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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 26080-2024

Replacing GB/T 26080-2010

Cold roll-forming rectangle steel tube for tower cranes

塔机用冷弯矩形管

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1 Scope and normative references

1 The document lays down the classification and codes, the information for ordering, the dimensions, shape, weight and permissible deviations, the technical requirements, the test methods, the inspection rules and the packaging, marking and quality certificate of cold roll-formed rectangular tubes for tower cranes. It applies to cold-formed hollow rectangular tubes, called tubes in the document, produced by continuous roll forming and high frequency welding from hot-rolled strip or plate that can be cold worked, and used for the members of tower cranes.

2 The documents cited are GB/T 228.1 (tensile testing of metallic materials at room temperature), GB/T 229 (Charpy pendulum impact test), GB/T 700 (carbon structural steels), GB/T 709-2019 (dimensions, shape, weight and permissible deviations of hot-rolled plates and strips), GB/T 1591 (high strength low alloy structural steels), GB/T 2101 (general rules for acceptance, packaging, marking and quality certificates of section steel), GB/T 2975 (sampling location and specimen preparation for mechanical testing of steel), GB/T 4171 (weathering structural steel), GB/T 4336 (spark discharge atomic emission spectrometry for carbon and low alloy steel), GB/T 6725-2017 (general technical requirements for cold formed steel sections), GB/T 20066 (sampling and preparation of samples for the determination of chemical composition of steel and iron), JB/T 9218-2015 (penetrant testing) and YB/T 081 (rounding of numerical values and judgement of test results in metallurgical standards).

3 The document defines no terms.

4 Classification, codes and information for ordering

4 Tubes are classified by the shape of their cross section. Tubes with all four corners rounded cover square tubes, coded F, and rectangular tubes, coded J. Tubes with one sharp corner and three rounded corners cover square sharp-corner tubes, coded JF, and rectangular sharp-corner tubes, coded JJ.

5 A contract placed under the document carries at least the number of the document, the product name and size including the code, the steel grade, the delivery weight, the ordered length and any other special requirement.

6 Dimensions, shape, weight and permissible deviations

6.1 Figure 1 shows the cross section of square and rectangular tubes and labels the side lengths, the diagonal lengths, the angle of the rounded corner, the wall thickness, the outer corner radius and the weld. Figure 2 does the same for square and rectangular sharp-corner tubes, adding the angle of the sharp corner. Table 1 lists the cross-sectional dimensions, theoretical weight and section properties of the usual square tubes and Table 2 does the same for the usual square sharp-corner tubes; both tables note that the values are computed on the assumption that the outer corner radius equals twice the wall thickness. Tubes of sizes outside those tables may be supplied by agreement between supplier and purchaser when the contract says so.

6.2.1 Table 3 fixes the permissible deviations of shape and dimensions of square and rectangular tubes. The side length deviation is +/- 0.5 mm for side lengths below 80 mm and +/- 0.7 % of the side length for side lengths of 80 mm and above. The wall thickness deviation follows the normal thickness accuracy class PT.A of GB/T 709-2019 and applies to the flat portion of the tube only. The outer corner radius lies between 1.5 and 2.5 times the wall thickness, and the absolute difference between any two corner radii is not more than 3.0 mm when the wall thickness is below 10 mm and not more than 4.0 mm when it is 10 mm or more. The difference between the two diagonals is not more than 1.2 mm for side lengths up to 135 mm and not more than 2.0 mm above 135 mm. The corner angle is 90° +/- 1.0°. Flatness does not exceed 0.6 % of the side length, with a minimum of 0.4 mm and a maximum of 1.0 mm. End cut squareness is within 2.0 mm. Bow is not more than 1.0 mm per metre and the total bow not more than 0.1 % of the total length. Twist is not more than 2 mm plus half a millimetre per metre of length.

6.2.1 Table 4 fixes the same set of deviations for square and rectangular sharp-corner tubes. Side length deviation, wall thickness deviation, corner angle, end cut squareness, bow and twist repeat the values of Table 3; the outer corner radius lies between 1.5 and 2.5 times the wall thickness without a further difference limit; flatness is not more than 0.5 mm on the welded face and not more than 0.5 % of the side length, with a minimum of 0.4 mm, on the other faces. Side length, diagonal, wall thickness, corner angle and corner radius are

measured with vernier callipers, micrometers, an angle gauge and radius gauges, while Figure 3 shows how bow, twist and flatness are measured.

