



**SLOVENSKI STANDARD**  
**SIST EN 197-1:2001/oprA2:2006**  
**01-november-2006**

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Cement - Part 1: Composition, specifications and conformity criteria for common cements; Amendment A2 (Sulfate resisting cement)

Zement - Teil 1: Zusammensetzung, Anforderungen und Konformitätskriterien von Normalzement; Änderung A2 ( Zement mit hohem Sulfatwiderstand)

Ciment - Partie 1: Composition, spécifications et criteres de conformité des ciments courants; Amendement A2 (Ciment résistant aux sulfates)

**Ta slovenski standard je istoveten z: EN 197-1:2000/prA2**

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**ICS:**

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

**SIST EN 197-1:2001/oprA2:2006 en**



ICS 91.100.10

English Version

**Cement - Part 1: Composition, specifications and conformity  
criteria for common cements; Amendment A2 (Sulfate resisting  
cement)**

Zement - Teil 1: Zusammensetzung, Anforderungen und  
Konformitätskriterien von Normalzement; Änderung A2 (  
Zement mit hohem Sulfatwiderstand)

This draft amendment is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 51.

This draft amendment A2, if approved, will modify the European Standard EN 197-1:2000. If this draft becomes an amendment, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for inclusion of this amendment into the relevant national standard without any alteration.

This draft amendment was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**Management Centre: rue de Stassart, 36 B-1050 Brussels**

## **Foreword**

This document (EN 197-1:2000/prA2:2006) has been prepared by Technical Committee CEN/TC 51 “Cement and building limes”, the secretariat of which is held by IBN.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

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

This Amendment extends the European Standard EN 197-1:2000 to cover the optional property of sulfate resistance for common cement. The further technical content of EN 197-1:2000 has not been changed.

The numbering of the clauses refers to EN 197-1:2000.

## Amendments 2

### Foreword

*Add (modification is underlined):*

4<sup>th</sup> paragraph:

The amendment A2:2006 contained the sulfate resisting common cements.

11<sup>th</sup> paragraph:

In view of the large number of different cements involved, it was considered necessary to separate the “common cements” from special cements i.e. those with additional or special properties. The purpose of EN 197-1 is to specify the composition, requirements and conformity criteria for the common cements. This includes all common cements and common cements with adequate sulfate resistance which are described by the respective national standardisation bodies within CEN as traditional and well tried. Types based on composition and a classification based on strength have been introduced in order to take into account the different cements included. The hardening of these cements mainly depends on the hydration of calcium silicates. Common cements with special properties as well as cements with different hardening processes will be included in further parts of this European Standard or in further European Standards respectively.

12<sup>th</sup> paragraph:

The requirements in EN 197-1 are based on the results of tests on cement in accordance with EN 196-1, -2, -3, -5, -6, -7, -8, and -9. The scheme for the evaluation of conformity of common cements and common cements with adequate sulfate resistance is specified in EN 197-2.

13<sup>th</sup> paragraph:

In order to find out whether cement with high sulfate resistance should be taken into account in EN 197-1, there was an investigation within CEN/TC 51 comprising all national specifications and recommendations in the European Union. The review of these investigations led to the following results:

- A wide variety of cements have been classified in the EU Member States as sulfate resisting. This is due to the different geographical and climatic conditions under which sulfate attacks on mortar and concrete occur at the place of use and the traditionally different rules governing the production and use of sulfate resistant mortars and concretes.

- Sulfate resistance is an additional property and therefore sulfate resisting cements have first to comply with the requirements of the standards which define the product, e. g. EN 197-1 for common cements.

- The additional requirements to be met by the nationally specified sulfate resisting cements refer to selected characteristics for which the required limit values are more stringent than those for common cements.

- Having satisfied the local requirements for various cement types many countries apply further restrictions to the production of concrete to be used in a sulfate environment, such as minimum cement contents and/or maximum water/cement ratio that vary depending on the cement type and the type and intensity of the sulfate conditions.

Based on the above results common cement types to be harmonized on European level have been chosen. The predominant part of the common cements with high sulfate resistance in the market is covered by this selection. It was not possible to take into account national local particularities the use of which is laid down within national application rules and regulations/provisions.

