



PLATES



Plates

Bhilai Steel Plant

Rationalised sizes of Plates from Plate Mill

Length (mm)								
Thickness (mm)	Width (mm)							
	1600	1800	2000	2200	2500	2800	3000	3200
8					6300 9300 12500			
10					6300 9300 12500			
12			6300 9300 12500		6300 8000 12500	7100 10000		
14				9300	5600 6300 7100 9000 9300 12500	5000 5600 6300 7100 8000 9000 12500		
16			7100 9300	5600 7100 9000 9300 12500	5000 6300 8000 9000 12500	5600 7100 8000 10000		
18		5600 7100 9000 9300	5600 6300 7100 8000 9000 9300 12500	5000 6300 8000 9000	5600 7100 8000 10000	5000 6300 9000 9300 10000		
20	5600 7100 9300	5000 5600 6300 7100 9000 9300 12500	5000 5600 6300 8000 9000 12500	5600 7100 8000 10000	5000 6300 9000 9300	5600 8000 9000 9300		
22	5000 5600 6300 7100 9000 9300 12500	5000 5600 6300 8000 9000 12500	5600 7100 8000 10000	5000 6300 7100 9300	5600 6300 8000 9000 9300	5000 5600 7100 8000		

Rationalised sizes of Plates from Plate Mill

Length (mm)

Thickness (mm)

Width (mm)

	1600	1800	2000	2200	2500	2800	3000	3200	
25	5000 5600 6300 8000 12500	5000 5600 7100 10000	5000 6300 9000 9300 10000	5600 6300 8000 9000 9300	5000 5600 7100 8000	6300 5600 7100 8000	6300 12500 12500	6300 12500	5600 6300 12500
28	5000 5600 7100 10000	5000 6300 9000 9300 10000	5600 8000 9000 9300	5000 5600 7100 8000	6300 7100 12500	5600 6300 12500	5600 6300 10000 12500	5000 5600 9300 10000	
32	5000 6300 9000 9300 10000	5000 5600 8000 9000	5000 7100 8000	5000 6300 7100 12500	5600 6300 12500	5000 5600 9300 10000	5000 9000 9300 10000	5000 8000 9000 9300 10000	
36	5000 5600 8000 9000	5000 7100 8000	6300 7100 12500	5600 6300 12500	5000 5600 9300 10000	5000 8000 9000 9300	8000 9000 9300	7100 8000 9000	
40	5000 7100 8000	6300 7100 12500	5600 6300 12500	5000 5600 10000	5000 9000 9300 10000	7100 8000 9000 9300 10000	7100 8000	6300 7100 8000	
45	6300 7100 12500	5600 6300 12500	5000 5600 10000	5000 9300 10000	8000 9000 9300	7100 8000	6300 7100	6300 7100	
50	5600 6300 12500	5000 5600 9300 10000	5000 9000 9300 10000	8000 9000 9300	7100 8000	6300 7100	5600 6300 7100	5600 6300	
56	5000 5600 9300 10000	5000 9300 10000	8000 9000 9300	7100 8000	6300 7100	5600 6300	5000 5600	5000 5600	
63	4500 5000 9000 9300 10000	8000 9300	7100 8000	6300 7100	5600 6300	5000 5600	4500 5000	4500 5000	



Length (mm)

Thickness (mm)	Width (mm)							
75	1600	1800	2000	2200	2500	2800	3000	3200
	7100	6300	5600	5000	4500	4500	4500	
	8000	7100	6300	5600	5000	5000		
80	6300	5600	5000	4500	4500			
	7100	6300	5600	5000	5000			
	8000	7100	6300	5600				
90	6300	5600	5000	5000				
		6300	5600					
100	5000	5000	5000					
	5600	5600						
	6300							
110	5000	5000						
	5600							
120	4500							
	5000							

Note :

- 1) Plates above 40 mm will be flame cut.
- 2) Plates up to 13.5 metre length can also be rolled from slabs of new slab caster.

