Grade A-B-C-D

Mechanical properties for acceptance purposes

Grade	Yield stress N/mm2 minimum	Tensile strength N/mm2	Elongation on 5,65 √s o % minimum	Charpy V-notch impact test *(see Notes 3, 4, 5, 6 and 7)*		
				Thickness mm	Average energy J minimum	
					Longitudinal	Transverse *(see Note 3)*
A						
B	235	400 - 520	22	≤ 50	27	20
D		*(see Note 1)*	*(see Note 2)*	> 50 ≤ 70	34	24
E				> 70 ≤ 100	41	27

Impact tests are to be made on the various grades at the following temperatures

A grade	20° C
B grade	0° C
D grade	-20° C
E grade	-40° C

NOTES

1. For sections Grade A, the upper limit of the tensile strength range may be exceeded at the discretion of the Surveyor.

2. For full tickness tensile test specimens with a width of 25 mm and a gauge length of 200 mm, the minimum elogation is to be:

Thickness mm		>5	>10	>15	>20	>25	>30	>35
	≤5	≤10	≤15	≤20	≤25	≤30	≤35	≤50
Elongation %	14	16	17	18	19	20	21	22

3. Tests are to be taken in the longitundinal direction. Normally, transverse test specimens are not required. Transverse test results for plates and wide flats are to be garenteed by the supplier.

4.a For Grade A steel, Charpy V-notch impact tests are not required for routine acceptance test purposes when the thickness does not exceed 50mm , or up to 100mm thick if the material is supplied in either the normalized or thermomechanically controlled-rolled condition and has been fine grain treated. However, the manufacturer should confirm, by way of regular in-house checks, that the material will meet a requirement of 27J at +20˚C. The results of these checks shall be reported to the Surveyor. The frequency of these checks should as a minimum be every 250 tonnes.

4.b When Grade A steel is supplied in the normalizing rolled condition or when special approval has been given for material thicker than 50mm to be supplied in the as-rolled condition, a set of three impact test specimens are to be tested from thereof each batch of 50 tonnes or fraction

5. Impact tests are generally not required for Grade B steel of 25mm or less in thickness. However, the manufacturer is to confirm, by way of regular in-house tests, and on occasional material selected by the Surveyor, that the material meets the requirements in the table above. The resultsof the tests are to be reported to the Surveyor. The frequency of the in-house checks are to be, as a minimum, one set of three impact test specimens for every 250 tonnes.

6. Impact tests are not required when the nominal material thickness is less than 6 mm.

7. For batch tested Grade B and D steel plates supplied in a condition other than furnace normalized, with a thickness equal to, or greater than 25mm and 12mm respectively, and where the average value of one set of tests is less than 40J, two further items from the same batch are to be selected and tested. If these fail to achieve an average of 40J either set, each individual piece of the heat is to be tested. The plates are acceptable provided they meet the requirements of the table above. Additional testing is not required where the manufactor can demonstrate to the satisfaction of the Surveyor that the plate was rolled outside the limits of the programmed rolling schedule. In this instance the plate should be rejected.

Grade A-B-C-D

Chemical composition and deoxidation practice

Grade	A	B	D	E
Deoxidation	For t ≤ 50mm: Any method (for rimmed steel, see NOTE 1)	For t ≤ 50mm: Any method except rimmed steel	For t ≤ 25mm: Killed	Killed and fine grain treated with aluminium
	For t > 50mm: Killed	For t > 50mm: Killed	For t > 25mm: Killed and fine grain treated with aluminium	
Chemical composition % *(see Note 5)*				
Carbon	0,21 max. (see Note 2)	0,21 max.	0,21 max.	0,18 max.
Manganese	2,5 x C% min.	0,80 min. (see Note 3)	0,60 min.	0,70 min.
Silicon	0,05 max.	0,35 max.	0,10 - 0,35	0,10 - 0,35
Sulphur	0,035 max.	0,035 max.	0,035 max.	0,035 max.
Phosphorus	0,035 max.	0,035 max.	0,035 max.	0,035 max.
Aluminium *(acid soluble)*	-	-	0,015 min. (see Note 4)	0,015 min. *(see Note 4)*
	Carbon + 1/6 of the manganese content is not to exceed 0,40%			

NOTES

1. For Grade A, rimmed steel may only be accepted for sections up to a maximum thickness of 12,5 mm, provided that it is stated on the test certificates or shipping statements to be rimmed steel.

2. The maximum carbon content fir Grade A steel may be increased to 0,23% for sections.

3. Where Grade B is impact tested the minimum manganese content may be reduced to 60%.

4. The total aluminium content may be determined.

5. Where additions of any other elements are made as part of the steelmaking practice, the content is to be recorded.