## 1 Scope

*Add (modification is underlined):*

EN 197-1 defines and gives the specifications of 27 distinct common cement products and 7 sulfate resisting common cements 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 range of six strength classes. The definition also includes requirements the constituents have to meet and the mechanical, physical and chemical requirements of these products and strength classes. EN 197-1 also states the conformity criteria and the related rules. Necessary durability requirements are also given.

In addition to those sulfate resisting cements defined in the present document, other cements conforming either to EN 197-1 or to national standards have been locally demonstrated to have sulfate resisting properties. These cements may be used in sulfate aggressive environments if permitted in national provisions valid in the place of the construction site. These cements may not bear the CE Marking for their sulfate resistance property.

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 EN 197-1 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 EN 197-1 is used to refer only to common cements unless otherwise specified.

## 3 Definition

*Add*

### 3.17

#### **Sulfate resisting common cement**

Common cement which fulfills the requirements to sulfate resisting properties according to this amendment of EN 197-1

## 5 Constituents

### 5.2.1 Portland cement clinker (K)

*Add (third paragraph):*

Sulfate resisting common cement shall fulfill additional requirements to the tricalcium aluminate  $C_3A$  content of the clinker (see 7.4.1).

The tricalcium aluminate content of the clinker shall be calculated by equation as follows:

$$C_3A = 2,65 A - 1,69 F$$

where:

A is the percentage of aluminium oxide ( $Al_2O_3$ ) by mass of the clinker as determined in accordance with EN 196-2

F is the percentage of iron (III) oxide ( $Fe_2O_3$ ) by mass of the clinker as determined in accordance with EN 196-2.

## 6 Composition and notation

Add (the title):

### 6.1 Composition and notation of common cements

Add:

### 6.2 Composition and notation of sulfate resisting common cements (SR-Cements)

The 7 products in the family of the sulfate resisting common cements, covered by EN 197-1 are given in Table 1.1.

They are grouped into three main cement types as follows:

- CEM I...-SR 0 Sulfate Resisting Portland Cement ( $C_3A$  content of the clinker = 0 %)
- CEM I...-SR 3 Sulfate Resisting Portland Cement ( $C_3A$  content of the clinker  $\leq$  3 %)
- CEM I...-SR 5 Sulfate Resisting Portland Cement ( $C_3A$  content of the clinker  $\leq$  5 %)
- CEM III/B...-SR S Sulfate Resisting Blastfurnace Cement
- CEM III/C...-SR S
- CEM IV/A...-SR P Sulfate Resisting Pozzolanic Cement
- CEM IV/B...-SR P

The composition of each of the 7 products in the family of the sulfate resisting common cements shall be in accordance with Table 1.1. The cement type notation shall be in accordance with the requirements of EN 197-1 with additionally notation by SR 0, SR 3, SR 5, SR S and SR P.

**Table 1.1 — The 7 products in the family of sulfate resisting common cements**

Main Types	Notation of the 5 products (types of sulfate resisting common cement)		Composition (percentage by mass <sup>a</sup> )				
			Main constituents				Minor Additional Constituents
			Clinker K	Blastfurnace Slag S	Pozzolana Natural P	Siliceous fly ash V	
CEM I	Sulfate Resisting Portland Cement	CEM I...-SR 0 CEM I...-SR 3 CEM I...-SR 5	95 - 100	-	-	-	0 - 5
CEM III	Sulfate Resisting Blastfurnace Cement	CEM III/B...-SR S	20 - 34	66 - 80	-	-	0 - 5
		CEM III/C...-SR S	5 - 19	81 - 95	-	-	0 - 5
CEM IV	Sulfate <sup>b</sup> Resisting Pozzolanic Cement	CEM IV/A...-SR P	65 - 80		←--- 20 - 35 ---→		0 - 5
		CEM IV/B...-SR P	45 - 64		←--- 36 - 55 ---→		0 - 5

<sup>a</sup> The values of the table refer to the sum of the main and minor additional constituents

<sup>b</sup> In sulfate resisting pozzolanic cements, types CEM IV/A...-SR P and CEM IV/B...-SR P, the main constituents besides clinker shall be declared by designation of the cement.