Rourkela Steel Plant

Rationalised sizes of Plates from Plate Mill

Length (mm)			
Thickness (mm)	Width (mm)		
	1500/1600	2000	2500
8,10,12	6300, 8000, 9000, 10000	6300, 8000, 9000, 9300, 10000,	6300 (only for 10 mm) 7100, 8000, 9000, 9300, 10000, 12500
14, 16, 18, 20	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000, 12500	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000, 12500	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000, 12500
22, 25	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000, 12500	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000, 12500	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000, 12500
28	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000, 12500	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000, 12500	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000
32	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000, 12500	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000, 12500	4500, 5600, 6300, 7100, 8000
36	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000, 12500	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000	5600, 6300, 7100, 8000
40	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000, 12500	4500, 5000, 5600, 6300, 7100, 8000, 9000	5600, 6300, 7100
45	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000	5600, 6300, 7100, 8000	5600, 6300
50	4500, 5000, 5600, 6300, 7100, 8000, 9000, 9300, 10000	5600, 6300, 7100, 8000	5000, 5600
56	4500, 5000, 5600, 6300, 7100, 8000	5600, 6300	
63	5600, 6300, 7100, 8000	5600	

Note :

1. For 8 mm order acceptable in minimum width of 1600 mm.
2. For normalised plates minimum length to be 6300 mm.
3. Plates can be supplied with random ultrasonic testing (offline) up to maximum 50 mm thickness.
4. Plates in other sizes can be supplied as per mutual agreement.

Packing & Supply Condition

Plates are supplied in bare packaging condition. Plates are normalised as per the requirements of specification. Thickness wise supply conditions are mentioned here :

Thickness (mm)	Supply Condition
8 -20 mm	Sheared condition
>20-63 mm	With gas cut edges

Rourkela Steel Plant

Rationalised sizes of Plates from Hot Strip Mill

Thickness (mm)	Width (mm)	Length (mm)
5, 6, 7, 8, 9, 10	1250	5000, 6300, 10000

Sizes of Chequered Plates of RSP

5, 6, 7, 8, 9, 10	1250	5000, 10000
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Note :

1. Plates are supplied in Mill Edge conditions (Width + 20 to + 50 mm)
2. Chequered plates are supplied with tear drop pattern

Bokaro Steel Plant

Rationalised sizes of HR Plates

Thickness (mm)	Width (mm)	Length (mm)
5, 6, 7, 8, 10	1000, 1250, 1400, 1500, 1600, 1700, 1800	4500, 5000, 5600, 6300, 8000

Applications

Specification	Application
IS: 2062/2006 E 250 (Grades A,B,C), ASTM-A-36 M, DIN 17100, IS: 2062/2006 E165	General structurals
IS: 5986/2002, Grade Fe 290, 330, 360, 410, 490, 570	Flanging and forming operations
SAILCOR (IRS M-41) HCRS (Cu+P), ASTM-A-588M, IS: 2062 with Copper	Atmospheric corrosion resistance
SAIL Boiler IS: 2002/1992, ASTM-A-285 M (Grade C), ASTM-A-515 M, ASTM-A-516 M, ASTM-A-517 M (Grade F), ASTM-A-537 M (Class 1), ASTM-A-204 (Grade B), DIN 17155 (Grade H1), EN 10028, BS 1501	Boilers and pressure vessels
ASTM-A-517 (Grade F)	Penstock
SAILHARD	Abrasion Resistant
SAILMA 300, 350, 410, 450, 550, 550 HI, 600, 600 HI as per IS: 2062/2006 DIN 17100 52.3, IS: 5986/2002, IS: 2062/2006, E300, E350, E410, E450, D&E, 450E, Fe 510	High Tensile
SAIL Marine IS: 3039, Lloyds Grade A, B, ABS Grade A, NCD 1431, LR Grade E&D, ABS Grade AH/DH/EH-32, 36, NV Grade AB&D	Ship Building
API 5L, Grade A, B, X42, X46, X52, X56, X60, X65	Oil and gas pipeline manufacturing
Chequered Plates conforming to IS: 3502/1994*	Industrial Flooring
Dead Soft Quality	Galvanising Pots and special engineering application
HSFQ 250/350 (Thickness < 8 mm)	Auto Components & Pre Engineered Building (PEB) Sections (For forming at ambient temperature)
SAIL FORMING 250/350 Thickness: 8 - 14 mm	Auto Components (For forming at high temperature - Hot Forming)
SAIL Form 34/38/46 SAIL Super Form 45 (SAPH 45)	Fabrication of long & cross members in auto sector
SAIL HITEN 690 AR	ATM Safe, Earth Moving Equipment
SAIL SPP 400/700 (Hardox 400/Weldox 700) SAIL-FRS	Earth Moving Equipment Fire Resistant Plates

* Base material as per IS: 2062/2006 and IS: 1977/1996.

