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Cold Rolled Ribbed Steel Bars

冷轧带肋钢筋

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Cold Rolled Ribbed Steel Bars

1 Scope

This document specifies the designation, dimensions, shape, weight and allowable deviations, raw materials and properties, test methods, inspection rules, packaging, marking and quality certificate of cold rolled ribbed steel bars (hereinafter referred to as the steel bars).

This document is applicable to cold rolled ribbed steel bars for ordinary reinforced concrete, manufacturing welded mesh and prestressing concrete.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 222 Permissible Tolerances for Chemical Composition of Steel Products

GB/T 2101 General Requirement of Acceptance, Packaging, Marking and Certification for Section Steel

GB/T 2103 General Requirements for Acceptance, Packaging, Marking and Quality Certification of Steel Wire

GB/T 17505 Steel and Steel Products - General Technical Delivery Requirements

GB/T 21839 Test Methods of Steel for Prestressing Concrete

GB/T 28900 Test Methods of Steel for Reinforcement of Concrete

YB/T 081 Rule for Rounding off of Numerical Values and Judgement of Testing Values for Technical Standards of Metallurgy

3 Terms and Definitions

The following terms and definitions are applicable to this document.

3.1 cold rolled ribbed steel bars

Steel bars with transverse ribs evenly distributed along the length direction on their surface after hot-rolled round wire rods are subjected to cold rolling.

3.2 nominal diameter

The diameter of a circle equal to the nominal cross-sectional area of the steel bars.

3.3 specific projected rib area

The ratio of the projected area of a transverse rib on a plane perpendicular to the axis of the steel bars to the product of the nominal perimeter of the steel bars and the rib spacing.

3.4 rib spacing

The chord length of the discontinuous part of the transverse rib on the circumference of the steel bars projected on a plane perpendicular to the axis of the steel bars.

4 Designation

There are five designations for the steel bars: CRB550, CRB600H, CRB650, CRB800 and CRB800H. CRB550 and CRB600H are steel bars for ordinary reinforced concrete, while CRB650, CRB800 and CRB800H are steel bars for prestressing concrete.

C, R, B and H are respectively the first letters of the words “Cold rolled”, “Ribbed”, “Bars” and “High ductility”; the figures represent the characteristic value of tensile strength.

5 Dimensions, Shape, Weight and Allowable Deviations

5.1 Nominal Diameter Ranges

The nominal diameter range of CRB550 steel bars is 4 mm ~ 12 mm, the nominal diameter range of CRB600H steel bars is 4 mm ~ 16 mm, and the nominal diameters of CRB650 steel bars and above are 4 mm, 5 mm and 6 mm.

5.2 Shape

5.2.1 Shape requirements

CRB600H shall have two-sided ribs (see Figure 1), CRB550 and CRB650 shall have three-sided ribs (see Figure 2). Upon negotiation between the supply-side and the demand-side, CRB800 and CRB800H are allowed to adopt other shapes.

5.2.2.4 The bevel angle α on both sides of the transverse ribs of the steel bars with two-sided ribs and three-sided ribs and the surface of the steel bars shall not be less than 45° .

5.2.2.5 The sum of the transverse rib spacings of the steel bars with two-sided ribs and three-sided ribs shall not be greater than 20% of the nominal circumference ($\sum f_i \leq 0.2\pi d$).

5.2.2.6 The specific projected rib area f_r shall be determined in accordance with Formula (1):

$$f_r = \frac{K \times F_R \times \sin \beta}{\pi \times d \times l} \dots\dots\dots (1)$$

Where,

$K = 2$ (two-sided ribs) or 3 (three-sided ribs);

F_R ---the longitudinal cross-sectional area of one rib, expressed in (mm^2);

β ---the included angle between the transverse rib and the axis of the steel bar, expressed in ($^\circ$);

d ---the nominal diameter of the steel bar, expressed in (mm);

l ---the transverse rib interval, expressed in (mm).

