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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 1591-2018

High strength low alloy structural steels

低合金高强度结构钢

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Foreword

This Standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This Standard replaces GB/T 1591-2008 “High strength low alloy structural steel”. As compared with GB/T 1591-2008, the main technical changes except editorial changes are as follows:

- DEFINE that the chemical composition of this Standard is also applicable to steel billets (see clause 1; clause 1 of the 2008 version);
- “normalizing rolling”, ADD the terms and definitions of “as-rolled” and “normalized” (see clause 3; clause 3 of the 2008 version);
- MODIFY the method of designation representation (see clause 4; clause 4
- ADD the order content (see clause 5);
- DEFINE the size, shape, weight and tolerance requirements (see clause 6; clause 5 of the 2008 version);
- USE the Q355 steel-grade to replace the Q345 steel-grade and related requirements (see clause 7, 9.2; clause 6, 8.1 of 2008 version);
- different delivery status, MODIFY the content of refined grain elements (see clause 7.1; clause 6.1 of 2008 version);
- each designation, and MODIFY the lower yield strength to the upper yield strength, INCREASE the index by 10 MPa ~ 15 MPa accordingly (see clause 7.4.1, 7.4.2; clause 6.4.1, 6.4.2 of 2008 version);
- DETAIL the steel surface quality requirements (see clause 7.5; clause 6.5 location of the impact test (see clause 8, clause 9; clause 7, clause 8 of the 2008 version);
- ADD a designation comparison table between this Standard and foreign standards (see Appendix A).

This Standard was proposed by the China Iron and Steel Association.

This Standard shall be under the jurisdiction of the National Steel Standardization Technical Committee (SAC/TC 183).

Drafting organizations of this Standard: Angang Co., Ltd., Metallurgical Industry Information Standards Institute, Shougang Corporation, Hegang Co., Ltd. Tangshan Branch, Xiwang Special Steel Co., Ltd., Shandong Iron and Steel Co., Ltd. Laiwu Branch, Yingkou CRRC Structural Steel New Materials Co., Ltd., CITIC Metal Co., Ltd.

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1 Scope

This Standard specifies the designation representation method, ordering content, size, shape, weight, technical requirements, test methods, inspection rules, packaging, marking, and quality certificate of high strength low alloy structural steel.

This Standard is applicable to high strength low alloy structural steel plates, steel strips, steel sections, steel bars, etc. for general structural and engineering purposes. Its chemical composition is also applicable to steel billets.

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 Standard.

3 Terms and definitions

The following terms and definitions apply to this document.

The status of steel which is not subject to any special rolling and/or heat treatment.

Translator's note: As "hot-rolled" and "as-rolled" are identical in Chinese, therefore, this Translation might not be able to identify the nuances between "hot-rolled" and "as-rolled".

The heat treatment process of steel by heating it to a suitable temperature above the temperature of the phase transition point, then cooling it in air to a temperature below a certain phase transition point.

The rolling process – the final deformation is performed in the rolling process within a certain temperature range, LET the steel to reach an as-rolled status, so as to facilitate that, even-though after normalizing, it still can reach the specified mechanical property values.

Note: For normalizing rolling, it is also referred to as "controlled rolling" in some publications.

The rolling process of which the final deformation of the steel is performed in a certain temperature range, thereby ensuring that the steel obtains such properties that cannot be obtained by only-heat treatment.

Note 1: Thermoforming that may reduce the steel strength value or steel post-weld heat treatment at temperatures above 580 °C may not be suitable. In accordance with the relevant technical specifications, flame straightening is allowed.

Note 2: Thermomechanical processing may include a process of increasing the cooling rate

in a tempered or non-tempered state, the tempering includes self-tempering but not includes direct quenching and quenching & tempering.

Note 3: Also known as TMCP (thermomechanical controlled process), also referred to as “controlled rolling” in some publications.

4 Designation representation

4.1 The steel designation consists of four parts: the initial Pinyin Q of the yield strength “Qu”, the specified minimum upper yield strength value, the delivery status code, and the quality-grade symbol (B, C, D, E, F).

Note 1: When the delivery status is as-rolled, the delivery status code AR or WAR can be omitted; when the delivery status is normalized or normalizing rolling, the delivery status code is indicated by N.

Note 2: Q + The specified minimum upper yield strength value + delivery status code, abbreviated as “steel-grade”.

Q - The initials of the Chinese Pinyin “Qu” of the yield strength of steel;

355 - The minimum value of the specified upper yield strength, in megapascal (MPa);

N - The delivery status is normalizing or normalizing rolling;

D - The quality-grade is D.

4.2 When the purchaser requires the steel plate to have thickness-direction performance, a symbol representing the thickness direction (Z-direction) performance level, such as Q355NDZ25, is added after the above-mentioned specified designation.

5 Ordering content

5.1 Contracts or orders placed under this Standard shall include the following:

- c) Steel designation (steel-grade + quality-grade);
- d) Size, shape and tolerance (see clause 6);
- f) Selection contents of all requirements (see clause 5.2).

5.2 After consultation between the supplier and the buyer, and indicated in the contract, the following contents can be selected as the ordering content of this Standard. If the purchaser does not specify when providing the inquiry and ordering, the product is supplied as specified in 5.1.

a) Carbon equivalent or weld crack sensitivity index (Pcm) (see 7.1.3, Table b) Added alloying elements and their contents (see 7.1.6, Table 1, Table 3, Table 5);

f) Impact-test's temperature and impact-test's sampling direction (see Table g) Bending test (see 7.4.3);