Plates manufactured by different steel plants as per following specifications

Bhilai Steel Plant

Mild

IS: 2062 E 250 Quality A
IS: 2062 E 250 Quality B
IS: 2062 E 250 Quality C
IS: 5986 Fe 290
IS: 5986 Fe 330
IS: 5986 Fe 360
IS: 5986 Fe 410
A/SA 36
A/SA 238 Gr. A, B, C, D
A/SA 573 Gr. 58, 65
EN 10025 S 235 JR+AR, 275 JR+AR
EN 10025 S 235 JR+N, 275 JR+N
EN 10025 S 235 JO+N, 275 JO+N
EN 10025 S 235 J2+N, 275 J2+N

BS 4360 Gr. 43A, B

BS 4360 Gr. 43C

BS 4360 Gr. 43D

DIN 17100 RSt 37.2, St 44.2

JIS G 3101 SS 400, 490

IRS/LRS/ABS/GL/DNV Gr. A

LRS/ABS/GL/DNV Gr. B

LRS/ABS/GL/DNV Gr. D

Dead Soft Quality

NES 791 PART 1

API

API 5L Gr. A, B

API 5L x 42, 46, 52, 56

APL 5L x 60, 65, 70

HIGH TENSILE

IS: 2062 E 300

IS: 2062 E 350

IS: 2062 E 410

IS: 2062 E 450 Quality D

IS: 2062 E 450 Quality E

IS: 5986 Fe 490

IS: 5986 Fe 510

SAIL MA 300, 300

SAIL A 300 HI, 350 HI

SAIL A 410

SAIL MA 410 HI

SAIL MA 450

SAIL MA 450 HI

A/SA 572, Gr. 42, 50, 55

A/SA 573, Gr. 70

BS 4360, Gr. 50B

DIN 17100 St 52.3

EN 10025 S355 JR+N

EN 10025 S355 JO+N

EN 10025 S355 J2+N

GOST 09G25, 10G2S1-Cat 1

GOST 09G25, 10G2S1-Cat 2

GOST 09G25, 10G2S1-Cat 3

GOST 521, Gr. 10 KhSND

JIS G 3106 SM 490A

JIS G 3106 SM 490B

ABS AH32, AH36, DH32, DH36

ABS AH36, EH36

NCD 1431

BQ

IS: 2002 Gr. 1

IS: 2002 Gr. 1 (For fire box)

IS: 2002 Gr. 2

IS: 2002 Gr. 3

A/SA 515 Gr. 60, 65, 70

A/SA 516 Gr. 55, 60, 65, 70

A/SA 285 Gr. A, B, C

BS 1501/1/224 Gr. 400A, 430A

DIN 17155H1

EN 10028-2 P235GH, 265GH

EN 10028-3 P275N, P355NL1

A/SA 537 C1 1

BS 1501-1-224 Gr. 460A, 490A

EN 10028-3 P355 N, P355 NL1

Special Steel

SAIL HARD

SAIL HITEN AR 690

HOT SAW DISC

IRS M 41

A/SA 588 Gr. A

A/SA 204, Gr. A, B, C

DIN 17155 Gr. 15 Mo3

DMR 249 Gr. A

SAIL MA 550

SAIL MA 550 HI

SAIL MA 600

SAIL MA 600 HI

SAIL -FRS

Rourkela Steel Plant

IS: 2062/2006

ASTM-A-36M

SAILMA

300HI/350HI/410HI/450HI

Wheels

Lloyds Grades A, B, D

IS: 2002/1992

ASTM-A-285 M

Grade C

Dead Soft Quality

LO-Pearl

IS: 8500/1992

IS: 5986/1992

IS: 3502

ASTM-A-517

Grade F

IS: 3039/1988

SAPH 440

ASTM-A-537 M Cl I

ASTM-A-515/ 516 M

Grades- 60/65/70

BSK-46

API 5L grade

A, B, X 42,

X46, X52, X56

X60, X65

DIN St 42.2/52.3

SAIL SPP 400/700

Bokaro Steel Plant

IS: 2062/2006

SAILMA

300HI/350HI

E38/ E34

IS: 8500/1992

SAILCOR/ HCRS

IRSM-41

BSK-46

SAPH-45

IS: 1977-

Fe 290/330/370

IS: 2002

IRS Gr. A

E-550, E-500, E-450

ASTM AA 36

JIS 3101 SS 4011

IS: 5986

DIN 17100

IS: 6240

Rolling and cutting tolerance for plates (as per IS 1852/85)

