

# Technical Specification References

Classification	Specification	Designation of Grade	Mechanical Properties					Chemical Composition %					Bend Test (N2)		
			Tensile Strength	Yield Strength	Elongation			C	Si	Mn	P	S	Bending Angle	Bending Radius	
					Test Piece	Thickness	%								Max
Hot Rolled Steel Plates and Sheets & Chequered Plates	JIS G 3131	SPHC	270 min	-	No 5	1.2mm & over, up to 1.6mm 1.6mm & over, up to 3.2mm 3.2mm & over	27 min 29 min 31 min	0.15	-	0.60	0.050	0.050	180°	Flat on itself 0.5t	
	JIS G 3101	SS 330	330 to 430	205 min	No 5	5mm & under	26 min	-	-	-	0.050	0.050	180°	0.5t	
		SS 400	400 to 510	245 min	No 5	5mm & under	21 min	-	-	-	0.050	0.050	180°	1.5t	
	BSEN 10025	S275JR	410-560 (N3)	275 min	-	-	3.0mm & over, up to 4.0mm	22 min	0.24	-	1.60	0.055	0.055	As specified in BS EN 10025	
		ASTM A 36	22-min	400 - 550	250 min	-	Gauge Length Lo=50mm	23 min	0.25	0.40	-	0.040	0.050	-	-
Galvanised Steel Sheets	JIS G 3302	SGCC	270 min	205 min	-	Up to 1.6mm 1.6mm & over, up to 3.0mm 3.0mm & over	-	-	-	-	-	-	180°	t <sup>(N1)</sup> t <sup>(N1)</sup> 2t <sup>(N1)</sup>	
		SGHC	270 min	205 min	-	Up to 1.6mm 1.6mm & over, up to 3.0mm 3.0mm & over	-	-	-	-	-	-	180°	t <sup>(N1)</sup> t <sup>(N1)</sup> 2t <sup>(N1)</sup>	
Cold Rolled Steel Sheets	JIS G 3141	SPCC	270 min	-	No 5	0.6mm & over, up to 1.0mm	36 min	0.12	-	0.50	0.040	0.045	180°	Flat on itself	
						1.0mm & over, up to 1.6mm	37 min								
						1.6mm & over, up to 2.5mm	38 min								
						2.5mm & over	39 min								

- NOTES: (N1) - up to grade z27 maximum  
(N2) - Bend Test test piece No.3  
(N3) - 3mm ≤ nominal thickness ≤ 100mm  
t - Thickness -

