

**Tsement. Osa 1: Harilike tsementide koostis,
spetsifikatsioonid ja vastavuskriteeriumid**

Cement - Part 1: Composition, specifications and conformity
criteria for common cements

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

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ICS 91.100.10

Võtmesõnad: harilikud tsemendid, spetsifikatsioonid, tsementidekoostis, vastavuskriteeriumid,

Inglisekeelsed võtmesõnad: cements, chemical composition, chemical properties, components, composition, conformity, conformity testing, construction, construction materials, definition, designations, durability, marking, mass concentration, mechanical properties, mechanical testing, physical,

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English Version

Cement - Part 1: Composition, specifications and conformity criteria for common cements

Ciment - Partie 1 : Composition, spécifications et critères de conformité des ciments courants

Zement - Teil 1: Zusammensetzung, Anforderungen und Konformitätskriterien von Normalzement

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN 197-1:2011) 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of an identical text or by endorsement, at the latest by March 2012, and conflicting national standards shall be withdrawn at the latest by June 2013.

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 197-1:2000, EN 197-4:2004.

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 EN 197-1.

Annexes A and ZA are informative.

In addition to consolidating EN 197-1:2000/A1:2004, EN 197-1:2000/prA2, EN 197-1:2000/A3:2007, EN 197-4:2004 and EN 197-4:2004/prA1 into a single standard, the principal changes from EN 197-1:2000 are the introduction of additional requirements for common cements with a low heat of hydration and common cements with sulfate resisting properties.

The preparation of a standard for cement was initiated by the European Economic Community (EEC) in 1969 and, at the request of a member state later in 1973, the work was given to the European Committee for Standardization (CEN). The Technical Committee CEN/TC 51 was entrusted with the task of preparing a cement standard for the countries of Western Europe, comprising the EEC and EFTA members.

In the early eighties, CEN/TC 51 decided to include in the standard for cement only those cements which are intended for use in any plain and reinforced concrete and which are familiar in most countries in Western Europe because they have been produced and used in these countries for many years. The EU Construction Products Directive (89/106/EEC) requires the incorporation of all traditional and well-trying cements in order to remove technical barriers to trade in the construction field. There are currently no criteria for the descriptions "traditional" and "well tried" and it was considered necessary to separate the "common cements" from special cements, i.e. those with additional or special properties.

The requirements in this 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 196-6, EN 196-7, EN 196-8, and EN 196-9. The scheme for the evaluation of conformity of common cements including common cements with low heat of hydration and common cements generally accepted as being sulfate resisting are specified in EN 197-2.

In order to find out which common cements are generally accepted as being sulfate resisting and should be included 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 has 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 conform to 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 at the European level have been chosen. The predominant part of the common cements considered to be sulfate resisting in the market is covered by this selection. It was not possible to take into account national particularities the use of which is laid down within national standards, national application rules and regulations/provisions.

The strength attained at 28 days is the important criterion in classifying cement for most uses. In order to achieve a specific strength class at 28 days the early strength, at 2 days or at 7 days, can vary and some types of cement may not attain the minimum early strengths specified in EN 197-1 for common cements.

The heat of hydration is linked to the early reactivity and lower early strengths indicate lower heat evolution and lower temperatures in concrete. For these cements additional precautions in use can be necessary to ensure adequate curing and safety in construction.

The purpose of this standard is to specify the composition requirements and conformity requirements for common cements, including common cements with low heat of hydration and common cements with adequate sulfate resistance as well as low early strength blast furnace cements and low early strength blast furnace cements with low heat of hydration.

Cement types and strength classes defined in this European Standard allow the specifier and/or the user to fulfil objectives of sustainability for cement based constructions. Cement types produced by using constituents listed and defined in Clause 5 allow the manufacturer to minimize the use of natural resources in accordance with local conditions of production.

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

It is recognised 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 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 necessary 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 or mortar valid in the place of use.

1 Scope

This European Standard defines and gives the specifications of 27 distinct common cements, 7 sulfate resisting common cements as well as 3 distinct low early strength blast furnace cements and 2 sulfate resisting low early strength blast furnace 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 nine strength classes. The definition also includes requirements which the constituents have to meet. It also includes mechanical, physical, and chemical requirements. Furthermore, this standard 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 this standard or to other standards, European or national, have been nationally demonstrated to have sulfate resisting properties. These cements which are listed in Annex A, are considered by different CEN Member countries as sulfate resisting within the limits of their territory.

NOTE 1 In addition to the specified requirements, an exchange of additional information between the cement manufacturer and user can 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 can 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.

This European Standard does not cover:

- very low heat special cement covered by EN 14216;
- supersulfated cement covered by EN 15743;
- calcium aluminate cement covered by EN 14647;
- masonry cement covered by EN 413-1.

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

EN 196-6, *Methods of testing cement — Part 6: Determination of fineness*

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

EN 451-1, *Method of testing fly ash — Part 1: Determination of free calcium oxide content*

EN 933-9, *Tests for geometrical properties of aggregates — Part 9: Assessment of fines - Methylene blue test*

EN 13639, *Determination of total organic carbon in limestone*

ISO 9277, *Determination of the specific surface area of solids by gas adsorption — BET method*

ISO 9286, *Abrasive grains and crude — Chemical analysis of silicon carbide*

3 Terms and definitions

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

3.1

reactive calcium oxide (CaO)

fraction of the calcium oxide which, under normal hardening conditions, can form calcium silicate hydrates or calcium aluminate hydrates

NOTE To evaluate this fraction, the total calcium oxide content (see EN 196-2) is reduced by the fraction corresponding to calcium carbonate (CaCO_3), based on the measured carbon dioxide (CO_2) content (see EN 196-2), and the fraction corresponding to calcium sulfate (CaSO_4), based on the measured sulfate (SO_3) content (see EN 196-2) after subtraction of the SO_3 taken up by alkalis.

3.2

reactive silicon dioxide (SiO_2)

fraction of the silicon dioxide which is soluble after treatment with hydrochloric acid (HCl) and with boiling potassium hydroxide (KOH) solution

NOTE The quantity of reactive silicon dioxide is determined by subtracting from the total silicon dioxide content (see EN 196-2) the fraction contained in the residue insoluble in hydrochloric acid and potassium hydroxide (see EN 196-2), both on a dry basis.

3.3

main constituent

specially selected inorganic material in a proportion exceeding 5 % by mass related to the sum of all main and minor additional constituents

3.4

minor additional constituent

specially selected inorganic material used in a proportion not exceeding a total of 5 % by mass related to the sum of all main and minor additional constituents

3.5

type of common cement

one of the 27 products (see Table 1) in the family of common cements

3.6

strength class of cement

class of compressive strength

3.7

autocontrol testing

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

3.8

control period

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