## 7 Mechanical physical, chemical and durability requirements

Add:

### 7.4.1 Sulfate resistance

The adequate sulfate resistance of sulfate resisting common cement of the cement types and strength class shown in columns 3 and 4 respectively of Table 3.1 shall conform to the requirements listed in column 5 of this table when tested in accordance with the standard referred to in column 2.

**Table 3.1 — Additional requirements for sulfate resisting common cements given as characteristic values**

1	2	3	4	5
Property	Test reference	Cement type	Strength class	Requirements <sup>a</sup>
Sulfate content (as SO <sub>3</sub> )	EN 196-2	CEM I...-SR 0 CEM I...-SR 3 CEM I...-SR 5	32,5 N 32,5 R 42,5 N	≤ 3,0 %
		CEM IV/A...-SR P CEM IV/B...-SR P	42,5 R 52,5 N 52,5 R	≤ 3,5 %
C <sub>3</sub> A; C <sub>3</sub> A in clinker	EN 196-2 <sup>d</sup>	CEM I...-SR 0	All	= 0 <sup>g</sup>
		CEM I...-SR 3		≤ 3 % <sup>g</sup>
		CEM I...-SR 5		≤ 5 % <sup>g</sup>
		CEM IV/A...-SR P CEM IV/B...-SR P		≤ 9 % <sup>g</sup>
Pozzolanicity <sup>f</sup>	EN 196-5	CEM IV/A...-SR P CEM IV/B...-SR P	All	Satisfies the test

<sup>a</sup> Requirements are given as percentage by mass of the final cement.

<sup>d</sup> The tricalcium aluminate content shall be calculated by the formula: C<sub>3</sub>A = 2,65A – 1,69F (see 5.2.1).

<sup>f</sup> The pozzolanicity test need shall be positive at 8 days.

<sup>g</sup> Test method for determination of C<sub>3</sub>A content in the final cement under development in CEN/TC 51/WG 15 (WI 00510..).

## 8 Standard designation

Add (1<sup>st</sup> paragraph):

Sulfate resisting common cement shall be identified additionally by the notation SR.

The designation of sulfate resisting cements on a national level may not be marked by SR.



Add:

And for sulfate resisting common cements:

#### EXAMPLE 6

Portland cement, conforming to EN 197-1, of strength class 42,5 with a high early strength and high sulfate resistance and  $C_3A$  content of the clinker  $\leq 3$  % is identified by:

**Portland cement EN 197-1 - CEM I 42,5R – SR 3**

#### EXAMPLE 7

Blastfurnace cement, conforming to EN 197-1, containing between 81 % and 95 % by mass of granulated blastfurnace slag (S), of strength class 32,5 with an ordinary early strength and high sulfate resistance is identified by:

**Blastfurnace cement EN 197-1 - CEM III/C 32,5N – SR S**

#### EXAMPLE 8

Pozzolanic cement, conforming to EN 197-1, containing in total a quantity of natural pozzolana (P) of between 20 % and 35 % by mass and of strength class 32,5 with an ordinary early strength and high sulfate resistance is identified by:

**Pozzolanic cement EN 197-1 - CEM IV/A (P) 32,5N – SR P**

#### EXAMPLE 9

Blastfurnace cement, conforming to EN 197-1, containing between 66 % and 80 % by mass of granulated blastfurnace slag (S) of strength class 42,5 with an ordinary early strength and a low heat of hydration and high sulfate resistance is identified by:

**Blastfurnace cement EN 197-1 - CEM III/B 42,5N - LH/SR S**

## 9 Conformity criteria

**Table 4 — Properties, test methods and minimum testing frequencies for the autocontrol testing by the manufacturer, and the statistical assessment procedure**

Add:

Property	Cements to be tested	Test method <sup>a, b</sup>	Autocontrol testing			
			Minimum testing frequency		Statistical assessment procedure	
			Routine situation	Initial period for a new type of cement	Variables <sup>e</sup>	Attributes
1	2	3	4	5	6	7
$C_3A$ ; $C_3A$ in clinker	Sulfate resisting common cements	EN 196-2	2/month	1/week		$x^f$

<sup>f</sup> If the number of samples is at least one per week during the control period, the assessment may be made by variables