6.2.2 and 6.2.3 Tubes are normally delivered in lengths from 2 000 mm to 12 000 mm, other lengths being possible by agreement stated in the contract. Where tubes are delivered in exact or multiple lengths the contract says so, and Table 5 gives the length deviation in millimetres: plus 250 for the ordinary exact length and plus 50 for the precise exact length.

6.3 Tubes are normally delivered by actual weight.

7 Technical requirements

7.1 The grade, chemical composition and mechanical properties of the raw material follow GB/T 700, GB/T 1591, GB/T 4171 and the other relevant standards; other grades may be supplied by agreement stated in the contract. The permissible deviations of the product analysis follow the relevant raw material standard.

7.2 For square tubes the sampling position is the middle of the face adjacent to the welded face, and for rectangular tubes the middle of the long side other than the welded side; the yield strength, tensile strength, percentage elongation after fracture and absorbed impact energy at that position meet GB/T 6725-2017. For sharp-corner tubes the sampling position is the middle of a non-welded face and the same properties apply. For tubes whose section is not larger than 60 mm x 60 mm, including rectangular tubes of the same perimeter, or whose ratio of side, or short side, to thickness is not more than 14, the percentage elongation after fracture of the flat portion may fall 3 % in absolute value below the value given in Table 1 of GB/T 6725-2017, the tensile specimen used being 12.5 mm wide. Figure 4 shows the sampling positions and states that specimens are taken along the length of the tube.

7.3 and 7.4 Tubes are delivered in the cold worked condition unless the supplier and purchaser agree otherwise. The surface must be free of cracks and free of dents, bulges or scratches deeper than the wall thickness tolerance; no crack visible to the naked eye is allowed at the corners; surface defects may be dressed by grinding provided the depth of dressing stays within the wall thickness tolerance; special surface requirements are agreed and stated in the contract.

7.5 The weld must be free of lack of fusion, overlap, burn-through and severe misalignment. The outer flash is removed and the surface left smooth; the inner flash is normally not removed and must be continuous, full and free of fine cracks. On the F135 x 135 product the height of the inner weld does not exceed 50 % of the wall thickness and the weld centre offset is not more than 5 mm. Welds may be repaired, not more than twice at the same place, and the thickness after repair must not fall below the minimum permissible thickness; a repaired weld is then subjected to 100 % penetrant testing and has to meet acceptance level 2 of JB/T 9218-2015. When the purchaser asks for it the weld may undergo the

flattening test of Annex A, and it passes if the weld does not crack when the welded face has been compressed by 10 % of the width of that face.

8 Test methods

8.1 Table 6 lists, for each of six inspection items, the number of samples, the sampling position and the test method: chemical composition, one per heat, from the raw material or the product according to GB/T 20066 and determined by GB/T 4336 or the relevant raw material standard; tensile test, one sample, position as in 7.2 and GB/T 2975, method GB/T 228.1; impact test, one sample, same sampling, method GB/T 229; weld flattening test, one sample, taken from a longitudinal length of square tube, method as in Annex A; dimensions, every tube, checked with measuring instruments and templates; surface, every tube, checked visually. Footnotes state that the flat portion excludes the weld and the corners, and that the flattening test applies only to square and rectangular tubes whose welded face is 118 mm or wider.

8.2 The type test of welding quality for square and rectangular tubes with a welded face of 118 mm or more has to reach acceptance level 2 of JB/T 9218-2015. Such a type test is carried out when a new product is being developed and approved, when after regular production the raw material or the process changes appreciably in a way that may affect quality, when production resumes after a stop of more than six months, when the customer asks for it and when the national quality supervision authorities ask for it.

8.3 The rounding of numerical values of test results follows YB/T 081.

9 Inspection rules

9.1 Inspection is carried out by the quality department of the supplier and the customer has the right to re-inspect against the document.

9.2 Each lot is made up of tubes of the same grade and the same size. Where the largest side length of the product is less than 118 mm the lot weight does not exceed 60 t; where the smallest side length is 118 mm or more it does not exceed 100 t.

9.3 Re-inspection and judgement follow GB/T 2101.

10 Packaging, marking and quality certificate

10.1 Tubes are normally bundled, each bundle holding tubes of a single lot number and stacked square at one end. Bundles are tied firmly with packing steel strip or low carbon steel wire, and Table 7 fixes the number of ties by tube length: three ties up to 7 m, four ties above 7 m and up to 10 m, five ties above 10 m. The ties at the ends sit not more than 1 m from the end and the spacing between ties is even.

10.2 Each bundle carries a tag giving the name of the supplier, the grade, the lot number,