SLOVENSKI STANDARD
SIST EN 14216:2015

01-oktober-2015

Nadomešča:
SIST EN 14216:2004

Cement - Sestava, zahteve in merila skladnosti za posebne cemente z zelo nizko toploto hidratacije

Cement - Composition, specifications and conformity criteria for very low heat special cements

Zement - Zusammensetzung, Anforderungen und Konformitätskriterien von Sonderzement mit sehr niedriger Hydratationswärme

Ciments - Composition, spécifications et critères de conformité de ciments speciaux à très faible chaleur d'hydratation

Ta slovenski standard je istoveten z: **EN 14216:2015**

ICS:

91.100.10	Cement. Mavec. Apno. Malta	Cement. Gypsum. Lime. Mortar

SIST EN 14216:2015 **en,fr,de**

EUROPEAN STANDARD

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EUROPÄISCHE NORM

EN 14216

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Supersedes EN 14216:2004

English Version

Cement - Composition, specifications and conformity criteria for very low heat special cements

Ciments - Composition, spécifications et critères de conformité de ciments speciaux à très faible chaleur d'hydratation

Zement - Zusammensetzung, Anforderungen und Konformitätskriterien von Sonderzement mit sehr niedriger Hydratationswärme

This European Standard was approved by CEN on 10 April 2015.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 14216:2015) 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of an identical text or by endorsement, at the latest by January 2016, and conflicting national standards shall be withdrawn at the latest by April 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14216:2004.

Compared to the version EN 14216:2004 the following major changes have been included in this document:

— use of the terminology given by the Construction Products Regulation (Regulation (EU) No 305/2011);

— a clause “Dangerous substances” has been added;

— the former Annex A (informative) “Water-soluble hexavalent chromium” has been deleted;

— Annex ZA has been revised in accordance with the Construction Products Regulation (Regulation (EU) No 305/2011).

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

For relationship with Regulation (EU) No. 305/2011, see informative Annex ZA, which is an integral part of this document.

The various stages in the development of a European Standard for common cement, in response to the preliminary mandate given to CEN by the EC and the EFTA, are described in EN 197-1. It is indicated that, in view of the large numbers of different cements involved, it was considered necessary to separate the "common cements", which are now covered by EN 197-1, from special cements, i.e. those with special properties or those having hardening processes not mainly dependent on the hydration of calcium silicates.

The low heat property for common cements is covered by EN 197-1.

A need for control of heat development during hydration of concrete is referred to in EN 206. Classification of cements with respect to heat of hydration is one method whereby heat development of concrete can be controlled. The purpose of this European Standard is therefore to specify the heat of hydration for very low heat special cements. Composition and other requirements are those specified in EN 197-1 for common cements. Conformity criteria are additionally specified.

The requirements in this European Standard are based on the results of tests on cement in accordance with EN 196-1, EN 196-2, EN 196-3, EN 196-5, EN 196-7, EN 196-8 and EN 196-9. The scheme for the evaluation of conformity in EN 197-2 is applicable to very low heat special cements.

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

Introduction

It is recognized that different cements have different properties and performance. Those performance tests now available (i.e. setting time, strength, soundness and heat of hydration) have been included in this European Standard. In addition, work is being carried out by CEN/TC 51 to identify any additional tests which are needed to specify further performance characteristics of cement. Until further performance tests are available, it is highly recommended that the choice of cement, especially the type and/or strength class in relation to the requirements for durability depending on exposure class and type of construction in which it is incorporated, follows the appropriate standards and/or regulations for concrete valid in the place of use.

1 Scope

This European Standard defines and gives the specifications of six distinct very low heat special cement products and their constituents. The definition of each cement includes the proportions in which the constituents are to be combined to produce these distinct products in a single strength class having a limited heat of hydration value. The definition also includes requirements the constituents have to meet and the mechanical, physical, chemical and heat of hydration requirements for these products. This European Standard also states the conformity criteria and the related rules. Necessary durability requirements are also given.

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

NOTE 1 The word "cement" in this European Standard is used to refer to very low heat special cement unless otherwise indicated.

NOTE 2 The risk of early-age thermal cracking in concrete depends upon the properties and execution and is, therefore, also dependent on factors other than the heat of hydration of the cement.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 time and soundness*

EN 196-5, *Methods of testing cement - Part 5: Pozzolanicity test for pozzolanic cement*

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 197-2:2014, *Cement - Part 2: Conformity evaluation*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 197-1 apply.

4 Very low heat special cement

Very low heat special 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. It has hydration reactions and processes identical to those of common cements (see EN 197-1) but through composition, fineness or reactivity of constituents the hydration process is slower.

Very low heat special cement is particularly suitable for dams and other similar massive construction, where the dimensions of the structure have a low surface/volume ratio. In this case, the dispersion of heat, developed during the hydration of the cement, is very slow and therefore it is possible to have large increases in temperature. Thermal gradients then develop between internal and external zones of the concrete setting up internal stress which can be greater than the tensile strength of the concrete and lead to cracking and breakdown. These same properties make very low heat special cement unsuitable for use in reinforced, elevated, concrete structures, e.g. bridges or buildings.

NOTE Low heat common cements or low heat low early strength blastfurnace cements conforming to EN 197-1 are suitable for dams and other similar massive construction, depending on the design of the concrete and method of construction.

5 Constituents

The constituents of very low heat special cements shall conform to the requirements of the constituents of common cements specified in EN 197-1.

