

MARINE HULL STEEL

Description

Hull steels are mild steels with a tensile strength ranging from 400 to 520 MPa and are listed in the “Rules and Regulation for the Construction and Classification of Steel ships”, published by Lloyd’s Register of Shipping. The tensile requirements are for plates not exceeding 30mm in thickness: greater thicknesses are subjects to special consideration.

Four grades are specified, namely A, B, C and E.

Although these grades have the same tensile strength, they are characterized by an increasing degree of toughness.

The higher strength grades of steel are grades with a minimum specified yield equal to or in excess of 335MPa. Three grades are AH36, DH36, and EH36.

Chemical Composition (ladle analysis, percent %) as specified by Lloyd’s rule

Grade	C Max	Mn	P Max	S Max	Si	Al ¹	Nb
A	0,21	²	0,035	0,035	0,50 max	-	-
B	0,21	0,80 min	0,035	0,035	0,35 max	-	-
D	0,21	0,60 min	0,035	0,035	0,10- 0,35	0,020 min	-
E	0,18	0,70 min	0,035	0,035	0,10-0,35	0,020 min	-
AH 36 ³	0,18	0,07-1,60 ⁴	0,035	0,035	0,50 max	0,020 min	0,020 -0,050
DH36 ³	0,18	0,90-1,60	0,035	0,035	0,5 max	0,020 min	0,020- 0,050
EH36 ³	0,18	0,90-1,60	0,035	0,035	0,5 max	0,020 min	0,020- 0,050

Notes:

1. Total Aluminum
2. % manganese not less than 2,5 times % carbon
3. Residual elements are restricted to the following maximum: copper ≤ 0,35%; chromium ≤ 0,20% nickel ≤ 0,40%; molybdenum ≤ 0,08%
4. 0,9% -1, 60 manganese for t ≥ 12,5mm

Typical Chemical Composition (ladle analysis, percent %)

Grade	Deoxidation Practice	Thickness t (mm)	C	Mn	P max	S max	Si	Al	Nb
A	Fully killed	4,5 ≤ t ≤ 30	0,14	0,90	0,020	0,020	0,25	0,035	-
B	Fully killed	4,5 ≤ t ≤ 30	0,14	0,9	0,020	0,020	0,25	0,035	-
D	Fully killed	6,0 ≤ t ≤ 30	0,12	0,95	0,020	0,020	0,25	0,035	-
E	Fully killed	6,0 ≤ t ≤ 30	0,12	1,00	0,020	0,010	0,25	0,035	-
AH36	Fully killed	6 ≤ t ≤ 30	0,15	1,45	0,015	0,015	0,40	0,035	0,025
EH36	Fully killed	6 ≤ t ≤ 30	0,15	1,45	0,015	0,015	0,40	0,035	0,025

Mechanical Property Requirements as specified by Lloyd's rules

Grade	Tensile Strength (MPa)	Minimum Yield stress (MPa)	Minimum Elongation ^{1/2} (%)	Charpy V –Notch ³ Impact test in the Longitudinal direction	
				Test temperature(°C)	Minimum average energy (J)
A	400-520	235	22	-	-
B	400-520	235	22	0	27
D	400-520	235	22	20	27
E	400-520	235	22	-40	27
AH36	490-620	355	21	0	34
DH36	490-620	355	21	-20	34
EH36	490-620	355	21	-40	34

Notes:

1. Gauge length $5,65\sqrt{S_0}$, where S_0 is the original cross section area of the tensile test specimen
2. Applicable to round tensile specimens only.
3. Longitudinal, full size test specimen.