

STEEL PLATES



8) Plate General Informations (ASTM/EN/JIS/ABS/LR)

Main Standards and Specifications

Standards		Specifications
ABS Specifications (American Bureau of Shipping Rules)	ASS (1998):	Rules Requirements for Materials and Welding, Part 2. Ordinary strength hull structural steel plates. Higher strength hull structural steel plates.
ASTM Specifications (American Society for Testing of Materials)	A36 (1996): A283 (1993): A285 (1990): A516 (1990): A572 (1997):	Standard specification for Carbon Structural Steel . Standard specification for Low and Intermediate Tensile Strength Carbon Steel Plates Standard specification for Pressure Vessel Plates, Carbon Steel, Low- and Intermediate Tensile Strength. Standard specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service. Standard specification for High-Strength, Low Alloy, Columbium-Vanadium Structural Steel .
BSI Specifications (British Standards Institute)	BS 7191 (1989): EN 10028 (1993): EN 10113 (1993): EN 10137 (1996): EN 10149 (1996): EN 10207 (1992):	Specification for Weldable structural steels for fixed offshore structures. Specification for Flat products made of steels for pressure purposes . Standard specification for Hot rolled products in weldable fine grain structural steels . Plates and wide flats made of high yield strength structural steels in the quenched and tempered or precipitation hardened conditions. Specification for Hot-rolled flat products made of high yield strength steels for cold forming . Steels for simple pressure vessels - Technical delivery requirements for plates, strips and bars.
JIS Specifications (Japanese Industrial Standards)	G 3101 (1991): G 3106 (1995):	Rolled steels for general structures . Rolled steels for welded structure .
LRS Specifications (Lloyd's Register of Shipping Rules)	LR (1998):	Manufacture, Testing and Certification of Materials.

8) Plate General Informations (ASTM/EN/JIS/ABS/LR)

List of Standard Specifications

Standard	Specifications	Yield strength N/mm ²			Tensile Strength N/mm ²	Elongation min. % L ₀ =5.65√S ₀	Charpy V-notch Temp. (°C) Energy (J)				
		t≤16mm	16<t≤40	t>40mm			20	0	-20	-40	-50
GENERAL STRUCTURES											
ASTM	A36	min. 250			400-550	50mm-200mm 23-20	-	-	-	-	-
ASTM A283	Grade A	min. 165			310-415	50mm-200mm 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	-	-	-	-	-
ASTM A572	Grade 42	min. 290			415	50mm-200mm 24-20	-	-	-	-	-
	Grade 50	min. 345			450	21-18	-	-	-	-	-
	Grade 60	min.415			520	18-16	-	-	-	-	-
	Grade 65	min. 450			550	17-15	-	-	-	-	-
EN 10025-3&4 : 2004	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
EN 10149-2	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	-	-
EN 10149-3	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	-	-
JIS G 3101	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	-	-	-	-	-
JIS G 3106	SM400A, B, C	245	235	215	400-510	18-24	0 °C B/C 27/47		-	-	-
	SM490A, B, C	325	315	295	490-610	17-23	B/C 27/47		-	-	-
	SM490YA, YB	365	355	335	490-610	15-21	YB27		-	-	-
	SM520B, C	365	355	335	520-640	15-21	B/C 27/47		-	-	-
	SM570	460	450	430	570-720	19-26	-	-	47	-	-

8) Plate General Informations (ASTM/EN/JIS/ABS/LR)

List of Standard Specifications

Standard	Specifications	Yield strength N/mm ²			Tensile Strength N/mm ²	Elongation min. % L ₀ =5.65√S ₀	Charpy V-notch Temp. (°C) Energy (J)				
		t≤16mm	16<t≤40	t>40mm			20	0	-20	-40	-50
BRIDGES, FLOOD GATES, STORAGE TANKS, WATER TANKS, BUILDINGS, CRANE STRUCTURES											
EN 10025-6							0		-20		-40
	S460Q, 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
	S550Q, 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)**} 830	^{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
EN 10137-3		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
SPECIAL STEEL											
BS 7191	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	-
HULL STRUCTURES											
ABS ³⁾							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
LR ³⁾	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
PRESSURE VESSELS, GENERAL											
ASTM A285							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	-	-	-	-

8) Plate General Informations (ASTM/EN/JIS/ABS/LR)

