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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 43893-2024

Hot-rolled steel sections for fabricated steel structure

装配式钢结构建筑用热轧型钢

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3 Terms and definitions

3.1 The document states that it has no terms and definitions to define.

4 Grade designation

4.1 The grade of a steel of improved weathering performance is made up of four parts: the letter Q, the first letter of the Chinese word for yield; the specified minimum upper yield strength value; the letter W, the first letter of the English word weathering, standing for

improved weathering performance; and the quality class letter, B, C, D or E. The worked example given is Q355WD, in which Q stands for yield, 355 is the specified minimum yield strength value in megapascals, W stands for weathering and D is quality class D. A note adds that Q plus the specified minimum upper yield strength value plus W is called, for short, the steel level.

5 Content of the order

5.1 A contract placed under the document is to contain at least the product name, the number of the document, the grade and quality class, the type and size, the delivery length, the mass and quantity, and any other special requirement raised by the purchaser, such as a special size or a special surface quality requirement.

6 Dimensions, shape, mass and permissible deviations

6.1 The cross-section of the H section and of the T section is shown in Figure 1 and Figure 2, with the symbols explained: H or h for the height, B for the width, t1 for the web thickness, t2 for the flange thickness, r for the fillet radius and, for the T section, Cx for the centroid. Section dimensions, sectional area, theoretical mass and section properties are to meet Table 1 for H sections and Table 2 for T sections; other sizes may be supplied by agreement between supplier and purchaser. The delivery length is to be stated in the contract, the usual fixed lengths being 6 000 mm, 8 000 mm and 12 000 mm, with other fixed lengths available on request.

6.1 (continued) Table 1 lists, for every H section size, the designation, the size expression in the form H by B by t1 by t2, the five cross-sectional dimensions, the sectional area in square centimetres, the theoretical mass in kilograms per metre, the outside surface area both per metre of length and per tonne of mass, the second moments of area about both axes, the radii of gyration about both axes, the elastic section moduli about both axes and the plastic section moduli about both axes. Table 2 does the same for T sections, with the height denoted h, without the plastic section moduli and with the centroid distance Cx added. The extraction of these two tables is frayed: in several rows two adjacent figures have run together into a single number, so the rows and columns cannot be matched with confidence throughout and the individual values are not reproduced here.

6.2 Dimensions, shape and permissible deviations are to meet Table 3 for H sections and Table 4 for T sections; other requirements may be supplied by agreement noted in the contract. For H sections the permissible deviation on the height is plus or minus 1.5 mm below 400 mm and plus or minus 2.5 mm at 400 mm and above; on the width, plus or minus 2.0 mm below 100 mm, plus or minus 2.5 mm from 100 mm up to but not including 200 mm, and plus or minus 3.0 mm at 200 mm and above; on the web thickness, plus or minus 0.5 mm below 5 mm, plus or minus 0.7 mm from 5 mm up to but not including 16 mm, plus or minus 1.0 mm from 16 mm up to but not including 25 mm, plus or minus 1.5

mm from 25 mm up to but not including 40 mm, and plus or minus 2.0 mm at 40 mm and above; and on the flange thickness, plus or minus 0.7 mm, plus or minus 1.0 mm, plus or minus 1.5 mm, plus or minus 1.7 mm and plus or minus 2.0 mm over the same five thickness bands. On length, the deviation is plus 500 mm up to 7 m, and above 7 m a further 5 mm is added to the positive deviation for each additional metre or part of a metre.

6.2 (continued) The same table fixes the flange slope, at not more than 1.5 mm or 1.0 % of the width for a height of 300 mm or less depending on whether the width is 150 mm or less or greater, and at not more than 1.5 mm or 1.2 % of the width for a height above 300 mm depending on whether the width is 125 mm or less or greater; the camber, at not more than 0.15 % of the length for a height of 300 mm or less and not more than 0.10 % for a height above 300 mm; the centring deviation S, at plus or minus 2.5 mm where the height is 300 mm or less and the width 200 mm or less and plus or minus 3.5 mm where the height is above 300 mm or the width above 200 mm, S being half the difference between the two flange overhangs; the web bow W, at not more than 2.0 mm for a height below 400 mm and not more than 2.5 mm at 400 mm and above; the flange bow F, for a width of 400 mm or less, at not more than 1.5 % of b with a maximum permissible value of 1.5 mm, the accompanying note that defines b in terms of B being damaged in the extraction and not reproduced; the end squareness E, at not more than 3.0 mm for a width of 200 mm or less and not more than 1.6 % of the width above that; and the blunting of the outer flange toe, which is not to let a round bar of diameter equal to 0.18 t2 pass. Two notes state that the measuring positions for dimensions and shape are those shown in the figure and that camber is measured along the flange tip. For T sections, Table 4 fixes the permissible deviation on the height as plus 4.0 mm and minus 6.0 mm below 200 mm and plus 5.0 mm and minus 7.0 mm at 200 mm and above, and the flange bow F prime as not more than B divided by 200 and not more than 1.5 mm at the connection area, not more than 2.0 mm elsewhere for a width of 150 mm or less and not more than B divided by 150 for a width above 150 mm, with a note that the permissible deviations for other positions follow those for the corresponding H section size. Burrs on the cut face are not to exceed 8 mm and the section is not to show obvious twist.