H T V B

# List Of Standard Specifications

Specifications	Yield strength N/mm <sup>2</sup>			Tensile strength N/mm <sup>2</sup>	Elongation min. % $L_0=5.65\sqrt{S_0}$	Charpy V-notch Temp. (°C) Energy (J)				
	t<16mm	16<t<40	t>40mm			20	0	-20	-40	-50
<b>GENERAL STRUCTURES</b>										
<b>ASTM A36</b>	min. 250			400-550	<b>50mm-200mm</b> 23-20	-	-	-	-	-
<b>ASTM A283</b>					<b>50MM-200MM</b>	-	-	-	-	-
Grade A	min. 165			310-416	30.27	-	-	-	-	-
Grade B	min. 185			345-450	28-25	-	-	-	-	-
Grade C	min. 205			380-515	25-22	-	-	-	-	-
Grade D	min. 230			415-550	23-20	-	-	-	-	-
<b>ASTM A572</b>					<b>50mm-200mm</b>	-	-	-	-	-
Grade 42	min. 290			415	24-20	-	-	-	-	-
Grade 50	min. 345			450	21-18	-	-	-	-	-
Grade 60	min. 415			520	18-16	-	-	-	-	-
Grade 65	min. 450			550	17-15	-	-	-	-	-
<b>EN 10113</b>						-	-	40	-	27
S275N	min. 275			370-510		-	-	40	-	27
S355N	min. 355			470-630		-	-	40	-	27
S420N	min. 420			520-680		-	-	40	-	27
S460N	min. 460			550-720		-	-	40	-	27
S275M	min. 275			360-510		-	-	40	-	27
S355M	min. 355			450-610		-	-	40	-	27
S420M	min. 420			500-660		-	-	40	-	27
S460M	min. 460			530-720		-	-	40	-	27
<b>EN 10149-2</b>						-	-	40	-	-
S315MC	min. 315			390-510	24	-	-	40	-	-
S355MC	min. 355			430-550	23	-	-	40	-	-
S420MC	min. 420			480-620	19	-	-	40	-	-
S460MC	min. 460			520-670	17	-	-	40	-	-
S500MC	min. 500			550-700	14	-	-	40	-	-
S550MC	min. 550			600-760	14	-	-	40	-	-
S600MC	min. 600			650-820	13	-	-	40	-	-
S650MC	650 (t ≤ 8mm)		620	700-880	12	-	-	40	-	-
S700MC	700 (t ≤ 8mm)		680	750-950	12	-	-	40	-	-
<b>EN 10149-3</b>						-	-	40	-	-
S260NC	min. 260			370-490	30	-	-	40	-	-
S315NC	min. 315			430-550	27	-	-	40	-	-
S355NC	min. 355			470-610	25	-	-	40	-	-
S420NC	min. 420			530-670	23	-	-	40	-	-
<b>JIS G 3101</b>						-	-	-	-	-
SS330	205	195	175	330-430	28-21	-	-	-	-	-
SS400	245	235	215	400-510	17-23	-	-	-	-	-
SS490	285	275	255	490-610	15-21	-	-	-	-	-
SS540	400	390	-	min. 540	13-17	-	-	-	-	-
<b>JIS G 3106</b>						<b>0°C</b>				
SM400A, B, C,	245	235	215	400-510	18-24	B/C 27/47		-	-	
SM490A, B, C,	325	315	295	490-610	17-23	B/C 27/47		-	-	

