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Common portland cement

通用硅酸盐水泥

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Table of Contents

Foreword	3
1 Scope	5
2 Normative references	5
3 Terms and definitions	6
4 Classification	6
5 Components and materials	6
6 Strength grade	9
7 Technical requirements.....	9
8 Test methods	11
9 Inspection rules	12
10 Packaging, marking, transportation and storage.....	15

Common portland cement

1 Scope

This document specifies the classification, components and materials, strength grades, technical requirements, test methods, inspection rules and packaging, marking, transportation and storage of common portland cement.

This document applies to common portland cement.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 176, Methods for chemical analysis of cement

GB/T 203, Granulated blastfurnace slag used for cement production

GB/T 750, Autoclave method for soundness of portland cement

GB/T 1345, The test sieving method for fineness of cement

GB/T 1346, Test methods for water requirement of normal consistency, setting time and soundness of the portland cement

GB/T 1596, Fly ash used for cement and concrete

GB/T 2419, Test method for fluidity of cement mortar

GB/T 2847, Pozzolanic materials used for cement production

GB/T 5483, Natural gypsum

GB 6566, Limits of radionuclides in building materials

GB/T 8074, Testing method for specific surface of cement - Blaine method

GB/T 9774, Sacks for packing cement

GB/T 12573, Sampling method for cement

GB/T 12960, Quantitative determination of constituents of cement

5.2 Materials

5.2.1 Portland cement clinker

The hydraulic cementitious material with calcium silicate as the main mineral component, which is obtained by grinding raw materials mainly containing CaO, SiO₂, Al₂O₃, and Fe₂O₃ into fine powder in appropriate proportions, and burning them until they are partially melted. The content (mass fraction) of calcium silicate mineral shall not be less than 66%, and the mass ratio of CaO and SiO₂ shall not be less than 2.0.

5.2.2 Gypsum

5.2.2.1 Natural gypsum

It shall be class G gypsum or class M mixed gypsum as specified in GB/T 5483, of grade (mass fraction) $\geq 55\%$.

5.2.2.2 Industrial by-product gypsum

Industrial by-product gypsum shall comply with the technical requirements specified in GB/T 21371.

5.2.3 Granulated blastfurnace slag/slag powder

Granulated blastfurnace slag/slag powder shall comply with the technical requirements specified in GB/T 203.

5.2.4 Fly ash

Fly ash shall comply with the technical requirements (except for strength activity index and alkali content) specified in GB/T 1596. The ammonium ion content in fly ash shall not exceed 210 mg/kg.

5.2.5 Pozzolan materials

Pozzolan materials shall comply with the technical requirements (except for the 28-day compression strength ratio of cement mortar) specified in GB/T 2847.

5.2.6 Limestone and sandstone

The methylene blue value of limestone and sandstone shall not be greater than 1.4 g/kg. The methylene blue value shall be tested according to the provisions of Appendix A in GB/T 35164-2017.

5.2.7 Cement grinding aids

Grinding aids are allowed to be added during cement grinding, where the amount added shall not exceed 0.5% of the cement mass. The grinding aids shall comply with the technical requirements specified in GB/T 26748.

The fineness of portland cement is expressed in terms of specific surface area, which shall be no less than 300 m²/kg and no more than 400 m²/kg. The fineness of ordinary portland cement, blastfurnace-slag portland cement, fly ash portland cement, pozzolana portland cement and composite portland cement is expressed by the sieve residue of 45 µm square hole sieve, which shall not be less than 5%.

Special requirements, if put forward by the buyer, shall be determined through negotiation between the buyer and the seller.

7.5 Limits of radionuclides

The internal exposure index I_{Ra} shall not be greater than 1.0, and the external exposure index I_r shall not be greater than 1.0.

8 Test methods

8.1 Components

Test according to GB/T 12960. During the determination, the measured data shall be rounded off.

8.2 Insoluble, loss on ignition, magnesium oxide, sulfur trioxide, chloride ion and alkali content

Perform according to GB/T 176.

8.3 Water-soluble chromium (VI) in cement

Follow the provisions in GB 31893.

8.4 Setting time

Follow the provisions in GB 1346.