6.3 Sections are delivered on theoretical mass, the density of the steel being taken as 7.85 grams per cubic centimetre; by agreement noted in the contract, delivery on actual mass is also possible. The permissible mass deviation is worked out as the difference between the actual and the theoretical mass of a single piece or of a batch divided by the theoretical mass, expressed as a percentage, and Table 5 sets it, for both H sections and split T sections, at plus or minus 4 % on a single piece and plus or minus 4 % on the delivered mass of a batch.

7 Technical requirements

7.1 The grade and the cast analysis chemical composition are to meet GB/T 700, GB/T

4171, GB/T 1591, GB/T 28414, GB/T 41324-2022, GB/T 34560.5, GB/T 34560.6, YB/T 4261, YB/T 4620, YB/T 4621 or YB/T 4831. By agreement noted in the contract, the grade and chemical composition of a steel of improved weathering performance may instead follow Table 6, which covers five steel levels, Q235W, Q355W, Q390W, Q420W and Q460W, each in quality classes B, C, D and E. Carbon is limited to 0.15 % for Q235W, 0.16 % for Q355W and 0.14 % for the other three levels. Silicon is 0.10 % to 0.40 % for Q235W, not more than 0.50 % for Q355W and not more than 0.65 % for the other three. Manganese is 0.20 % to 0.60 % for Q235W, 0.50 % to 1.50 % for Q355W, not more than 1.30 % for Q390W and Q420W and not more than 1.50 % for Q460W. Phosphorus and sulfur are each limited to 0.030 % for Q235W, Q355W and Q390W; for Q420W both are limited to 0.025 %, and for Q460W phosphorus to 0.025 % and sulfur to 0.030 %. Copper is 0.15 % to 0.50 % throughout; chromium is 0.20 % to 0.60 % for Q235W and Q355W and 0.30 % to 0.60 % for the other three; nickel is not more than 0.50 % for Q235W and Q355W and 0.12 % to 0.50 % for the other three. Four footnotes apply: one or more microalloying elements may be added to improve the properties, niobium 0.015 % to 0.060 %, vanadium 0.02 % to 0.12 %, titanium 0.005 % to 0.10 % and total aluminium not less than 0.015 %, and where they are used in combination at least one of them is to reach the lower limit given; the combined addition of niobium, vanadium and titanium is not to exceed 0.22 %; the lower nickel limit may be waived by agreement; and the maximum nitrogen content is not to exceed 120 parts per million by mass, although where enough nitrogen-fixing elements are added no nitrogen limit need apply. The permissible deviation of the product analysis is to meet GB/T 222.

7.2 The steel is made in an oxygen converter or an electric arc furnace, with secondary refining where needed.

7.3 H sections are delivered in the as-rolled, normalized or normalizing-rolled condition; T sections are made by splitting H sections.

7.4 Mechanical and technological properties of sections delivered to GB/T 700, GB/T 4171, GB/T 1591, GB/T 28414, GB/T 41324-2022, GB/T 34560.5, GB/T 34560.6, YB/T 4261, YB/T 4620, YB/T 4621, YB/T 4831 or to an agreed grade are to meet the corresponding standard or agreement; for the grades of Table 6 they are to meet Table 7. Table 7 sets, for Q235W, an upper yield strength of not less than 235 MPa at thicknesses up to 16 mm and not less than 225 MPa above 16 mm, a tensile strength of 360 MPa to 510 MPa, an elongation after fracture of not less than 25 %, a tensile to yield ratio of not less than 1.25, a 180 degree bend with a former diameter of twice the specimen thickness up to 16 mm and three times above 16 mm, and a Charpy V-notch absorbed energy of not less than 27 J. For Q355W the figures are not less than 355 MPa and 345 MPa, 470 MPa to 630 MPa, not less than 22 %, not less than 1.25, the same bend requirement and not less than 34 J; for Q390W, not less than 390 MPa and 380 MPa, 490 MPa to 650 MPa, not less than 20 %, not less than 1.20, the same bend requirement and not less than 34 J; for Q420W, not less than 420 MPa and 415 MPa, 520 MPa to 680 MPa, not less than 22 %, not less than 1.20