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GB

**NATIONAL STANDARD
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中华人民共和国国家标准**

GB 5313-1985

**Steel Plate with Through-thickness Characteristics
厚度方向性能钢板**

a CodeofChina.com translation work
for your reference only

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1 Introduction

1.1 The steel plate, used for certain crucial welding assembly, such as shipbuilding, outshone production platform, boiler and pressure vessel, not only require certain mechanical property of its broad ways and length heading ,but also satisfactory lamellar tearing- resistant performance of its thickness. The steel plate' performance in the lamellar tearing resistance aspect can be assessed by reduction in area when doing tension test of through-thickness.

1.2 This standard is applicable to killed steel plate with thickness between 15mm and 150mm, and with yield point no larger than 51 kgf/mm² (500n/mm²). For the steel plate which the thickness is less than 15mm or greater than 150mm, or the yield point is greater than 51kgf/mm² (500N/mm²), specific requirements shall be negotiated at order time.

1.3 The standard serves as supplementary provision for relevant standard steel plate requiring through-thickness property test.

2 Technical Requirements

2.1 The sulfur levels (heat analysis) of the steel shall meet the requirements in table 1.

Table 1

| Z-direction Properties Z | Z15 | Z25 | Z35 |
|------------------------------------|------|-------|------|
| Sulfur content, %, not larger than | 0.01 | 0.007 | 0.00 |

2.2 For the steel plate, the through-thickness property, and the average reduction in area and individual reduction in area shall meet the requirement of Table 2.

Table 2

| Level | Reduction in area % | |
|-------|-------------------------------|------------------------|
| | the mean of the three samples | Individual Sample Mean |
| | Not less than | |
| Z15 | 15 | 10 |
| Z25 | 25 | 15 |
| Z35 | 35 | 25 |

2.3 Steel plate being delivered according to this standard, must be inspected through ultrasonic examination in accordance with the ways and the standards negotiated at

order time.

3. Testing Method and Checking Rule

3.1 Group or Batch

3.1.1 Z 15 level steel plate may be checked either by every rolled plate sheet or randomly by group, according to customers' requirements. When inspected batch by batch, each batch shall be composed of steel plate bearing the same furnace number and coming from the same heat treating regime. The Total Weight shall not be larger than 25t, and the ratio of the normal thickness difference of each batch to the minimum thickness of the same batch shall not exceed 20%.

3.1.2 For Z 25 and Z 35 level steel plates, every original rolled plate shall be inspected.

3.2 Sampling

The shape biscuit should be cut off at the middle part of either of the two ends in the rolling direction of steel plate, with its size being able to make six tension test piece. Three of the six pieces are processed, and the other three are standby (Detailed in Figure 1).

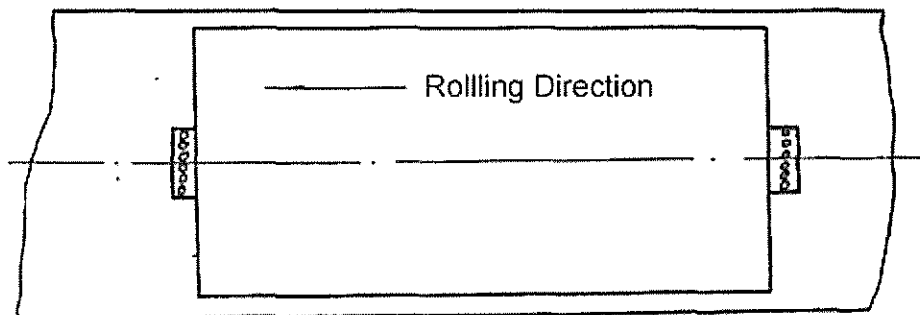


Figure 1: Sampling Location

3.3 Sample Preparation

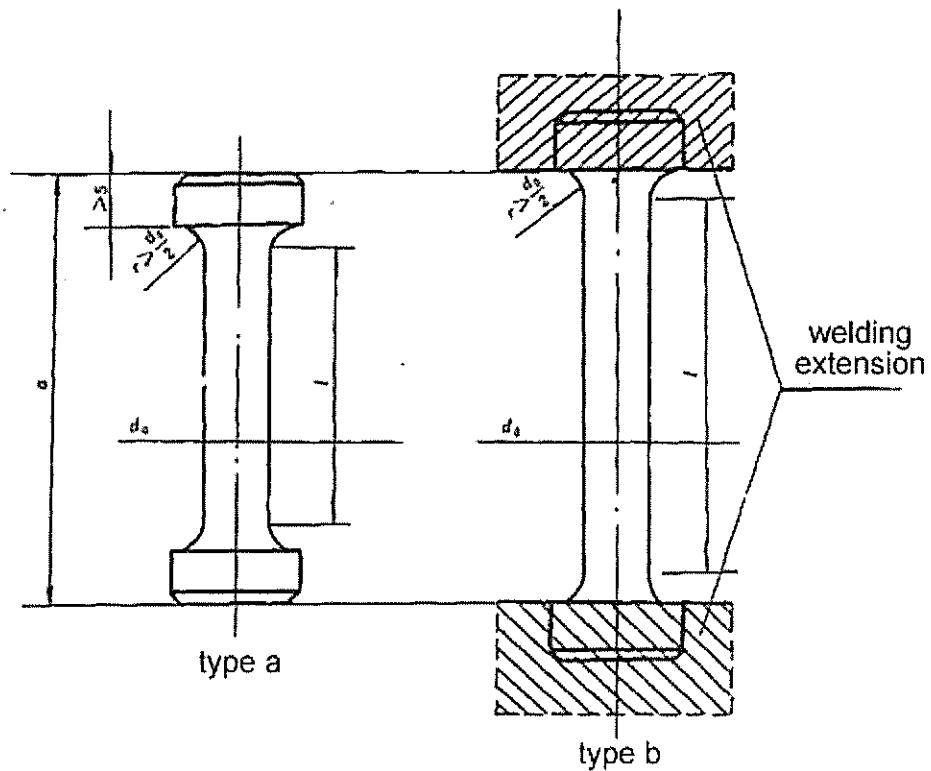
3.3.1 Round samples shall be adopted in the test, the diameter should be in accordance with provisions in Table 3, and the parallel length of the samples shall not be less than 1.5 times of the diameter.

