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

GB 31893-2015

**Limit and determination of the water-soluble Chromium (VI)
content for cement**

水泥中水溶性铬（VI）的限量及测定方法

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1 Scope

GB 31893-2015 is the Chinese national standard on limit and determination of the water-soluble chromium (vi) content for cement, in the field of construction materials and building. It carries no /T suffix, which in the Chinese system means compliance is mandatory: a product or a practice within its scope has to meet it to be lawfully made, sold or carried out in China. It was issued on 11 September 2015 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 October 2016. Classification: ICS 91.100.10, CCS Q11. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This Standard specifies the limits and determination methods for water-soluble chromium (VI) in common Portland cement. This Standard applies to common portland cement and other cements specified to use this Standard.

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) is applicable to this Document.

GB/T 6682 Water for analytical laboratory use - Specification and test methods

GB/T 12573 Sampling method for cement

GB/T 17671 Test method of cement mortar strength (ISO method) JC/T 681 Mixer for

mixing mortars JJG 196 Verification Regulation of Working Glass Container

3 Indicator Requirements

The water-soluble chromium (VI) content in cement shall not exceed

4 Test

4.1 Preparation of cement specimen Samples shall be taken according to GB/T 12573. Samples sent to the laboratory shall be representative and homogeneous. Reduce the sample to approximately 1000 g of sample to be tested using a divider or quartering method; place it in a sealed, clean, and dry container; and mix thoroughly. All operations shall be performed as quickly as possible to minimize the sample's contact time with air.

4.2 Test methods It shall be performed according to Appendix A.

5.1 Inspection forms

5.1.1 The indicators listed in this Standard are type test items.

5.1.2 Under normal production conditions, cement production enterprises shall conduct water-soluble chromium (VI) content test at least once every six months.

5.1.3 Inspection shall be conducted under any of the following circumstances.

- When a new product is being trial-produced and finalized;
- When the product is being manufactured in a different location;
- When there are changes in the production process, refractory materials, or raw materials;
- When production resumes after a shutdown of more than six months.

5.2 Judgment of Inspection Results Products whose inspection results meet the requirements of Clause 3 are judged to be qualified. Products whose inspection results do not meet the requirements of Clause 3 are judged to be unqualified.

Appendix A

(Normative) Determination of Water-Soluble Chromium (VI) in Cement - Diphenylcarbazide Spectrophotometric Method A.1 Principle The cement specimen, standard sand, and water are mixed to form cement mortar, which is then filtered. Diphenylcarbazide is added to the filtrate to adjust the acidity and color development. The absorbance of the solution is measured at 540 nm; and the concentration c of chromium (VI) in the solution is found on the working curve. A.2 Basic requirements for the test A.2.1 Number of tests and requirements The test is to be performed twice; and the result is expressed as the average

of the two test results. For routine production control analysis, the test may be performed only once. A blank test shall be performed simultaneously, and the measured results shall be corrected. A.2.2 Repeatability and reproducibility Repeatability. Precision under repeatability conditions refers to the test results obtained by the same operator in the same laboratory using the same equipment and the same method within a short time interval.

Reproducibility. Precision under reproducibility conditions refers to the test results obtained by different operators in different laboratories using different equipment and the same method on the same specimen. A.2.3 Repeatability limit and reproducibility limit

Repeatability Limit. A value where, under repeatability conditions, the absolute difference between two test results is less than or equal to this value with a probability of 95%.

Reproducibility Limit. A value where, under reproducibility conditions, the absolute difference between two test results is less than or equal to this value with a probability of 95%.

A.2.4 Repeatability limit and reproducibility limit of determination results The repeatability limits and reproducibility limits listed in this Standard are absolute deviations, expressed in mg/kg. Under repeatability conditions, when determining the same specimen using the methods listed in this Standard, the difference between two determinations shall be within the listed repeatability limits (Table A.2). If the repeatability limits are exceeded, a third determination shall be performed within a short period. If the difference between the determination result and the previous two or any other determination result meets the repeatability limits, the average value shall be taken. Otherwise, the cause shall be investigated, and the analysis shall be repeated according to the above provisions. Under reproducibility conditions, when separately determining the same specimen using the methods listed in this Standard, the difference between the average values of the obtained determination results shall be within the listed reproducibility limits (Table A.2). A.2.5

Expression of mass, volume, and results Mass is expressed in g, accurate to

0.1 g for the dissolution stage and accurate to 0.0001 g for the analytical stage. Pipette volume is expressed in mL, with accuracy conforming to JJG 196. Test results are expressed in mg/kg and rounded-off to two digits after the decimal point. A.2.6 Blank Test Using the same amounts of reagents and standard sands, without adding the specimen, perform the test according to the same procedure, and correct the test results. A.3

Reagents and materials A.3.1 Instructions Unless otherwise specified, all reagents used shall be analytically pure or higher. The used water shall meet the requirements for Grade III as specified in GB/T 6682. The density of concentrated liquid reagents used in this Standard is the density (ρ) at 20 °C, expressed in g/cm³. A.3.2 Hydrochloric acid (HCl) $\rho =$

1.19 g/cm³, mass fraction 36% ~ 38%. A.3.3 Acetone (C₃H₆O) $\rho = 0.79$. A.3.4

1.0 mol/L hydrochloric acid Pipette