6 Composition and notation

The six products in the family of very low heat special cements, covered by this European Standard, and their notation are given in Table 1. They are grouped into three main cement types as follows:

- VLH III Blastfurnace cement;
- VLH IV Pozzolanic cement;
- VLH V Composite cement.

The composition of each of the six products in the family of very low heat special cements shall be in accordance with Table 1.

For clarity in definition, the requirements for the composition refer to the sum of all main and minor additional constituents. The final cement should be understood as the main and minor additional constituents plus the necessary calcium sulfate and any additives.

Table 1 — The 6 products in the family of very low heat special cements

Main type	Notation of the 6 products (types of very low heat special cement)		Composition (percentage by mass in %) [a]							
			Main constituents							Minor additional constituents
			Clinker	Blast-furnace slag	Silica fume	Pozzolana		Fly ash		
						natural	natural calcined	siliceous	calcareous	
			K	S	D [b]	P	Q	V	W	
VLH III	Blastfurnace cement	VLH III/B	20–34	66–80	–	–	–	–	–	0–5
		VLH III/C	5–19	81–95	–	–	–	–	–	0–5
VLH IV	Pozzolanic cement [c]	VLH IV/A	65–89	–	<---------- 11–35 ---------->					0–5
		VLH IV/B	45–64	–	<---------- 36–55 ---------->					0–5
VLH V	Composite cement [c]	VLH V/A	40–64	18–30	–	<-------- 18–30 -------->			–	0–5
		VLH V/B	20–38	31–49	–	<-------- 31–49 -------->			–	0–5

[a] The values of the table refer to the sum of the main and minor additional constituents.

[b] The proportion of silica fume is limited to 10 %.

[c] In pozzolanic cements VLH IV/A and VLH IV/B and in composite cements VLH V/A and VLH V/B the main constituents other than clinker shall be declared by designation of the cement (for example see Clause 8).

7 Mechanical, physical, heat of hydration, chemical and durability requirements

7.1 Mechanical requirements - Standard strength

The standard strength of a very low heat special cement is the compressive strength determined in accordance with EN 196-1 at 28 d and shall conform to the requirements in Table 2.

One class of standard strength is included; class 22,5 (see Table 2).

Table 2 — Mechanical and physical requirements given as characteristic values

Strength class	Compressive strength MPa		Initial setting time	Soundness (expansion)
	Standard strength			
	28 d		min	mm
22,5	≥ 22,5	≤ 42,5	≥ 75	≤ 10

7.2 Physical requirements

7.2.1 Initial setting time

The initial setting time, determined in accordance with EN 196-3, shall conform to the requirement in Table 2.

7.2.2 Soundness

The expansion, determined in accordance with EN 196-3, shall conform to the requirement in Table 2.

7.2.3 Heat of hydration

The heat of hydration of very low heat special cements shall not exceed the characteristic value of 220 J/g, determined in accordance with either EN 196-8 at 7 d or in accordance with EN 196-9 at 41 h.

A pre-normative research project has demonstrated the equivalence of test results for EN 196-8 at 7 d and EN 196-9 at 41 h. Nevertheless, in case of dispute between laboratories, the method to be applied should be agreed.

7.3 Chemical requirements

The properties of the cements of the cement type shown in column 3 of Table 3 shall conform to the requirements listed in column 4 of this table when tested in accordance with the standard referred to in column 2.

Table 3 — Chemical requirements given as characteristic values

1	2	3	4
Property	**Test reference**	**Cement type**	**Requirements** [a]
Loss on ignition	EN 196-2	VLH III	≤ 5,0 %
Insoluble residue	EN 196-2 [b]	VLH III	≤ 5,0 %
Sulfate content (as SO_3)	EN 196-2	VLH IV VLH V	≤ 3,5 %
		VLH III/B	≤ 4,0 %
		VLH III/C	≤ 4,5 %
Chloride content	EN 196-2	All [c]	≤ 0,10 %
Pozzolanicity	EN 196-5	VLH IV	Satisfies the test at 8 d

[a] Requirements are given as percentage by mass of the final cement.

[b] Determination of residue insoluble in hydrochloric acid and sodium carbonate.

[c] Cement type VLH III may contain more than 0,1 % chloride but in that case the maximum chloride content shall be stated on the packaging and/or the delivery note.

7.4 Durability requirements

In many applications, particularly in severe environmental conditions, the choice of cement has an influence on the durability of concrete, mortar and grouts, e.g. frost resistance, chemical resistance and protection of reinforcement.

The choice of cement, from this European Standard, particularly as regards type and heat of hydration for different applications and exposure classes shall follow the appropriate standards and/or regulations for concrete or mortar valid in the place of use.

The mortar or concrete made from very low heat special cements requires additional protection from drying out and from carbonation during curing. Frost resistance of very low heat special cement concrete should be suitable for the exposure conditions in the place of use.

7.5 Dangerous substances

National regulations on dangerous substances may require verification and declaration on release, and sometimes content, when construction products covered by this standard are placed on those markets.

In the absence of European harmonized test methods, verification and declaration on release/content should be done taking into account national provisions in the place of use.

NOTE An informative database covering European and national provisions on dangerous substances is available at the Construction web site on EUROPA accessed through: http://ec.europa.eu/enterprise/construction/cpd-ds/.

8 Standard designation

Very low heat special cements shall be identified by the notation of the cement type as specified in Table 1 and the figure 22,5 indicating the standard strength class (see 7.1).