AB (1996) High Strength Hull Structural Steel Plates

Desig-nation	Chemical Composition, % [2]															
	C	Si[4]	Mn	P	S	Cu[8]	Cr[8]	Ni[8]	Mo[8]	Cb	V[6],[7]	Al[5],[6] (acid soluble)	Ti	N	Mark-ing[9]	Deoxi-dation[1]
	max.			max.						(Nb)[6],[7]		min.				
AH32	0.18	0.10~0.50	0.90~1.60[3]	0.035	0.035	0.35	0.20	0.40	0.08	0.02~0.05	0.05~0.10	0.015	0.02	-		
DH32	0.18	0.10~0.50	0.90~1.60[3]	0.035	0.035	0.35	0.20	0.40	0.08	0.02~0.05	0.05~0.10	0.015	0.02	-		
EH32	0.18	0.10~0.50	0.90~1.60[3]	0.035	0.035	0.35	0.20	0.40	0.08	0.02~0.05	0.05~0.10	0.015	0.02	-		
AH36	0.18	0.10~0.50	0.90~1.60[3]	0.035	0.035	0.35	0.20	0.40	0.08	0.02~0.05	0.05~0.10	0.015	0.02	-		
DH36	0.18	0.10~0.50	0.90~1.60[3]	0.035	0.035	0.35	0.20	0.40	0.08	0.02~0.05	0.05~0.10	0.015	0.02	-		
EH36	0.18	0.10~0.50	0.90~1.60[3]	0.035	0.035	0.35	0.20	0.40	0.08	0.02~0.05	0.05~0.10	0.015	0.02	-	AB/XHYY (X = A,D,E, or F YY = 32, 36 or 40	Killed, Fine Grain Practice
AH40	0.18	0.10~0.50	0.90~1.60[3]	0.035	0.035	0.35	0.20	0.40	0.08	0.02~0.05	0.05~0.10	0.015	0.02	-		
DH40	0.18	0.10~0.50	0.90~1.60[3]	0.035	0.035	0.35	0.20	0.40	0.08	0.02~0.05	0.05~0.10	0.015	0.02	-		
EH40	0.18	0.10~0.50	0.90~1.60[3]	0.035	0.035	0.35	0.20	0.40	0.08	0.02~0.05	0.05~0.10	0.015	0.02	-		
FH32	0.16	0.10~0.50	0.90~1.60	0.025	0.025	0.35	0.20	0.80	0.08	0.02~0.05	0.05~0.10	0.015	0.02	0.009 (0.012 if Al present)		
FH36	0.16	0.10 ~ 0.50	0.90 ~ 1.60	0.025	0.025	0.35	0.20	0.80	0.08	0.02~0.05	0.05~0.10	0.015	0.02	0.009 (0.012 if Al present)		
FH40	0.16	0.10 ~ 0.50	0.90 ~ 1.60	0.025	0.025	0.35	0.20	0.80	0.08	0.02~0.05	0.05~0.10	0.015	0.02	0.009 (0.012 if Al present)		

Notes:

1) The steel is to contain at least one of the grain refining elements in sufficient amount to meet the fine grain practice requirement (See 2/1.5.2d).

2) The contents of any other element intentionally added is to be determined and reported.

3) Grade AH 12.5 mm (0.50 in.) and under in thickness may have a minimum manganese content of 0.70%.

4) Where the content of soluble aluminum is not less than 0.015%, the minimum required silicon content does not apply.

5) The total aluminum content may be used in lieu of acid soluble content, in accordance with 2/1.5.2d.

6) The indicated amount of aluminum, niobium and vanadium applies when any such element is used singly. When used in combination, the minimum content in 2/1.5.2d will apply.

7) These elements need not be reported on the mill sheet unless intentionally added.

8) These elements may be reported as ≤0.02% where the amount present does not exceed 0.02%.

9) The marking AB/DHYYN is to be used to denote Grade DHYY plates which have either been normalized, thermomechanical control rolled or control rolled in accordance with an approved procedure.

10) See 2/1/5.3 for carbon equivalent and cold cracking susceptibility requirements for thermo-mechanically controlled steel.

11) For other steels, the carbon equivalent (Ceq) may be calculated from the ladle analysis in accordance with the equation in 2/1.5.3a. Selection of the maximum value of carbon equivalent for these steels is a matter to be agreed between the fabricator and steel mill when the steel is ordered.