# List Of Standard Specifications

Specifications	Yield strength N/mm <sup>2</sup>			Tensile strength N/mm <sup>2</sup>	Elongation min. % $L_0=5.65\sqrt{S_0}$	Charpy V-notch Temp. (°C) Energy (J)				
	t<16mm	16<t<40	t>40mm			20	0	-20	-40	-50
Contd. <b>GENERAL STRUCTURES</b>										
<i>Contd. JIS G 3106</i>						0°C	-5°C			
SM490YA, YB	365	355	335	490-610	15-21	YB 27	-	-	-	-
SM520B, C	365	355	335	520-640	15-21	B/C 27/47	-	-	-	-
SM570	460	450	430	570-720	19-26	-	-	47	-	-
<b>BRIDGES, FLOOD GATES, STORAGE TANKS, WATER TANKS, BUILDINGS, CRANE STRUCTURES</b>										
<i>EN 10137-2</i>						0	-20		-40	
S450Q, QL, QL1	1) 460	1) 440	1) 400	1) 550-720	17	40/50/60	30/40/50	-30/40		
S500Q, QL, QL1	1) 500	1) 480	1) 440	1) 590-770	17	40/50/60	30/40/50	-30/40		
S440Q, QL, QL1	1) 550	1) 530	1) 490	1) 640-820	16	40/50/60	30/40/50	-30/40		
S620Q, QL, QL1	1) 620	1) 580	1) 560	1) 700-890	15	40/50/60	30/40/50	-30/40		
S690Q, QL, QL1	1) 690	1) 650	1) 630	1) 760-940	14	40/50/60	30/40/50	-30/40		
S890Q, QL, QL1	1) 890	1) 830	-	1) 880-1100	11	40/50/60	30/40/50	-30/40		
S960Q, QL, QL1	1) 960	-	-	1) 980-1150	10	40/50/60	30/40/50	-30/40		
<i>EN 10137-3</i>	3mm<t<50mm	50mm<t<70mm		0	-20	-40				
S500A, AL	2) 500	2) 480		600-700	17	55/65	40/50	-40		
S550A, AL	2) 550	2) 530		650-820	16	55/65	40/50	-40		
S620A, AL	2) 620	2) 580		710-880	15	55/65	40/50	-40		
S690A, AL	2) 690	2) 650		760-930	14	55/65	40/50	-40		
<b>SPECIAL STEEL</b>										
<i>BS 7191</i>										
275D	275	265	-	430-580	22	-	-	40	-	-
275E	275	265	265	430-580	22	-	-	-	40	-
275EZ	275	265	265	430-580	22	-	-	-	40	-
355D	355	345	-	490-640	20	-	-	50	-	-
355E	355	345	-	490-640	20	-	-	-	50	-
355EM	355	345	340	460-620	20	-	-	-	50	-
355EMZ	355	345	340	460-620	20	-	-	-	50	-
450EM	450	415	-	550-700	19	-	-	-	60	-
450EMZ	450	415	-	550-700	19	-	-	-	60	-
<b>HULL STRUCTURES</b>										
<i>ABS<sup>3)</sup></i>						For thickness t ≤ 50mm				
Grade A, B, D, E		min. 235		400-550	22	-	27	27	27	-60
Gr. AH, DH, EH, FH 32		min. 315		440-590	22	-	34	34	34	34
Gr. AH, DH, EH, FH 36		min. 355		490-620	21	-	34	34	34	34
Gr. AH, DH, EH, FH 40		min. 390		510-650	20	-	41	41	41	41
<i>LR<sup>3)</sup></i>										
Grade A, B, D, E		min. 235		400-520	22	27	27	27	27	-60
Gr. AH, DH, EH, FH 32		min. 315		440-590	22	-	31	31	31	31
Gr. AH, DH, EH, FH 36		min. 355		490-620	21	-	34	34	34	34
Gr. AH, DH, EH, FH 40		min. 390		510-650	20	-	41	41	41	41
<b>PRESSURE VESSELS, GENERAL</b>										
<i>ASTM A285</i>	50mm-200mm									
Grade A	min. 165			310-450	30-27	-	-	-	-	-
Grade B	min. 185			345-485	28-25	-	-	-	-	-
Grade C	min. 205			380-515	27-23	-	-	-	-	-