Width

The tolerances on width of plate shall be as follows

Length (mm)	Width (mm)	Thickness (mm)	Tolerance on Width
Up to and including 8000	Up to and including 2000	Up to and including 20	- 0, +10 mm
		Over 20	-0, +15 mm
Up to and including 8000	Over 2000	Up to and including 20	- 0, +0.5% of width
		Over 20	-0, +20 mm
Over 8000	All widths	Up to and including 20	- 0, +0.2% of length
		Over 20	-0, +0.3% of length

Note 1 : Plates over 20 mm in thickness may be supplied with either as rolled or gas-cut edges. In case of Bhilai plates, above 40 mm thick plates shall be supplied with flame cut edges. The tolerances on width in such cases shall be subject to arrangement between the purchaser and the supplier.

Note 2 : In case plates below 20 mm in thickness are supplied in as-rolled condition the tolerances shall be mutually agreed to between the purchaser and the supplier.

Note 3 : Plates from BSP can be supplied in trimmed condition, width tolerance for untrimmed plates will be (+) 100 mm (-) mm

Thickness

The tolerances on thickness shall be as follows :

Thickness	Tolerance in percentage of nominal Thickness
Less than 8 mm	+12.5, - 5.0
From 8 mm up to & including 12 mm	+7.5, - 5.0
Over 12 mm	± 5.0

The thickness shall be measured at the following points

- One at each corner of the plate.
- One in the middle of the width, and
- One in the middle of the length.

These measurements shall be 25 mm away from the edge and at points randomly chosen. The thickness measured at each of these points shall satisfy the tolerances specified above.

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 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

SAILMA

Nb + Ti + V%

Grade	C max	Mn max	S max	P max	Al min	Si max	CE max	MAE max
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
450 HI	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
550 HI	0.20	1.65	0.015	0.025	0.02	0.50	0.54	≤ 0.25
660	0.20	1.70	0.015	0.025	0.02	0.50	0.54	≤ 0.25

Specification	Grade	C % max	Mn % max	P % max	S % max	Si %		
SAIL-FRS		0.20	1.5	0.040	0.040	1.0 Cr+Mo % = 1.00	Nb + V + Ti (max)%	

Note: Micro alloying elements like Nb, V, Ti or B shall be added singly or in combination and total micro alloying shall be as indicated or as per mutual agreement between SAIL & Purchaser.

IS: 2041-2009 - Chemical Composition

(Steel Plates for pressure vessels used at moderate and low temperature)

Grade	C max	Si	Mn	P max	S max	Al (total) min	N max	Nb max	V max	Ti max	Nb+V+Ti min	Cr max	Cu max	Mo max	Ni max
R 220	0.21	0.15-0.35	0.60-1.50	0.035	0.035	0.020	0.012	–	–	–	–	–	–	–	–
R 260	0.25	0.15-0.35	0.85-1.50	0.035	0.035	0.020	0.012	–	–	–	–	–	–	–	–
R 275	0.16	0.40 max	0.80-1.50	0.025	0.015	0.020	0.012	0.05	0.05	0.03	0.05	0.30	0.30	0.08	0.50
R 355	0.18	0.50 max	1.10-1.70	0.025	0.015	0.020	0.012	0.05	0.10	0.03	0.12	0.30	0.30	0.08	0.50
H 235	0.16	0.35 max	0.60-1.20	0.025	0.015	0.020	0.012	0.02	0.02	0.03	0.06	0.30	0.30	0.08	0.30
H 265	0.2	0.40 max	0.80-1.40	0.025	0.015	0.020	0.012	0.02	0.02	0.03	0.06	0.30	0.30	0.08	0.30
H 295	0.2	0.40 max	0.90-1.50	0.025	0.015	0.020	0.012	0.02	0.02	0.03	0.06	0.30	0.30	0.08	0.30
H 355	0.22	0.60 max	1.10-1.70	0.025	0.015	0.020	0.012	0.02	0.02	0.03	0.06	0.30	0.30	0.08	0.30

