SLOVENSKI STANDARD
SIST EN 15743:2010

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Supersulfatni cement - Sestava, zahteve in merila skladnosti za običajne cemente

Supersulfated cement - Composition, specifications and conformity criteria

Sulfathüttenzement - Zusammensetzung, Anforderungen und Konformitätskriterien

Ciment sursulfaté - Composition, spécifications et critères de conformité

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Ciment sulfaté - Composition, spécifications et critères de conformité

Sulfathüttenzement - Zusammensetzung, Anforderungen und Konformitätskriterien

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Foreword

This document (EN 15743:2010) has been prepared by Technical Committee CEN/TC 51 “Cement and building limes”, the secretariat of which is held by NBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2010, and conflicting national standards shall be withdrawn at the latest by July 2010.

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For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

Annex A is informative.

This European Standard sets out requirements for the composition and specifications of supersulfated cement. The scheme for the evaluation of conformity of supersulfated cement is that specified in EN 197-2.

The requirements in this European Standard are based on the results of tests on cement in accordance with parts 1, 2, 3, 7, 8 and 9 of EN 196, *Methods of testing cement.*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

The basis for this European Standard has been the national standards already existing in Europe. Supersulfated cement was originally standardised in several European countries, Belgium, France, Germany, Netherlands and the United Kingdom, and has been used in concrete for foundations and massive structures. The demand for quick setting cements enabling early formwork removal caused the manufacturing of supersulfated cements to be superseded by those based on Portland cement clinker. Standards were either abandoned, as in France, or kept in the catalogue of standards but never used, as in the United Kingdom.

In discharging the mandate given to CEN, Technical Committee TC 51 considered the large number of different cements involved. It was decided to separate the "common cements", where the hardening mainly depends on the hydration of calcium silicates and setting these out in EN 197-1, from "special cements", i.e. those with additional or special properties.

Supersulfated cement hardening depends on granulated blastfurnace slag activation by calcium sulfate. A lower heat of hydration than for Portland cement clinker results in lower early compressive strength than common cements and a significantly lower early heat of hydration. In addition, it produces concrete which has resistance to chemically aggressive environments, such as sulfates.

Ongoing developments in material technology as well as in production technology again open the option to produce supersulfated cement fulfilling the demands and requirements of the market. As the principles in hydration differ from that of "common cements" covered by EN 197-1, CEN Technical Committee TC 51 decided to elaborate a separate standard for supersulfated cement.

The rate of hardening and lower early strength require that additional precautions are considered when using supersulfated cements to ensure adequate concrete curing.

1 Scope

This European Standard defines and gives the specifications of supersulfated cement and its constituents. The definition of supersulfated cement includes the proportions in which the constituents are to be combined to produce products in accordance with this standard. The definition also includes requirements the constituents have to meet and the mechanical, physical, chemical including heat of hydration requirements. This standard also states the conformity criteria and the related rules.

NOTE 1 In addition to the specified requirements, an exchange of additional information between the cement manufacturer and user may be helpful. The procedures for such an exchange are not within the scope of this standard but should be dealt with in accordance with national standards or regulations or may be agreed between the parties concerned.

NOTE 2 The word "cement" in this standard is used to refer only to supersulfated cement unless otherwise specified.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 196-1, *Methods of testing cement — Part 1: Determination of strength*

EN 196-2, *Methods of testing cement — Part 2: Chemical analysis of cement*

EN 196-3, *Methods of testing cement — Part 3: Determination of setting times and soundness*

EN 196-7, *Methods of testing cement — Part 7: Methods of taking and preparing samples of cement*

EN 196-8, *Methods of testing cement — Part 8: Heat of hydration — Solution method*

EN 196-9, *Methods of testing cement — Part 9: Heat of hydration — Semi-adiabatic method*

EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 197-2:2000, *Cement — Part 2: Conformity evaluation*

EN 459-1, *Building lime — Part 1: Definitions, specifications and conformity criteria*

EN 934 (all parts), *Admixtures for concrete, mortar and grout*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
heat of hydration
quantity of heat generated by cement hydration within a given period of time

3.2
main constituents
granulated blastfurnace slag and calcium sulfate in a proportion exceeding 90 % by mass related to the sum of all main and additional constituents

3.3
additional constituents
Portland cement clinker (K) and other additional constituents (A) used in a proportion not exceeding a total of 10 % by mass related to the sum of all main and additional constituents

NOTE Other additional constituents are specially selected inorganic materials of natural origin and/or derived from specified industrial processes.

3.4
strength class of supersulfated cement
class of compressive strength

3.5
control period
period of production and dispatch identified for the evaluation of the autocontrol test results

3.6
characteristic value
value of a required property outside of which lies a specified percentage, the percentile P_k, of all the values of the population

3.7
specified characteristic value
characteristic value of a mechanical, physical or chemical property which in the case of an upper limit is not to be exceeded or in the case of a lower limit is, as a minimum, to be reached

3.8
single result limit value

value of a mechanical, physical or chemical property which – for any single test result – in the case of an upper limit is not to be exceeded or in the case of a lower limit is, as a minimum, to be reached

3.9
allowable probability of acceptance *CR*
for a given sampling plan, allowed probability of acceptance of cement with a characteristic value outside the specified characteristic value

3.10
sampling plan
specific plan which states the (statistical) sample size(s) to be used, the percentile P_k and the allowable probability of acceptance *CR*

3.11
spot sample
sample taken at the same time and from one and the same place, relating to the intended tests

NOTE 1 It may be obtained by combining one or more immediately consecutive increments.

