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**High Strength Structural Steel Plate in the Quenched and
Tempered Condition with improved Formability**

改善成形性高强度结构用调质钢板

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High Strength Structural Steel Plate in the Quenched and Tempered Condition with improved Formability

1 Scope

This Standard specifies the grade designation, ordering contents, size, shape, weight, technical requirements, test methods, inspection rules, package, mark and quality certificate of the high strength structural steel plate in the quenched and tempered condition with improved formability.

This Standard is applicable to the no-greater-than-50mm-thick high-strength structural steel plate with improved formability delivered in modulation (quenching and tempering) state (hereinafter refer to as steel plate).

2 Normative References

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this document.

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

GB/T 223.5 Steel and Iron - Determination of Acid-Soluble Silicon and Total Silicon Content - Reduced Molybdosilicate Spectrophotometric Method

GB/T 223.9 Iron Steel and Alloy – Determination of Aluminium Content - Chromazurol S Photometric Method

GB/T 223.11 Iron, Steel and Alloy - Determination of Chromium Content - Visual Titration or Potentiometric Titration Method

GB/T 223.14 Methods for Chemical Analysis of Iron, Steel and Alloy - The N-Benzoyl-N-Phenylhydroxylamine Extraction Photometric Method for the Determination of Vanadium Content

GB/T 223.17 Methods for Chemical Analysis of Iron, Steel and Alloy – The Diantipyrylmethane Photometric Method for the Determination of Titanium Content

GB/T 223.19 Methods for Chemical Analysis of Iron Steel and Alloy - The

Volumetric Method after Combustion in the Pipe Furnace

GB/T 223.76 Methods for Chemical Analysis of Iron, Steel and Alloy - The Flame Atomic Absorption Spectrometric Method for the Determination of Vanadium Content

GB/T 223.78 Methods for Chemical Analysis of Iron, Steel and Alloy - Curcumin Spectrophotometric Method for the Determination of Boron Content

GB/T 228.1 Metallic Materials - Tensile Testing - Part 1: Method of Test at Room Temperature

GB/T 229 Metallic Materials - Charpy Pendulum Impact Test Method

GB/T 232 Metallic Materials - Bend Test

GB/T 247 General Rule of Package Mark and Certification for Steel Plates (Sheets) and Strips

GB/T 709 Dimensions, Shape, Weight and Tolerances for Hot Rolled Steel Sheets and Strips

GB/T 2975 Steel and Steel Products - Location and Preparation of Samples and Test Pieces for Mechanical Testing

GB/T 4336 Carbon and Low-Alloy Steel - Determination of Multi-Element Contents -Spark Discharge Atomic Emission Spectrometric Method (Routine Method)

GB/T 8170 Rules of Rounding off for Numerical Values & Expression and Judgement of Limiting Values

GB/T 14977 General Requirement for Surface Condition of Hot-Rolled Steel Plates

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

GB/T 20066 Steel and Iron-Sampling and Preparation of Samples for the Determination of Chemical Composition

GB/T 20123 Steel and Iron - Determination of Total Carbon and Sulfur Content Infrared Absorption Method after Combustion in an Induction Furnace (Routine Method)

GB/T 20125 Low-Alloy Steel - Determination of Multi-Element Contents - Inductively Coupled Plasma Atomic Emission Spectrometric Method

GB/T 20126 Unalloyed Steel - Determination of Low Carbon Content - Part 2:

specified value.

6.4.3 When the thickness of the steel plate is less than 12mm, the Charpy (V-notch) impact test shall use a small-sized specimen. For the steel plate with thickness $>8\text{mm} \sim <12\text{mm}$, the specimen size shall be $7.5\text{mm} \times 10\text{mm} \times 55\text{mm}$; its test result shall be no less than 75% of the specified value in Table 2; for the steel plate with thickness $6\text{mm} \sim 8\text{mm}$, the specimen size shall be $5\text{mm} \times 10\text{mm} \times 55\text{mm}$; its test result shall be no less than 50% of the specified value in Table 2. The steel plate with thickness less than 6mm shall not perform the impact test.

6.4.4 When the thickness of the steel plate is greater than 30mm, the bend test shall use the thinning specimen; the size of an auxiliary specimen is to keep a rolling surface thinning to 30mm; the rolling surface is the outer curved surface during the test. After the bend test, the outer surface of the specimen shall be free of the visible cracks.

6.4.5 According to the demand of the purchaser, indicated in the contract, the supplier can perform the hardness test; the test type and specified hardness value shall be determined through the negotiation between the supplier and the purchaser.

6.5 Surface quality

6.5.1 The surface of the steel plate shall be free of the following defects, like cracks, air bubbles, scars, folding and inclusion, etc. If the above defects exist, they are allowed to be removed; the removing depth shall be calculated from the actual size of the steel plate; it shall be no greater than half of the thickness tolerance of the steel plate; and the minimum thickness of the steel plate shall be ensured. The removing position of the defects shall be smooth without edges and corners.

6.5.2 Other defects are allowed to exist; however, their depths shall be calculated from the actual size of the steel plate; and no greater than half of thickness tolerance; the defect thickness shall be ensured no greater than the allowable minimum thickness of the steel plate.

6.5.3 The steel plate shall be free of the visible delamination.

6.5.4 Through the negotiation between the supplier and the purchaser, indicated in the contract, the steel plate is allowed to weld repair. If the weld repair is performed after the modulation, then the modulation treatment shall be carried out again after the weld repair.

6.5.5 Through the negotiation between the supplier and the purchaser, indicated in the contract, the surface quality can be implemented as specified in GB/T 14977.

6.6 Special requirements

6.6.1 Through the negotiation between the supplier and the purchaser, indicated in the

the same heat treatment system; the weight of per batch of steel plate is no greater than 60t.

8.3 The sampling quantities and test methods of steel plates shall conform to the provisions of Table 3.

8.4 The reinspection and judgement rules of steel plate shall conform to the provisions of GB/T 17505.

8.5 The test results of chemical composition and mechanical property shall be rounded off as per the rounding off comparison method; the rounding off rules shall conform to the provisions of GB/T 8170.

9 Package, Mark and Quality Certificate

The package, mark and quality certificate of the steel plate shall conform to the provisions of GB/T 247.

10 Approximation between Domestic and Foreign Grades

The comparison list of the grades between this Standard and the relevant standards can refer to Appendix A.

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