IS: 2041- 2009 Mechanical Properties

Grade	Yield Stress MPa Min				Tensile Strength MPa	Elongation percent on Gauge Length 5.65 /So, min	Impact Energy (J) min at a temperature in °C of				0.2% proof stress at 300 eg C MPa, min				
	<=16	>16 to 40 mm	>40 to 60 mm	>60 to 100 mm			20	0	–20	–40					
R 220	220	220	220	220	415-540	21	50	40	27	20	–	Impact test optional for R 220 and R 260			
R 260	260	260	260	260	490-620	21	50	40	27	20	–				
R 275	275	265	255	235	390-510	23	80	70	50	40	–				
R 355	355	345	335	315	490-640	21	80	70	50	40	–				
H 235	235	225	215	200	360-480	24	40	34	27	–	153				
H 265	265	255	245	215	410-530	22	40	34	27	–	173				
H 295	295	290	285	260	460-580	21	40	34	27	–	192				
H 355	355	345	335	315	510-650	20	40	34	27	–	232				

Mechanical Properties: IS: 2062/2011

Grade Designation	Quality	Tensile Strength Rm Min Mpa	Yield Stress			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-165		290		165		23	2t	—	—	—
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
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

Mechanical Properties: IS: 2062/2006

SAILMA

Specification Grade	Yield MPa, min	UTS, MPa, min	% EI min 5.65/A0	Internal Bend Diameter, min		Charpy Impact Test	
				<25 mm	>25 mm	Temp °C	J, min
SAILMA 300	300	440	24	2t	—	—	—
SAILMA 300 HI	300	440	24	2t	—	0	40
SAILMA 350	350	490	24	2t	—	—	—
SAILMA 350HI	350	490	24	2t	—	0 -20	40 30
SAILMA 410	410	540	22	2t	—	—	—
SAILMA 410 HI	410	540	22	2t	—	0 -20	35 25
SAILMA 450	450	570	22	2.5t	—	—	—
SAILMA 450 HI	450	570	22	2.5t	—	0 -20	30 20
SAILMA 550	550	650	14	3t	—	—	—
SAILMA 550 HI	550	650	14	3t	—	0 -20	25 15
SAILMA 600	600	730	14	3.5t	—	—	—

Chemical Composition

Specification	Grade	C % max	Mn % max	P % max	S % max	Si % max	CE
ASTM A-36		0.25	0.80-1.20	0.04	0.05	0.15-0.40	

Specification	Grade	C % max	Mn % max	P % max	S % max	CE
IS: 5986:2002	Fe 290	0.12	0.60	0.040	0.040	—
*	Fe 330	0.15	0.80	0.040	0.040	—
	Fe 360	0.17	1.00	0.040	0.040	—
	Fe 410	0.20	1.20	0.040	0.040	0.42
	Fe 490	0.20	1.50	0.040	0.040	0.45
	Fe 510	0.20	1.50	0.040	0.040	0.45