List of Standard Specifications

Standard	Specifications	Yield strength N/mm ²			Tensile Strength N/mm ²	Elongation min. %	Charpy V-notch Temp. (°C) Energy (J)						
		t≤16mm	16<t≤40	t>40mm			20	0	-20	-40	-50		
PRESSURE VESSELS, GENERAL													
ASTM A516	Grade 55	min. 205			380-515	50mm-200mm		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		-	-	-	-	-	
EN 10028-2	P235GH	235	225	⁴⁾ 215	⁴⁾ 360-480	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	-	-	-	-	-		
EN 10028-3	P275 N, NH NL1 NL2	275	275	⁵⁾ 265	^{5)*} 390-510	24	23	55	47	40	-	-	
								63	55	47	34	27	
								100	90	65	40	30	
	P355 N, NH NL1 NL2	355	355	⁵⁾ 345	^{5)*} 490-630	22	21	55	47	40	-	-	
								63	55	47	34	27	
								100	90	65	40	30	
	P460 N, NH NL1 NL2	460	450	⁵⁾ 440	^{5)*} 570-720	17	16	55	47	40	-	-	
								63	55	47	34	27	
100								90	65	40	30		
EN 10028-4			t<30mm	30mm<t≤50mm				t<50mm					
	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 Ni 9		⁶⁾ 585	^{6)*} 575		680-820		18	120	120	120	120	120
EN 10028-5	P355 M ML1 ML2	355	355	⁷⁾ 345	450-610	22		60	40	27	-	-	
								-	60	40	27	-	
								-	80	60	40	27	
	P420 M ML1 ML2	420	400	⁷⁾ 390	500-660	19		60	40	27	-	-	
								-	60	40	27	-	
								-	80	60	40	27	
P460 M ML1 ML2	460	440	⁷⁾ 430	530-720	17		60	40	27	-	-		
							-	60	40	27	-		
							-	80	60	40	27		
EN 10028-6	P355 Q, QH QL1 QL2	⁸⁾ 355	⁸⁾ 335	^{8)**} 315	^{8)***} 490-630	22		60	40	27	-	-60	
								-	60	40	27	-	
								80	60	40	27		

8) Plate General Informations (ASTM/EN/JIS/ABS/LR)

List of Standard Specifications

Standard	Specifications		Yield strength N/mm ²			Tensile Strength N/mm ²	Elongation min. %	Charpy V-notch Temp. (°C) Energy (J)							
			t≤16mm	16<t≤40	t>40mm			20	0	-20	-40	-50			
Contd.															
EN 10028-6															
PRESSURE VESSELS, GENERAL															
EN 10028-6	P460	Q, QH	8) 460	8)* 440	8)** 400	8)*** 500-720	19	60	40	27	-	-60			
		QL1						-	60	40	27	-			
		QL2						-	80	60	40	27			
	P500	Q, QH	8) 500	8)* 480	8)** 440	8)*** 590-770	17	60	40	27	-	-			
		QL1						-	60	40	27	-			
		QL2						-	80	60	40	27			
	P690	Q, QH	8) 690	8)* 670	8)** 630	8)*** 770-940	14	60	40	27	-	-			
		QL1						-	60	40	27	-			
		QL2						-	80	60	40	27			
	PRESSURE VESSELS, LOW TEMPERATURE SERVICE														
	EN 10207														
		P235S		235	225	215	360-480	3-40mm	40-60	26	25	-	-	28	-
	P265S		265	255	245	410-530			22	22	-	-	28	-	-
	P275SL		275	265	255	390-510			24	24	-	-	-	-	28

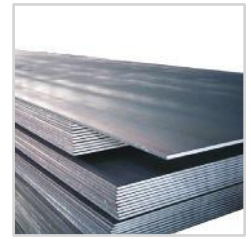
Note:

- 1) For t≤50mm
- 1)* For 50<t≤100mm
- 1)** For 100<t≤150mm. For t>150mm, see EN 10137-2.
- 1)*** For t≤100mm. For t>100mm, see EN 10137-2.
- 2) For t≤50mm.
- 2)* 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)* For plates thicker than 70mm, see EN 10028-3:1992.
- 6) For t≤30mm.
- 6)* For 30<t≤50mm.
- 7) Maximum thickness 63mm.
- 8) For t≤50mm.
- 8)* For 50<t≤100mm.
- 8)** For 100<t≤150mm
- 8)*** For t≤100mm. For 100<t≤150mm, see EN 10028-6.