NOTE 2 See EN 196-7.

3.12
autocontrol testing
continual testing by manufacturer of cement spot samples taken at the point(s) of release from the factory/depot.

4 Supersulfated cement

Supersulfated cement is a hydraulic binder, i.e. a finely ground inorganic material which, when mixed with water, forms a paste which sets and hardens by means of hydration reactions and processes and which, after hardening, retains its strength and stability even under water.

Supersulfated cements consist mainly of granulated blastfurnace slag and calcium sulfate. They are statistically homogeneous in composition resulting from quality assured production and material handling processes. The link between these production and material handling processes and the conformity of cement to this standard is defined in EN 197-2.

In supersulfated cement, in contrast to common cements according to EN 197-1, ground granulated blastfurnace slag is mainly activated by calcium sulfate. In order to accelerate the activation and early hydration of slag, additional constituents may be added.

5 Constituents

5.1 Main constituents

5.1.1 Granulated blastfurnace slag (S)

Granulated blastfurnace slag is made by rapid cooling of a slag melt of suitable composition, as obtained by smelting iron ore in a blastfurnace and consists of at least two-thirds by mass of glassy slag and possesses hydraulic properties when suitably activated.

Granulated blastfurnace slag shall consist of at least two-thirds by mass of the sum of calcium oxide (CaO), magnesium oxide (MgO) and silicon dioxide (SiO_2). The remainder contains aluminium oxide (Al_2O_3) together with small amounts of other compounds. The ratio by mass (CaO + MgO)/(SiO_2) shall exceed 1,0.

NOTE Rapid cooling includes quenching in water (granulation) and projecting through water and air (pelletisation).

5.1.2 Calcium sulfate (Cs)

Calcium sulfate can be gypsum calcium sulfate dihydrate ($CaSO_4.2H_2O$), hemihydrate ($CaSO_4.½H_2O$), or anhydrite (anhydrous calcium sulfate, $CaSO_4$) or any mixture of them. Gypsum and anhydrite are found naturally. Calcium sulfate is also available as a by-product of certain industrial processes.

5.2 Additional constituents

5.2.1 Portland cement clinker (K)

Portland cement clinker is made by sintering a precisely specified mixture of raw materials (raw meal, paste or slurry) containing elements, usually expressed as oxides, CaO, SiO_2, Al_2O_3, Fe_2O_3 and small quantities of other materials. The raw meal, paste or slurry is finely divided, intimately mixed and therefore homogeneous.

Portland cement clinker is a hydraulic material which shall consist of at least two-thirds by mass of calcium silicates ($3CaO.SiO_2$ and $2CaO.SiO_2$), the remainder consisting of aluminium and iron containing clinker phases and other compounds. The ratio by mass (CaO)/(SiO_2) shall be not less than 2,0. The content of magnesium oxide (MgO) shall not exceed 5,0 % by mass.

5.2.2 Other additional constituents (A)

Other additional constituents are specially selected, inorganic mineral materials of natural origin, inorganic mineral materials derived from the cement production process, excluding Portland cement clinker according to 5.2.1, and/or inorganic mineral materials derived from the production process for air lime or natural hydraulic lime to EN 459-1.

Other additional constituents, after appropriate preparation and on account of their particle size distribution, improve the physical properties of the cement (such as workability or water retention). They can be inert or have slightly hydraulic, latent hydraulic or pozzolanic properties. However, no requirements are set for them in this respect.

Other additional constituents shall be correctly prepared, i.e. selected, homogenised, dried and comminuted depending on their state of production or delivery. They shall not increase the water demand of the cement appreciably, impair the resistance of the concrete or mortar to deterioration in any way or reduce the corrosion protection of the reinforcement.

NOTE Information on the other additional constituents in the cement should be available from the manufacturer on request.

5.3 Additives

Additives for the purpose of this standard are constituents not covered in 5.1 to 5.2 which are added to improve the manufacture or the properties of the cement.

The total quantity of additives shall not exceed 1,0 % by mass of the cement (except for pigments). The quantity of organic additives on a dry basis shall not exceed 0,2 % by mass of the cement without the higher value being declared.

These additives shall not promote corrosion of the reinforcement or impair the properties of the cement or of the concrete or mortar made from the cement.

When admixtures for concrete, mortar or grouts conforming to the EN 934 series are used in cement the standard notation of the admixture shall be declared on bags or delivery documents.

6 Composition and notation

The notation of supersulfated cement is:

— SSC Supersulfated cement.

The composition of supersulfated cement shall be in accordance with Table 1.

NOTE The requirements for the composition refer to the sum of all main and additional constituents. The final cement should be understood as the main and additional constituents plus the necessary additives.

Table 1 — Supersulfated cement

Type	**Notation**		**Composition** (Percentage by mass[a])			
			Main Constituents		**Additional Constituents**	
			Granulated blastfurnace slag	**Calcium sulfate**	**Portland cement clinker**	**Other**
			S	Cs	K	A
SSC	Supersulfated cement	SSC	≥ 75	5 ≤ Cs ≤ 20	0 < K ≤ 5	0 ≤ A ≤ 5
[a] The values in the table refer to the sum of the main and additional constituents.						