SLOVENSKI STANDARD

SIST ENV 197-1:1997

01-avgust-1997

Cement - Sestava, zahteve in merila skladnosti - 1. del: Običajni cementi

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

Zement - Zusammensetzung, Anforderungen und Konformitätskriterien - Teil 1: Allgemein gebräuchlicher Zement

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

Ta slovenski standard je istoveten z: ENV 197-1:1992

ICS:

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

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EUROPEAN PRESTANDARD

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English version

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

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Zement - Zusammensetzung, Anforderungen und Konformitätskriterien - Teil 1: Allgemein gebräuchlicher Zement

This European Prestandard (ENV) was approved by CEN on 1992-04-29 as a prospective standard for provisional application. The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into an European Standard (EN).

CEN members are required to announce the existance of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
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Foreword

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 TC 51 was entrusted with the task of preparing a cement standard for the countries of Western Europe, comprising the EEC and EFTA members.

The inquiry initiated by CEN/TC 51 in the mid-seventies identified at that time nearly 20 different kinds of cement, and a second inquiry in 1990 resulted in some further 50 different kinds of cement, which had all been standardized on a national basis and which had proved satisfactory in common or special fields of application under local conditions. The evaluation of the inquiries showed that different sources of raw materials, different climatic conditions and different social/cultural attitudes have established a typical architecture with different building techniques in the different regions of Western Europe which led to the great variety of kinds of cement. The same or similar cement may be used in very different structures with different types of application and with substantially different requirements regarding its performance under the respective climatic conditions.

When CEN/TC 51 became aware of this situation, it decided in the early eighties to include in ENV 197 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 earlier view of CEN/TC 51 was that the more regional cements should continue to be standardized at the national level. The 1989 draft of ENV 197 followed this approach, but did not achieve the majority necessary for acceptance because a few countries wanted to incorporate all their nationally standardized cements and because the EEC Directive Relating to Construction Products requires the incorporation of all traditional and well tried cements in order to remove technical barriers to trade in the construction field.

In view of the large number of different kinds of cement involved, CEN/TC 51 has now decided to divide ENV 197 into several parts. In this first part, ENV 197-1, only those cements have been taken into consideration of which the hardening mainly depends on the hydration of calcium silicates and which are provided for common uses. Cements with different mechanisms of hardening or additional special properties will be dealt with in later parts of the prestandard, i.e. in ENV 197-2, ENV 197-3 etc.

The requirements in this European Prestandard are based on the results of tests on cement in accordance with EN 196 "Methods of testing cement" that consists of the following parts:

Part 1. Determination of strength

Part 2. Chemical analysis of cement

Part 3. Determination of setting time and soundness

Part 4. Quantitative determination of constituents[1)]

Part 5. Pozzolanicity test for pozzolanic cements

Part 6. Determination of fineness

Part 7. Methods of taking and preparing samples of cement

Part 21. Determination of the chloride, carbon dioxide and alkali content of cement

1) This Part has the status of ENV. An EN is in preparation.

0 Introduction

Different climatic conditions, different sources of raw materials and different social/cultural attitudes have led to different developments in architecture, structures, building materials and their application and usage in different regions of Western Europe. This applies especially to cement which is used as a universal binding agent in almost all fields of construction.

The provisional mandates to CEN from the European Commission and the EFTA Authorities for the "Realization of a standardization programme in the field of construction products: Cement and building limes" require that "all traditional and well tried cements" used in Europe should be included in the standards which are developed. There are as yet no criteria for the descriptions "traditional" and "well tried". From a study of an inquiry, set up by CEN/TC 51 in 1990, it became obvious that some of the cements described as traditional by the respective national standardization bodies have been produced and used for decades so that their durability performance has been proved in practice. In contrast, there are some cements, also regarded as traditional and well tried by the respective national standardization bodies, which have been produced only for a few years and have been standardized nationally for only one or two years.

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 this Prestandard is to specify the composition, requirements and conformity criteria for the common cements. This includes all common cements which are described by the respective national standardization 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.

1 Scope

This European Prestandard specifies properties of the constituents of common cements and the proportions in which they are to be combined to produce a range of types and classes of cement. It then specifies the mechanical, physical and chemical requirements for these types and classes and states the rules for assessing their conformity to these requirements.

It is recognized that different cements have different properties and performance. Where performance tests are available (i.e. setting time, strength and soundness), they have already been taken into account in this European Prestandard. In addition, work is being carried out by CEN/TC 51 to identify any additional tests which are needed to specify further performance of cement. In the meantime, and during the life of this prestandard, it is necessary that the choice of cement, especially the type and/or strength class in relation to the exposure class and type of construction in which it is incorporated, should follow the national standards and other regulations valid in the place where the cement is used.

In addition to these requirements, an exchange of additional information between the cement producer and user may be helpful. The procedures for such an exchange are not within the scope of ENV 197-1 but are to be dealt with in accordance with national standards or regulations or may be agreed between the parties concerned.

