.040	0.02	0.45	0.45	≤ 0.25
	410	0.20	1.60	0.045	0.045	0.02	0.45	0.47	≤ 0.25
	410 HI	0.20	1.60	0.040	0.040	0.02	0.45	0.46	≤ 0.25
	450	0.20	1.65	0.045	0.045	0.02	0.45	0.48	≤ 0.25
	450HI	0.20	1.65	0.040	0.040	0.02	0.45	0.47	≤ 0.25
	550	0.20	1.65	0.020	0.025	0.02	0.50	0.54	≤ 0.25
	550HI	0.20	1.65	0.015	0.025	0.02	0.50	0.54	≤ 0.25
	600	0.22	1.70	0.015	0.025	0.02	0.50	0.54	≤ 0.25
		Nb+V+Ti 0.30% max							

* under revision

Specification	Grade	C % max	Mn % max	P % max	S % max	Si % max	Al % min
Strapping Quality	IRS P 41	0.25-0.45	1.20-1.45	0.040	0.040	0.15-0.35	
	SAE 1541	0.36-0.44	1.30-1.60	0.030	0.030	0.15-0.35	
	SAIL MC 30	0.26-0.35	0.60-0.90	0.04	0.04	0.15-0.35	0.02
	SAIL MC 40	0.36-0.45	0.60-0.90	0.04	0.04	0.15-0.35	0.02
	SAIL MC 45	0.41-0.50	0.60-0.90	0.04	0.04	0.15-0.35	0.02
	SAIL MC 50	0.46-0.55	0.60-0.90	0.40	0.04	0.15-0.35	0.02
	SAIL MC 55	0.51-0.60	0.60-0.90	0.04	0.04	0.15-0.35	0.02
	SAIL MC 60	0.56-0.65	0.60-0.90	0.04	0.04	0.15-0.35	0.02
Medium Si Electrical Steel		0.05	0.40	0.025	0.025	0.30 - 1.50	
IS 6240		0.16	0.30 min	0.025	0.025	0.25 Al 0.02 min	MAE, 0.1% (Nb, Ti, B) N<90 ppm
SAIL HS LPG JISG 3116	SG 255	0.20 max	0.30 min	0.04	0.040	-	
	SG 295	0.20 max	0.10 max	0.04	0.040	0.35	
SAIL HS LPG EN 10120	P265NB	0.19 max	0.40 min	0.025	0.015	0.25	
	P310NB	0.20 max	0.70 min	0.025	0.015	0.50	
	Nb 0.05 max Ti 0.03 max for SG 295 and P310 NB						

Mechanical Properties

Specification	Grade	C % max	Mn % max	P % max	S % max	Si % max	Al % min
'SAPH 45/440 JIS G 3113	SAIL SUPER FORM	0.14	1.2	0.015	0.010	0.15	
	Nb + Ti 0.10 max for SAIL FORM Grade						
API 5 L	A	0.22	0.9	0.030	0.030		
	B	0.26	1.20	0.030	0.030		
	X42	0.26	1.30	0.030	0.030		
	X46	0.26	1.40	0.030	0.030		
	X52	0.26	1.40	0.030	0.030		
	X56	0.26	1.40	0.030	0.030		
	X60	0.26	1.40	0.030	0.030		
	X65	0.26	1.45	0.030	0.030		
	X70	0.26	1.65	0.030	0.030		
	Nb +V + Ti < 0.15%						

Mechanical Properties

Specification	Grade	Yield Strength	Ultimate Tensile Strength	Elongation %		Internal diameter of bend
		MPa min	MPa min	Up to 3 mm	Above 3 mm	
IS: 10748/1995	I	170	290	30		T
	II	210	330	28		2T
	III	240	410	25		2T
	IV	275	430	20		3T
	V	310	490	15		3T, HRB
SAIL WTCR				35		65 max Hardness
SAIL SOFT				38		55 HRB max

IS: 1079 (Sixth Revision)

Quality			**Tensile Strength Rm2 max MPa**	**Percentage Elongation after Fracture A 3, 4 min**			
				t<3		**t>3**	
Desig-nation	**Old Desig-nation**	**Name**		**Gauge length Lo= 80 mm**	**Gauge length Lo= 50 mm**	**Gauge length Lo= 5.65 mm**	**Gauge length Lo= 50 mm**
HR0	(New)	Ordinary	*	*	*	*	*
HR1	O	Commercial	440	23	24	28	29
HR2	D	Drawing	420	25	26	30	31
HR3	DD	Deep Drawing	400	28	29	33	34
HR4	EDD	Extra Deep Drawing	380	31	32	36	37
HR5	SAILFORM 34	YST 340	400-500	*	*	26	27
	SAILFORM 38	YST 380	450-570	*	*	24	25
	SAILFORM 45	YST 450	500-620	*	*	20	21

