GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 77.140.50

H 46

GB/T 33972-2017

Hot rolled steel sheet and strip for bogie frame of high-speed train

Issued on: July 12, 2017 **Implemented on: April 1, 2018**

Issued by: General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China;
Standardization Administration of the People's Republic of China.

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Foreword

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

This Standard was proposed by China Iron and Steel Association.

This Standard shall be under the jurisdiction of National Technical Committee 183 on Steels of Standardization Administration of China (SAC/TC 183).

The drafting organizations of this Standard: Wuhan Iron and Steel (Group) Co., Ltd., CRRC Qingdao Sifang Co., Ltd., China Metallurgical Information and Standardization Institute, Shougang Group, Anshan Iron and Steel Group Coporation.

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Hot rolled steel sheet and strip for bogie frame of high-speed train

1 Scope

This Standard specifies the designation, ordering content, dimensions, shape, weight, technical requirements, test methods, inspection rules, packaging, marking and quality certification of hot rolled steel sheet and strip for bogie frame of high-speed train.

This Standard applies to hot rolled steel sheet and strip for bogie frame of high-speed train, with a thickness of 3.0 mm ~ 25.0 mm, as well as hot rolled steel sheet and strip for the rail transit such as inter-city trains and subways (hereinafter referred to as steel sheet and strip).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition dated applies to this document. For undated references, the latest edition of the referenced documents (including all amendments) applies 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 223.11, *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-benzoy-n-phenylhydroxylamine extraction photometric method for the determination of vanadium content*

GB/T 223.23, *Iron, steel and alloy – Determination of nickel content – The dimethylglyoxime spectrophotometric method*

GB/T 223.26, *Iron, steel and alloy – Determination of molybdenum content – The thiocyanate spectrophotometric method*

GB/T 223.40, Iron, steel and alloy - Determination of niobium content by the

GB/T 13298, *Inspection methods of microstructure for metals*

GB/T 13299, *Steel – Determination of microstructure*

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 20124, *Steel and iron – Determination of nitrogen content – Thermal conductimetric method after fusion in a current of inert gas*

GB/T 20125, *Low-alloy steel – Determination of multi-element contents – Inductively coupled plasma atomic emission spectrometric method*

3 Designation

Designation of steels consists of four parts, including the Chinese pinyin initials “Q”, “G” and “Z” of “Qu” representing yield strength of steels, “Gao” of high-speed trains and “Zhuan” of bogie frame, and the specified minimum yield strength value [Translator note: “Qu” means yield; “Gao” means high-speed; “Zhuan” means bogie].

EXAMPLE: Q355GZ

Q – the Chinese pinyin initial of “Qu” of steels’ yield strength;

G – the Chinese pinyin initial of “Gao” of high-speed trains;

Z – the Chinese pinyin initial of “Zhuan” of bogie frame;

355 – the specified yield strength value, in MPa.

4 Ordering content

Contracts or orders based on this Standard shall include the following content:

a) a reference to this Standard;

b) product type (steel sheet and strip);

c) designation;

d) delivery condition;

6.9.1 The surface of steel sheet and strip shall be free from cracks, scars, folds, bubbles, inclusions, layers and other defects detrimental to use.

6.9.2 The surface of steel sheet and strip allows local pits, indentations, scratches and other slight deficiencies which are not greater than half of the thickness tolerance of thickness, but the minimum thickness of steel sheet shall be ensured.

6.9.3 As agreed on by the purchaser and the supplier, the surface quality of steel sheet and strip can be as specified in GB/T 14977.

6.10 Other requirements

As agreed on by the purchaser and the supplier, steel sheet and strip may also be tested for other items including steel atmospheric corrosion resistance evaluation. For the evaluation of atmospheric corrosion resistance see Annex A.

7 Test methods

7.1 The chemical composition of steels shall be carried out as specified in GB/T 222, GB/T 223.5, GB/T 223.11, GB/T 223.14, GB/T 223.23, GB/T 223.26, GB/T 223.40, GB/T 223.53, GB/T 223.62, GB/T 223.63, GB/T 223.84, GB/T 223.85, GB/T 4336, GB/T 20124 and GB/T 20125 or general methods. However, during arbitration, it shall be carried out as specified in GB/T 222, GB/T 223.5, GB/T 223.11, GB/T 223.14, GB/T 223.23, GB/T 223.26, GB/T 223.40, GB/T 223.53, GB/T 223.62, GB/T 223.63, GB/T 223.84 and GB/T 223.85.

7.2 The test items and test methods of steel sheet and strip shall be as specified in Table 6.

Table 6 – Test items, sample numbers, sampling methods and test methods

S/N	Test item	Sample quantity	Sampling method	Test method
1	Chemical composition	1 /furnace	GB/T 20066	See 7.1
2	Tensile test	1 /batch	GB/T 2975	GB/T 228.1
3	Bend test	1 /batch	GB/T 2975	GB/T 232
4	Impact test	3 /batch	GB/T 2975	GB/T 229
5	Grain size	1 /batch	GB/T 6394	GB/T 6394
6	Nonmetallic inclusion	1 /batch	GB/T 10561-2005	Method A of GB/T 10561-2005
7	Banded structure	1 /batch	GB/T 13298	GB/T 13299
8	Nondestructive testing	piece by piece / coil by coil	-	GB/T 2970
9	Dimensions and shape	piece by piece /	-	An appropriate

Annex A

(Informative)

Guide for evaluation of steel atmospheric corrosion resistance

A.1 General rules

When steel sheet and strip have a good atmospheric corrosion resistance property, the requirement is that the corrosion resistance index calculated according to this Annex shall be 6.0 or more.

A.2 Range

This Annex provides one method for the evaluation of atmospheric corrosion resistance of low-alloy steels through the chemical composition.

This Method is to calculate the corrosion resistance index of steels based on the predictive equation of the chemical composition of steels.

There are multiple corrosion resistance indexes in use all over the world, so it is necessary to consider different service environments and chemical compositions of steels when selecting one index. Based on the differences of service environments and chemical composition of steels, any index may be inapplicable; and therefore, it is necessary for the purchaser and the supplier together to decide which index to use and the size of the index in the predicted service environment.

A.3 Terminology

Low-alloy steels refers to carbon steels which contain a total content of alloying elements greater than 1% but less than 5%.

NOTE: Most “low-alloy weathering resistant steels” contain additions of elements Cr and Cu, which may also contain additions of Si, Ni, P or other alloying elements which may increase the atmospheric corrosion resistance property.

A.4 Method

A.4.1 Legault and Leckie published the equation predicting the corrosion loss of low-alloy steels after 15.5 years of exposure to different atmospheric environments based on the chemical composition of steels. This equation was based on the extensive data published by Larrabee and Coburn.

A.4.2 For use, Legault-Leckie equation in an industrial environment (Kearny, N.J.) was modified to allow calculation of the atmospheric corrosion resistance index based on

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