2 Normative references

This European Prestandard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 196-1	Methods of testing cement - Determination of strength
EN 196-2	Methods of testing cement - Chemical analysis of cement
EN 196-3	Methods of testing cement - Determination of setting time and soundness
ENV 196-4	Methods of testing cement - Quantitative determination of constituents[1)]
EN 196-5	Methods of testing cement - Pozzolanicity test for pozzolanic cements

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EN 196-6	Methods of testing cement - Determination of fineness
EN 196-7	Methods of testing cement - Methods of taking and preparing samples of cement
EN 196-21	Methods of testing cement - Determination of the chloride, carbon dioxide and alkali content of cement
AFNOR P 18-592:	1980 Aggregates-methylene blue test
DIN 66131	Determination of specific surface area of solids by gas absorption using the Brunauer, Emmett and Teller method (BET); basic principles
DIN 66132	Determination of specific surface area of solids by adsorption of nitrogen; Haul and Dümbgen single-point differential method
Zement-Kalk-Gips 43 (1990), No. 8, p. 409 - 412	Procedures for the determination of total organic carbon (TOC) in limestone

3 Cement

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.

Cement conforming to this European Prestandard, termed CEM cement, shall, when appropriately batched and mixed with aggregate and water, be capable of producing concrete or mortar which retains its workability for a sufficient time and shall after defined periods attain specified strength levels and also possess long-term volume stability.

Hydraulic hardening of CEM cement is primarily due to the hydration of calcium silicates[2] but other chemical compounds may also participate in the hardening process, e.g. aluminates. The sum of the proportions of reactive calcium oxide (CaO)[3] and reactive silicon dioxide (SiO_2)[4] in CEM cement shall be at least 50 % by mass.

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2) There are also cements whose hardening is mainly due to other compounds, e.g. calcium aluminate in high-alumina cement, (to be included in future Parts of ENV 197).

3) Reactive calcium oxide (CaO) is considered to be only that fraction of the CaO which under normal hardening conditions can form calcium silicate hydrates or calcium aluminate hydrates. To evaluate this fraction, the total CaO content is to be reduced by the fraction calculated as calcium carbonate ($CaCO_3$) on the basis of the measured carbon dioxide (CO_2) content and the fraction calculated as calcium sulfate ($CaSO_4$) on the basis of the measured sulfur trioxide (SO_3) content, disregarding the SO_3 taken up by alkalis.

4) Reactive silicon dioxide (SiO_2) is defined as that fraction of the SiO_2 which, after treatment with hydrochloric acid (HCl), is soluble in boiling potassium hydroxide (KOH) solution. The quantity of reactive SiO_2 is determined by subtracting from the total SiO_2 content (see 13.9 of EN 196-2) that fraction contained in the insoluble residue (see clause 10 of EN 196-2), both on a dry basis.

CEM cements consist of individual small grains of different materials but they shall be statistically homogeneous in composition. A high degree of uniformity in all cement properties shall be obtained through continuous mass production processes, in particular, adequate grinding and homogenization processes. Qualified and skilled personnel and the facilities to test, evaluate and adjust product quality are essential for producing cements included in this European Prestandard.

The cement manufacturing process and its control shall ensure that the composition of CEM cements is kept within the limits fixed in this European Prestandard.

4 Constituents

4.1 Portland cement clinker (K)

Portland cement clinker is a hydraulic material which shall consist of at least two-thirds by mass of calcium silicates ($(CaO)_3.SiO_2$ and $(CaO)_2.SiO_2$), the remainder containing aluminium oxide (Al_2O_3), iron oxide (Fe_2O_3) and other oxides. 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.

Portland cement clinker is made by burning, at least to sintering, a precisely specified mixture of raw materials (raw meal, paste or slurry) containing CaO, SiO_2, Al_2O_3 and small quantities of other materials. The raw meal, paste or slurry shall be finely divided, intimately mixed and therefore homogeneous.

4.2 Granulated blastfurnace slag (S)

Granulated blastfurnace slag is a latent hydraulic material, i.e. it possesses hydraulic properties when suitably activated. It shall contain at least two-thirds by mass of glassy slag. The granulated blastfurnace slag shall consist of at least two-thirds by mass of the sum of CaO, MgO and SiO_2. The remainder contains Al_2O_3 together with small amounts of other oxides. The ratio by mass $(CaO + MgO)/(SiO_2)$ shall exceed 1,0.

Granulated blastfurnace slag is made by rapid cooling of a slag melt of suitable composition, as obtained by smelting iron ore in a blastfurnace.

4.3 Pozzolanic material (P, Q)

4.3.1 General

Pozzolanic materials are natural substances or industrial pozzolanas, siliceous or silico-aluminous, or a combination thereof. Although fly ash and silica fume have pozzolanic properties, they are specified in separate clauses (see 4.4 and 4.7).