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AB (1996) High Strength Hull Structural Steel Plates

Tensile Properties				Impact Test							
Grade	Tensile Strength N/mm^2	Yield Pt min. N/mm^2	Elongation[12],[13],[14] min. %	Grade	Temp	Average Absorbed Energy(16) J (kgf-m,ft-lbs)					
						t≤50mm(2.0 in.)		50mm(2.0in.)< t ≤70mm (2.8 in)		70mm(2.8in.)< t ≤100mm (4.0 in)	
	(kgf/mm^2,ksi)	(kgf/mm^2,ksi)			C (F)	Long'l[17]	Transv[17]	Long'l[17]	Transv[17]	Long'l[17]	Transv[17]
AH 32				AH 32		34 (3.5, 25)	24 (2.4, 17)	38 (3.9, 28)	26 (2.7, 19)	46 (4.7, 34)	31 (3.2, 23)
DH 32	440/590	315	22	AH 36	0 (32)	34 (3.5, 25)	24 (2.4, 17)	41 (4.2, 30)	27 (2.8, 20)	50 (5.1, 37)	34 (3.5, 25)
EH 32	(45/60, 64/85)	(32, 46)		AH 40		41 (4.2, 30)	27 (2.8, 20)	NA	NA	NA	NA
FH 32											
				DH 32		34 (3.5, 25)	24 (2.4, 17)	38 (3.9, 28)	26 (2.7, 19)	46 (4.7, 34)	31 (3.2, 23)
				DH 36	-20(-4)	34 (3.5, 25)	24 (2.4, 17)	41 (4.2, 30)	27 (2.8, 20)	50 (5.1, 37)	34 (3.5, 25)
AH 36				DH 40		41 (4.2, 30)	27 (2.8, 20)	NA	NA	NA	NA
DH 36	490/620	355	21								
EH 36	(50/63, 71/90)	(36, 51)		EH 32		34 (3.5, 25)	24 (2.4, 17)	38 (3.9, 28)	26 (2.7, 19)	46 (4.7, 34)	31 (3.2, 23)
FH 36				EH 36	-40(-40)	34 (3.5, 25)	24 (2.4, 17)	41 (4.2, 30)	27 (2.8, 20)	50 (5.1, 37)	34 (3.5, 25)
				EH 40		41 (4.2, 30)	27 (2.8, 20)	NA	NA	NA	NA
AH 40				FH 32		34 (3.5, 25)	24 (2.4, 17)				
DH 40	510/650	390	20	FH 36	-60(-76)	34 (3.5, 25)	24 (2.4, 17)				
EH 40	(52/66, 74/94)	(40, 57)		FH 40		41 (4.2, 30)	27 (2.8, 20)				
FH 40											

12) Based on alternative A flat test specimen or alternative C round specimen in Figure 2/1.1.

13) Minimum elongation for alternative B flat specimen in Figure 2/1.1 is to be in accordance with Table 2/1.2-3.

14) Minimum elongation for ASTM E8M/E8 or A370 specimen is Table 2/1.2-3 for 200 mm (8 in.) specimen and 22% for 50 mm (2 in.) specimen.

15) Elongation requirements for Alternative B specimen are as follows.

	Thickness in mm (in.)							
exceeding: →		5 (.20)	10 (.40)	15 (.60)	20 (.80)	25 (1.00)	30 (1.20)	40 (1.60)
not exceeding: →	5 (.20)	10 (.40)	15 (.60)	20 (.80)	25 (1.00)	30 (1.20)	40 (1.60)	50 (2.00)
Grade								
XH 32	14	16	17	18	19	20	21	22
XH 36	13	15	16	17	18	19	20	21
XH 40	12	14	15	16	17	18	19	20

16) The energy shown is minimum for full size specimen. See 2/1.3.5c for subsize specimen requirement.

17) Either direction is acceptable.

18) Carbon equivalent for Higher-strength Hull Structural Steel 100mm (4.0 in.) and under produced by TMCP is as follows.

	Carbon Equivalent, Max. (%)	
Grade	t ≤ 50 mm (2.0 in.)	50mm (2.0 mm (20 in.) < t ≤ 100 mm (4.0 in.)
AH 32, DH 32, EH 32	0.36	0.38
FH 32	0.36	NA
AH 36, DH 36, EH 36	0.38	0.40
FH 36	0.38	NA
AH 40, DH 40, EH 40, FH 40	0.40	NA

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