If the geometric parameters of the steel bars are known, the specific projected rib area can be calculated using Formula (2):

$$f_r = \frac{(d \times \pi - \sum f_i) \times (h + 4h_{1/4})}{6 \times \pi \times d \times l} \dots\dots\dots (2)$$

Where,

d ---the nominal diameter of the steel bar, expressed in (mm);

$\sum f_i$ ---the sum of the spacings between each row of transverse ribs on the circumference of the steel bar, expressed in (mm);

h ---the midpoint height of the transverse rib, expressed in (mm);

$h_{1/4}$ ---the height at 1/4 of the transverse rib, expressed in (mm);

l ---the transverse rib interval, expressed in (mm).

NOTE: the calculation results of Formula (2) are approximate values.

5.3 Dimensions, Weight and Allowable Deviations

The dimensions, weight and allowable deviations of the steel bars with two-sided ribs and three-sided ribs shall comply with the stipulations of Table 1.

supply-side and the supply-side, it is allowed to be replaced by the inspection data of the same designation continuously produced with the same raw materials and the same process.

7.2 Mechanical Properties

The nominal cross-sectional areas listed in Table 1 are used to calculate the strength of the steel bars.

7.3 Stress Relaxation Test

7.3.1 During the test, the ambient temperature of the specimen shall be maintained at $20\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$.

7.3.2 Mechanical straightening is allowed on the specimen, but any heat treatment or other cold machining shall not be carried out.

7.3.3 The initial test force applied onto the specimen is 70% of the nominal tensile strength of the specimen multiplied by the nominal cross-sectional area of the specimen.

7.3.4 The loading speed is $200\text{ MPa/min} \pm 50\text{ MPa/min}$. The loading of the initial load shall be completed within 3 ~ 5 minutes. After maintaining the load for 2 minutes, start recording the relaxation value.

7.3.5 The length of the specimen is not less than 60 times the nominal diameter.

7.3.6 It is allowed to use test data of at least 120 h to extrapolate the 1,000-h relaxation rate value.

7.4 Dimensional Measurements

7.4.1 The height of the transverse ribs is measured by measuring the height of each row of transverse ribs of the same section and taking the average value; the rib interval is measured by measuring the average interval, that is, measure the distance between the centers of the 1st and 11th transverse ribs in the same row and divide it by 10, which is the average interval between the transverse ribs.

7.4.2 Dimensional measurements are accurate to 0.02 mm.

7.5 Measurement of Weight Deviations

When measuring the weight deviations of the steel bars, the length of the specimen shall not be less than 500 mm. The length measurement is accurate to 1 mm and the weight measurement is accurate to 1 g. The weight deviations (%) of the steel bars shall be calculated in accordance with Formula (3):

$$\eta = \frac{M - (L \times m)}{L \times m} \times 100 \quad \dots\dots\dots (3)$$

Where,

η ---the deviation of the actual weight from the theoretical weight, expressed in (%);

M ---the actual weight of the specimen, expressed in (g);

L ---the length of the specimen, expressed in (mm);

m ---the theoretical unit weight, expressed in (g/mm).

7.6 Rounding-off of Numerical Values

The rounding-off and determination of numerical values of the inspection results shall comply with the stipulations of YB/T 081.

8 Inspection Rules

8.1 Inspection and Acceptance

The inspection and acceptance of the steel bars shall be carried out by the supply-side's quality supervision department. The demand-side has the right to conduct inspection.

8.2 Batch Grouping Rules

The steel bars shall be inspected and accepted in batches. Each batch shall be composed of steel bars of the same designation, the same shape, the same specifications, the same production process and the same delivery status. Each batch shall not be greater than 60 t.

8.3 Sampling Quantity

The sampling quantity for steel bar inspection shall comply with the provisions of Table 4.

8.4 Re-inspection and Determination

The re-inspection and determination of the steel bars shall comply with the provisions of GB/T 17505.

9 Packaging, Marking and Quality Certificate

9.1 Each plate (bundle) of steel bars shall be evenly tied with no less than 3 tracks, and the ends shall be bent into the plate.

9.2 The steel bars shall be rolled with obvious and complete steel bar designation marks. The interval of the marks is twice the interval of the transverse ribs. One transverse rib within the mark interval shall be cancelled, as shown in Figure 3. For high ductility cold-rolled ribbed steel bars, a short transverse rib shall be added within the 3rd mark interval, as shown in Figure 4. The steel bars are only allowed to be rolled with the factory name or factory logo, and shall

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