Plates

Dimensions and Mass



8a (i) Mild Steel Plates

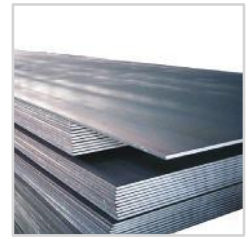
Width x Length (m)		1.219 x 2.438	1.219 x 4.876	1.524 x 3.048	1.524 x 6.096	1.829 x 6.096	2.438 x 6.096
Width x Length (ft)		4 x 8	4 x 16	5 x 10	5 x 20	6 x 20	8 x 20
Thickness	Weight	Calculated Weight / pc					
mm	kg/ft ²	kg/pc	kg/pc	kg/pc	kg/pc	kg/pc	kg/pc
1.2	0.875	28	-	44	-	-	-
1.4	1.021	33	-	51	-	-	-
1.5	1.094	35	-	55	-	-	-
1.6	1.166	37	-	58	-	-	-
1.8	1.312	42	-	66	-	-	-
1.9	1.385	44	-	69	-	-	-
2.0	1.458	47	-	73	-	-	-
2.3	1.677	54	-	84	-	-	-
2.6	1.896	61	-	95	-	-	-
2.8	2.041	65	-	102	-	-	-
3.0	2.187	70	-	109	-	-	-
3.2	2.333	75	-	117	-	-	-
4.0	2.916	93	187	146	292	350	467
4.5	3.281	105	210	164	328	394	525
5.0	3.645	117	233	182	365	438	583
6.0	4.374	140	280	219	438	525	700
6.35	4.629	148	296	232	463	556	741
7.5	5.468	175	350	273	547	656	875
8.0	5.832	187	373	292	583	700	933
9.0	6.561	210	420	328	656	788	1050
9.53	6.948	222	445	348	695	834	1112
10	7.290	233	467	365	729	875	1167
12	8.749	280	560	438	875	1050	1400
12.7	9.259	296	593	463	926	1112	1482
13	9.478	303	607	474	948	1138	1517
14	10.207	327	653	511	1021	1225	1633
15	10.936	350	700	547	1094	1313	1750
16	11.665	373	747	583	1167	1400	1867
18	13.123	420	840	656	1313	1575	2100
19	13.852	443	887	693	1386	1663	2217
20	14.581	467	933	729	1459	1750	2333
22	16.039	513	1027	802	1604	1926	2567
24	17.497	560	1120	875	1750	2101	2800
25	18.226	583	1166	912	1823	2188	2917
25.4	18.518	593	1185	926	1852	2223	2963
28	20.413	653	1306	1021	2042	2451	3267
30	21.871	700	1400	1094	2188	2626	3500
32	23.330	747	1493	1167	2334	2801	3733
35	25.517	817	1633	1276	2553	3063	4083
36	26.246	840	1680	1313	2625	3151	4200
38	27.704	887	1773	1386	2771	3326	4433
40	29.162	933	1866	1459	2917	3501	4667
44	32.078	1027	2053	1604	3209	3851	5133
45	32.807	1050	2100	1641	3282	3939	5250
50	36.452	1166	2333	1823	3646	4376	5833

Note : The above weight are rounded up to kg.

www.choobee.com

Plates

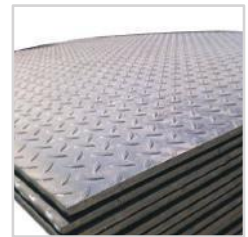
Dimensions and Mass



8a (i) Mild Steel Plates - II

Width x Length (m)		1.219 x 2.438	1.219 x 4.876	1.524 x 3.048	1.524 x 6.096	1.829 x 6.096	2.438 x 6.096
Width x Length (ft)		4 x 8	4 x 16	5 x 10	5 x 20	6 x 20	8 x 20
Thickness	Weight	Calculated Weight / pc					
mm	kg/ft ²	kg/pc	kg/pc	kg/pc	kg/pc	kg/pc	kg/pc
55	40.098	1283	2566	2006	4011	4814	6417
57	41.556	1330	2660	2078	4157	4989	6650
60	43.743	1400	2800	2188	4376	5251	7000
63.5	46.295	1481	2963	2315	4631	5558	7408
65	47.388	1516	3033	2370	4740	5689	7583
70	51.033	1633	3266	2553	5105	6127	8167
75	54.679	1750	3499	2735	5470	6564	8750
80	58.324	1866	3733	2917	5834	7002	9333
90	65.614	2100	4199	3282	6564	7877	10500
100	72.905	2333	4666	3646	7293	8752	11667
110	80.195	2566	5133	4011	8022	9628	12833
120	87.486	2800	5599	4376	8751	10503	14000
125	91.131	2916	5832	4558	9116	10941	14583
130	94.776	3033	6066	4740	9481	11378	15167
140	102.067	3266	6532	5105	10210	12253	16333
150	109.357	3499	6999	5470	10939	13129	17500

Calculated weight based on Metric units 7.85kg/mm m2 - 0.7293 kg/mm ft2



8a (ii) MS Chequered Plates (Metric Units)

Width x Length (m)		1.219 x 2.438	1.219 x 4.876	1.524 x 3.048	1.524 x 6.096
Width x Length (ft)		4 x 8	4 x 16	5 x 10	5 x 20
Thickness	Calculated Weight	Calculated Weight / pc			
mm	kg/ft ²	kg/pc	kg/pc	kg/pc	kg/pc
2.0	1.617	51.74	-	-	-
2.3	1.836	58.74	-	-	-
3.0	2.346	75.07	150.14	117.33	234.67
4.0	3.075	98.40	196.80	153.80	307.60
4.5	3.440	110.07	220.13	172.03	344.06
5.0	3.804	121.73	243.46	190.26	380.53
6.0	4.533	145.06	290.12	226.73	453.45
7.5	5.627	180.05	360.11	281.42	562.85
8.0	5.991	191.72	383.44	299.66	599.31
9.0	6.720	215.05	430.10	336.12	672.24
12.0	8.907	285.04	570.07	445.51	891.03

The calculation of the above weight is based on MS Plate (7.85 kg/mm m2) and add 0.15881 kg/ft2 for chequered plates.