Nb+V+Ti+B 0.20 max

* under revision

Chemical Composition

Specification	Grade	C % max	Mn % max	P % max	S % max	Si % max	CE
ASTM-A-588 M	A	0.19	0.80-1.25	0.040	0.050	0.30-0.65	
	Al 0.02 min, Cr 0.40-0.65, Ni 0.40 max, Cu 0.25-0.40, V 0.02-0.10						
DIN 17100	ST 52.3	0.20-0.22	1.6 0	0.040	0.040	0.55	Al 0.02 min
HCRS (Cu+P)	0.15	0.25-0.8	0.07-0.15	0.03	0.28-0.50		Cu 0.2 min
SAILCOR (IRS M-41)	0.10	0.25-0.45	0.075-0.140	0.03	0.30-0.60		
	Al 0.03 max, Cr 0.35-0.60, Ni 0.20-0.47, Cu 0.30-0.60 V 0.05 max						
IS: 2002/1992	1	0.18	0.50-1.20	0.035	0.040	0.15-0.35	0.44 Cu 0.10% max
	2	0.20	0.50-1.20	0.035	0.040	0.15-0.35	0.44 Al 0.022% max
	3	0.22	0.50-1.20	0.035	0.040	0.15-0.35	0.44
ASTM-A-285 M	C	0.28	0.90	0.035	0.035		
ASTM-A-515M	60	0.24/ 0.27	0.90	0.035	0.035	0.15-0.40	Al 0.02% max
	65	0.28/ 0.31	0.90	0.035	0.035	0.15-0.40	
	70	0.31/ 0.33	1.20	0.035	0.035	0.15-0.40	
ASTM-A-516	55	0.18/ 0.22	0.60-0.90	0.035	0.035		
	65	0.24/ 0.28	0.85-1.20	0.035	0.035		
	70	0.27/ 0.30	0.85-1.20	0.035	0.035		
	– For each reduction of 0.10% of C below the specified max, an increase of 0.60% of Mn above the specified max is permitted up to 1.50%. – Grade 60 plates, Mn 0.85-1.20 for thickness ≤ 12.5 mm – Heats will be micro alloyed for orders requiring impact test						
ASTM-A-537M	Cl 1	0.24	0.7-1.60	0.035	0.035	0.15-0.50	Micro alloyed with Nb/V if required
	Al 0.02 min, Cr 0.25 max, Ni 0.25 max, Cu 0.35 max, Mo 0.08 max						
DIN 17155	H1	0.16	0.40-1.20	0.035	0.030	0.35	
	Al 0.02% min, Cr 0.25% max, Ni 0.30% max, Cu 0.30% max, Nb 0.01% max, V 0.03% max, Ti 0.03% max, Mo 0.10% max						

Mechanical Properties

Specification	Grade	Yield Strength MPa Min	Ultimate Tensile Strength MPa Min		Elongation % min GL 5.65 So			Internal diameter of bend		
ASTM-A-36	250	400-550			200 mm-18 50 mm-21					
								< 12 mm	> 12	
IS: 5986:2002 *	Fe 290	180	290-400		30			Close	T	
	Fe 330	205	330-440		28			Close	T	
	Fe 360	235	360-470		28			T	2t	
	Fe 410	255	410-520		24			2t	3t	
	Fe 490	335	490-610		22			2t	2t	
	Fe 510	355	510-620		20			2t	2t	
ASTM-A-588 M					200 mm	50 mm		</-20	<20 <25	>25 <40
	A	345	485		16	19		T	1.5T	2t
DIN 17100	ST 52.3	< 16 mm	> 16 < 40	> 40 > 63						
			355	345	335			490-630	18	
Charpy Impact energy 27J at -20°C										
SAILCOR (IRSM-41) HCRS(Cu+P)		340				480	22			T
		< 16 mm	> 16 < 40	> 40 > 60	UTS					
IS 2002/2009	1	235	225	215	360-480	24				2T
	2	265	255	245	410-530	22				2T
	3	290	285	280	460-580	21				3T
						200 mm	50 mm			
ASTM-A-285 M	C	205		385-515		23	27			
ASTM-A-515 M	60	220		415-550		21	25			
	65	240		450-585		19	23			
	70	260		485-620		17	21			
ASTM-A516 M	55	205		380-515		23	27			
	60	220		415-550		21	25			
	65	240		450-585		19	23			
	70	260		485-620		17	21			
Charpy Impact energy 18 J for Gr 60 & 65 at -51°C and 20J for Gr 70 at -46°C for -25 mm: 18J for Gr 60 & 65 at -46°C and 20J for Gr 70 at -40°C for >25 <50										
ASTM-A-537 M	Class I	345	485-620			18	22			
DIN 17155	HI	235 for < 16mm	225 for > 16 < 40 mm	360-480				24		

Charpy Impact energy 31J at 0°C

For ASTM-A-588 M/285 M/204 M/ 515 M/ 516 M/ 537 M & DIN 17100
Bend Test is a supplementary requirement