8.5 Soundness

8.5.1 Perform the boiling method in accordance with GB/T 1346.

8.5.2 Perform the autoclave method in accordance with GB/T 750.

8.6 Strength

Perform the strength test method according to GB/T 17671. When testing the mortar strength of pozzolana portland cement, fly ash portland cement, composite portland cement and ordinary portland cement mixed with pozzolanic materials, the water consumption is determined such that the fluidity of mortar is not less than 180 mm on the basis of 0.50 water-cement ratio. When the water-cement ratio is 0.50 and the

fluidity of mortar is less than 180 mm, the water-cement ratio shall be adjusted in increments of 0.01 until the fluidity of mortar is not less than 180 mm.

The fluidity test of mortar is carried out according to GB/T 2419, and the mortar is prepared according to GB/T 17671.

8.7 Specific surface area

Follow the provisions in GB/T 8074.

8.8 45 μm sieve residue

Follow the provisions in GB/T 1345.

8.9 Radioactivity

Follow the provisions in GB 6566.

9 Inspection rules

9.1 Numbering and sampling

When (or before) cement leaves the factory, it shall be numbered and sampled according to the same type and strength grade. Bagged cement and bulk cement shall be numbered and sampled separately. Each number is a sampling unit. The cement factory number is stipulated as follows according to the annual designed production capacity:

Where the annual production capacity is $\geq 200 \times 10^4$ t, no more than 4 000 t shall be numbered as one;

Where the annual production capacity is $\geq 120 \times 10^4$ t, no more than 2 400 t shall be numbered as one;

Where the annual production capacity is $\geq 60 \times 10^4$ t, no more than 1 000 t shall be numbered as one;

Where the annual production capacity is $\geq 30 \times 10^4$ t, no more than 600 t shall be numbered as one;

Where the annual production capacity is $< 30 \times 10^4$ t, no more than 400 t shall be numbered as one.

The sampling method shall be carried out in accordance with GB/T 12573. Take samples continuously, or take equal amounts of samples from more than 20 different parts, with the total amount not less than 12 kg. When the capacity of the bulk cement transport vehicle exceeds the tonnage specified by the factory number, the quantity of this number is allowed to exceed the specified tonnage for sampling.

radionuclides, autoclave method for soundness, etc., as well as inspection results or validation results of all ex-factory inspection items.

9.5 Inspection report

The content of the inspection report shall include the ex-factory inspection items such as the document number, cement type, code, factory number, mixed material type and dosage, as well as density (only for portland cement), water requirement of normal consistency, type and dosage of gypsum and grinding aids, and other technical requirements stipulated in the contract, etc. When requested by the buyer, the producer shall report all inspection results except the 28-day strength within 10 days from the date of shipment of the cement, and shall supplement the inspection result of the 28-day strength within 35 days.

9.6 Delivery and acceptance

9.6.1 The quality acceptance of cement at the time of delivery can be based on the inspection results of physical samples or the inspection report of the cement of the same number from the producer. The acceptance method shall be agreed upon by the buyer and the seller and shall be specified in the contract or agreement. If there is no written contract or agreement, or the acceptance method is not indicated in the contract or agreement, the seller shall inform the buyer in writing before shipment and, after approval by the buyer, indicate on the delivery form “the inspection report of the cement of the same number from the producer shall be used as the basis for acceptance”.

9.6.2 When the inspection result of the physical sample is taken as the acceptance basis, the buyer and the seller shall jointly sample and sign the seal before delivery or at the place of delivery. The sampling method shall be carried out in accordance with GB/T 12573, and the sampling quantity shall be no less than 24 kg, divided into two equal parts. One part shall be kept by the seller for 40 days, and the other part shall be inspected by the buyer according to the items and methods specified in this document.

Within 40 days, if the buyer determines after inspection that the product quality does not meet the requirements of this document and the producer has objections, the two parties shall send another sealed sample kept by the seller to a third-party cement quality inspection agency recognized by both parties for inspection. The soundness inspection of cement shall be completed within 10 days from the date of sampling.

9.6.3 When the inspection report of the cement of the same number from the producer is used as the basis for acceptance, the buyer shall take samples from the cement of the same number before shipment or at the time of delivery, and the buyer shall keep it for 90 days after it is signed by both parties. The sampling method shall be carried out in accordance with GB/T 12573, and the sampling quantity shall not be less than 12 kg. Alternatively, it can authorize the seller to take, seal and keep for 90 days the sealed sample of cement of the same number.

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