Table 3

| Plating Thickness A | Sample Diameter d_0 |
|---------------------|-----------------------|
| $a < 25$ | $d_0 = 6$ |
| $a > 25$ | $d_0 = 10$ |

3.3.2 The sample may be formed by the whole plating thickness (detailed in Figure 2a); when the sample can not be directly processed upon the through-thickness of the steel plate, the tension sample with full thickness, which is welded with exposed core may be adopted.

When the test of thickness-directional property near the superficial part is necessary, sample b or sample c in Figure 2 can be adopted after negotiated by the parties.



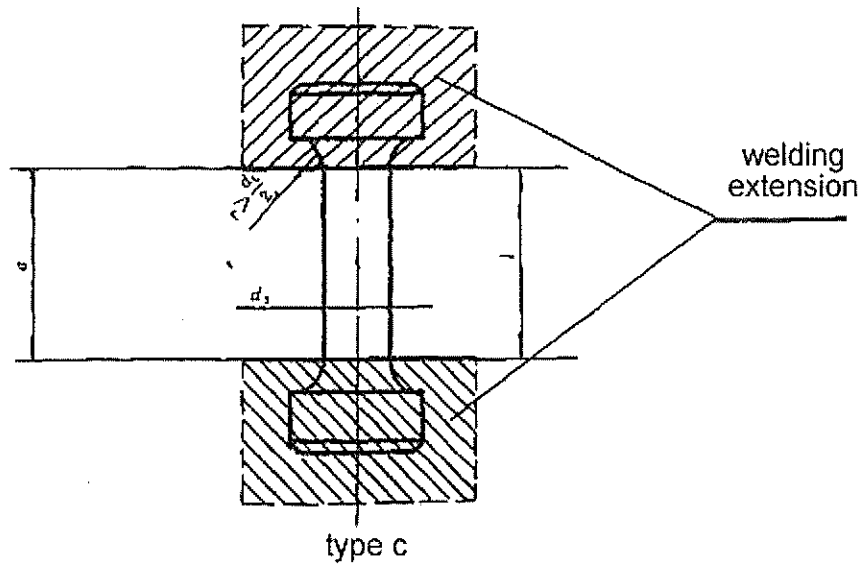


Figure 2: Selection and Preparation of Sample

3.3.3 As to welding sample exposed core, any applicable means may be adopted, such as friction welding and arc welding, yet all these welding method shall ensure a minimum range of warm influence, furthermore prevent range of warm influence from reaching the length of parallelism.

3.4 Measurement and Calculation of Cross-Section Reduction

3.4.1 Thickness-directional tension test shall be carried out according to "Metal Tensile Test Method" GB 228 - 76.

3.4.2 The cross-section reduction shall be calculated by the following formula.

$$\psi_z = \frac{F_o - F}{F_o} \times 100$$

Where,

F_o - original cross-sectional area, mm^2

$$F_o = \frac{1}{4} \pi d_o^2$$

F - Mini cross-sectional area of post-rift sample

$$F = \frac{\pi}{4} \left(\frac{d_1 + d_2}{2} \right)$$

d_1 and d_2 refer to the measured values of the two orthogonal diameter, if cross-section is elliptic, d_1 and d_2 refer to respectively the two axis of the ellipse.

3.5 Retesting

If sample is processed improperly or welded badly, it should be regarded as a failure. If sample ruptured at welding seam or heat-affected zone, the test shall also be regarded as invalid.

3.6 Re-inspection

Either individual or average value of the cross-section reduction of the three samples is less than those specified in Table 1, the three standby samples shall be used for re-inspection. And the average value of the six samples and the individual value of the three reexamination sample must be in accordance with provisions in Table 1. Otherwise, those steel plates inspected by batch, should be inspected sheet by sheet.

4. Mark

Through-thickness property steel plate shall be denoted through the ranking number Z 15, Z 25, Z 35 after the grade of steel. For instance, the mark for 4C steel plate with required thickness -directional property using for shipbuilding is 4 C-Z 25.

Additional explanation

The standard is proposed by Ministry of Metallurgical Industry of the People's Republic of China

This standard is drafted by information standard research station of Ministry of Metallurgical Industry, WuYang Iron and Steel Company.

The chief drafting staffs of this standard are Zhou Bishan and Liu Mingyu.