* under revision

Chemical Composition

Specification	Grade	C % max	Mn % max	P % max	S % max	Si % max	CE
ASTM-A-204 M	B	0.20/ 0.23	0.90	0.035	0.035	0.15- 0.40	
	Mo 0.45 - 0.60%						
ASTM-A -517	F	0.1-0.2	0.6-1.0	0.035	0.035	0.15-0.35	
	Ni 0.7-1.0, Cr 0.4-0.65, Mo 0.4-0.6, V 0.03-0.08, Cu 0.15- 0.50, Bo 0.0005-0.0006						
API-5L	A	0.22	0.90	0.030	0.030		
	B	0.26	1.20	0.030	0.030		
(PSL-I)	X-42	0.26	1.30	0.030	0.030		
	X-46	0.28	1.40	0.030	0.030		
	X-52	0.28	1.40	0.030	0.030		
	X-56	0.26	1.40	0.030	0.030		
	X-60	0.26	1.40	0.030	0.030		
	X-65	0.26	1.45	0.030	0.030		
	X-70	0.26	1.65	0.03	0.03		
	Nb+V+Ti < 0.15%						
IS: 3039	I	0.23	*	0.040	0.040	**	0.42
	* Mn content not less than 2.5 times Carbon content if thickness > 12.5 mm. ** Si 0.10-0.35% if killed quality, otherwise up to 12.5 mm thickness. *** Al min 0.01%						
	II	0.21	0.70-1.4	0.040	0.040	0.10-0.35	
	III	0.18	0.70-1.5	0.040	0.040	0.19-0.50	*
	* Al min 0.015%						
Lloyds Grade	A	0.20- 0.23	2.5xc% min	0.035	0.035	0.50	0.40
	B	0.21	0.80min	0.035	0.035	0.35	0.40
	For Gr B Mn 0.60% min if impact tested.						
SAILHARD		0.23	1.6	0.050	0.050	0.50	
	Al 0.10 max, Cr 0.65 max, Nb+V+Ti 0.15 max						
GOST 19282	09G2S	0.12	1.3-1.7	0.035	0.040	0.5-0.8	
	10G2S1	0.12	1.3-1.65	0.035	0.040	0.8-1.1	
	Al 0.050 max, Cr 0.30 max, Ni 0.30 max, Cu 0.30 max, Ti 0.03 max, N 0.008 max						

Chemical Composition

Specification	Grade	C % max	Mn % max	P % max	S % max	Si % max	Others
SAIL SPP 400	Hardox 400	0.20	1.70	0.02	0.01	0.10-0.70	Cr : 0.80 max Mo : 0.80 max
SAIL SPP 700	Weldox 700E	0.21	1.4	0.02	0.01	0.40	Cr : 0.5 Mo : 0.45 V : 0.08
SAIL HITEN 690 AR		0.22	1.60	0.025	0.015	0.60	Al - 0.02 max V - 0.20 max Ti - 0.02 max Nb - 0.050 max

Mechanical Properties

Specification	Grade	Yield Strength MPa Min		Ultimate Tensile Strength MPa Min	Elongation % min GL $5.65 \sqrt{S_0}$	Internal diameter of bend
ASTM-A-204 M					200 50 mm mm	<25 >25 mm < 40 mm
	B	275		485 -620	17 21	1.5T 2T
ASTM-A-517	F	690		795-930	16	
API 5L	A	207		331	25	
	B	241-448		414-758		1.944A 0.2/ U0.9 (GL:50.8 mm)
	X-42	290-496		414-758		A : Cross sectional area in mm ²
	X-46	317-524		434-758		U : Minimum UTS in MPa
	X-52	359-531		455-758		
	X-56	386-544		490-758		
	X-60	414-565		517-758		
	X-65	448-600		531-758		
	X-70	483-629		564-758		
IS 3039		< 25 mm	>25<50 mm			
	I	230	220	400-900	22	
	II	235	235	400-900	22	
	III	235	235	400-900	22	
Lloyds Grade	A	235		400-490	22	
	B	235		400-490	22	

Impact 27J at 0°C for >25mm

Mechanical Properties

Specification	Grade	Yield Strength MPa Min				Ultimate Tensile Strength MPa Min	Elonga- tion %min GL 5.65 So		Internal diameter of bend
SAILHARD	Hardness - 200 BHN (Min)								
GOST 19282		8 to <10	10 to <20	>20 <32	>32 <40	8 to <10	10 to <20	>20 <32	>32 <40
	09G2S	490	470	460	450	345	325	305	285
	10G2S1	490	480	470	450	345	325	325	325
Elong 21, Bend Test- 2T, Charpy Impact energy 59 J min at +20°C. Impact for category 3 only.									
DSQ LO-Pearl		245				375	25		3T
		304 for t < 6mm							
SAIL SUPER FORM	SAPH 45/440	294 for t = 6-8 mm							
HCRS	Cu-P		340			480	21		
SAIL SPP 400			900			1100	10		
SAIL SPP 700			620			725- 860	16		
SAIL HITEN 690 AR			550			690	15		3.5T

Note : The mechanical properties specified in API Grades are for pipes only.

