W14 Steel plates and wide flats with specified minimum through thickness properties ("Z" quality)

(1982) (Rev.1 July 2002) (Rev.2 May 2004) (Rev.3 Sep 2021)

W14.1 Scope

These requirements supplement those given in W11 and W16 for material with a thickness greater than or equal to 15mm and intended to have a specified minimum ductility in the through thickness or "Z" direction (Figure 1). Products with a thickness less than 15mm may be included at the discretion of the Society.

The use of such material, known as "Z" quality steel, is recommended for structural details subject to strains in the through thickness direction to minimise the possibility of lamellar tearing during fabrication. Two "Z" quality steels are specified, Z25 for normal ship applications and Z35 for more severe applications.

Through thickness properties are characterised by specified values for reduction of area in a through thickness tensile test.

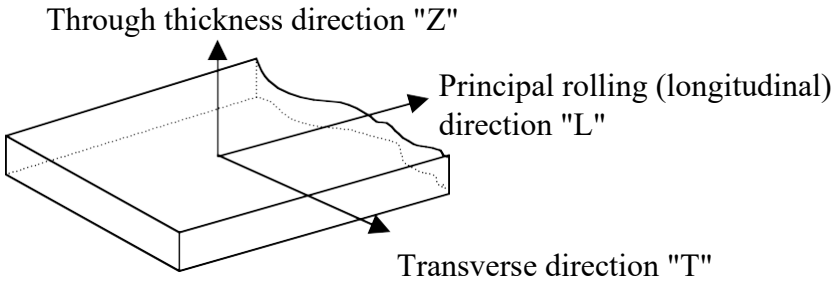

Figure 1 Schematic of testing directions

Note:

1. Changes introduced in Rev.3 are to be uniformly implemented by IACS Societies on ships contracted for construction on or after 1 January 2023 and when the application for certification of steel plates is dated on or after 1 January 2023.

2. The "contracted for construction" date means the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. For further details regarding the date of "contract for construction", refer to IACS Procedural Requirement (PR) No. 29.

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W14.2 Manufacture

All the materials are to be manufactured at works approved by the Society for "Z" quality steels.

The approval should follow the procedure given in UR W11 Appendix A but take into account the improved steelmaking techniques of calcium treatment, vacuum degassing and argon stirring as well as the control of centre-line segregation during continuous casting.

W14.2 *bis* Chemical composition

In addition to the requirements of the appropriate steel specification W11 or W16, the maximum sulphur content is to be 0.008% determined by the ladle analysis.

W14.3 Test procedure

In addition to the requirements of the appropriate steel specification W11 or W16, preparation of specimens and testing procedures are to be as follows:

W14.3.1 Test sampling

For plates and wide flats, one test sample is to be taken close to the longitudinal centreline of one end of each rolled piece representing the batch. See Table 1 and Figure 2.

Table 1 Batch size dependent on product and sulphur content

Product	S > 0.005%	S ≤ 0.005%
Plates	Each piece(parent plate)	Maximum 50t of products of the same cast, thickness and heat treatment
Wide flats of normal thickness ≤ 25mm	Maximum 10t of products of the same cast, thickness and heat treatment	Maximum 50t of products of the same cast, thickness and heat treatment
Wide flats of nominal thickness >25mm	Maximum 20t of products of the same cast, thickness and heat treatment	Maximum 50t of products of the same cast, thickness and heat treatment

W14.3.2 Number of tensile test specimens

The test sample must be large enough to accommodate the preparation of 6 specimens. 3 test specimens are to be prepared while the rest of the sample remains for possible retest.

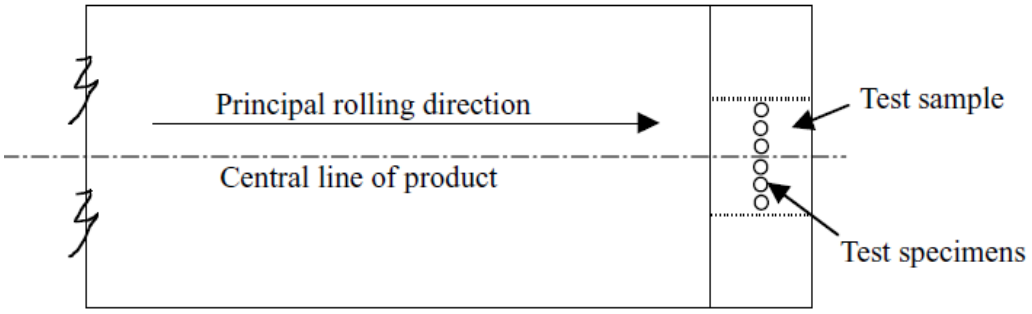

Figure 2 Plate and wide flat sampling position

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W14.3.3 Tensile test specimen dimensions

Round test specimens including built-up type by welding are to be prepared in accordance with a recognised national standard.

W14.3.4 Tensile test results

The test is considered invalid and further replacement test is required if the fracture occurs in the weld or heat affected zone.

The minimum average value for the reduction of area of at least 3 tensile test specimens taken in the through thickness direction must be that shown for the appropriate grade given in Table 2. Only one individual value may be below the minimum average but not less than minimum individual value shown for the appropriate grade. See Figure 3.

A value less than the minimum individual value is a cause for rejection.

Table 2 Reduction of area acceptance values

Grad	Z25	Z35
Minimum average	25%	35%
Minimum individual	15%	25%

W14.4 Retest procedure

Figure 3 shows the three cases where a retest situation is permitted. In these instances three more tensile tests are to be taken from the remaining test sample. The average of all 6 tensile tests is to be greater than the required minimum average with no greater than two results below the minimum average.

In the case of failure after retest, either the batch represented by the piece is rejected or each piece within the batch is required to be tested.

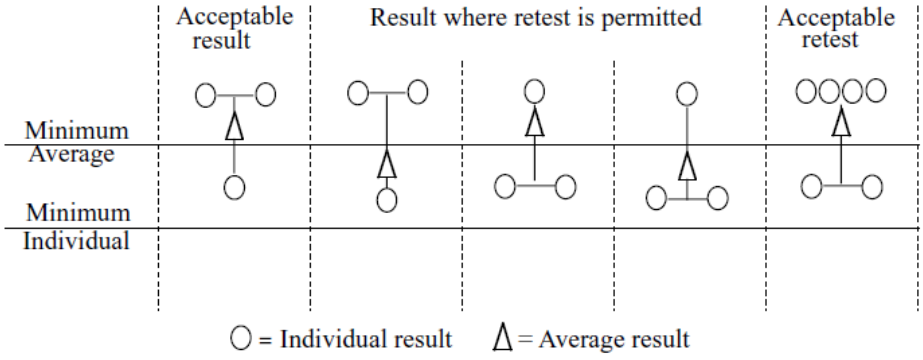

Figure 3 Diagram showing acceptance / rejection and retest criteria

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W14.5 Ultrasonic tests

Ultrasonic testing is required and is to be performed in accordance with either EN 10160:1999 Level S1/E1 or ASTM A 578:2017 Level C.

Ultrasonic testing should be carried out on each piece in the final supply condition and with a probe frequency of 4MHz.

W14.6 Marking

Products complying with these requirements are to be marked in accordance with the appropriate steel requirement W11 or W16 and in addition with the notation Z25 or Z35 added to the material grade designation, e.g. EH36Z25 or EH36Z35.

W14.7 Certification

The following information is required to be included on the certificate in addition to the appropriate steel requirement given in W11 or W16:

(a) Through thickness reduction in area (%)
(b) Steel grade with Z25 or Z35 notation.

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