NOTES:

1. 1 MPa = 1N/mm^2
2. Minimum tensile strength for qualities HR1, HR2, HR3 and HR4 would normally be expected to be 270 MPa. Where minimum tensile strength is required, the value of 270 MPa may be specified. All tensile strength values are determined to the nearest 10 MPa.
3. The non proportional test piece with a fixed original gauge length (50 mm) up to 6 mm thick sheet can be used in conjunction with a conversion table. In case of dispute, however, only the results obtained on a proportional test piece will be valid for material 3 mm and over in thickness.
4. HR5 grade is for cold rolling only, therefore mechanical properties are not applicable.
5. Where "t" is thickness of steel sheet, in mm.
6. Tensile testing is not mandatory for HR1, unless agreed to between the purchaser and manufacturer.

* Properties on mutual agreement between the purchaser and manufacturer.

Mechanical Properties

Specification	Grade	Yield Strength	Ultimate Tensile Strength	Elongation %		Internal diameter of bend
		MPa min	MPa min	Up to 3 mm	Above 3 mm	
SAIL DRAW						
SAIL RIM						
SAE 1012						
SAIL PROP	SAE 1020	310-320	440	15		
SAIL PRE FAB	SAE 1020 spl.	345 min	450 min	21		

IS: 2062/2011

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

Mechanical Properties

Grade Designation	Quality	Tensile Strength Rm Min Mpa	Yield Stress Min Mpa			Percentage Elongation A, at Gauge Length, L=5.65 √S Min	Internal Bend Diameter Min (See Note 2)		Charpy Impact Test (See Note 3 & 4)	
			<20	20-40	>40		<25	>25	Temp °C	Min
E-550	A	650	550	530	520	12	3.0t	–	–	–
	BR								RT	15
E 600	A	730	600	580	570	12	3.5t	–	–	–
	BR								RT	15
E 650	A	780	650	630	620	12	4.0t	–	–	–
	BR								RT	15

Specification diameter	Grade	Yield Strength	Ultimate Tensile Strength	Elongation %		Internal of bend
		MPa min	MPa	Up to 3 mm	Above 3 mm	
Strapping Quality						
SAE 1541						
Medium Carbon	C 30	55% of UTS	500-600	21		
	C 40		580-680	18		
	C 50		660-780	13		
Med Si Elec						
IS 6240/12008		240	350-450	25		T
SAIL HS LPG	SG 255	255	400	28		
JISG 3116	SG 295	295	450	26		
SAIL HS LPG	P265NB	265	410-500	24		
EN 10120	P310NB	310	460-550	28		

Mechanical Properties

IS 1079 (Sixth Revision)

Quality			Tensile Strength Rm2 max MPa	Percentage Elongation after Fracture A 3, 4 min			
				t<3		t>3	
Desig-nation	Old Desig-nation	Name		Gauge length Lo= 80 mm	Gauge length Lo= 50 mm	Gauge length Lo= 5.65 mm	Gauge length Lo= 50 mm
HR0	(New)	Ordinary	*	*	*	*	*
HR1	O	Commercial	440	23	24	28	29
HR2	D	Drawing	420	25	26	30	31
HR3	DD	Deep Drawing	400	28	29	33	34
HR4	EDD	Extra Deep Drawing	380	31	32	36	37
HR6	SAILFORM 34	YST 340	400-500	*	*	26	27
	SAILFORM 38	YST 380	450-570	*	*	24	25
	SAILFORM 45	YST 450	500-620	*	*	20	21

Specification	Grade	Yield Strength	Ultimate Tensile Strength	Elongation %		Internal diameter of bend
		MPa min	MPa min	Up to 3mm	Above 3mm	
SAIL SUPER FORM SAPH 45	JISG 3113 SAPH 45/440	304 (1< 6 mm) 294 (t:6 to 8 mm)	441	GL: 50 mm 345 (t <6 mm) 32% (t:6-8 mm)		
APL-5L	A	207	331			
	B	241-418	414-758	% elongation		
	X42	290-496	414-758	$1.944A^{0.2}/U$ 0.9		
	X46	317-524	434-758	(GL: 50.8 mm)		
	X52	359-531	455-758	for all API Grades		
	X56	386-544	490-758	A: Cross sectional		
	X60	414-565	517-758	area in mm^2		
	X65	448-600	531-758	U: Minimum UTS		
	X70	483-621	565-758	in MPa		

NOTES: These are pipe properties. Hot rolled plate/coil properties are to be mutually agreed upon by producer and pipe manufacturers.