HRC/Plate properties are to be mutually agreed upon by the producers & pipe manufacturers.

The chemistry and mechanical properties of ABS grade Plates.

Grade	Chemistry	Tensile Strength
A	C 0.21, Mn 2.5 x C% min S, P 0.035 Al 0.02 min, CE 0.040	YS 235 UTS 400-520 Impact > 50 mm 34J/RT
B	C 0.21, Mn 0.80 min S, P 0.035 Al 0.02 min, CE 0.040	YS 235 UTS 400-520 Impact > 25 mm 27J/0°
C	C 0.21, Mn 0.60 min S, P 0.035 Al 0.03 min, CE 0.040	YS 315 UTS 400-520 Impact 27J/-2° for all thicknesses
AH 32 DH 32 EH 32	C 0.18, Mn 0.70-1.60 Nb 0.02-0.05, S 0.035, P 0.035 V 0.05-0.10, Ti 0.02 max	YS 315 Imp AH 32 0°C 34 J DH 32 -20°C 34 J EH 32 -40°C 34 J
AH 36 DH 36 EH 36	C 0.18 Mn 0.70-1.60 S 0.035, P 0.035, Nb 0.02-0.05 V 0.05-0.10, Ti 0.02 max	YS 355 UTS 490-620 Imp AH 36 0°C 34 J DH 36 -20°C 34 J EH 36 -40°C 34 J

Mechanical Properties

Processing of plate orders for Home Sales through Vacuum Degassing (VD)/Isothermal/normal route as per customer requirements.

Requirement			Process		
Category	Grade	Specifications/ Sub Grades	Vacuum Degassing (VD) (Ref. A20/A20 M:07 CI 5.3.4 & S1)	Isothermal (Ref. A20/A20 M:07 CI 5.3.4)	Normal
UT	Mild	IS 2062 E 250 A, B, C, A/SA 283 A/SA 36, BS4360 Gr 43A, BS/DIN EN 10025 S235, 275 JIS G 3101 SS 400, DIN 17100 RSt 37.2, 44.2 Other Equivalent grades	> = 50 mm All grades with UT	40 to < 50 mm All grades with UT	< 40 mm All grades
	Boiler Quality (Normal strength)	IS 2002/1,2,3, IS2041/1,2 A/SA 515 & 516 Grades A/SA 285	> = 50 mm	40 to < 50 mm	< 40 mm
		DIN 17155 HI, EN 10028 2-P 235 GH, P265GH, EN 10028-2-P275	All thickness	–	–
	Boiler Quality (High Strength)	BS 1501-1 BS EN 10028-2-P295GH & 355GH BS EN 10028-3-P355	All thickness	–	–
		A/SA 537 Class 1, IS2041/3	> = 50 mm	40 to < 50 mm	< 40 mm
	Boiler Qty. (Spl)	A/SA 204, SAIL FRS	All thickness	–	–
	High Tensile	IS 2062 E 300, 350, 410 Sailma 300, 300HI/350, 350HI/410, 410HI ASTM A 572 Gr 42, 50, DIN 17100 St 52.3 BS/DIN EN S355 JO, JR, J2, NL GOST 9G2S, 10G2S1, BS4360 Gr 50	> = 50 mm	40 to < 50 mm	< 40 mm
Special	API, DMR, SAIL HITEN, SAILHARD, SAILMA 450 550, 600 SAILMA 450HI 550HI, 600HI, HT 750 IS 2062 E 450 D, E A 588, A 242, GOST5521 Hot Saw Disc	All thickness			
UT	All grades	All specifications/ Sub grades	> = 50 mm	40 to < 50 mm	< 40 mm
IMPACT	All grades	All specifications/ Sub grades	Impact test tempe- rature lower than (-) 20°C		
SPL TDC	All grades	All specifications/ sub grades	As per Customer's requirement or agreement		
Normalised Plate	As per mandatory requirement of the specification or as per agreed TDC				
Normalised Rolling	As per requirement of the customer				