# List Of Standard Specifications

Specifications	Yield strength N/mm <sup>2</sup>			Tensile strength N/mm <sup>2</sup>	Elongation min. %	Charpy V-notch Temp. (°C) Energy (J)					
	t<16mm	16<t<40	t>40mm			20	0	-20	-40	-50	
<b>Contd. PRESSURE VESSELS, GENERAL</b>											
<b>ASTM A516</b>					<b>50mm-200mm</b>						
Grade 55	min. 205			380-515	27-23	-	-	-	-	-	
Grade 60	min. 220			415-550	25-21	-	-	-	-	-	
Grade 65	min. 240			450-585	23-19	-	-	-	-	-	
Grade 70	min. 260			485-620	21-17	-	-	-	-	-	
<b>EN 10028-2</b>											
P235GH	235	225	4) 215	4) 350-480	25	-	27	-	-	-	
P265GH	265	255	4) 245	4) 410-530	23	-	27	-	-	-	
P295GH	295	290	4) 285	4) 460-580	22	-	27	-	-	-	
P355GH	355	345	4) 335	4) 510-650	21	-	27	-	-	-	
16 Mo 3	275	270	4) 260	4) 440-590	24-23	31	-	-	-	-	
13 CrMo 4-5	300	4) 295		4) 450-600	20	31	-	-	-	-	
10 CrMo 9-10	310	300	4) 290	4) 480-630	18	31	-	-	-	-	
11 CrMo 9-10	min. 310			520-670	18	31	-	-	-	-	
<b>EN 10028-3</b>					<b>≤70mm</b>	<b>70-150</b>					
P275 N, NH	275	275	5) 265	5)* 390-510	24	23	55	47	40	-	-
NL1							63	55	47	34	27
NL2							100	90	65	40	30
P355 N, NH	355	355	5) 345	5)* 490-630	22	21	55	47	40	-	-
NL1							63	55	47	34	27
NL2							100	90	65	40	30
P460 N, NH	460	450	5) 440	5)* 570-720	17	16	55	47	40	-	-
NL1							63	55	47	34	27
NL2							100	90	65	40	30
<b>EN 10028-4</b>	<b>t&lt;30mm</b>	<b>30mm&lt;t&lt;50mm</b>			<b>t&lt;50mm</b>						
11 MnNi 5-3	6) 285	6)* 275		420-530	24		70	60	55	50	45
13 MnNi 6-3	6) 355	6)* 345		490-610	22		70	60	55	50	45
15 MnNi 6	6) 355	6)* 345		490-640	22		65	65	65	60	50
12 Ni 14	6) 355	6)* 345		490-640	22		65	60	55	55	50
12 Ni 19	6) 390	6)* 380		530-710	20		70	70	70	65	65
X8 Ni9 HT 640	6) 490	6)* 480		640-840	18		70	70	70	70	70
X8 Ni9 HT 680	6) 585	6)* 575		680-820	18		120	120	120	120	120
X7 Ni9	6) 585	6)* 575		680-820	18		120	120	120	120	120
<b>EN 10028-5</b>											
P355 M	355	355	7) 345	450-610	22		60	40	27	-	-
ML1						-	60	40	27	-	
ML2						-	80	60	40	27	
P420 M	420	400	7) 390	500-660	19		60	40	27	-	-
ML1						-	60	40	27	-	
ML2						-	80	60	40	27	
P460 M	460	440	7) 430	530-720	17		60	40	27	-	-
ML1						-	60	40	27	-	
ML2						-	80	60	40	27	
<b>EN 10028-6</b>											
P355 Q, QH	8) 355	8)* 335	8)** 315	8)*** 490-630	22		60	40	27	-	-
QL 1						-	60	40	27	-	
QL2						-	80	60	40	27	

# List Of Standard Specifications

Specifications	Yield strength N/mm <sup>2</sup>			Tensile strength N/mm <sup>2</sup>	Elongation min. %	Charpy V-notch Temp. (°C) Energy (J)				
	t<16mm	16<t<40	t>40mm			20	0	-20	-40	-50
Contd. PRESSURE VESSELS, GENERAL										
<i>Contd. EN 10028-6</i>										
P460 Q, QH										-60
QL1	8) 460	8) <sup>*</sup> 440	8) <sup>**</sup> 400	8) <sup>***</sup> 500-720	19	60	40	27	-	-
QL2						-	60	40	27	-
P500 Q, QH										
QL1	8) 500	8) <sup>*</sup> 480	8) <sup>**</sup> 440	8) <sup>***</sup> 590-770	17	60	40	27	-	-
QL2						-	60	40	27	-
P690 Q, QH										
QL1	8) 690	8) <sup>*</sup> 670	8) <sup>**</sup> 630	8) <sup>***</sup> 770-940	14	60	40	27	-	-
QL2						-	60	40	27	-
										27
PRESSURE VESSELS, LOW TEMPERATURE SERVICE										
<i>EN 10207</i>						3-40mm	40-60			
P235S	235	225	215	360-480		26	25	-	-	28
P265S	265	255	245	410-530		22	22	-	-	28
P275SL	275	265	255	390-510		24	24	-	-	28

**Table 28 - Plates: List of standards specifications**

- 1) For t≤50mm  
 1)<sup>\*</sup> For 50<t≤100mm  
 1)<sup>\*\*</sup> For 100<t≤150mm. For t>150mm, see EN 10137-2  
 1)<sup>\*\*\*</sup> For t≤100mm. For t>100m, see EN 10137-2  
 2) For t≤50mm  
 2)<sup>\*</sup> For 50<t≤70mm  
 3) For LR and ABS plates the difference between A, B, D, E, F grades are the impact tests. They are made at the following temperatures:

A grade	+20 °C	E/EH grade	-40 °C
B/AH grade	0 °C	FH grade	-60 °C
D/DH grade	-20 °C		

- 4) For plates thicker than 60mm, see EN 10028-2:1992  
 5) For plates thicker than 50mm, see EN 10028-3:1992  
 5)<sup>\*</sup> For plates thicker than 70mm, see EN 10028-3:1992  
 6) For t≤30mm  
 6)<sup>\*</sup> For 30<t≤50mm  
 7) Maximum thickness 63mm  
 8) For t≤50mm  
 8)<sup>\*</sup> For 50<t≤100mm  
 8)<sup>\*\*</sup> For 100<t≤150mm  
 8)<sup>\*\*\*</sup> For t≤100mm. For 100<t<150mm, see EN 10028-6

# Hot-Rolled Steel Plates

JIS G 3131 - 1996 SPHC  
BS EN 10025 S275 JR  
BS EN 10025 S355 JR

JIS G 3101 - SS330  
JIS G 3101 - SS400  
ASTM A 36

Thickness	Width x Length								
	4' x 8' 1219mm x 2438mm			5' x 10' 1524mm x 3048mm			5' x 20' 1524mm x 6096mm		
	Calculated Weight								
mm	kg/pc	lb/pc	pcs/mt	kg/pc	lb/pc	pcs/mt	kg/pc	lb/pc	pcs/mt
1.2	27.996	61.719	35.7	43.757	96.467	22.9	87.515	192.935	11.4
1.4	32.661	72.005	30.6	51.050	112.545	19.6	102.100	225.091	9.8
1.5	34.994	77.149	28.6	54.697	120.584	18.3	109.393	241.169	9.1
1.6	37.327	82.292	26.8	58.343	128.623	17.1	116.686	257.246	8.6
1.8	41.993	92.578	23.8	65.636	144.701	15.2	131.272	289.402	7.6
1.9	44.326	97.722	22.6	69.282	152.740	14.4	138.565	305.480	7.2
2.0	46.659	102.865	21.4	72.929	160.779	13.7	145.858	321.558	6.9
2.2	51.325	113.151	19.5	80.222	176.857	12.5	160.444	353.714	6.2
2.3	53.658	118.295	18.6	83.868	184.896	11.9	167.736	369.792	6.0
2.5	58.324	128.581	17.1	91.161	200.974	11.0	182.322	401.948	5.5
2.8	65.323	144.011	15.3	102.100	225.091	9.8	204.201	450.181	4.9
2.9	67.656	149.154	14.8	105.747	233.130	9.5	211.494	466.259	4.7
3.0	69.989	154.297	14.3	109.393	241.169	9.1	218.787	482.337	4.6
3.2	74.655	164.584	13.4	116.686	257.246	8.6	233.372	514.493	4.3
3.8	88.652	195.443	11.3	138.565	305.480	7.2	277.130	610.960	3.6
4.0	93.318	205.730	10.7	145.858	321.558	6.9	291.716	643.116	3.4
4.3	100.317	221.159	10.0	156.797	345.675	6.4	313.594	691.350	3.2
4.5	104.983	231.446	9.5	164.090	361.753	6.1	328.180	723.506	3.0
5.0	116.648	257.162	8.6	182.322	401.948	5.5	364.644	803.895	2.7
5.8	135.312	298.308	7.4	211.494	466.259	4.7	422.988	932.518	2.4
6.0	139.978	308.594	7.1	218.787	482.337	4.6	437.573	964.674	2.3
7.5	174.972	385.743	5.7	273.483	602.921	3.7	546.967	1205.843	1.8
8.0	186.637	411.459	5.4	291.716	643.116	3.4	583.431	1286.232	1.7
9.0	209.966	462.892	4.8	328.180	723.506	3.0	656.360	1447.011	1.5
10.0	233.296	514.324	4.3	364.644	803.895	2.7	729.289	1607.790	1.4
11.0	256.625	565.757	3.9	401.109	884.285	2.5	802.218	1768.569	1.2
12.0	279.955	617.189	3.6	437.573	964.674	2.3	875.147	1929.348	1.1
13.0	303.285	668.621	3.3	474.038	1045.064	2.1	948.076	2090.127	1.1
14.0	326.614	720.054	3.1	510.502	1125.453	2.0	1021.004	2250.906	1.0
15.0	349.944	771.486	2.9	545.967	1205.843	1.8	1093.933	2411.685	0.9
16.0	373.273	822.919	2.7	583.431	1286.232	1.7	1166.862	2572.465	0.9

(\*Other sizes & lengths not stipulated in the table above may be made available upon request)

# Hot-Rolled Steel Plates

JIS G 3131 - 1996 SPHC  
BS EN 10025 S275 JR  
BS EN 10025 S355 JR

JIS G 3101 - SS330  
JIS G 3101 - SS400  
ASTM A 36

Thickness	Width x Length								
	6' x 8' 1829mm x 2438mm			6' x 10' 1829mm x 3048mm			6' x 20' 1829mm x 6096mm		
	Calculated Weight								
mm	kg/pc	lb/pc	pcs/mt	kg/pc	lb/pc	pcs/mt	kg/pc	lb/pc	pcs/mt
1.2	-	-	-	-	-	-	-	-	-
1.4	-	-	-	-	-	-	-	-	-
1.5	-	-	-	-	-	-	-	-	-
1.6	-	-	-	-	-	-	-	-	-
1.8	-	-	-	-	-	-	-	-	-
1.9	-	-	-	-	-	-	-	-	-
2.0	-	-	-	-	-	-	-	-	-
2.2	-	-	-	-	-	-	-	-	-
2.3	-	-	-	-	-	-	-	-	-
2.5	-	-	-	-	-	-	-	-	-
2.8	-	-	-	-	-	-	-	-	-
2.9	-	-	-	-	-	-	-	-	-
3.0	105.012	231.509	9.5	131.286	289.434	7.6	262.573	578.868	3.8
3.2	112.013	246.943	8.9	140.039	308.730	7.1	280.078	617.459	3.6
3.8	133.015	293.245	7.5	166.296	366.616	6.0	332.592	733.233	3.0
4.0	140.016	308.679	7.1	175.048	385.912	5.7	350.097	771.824	2.9
4.3	150.517	331.830	6.6	188.177	414.855	5.3	376.354	829.711	2.7
4.5	157.518	347.264	6.3	196.930	434.151	5.1	393.859	868.302	2.5
5.0	175.020	385.849	5.7	218.811	482.390	4.6	437.621	964.780	2.3
5.8	203.023	447.584	4.9	253.820	559.572	3.9	507.641	1119.144	2.0
6.0	210.024	463.018	4.8	262.573	578.868	3.8	525.145	1157.736	1.9
7.5	262.530	578.773	3.8	328.216	723.585	3.0	656.432	1447.170	1.5
8.0	280.032	617.358	3.6	350.097	771.824	2.9	700.194	1543.648	1.4
9.0	315.036	694.527	3.2	393.859	868.302	2.5	787.718	1736.603	1.3
10.0	350.040	771.697	2.9	437.621	964.780	2.3	875.242	1929.559	1.1
11.0	385.043	848.867	2.6	481.383	1061.258	2.1	962.767	2122.515	1.0
12.0	420.047	926.037	2.4	525.145	1157.736	1.9	1050.291	2315.471	1.0
13.0	455.051	1003.206	2.2	568.908	1254.214	1.8	1137.815	2508.427	0.88
14.0	490.055	1080.376	2.0	612.670	1350.692	1.6	1225.339	2701.383	0.82
15.0	525.059	1157.546	1.9	656.432	1447.170	1.5	1312.864	2894.339	0.76
16.0	560.063	1234.715	1.8	700.194	1543.648	1.4	1400.388	3087.295	0.71

(\*Other sizes & lengths not stipulated in the table above may be made available upon request)