



BSI Standards Publication

Cement

Part 5: Portland-composite cement CEM II/C-M and Composite cement CEM VI

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European foreword

This document (EN 197-5:2021) has been prepared by Technical Committee CEN/TC 51 “Cement and building lime”, 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of an identical text or by endorsement, at the latest by November 2021, and conflicting national standards shall be withdrawn at the latest by November 2021.

The purpose of this document is to specify the requirements for the two more recently developed cement types, Portland-composite cement CEM II/C-M and Composite cement CEM VI, which are not covered by the European Standard EN 197-1:2011. The fitness of these cement types for the intended use to produce structural concrete (reinforced or not) has been experimentally assessed by testing programs developed in the frame of CEN/TC 51/WG 6, the results of which have been included in three dossiers [5, 6, 7] approved by CEN/TC 51.

The cement types and strength classes defined in this document allow the specifier and/or the user to fulfil objectives of sustainability for cement-based constructions and to minimize the use of natural resources in accordance with local conditions of production.

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Introduction

It is recognized that different cements have different properties and performance. The performance tests available at the time of publication of this document (i.e. for the determination of 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, mortar, grout etc. valid in the place of use.

The European Committee for Standardization (CEN) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning Portland limestone calcined clay cement given in Clause 4 as a possible CEM II/C-M cement and which is claimed to be relevant for the following clauses of this document: Clause 1 and Clause 4.

CEN takes no position concerning the evidence, validity and scope of this patent right.

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Aalborg Portland A/S, 9220 Aalborg Ost, Denmark.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. CEN shall not be held responsible for identifying any or all such patent rights.

1 Scope

This document deals with Portland-composite cement CEM II/C-M, not covered by EN 197-1, and a different type of Composite cement CEM VI, also not covered by EN 197-1, whose intended use is the preparation of concrete, mortar, grout etc.

This document does not cover:

- common cement covered by EN 197-1;
- 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 documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 197-1:2011, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 197-2:2020, *Cement — Part 2: Assessment and verification of constancy of performance*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 197-1:2011 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

4 Constituents and composition

Constituents of cement covered by this document shall fulfil the requirements specified in Clause 5 of EN 197-1:2011.

However, the following requirement for limestone (L, LL) replacing 5.2.6 a) of EN 197-1:2011 shall apply:

The calcium carbonate (CaCO_3) content calculated from the calcium oxide content shall be at least 40 % by mass and the sum of calcium carbonate and magnesium carbonate (CaCO_3 and MgCO_3) content calculated from the calcium oxide and magnesium oxide content respectively shall be at least 75 % by mass.

The composition of Portland-composite cement CEM II/C-M and Composite cement CEM VI covered by this document is specified in Table 1.

Table 1 — Portland-composite cement CEM II/C-M and Composite cement CEM VI

Main types	Notation of the products (types of cement)		Composition (percentage by mass a)											Minor additional constituents
			Main constituents											
			Clinker	Blast-furnace slag	Silica fume	Pozzolana		Fly ash		Burnt shale	Limestone			
	natural	natural calcined				siliceous	calcareous							
	Type name	Type notation	K	S	D ^b	P	Q	V	W	T	L ^c	LL ^c		
CEM II	Portland-composite cement ^d	CEM II/ C-M	50-64	←----- 36-50 ----->									0-5	
CEM VI	Composite cement	CEM VI (S-P)	35-49	31-59	-	6-20	-	-	-	-	-	-	0-5	
		CEM VI (S-V)	35-49	31-59	-	-	-	6-20	-	-	-	-	0-5	
		CEM VI (S-L)	35-49	31-59	-	-	-	-	-	-	6-20	-	0-5	
		CEM VI (S-LL)	35-49	31-59	-	-	-	-	-	-	-	6-20	0-5	
^a The values in the table refer to the sum of the main and minor additional constituents.														
^b In case of the use of silica fume, the proportion of silica fume is limited to 6-10 % by mass.														
^c In case of the use of limestone, the proportion of limestone (sum of L, LL) is limited to 6-20 % by mass.														
^d The number of main constituents other than clinker is limited to two and these main constituents shall be declared by designation of the cement (for examples, see Clause 6).														

5 Requirements

Cements covered by this document shall fulfil the requirements specified in 7.1, 7.2 and 7.4.1 of EN 197-1:2011.

The requirements listed in Table 3 of EN 197-1:2011 for low early strength, indicated by L, are applicable for CEM II/C-M and CEM VI cements.

In addition, cements covered by this document shall conform to the requirements listed in Table 2.

Table 2 — Additional requirements and Limit values for single results for Portland composite cement CEM II/C-M and Composite cement CEM VI

1	2	3	4	5
Property	Test reference	Strength class	Requirements given as characteristic values ^a	Limit values for single results ^a
Sulfate content (as SO ₃)	EN 196-2	all	≤ 4,0 ^b	≤ 4,5
Chloride content	EN 196-2	all	≤ 0,10 ^c	≤ 0,10 ^c

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

^b Portland composite cement with a T content > 20 % may contain up to 4,5 % sulfate (as SO₃) for all strength classes.

^c Composite cement CEM VI may contain more than 0,10 % chloride by mass. If so, the value of 0,10 % chloride by mass shall be replaced by the upper limit for the chloride content expressed as a percentage by mass with two decimal places and this upper limit shall be stated on the packaging and/or the delivery note.

6 Standard designation

Cements covered by this document shall be designated by at least the notation of the cement type as specified in Table 1 and the Figures 32,5, 42,5 or 52,5 indicating the strength class. In order to indicate the early strength class the letter L, N or R shall be added as appropriate.

When in the same factory a manufacturer produces different cements complying with the same standard designation, these cements receive an additional identification in the form of a number or of two lower case letters, between brackets, in order to distinguish these cements from each other. For the numbering system, this number should be 1 for the second certified cement, 2 for the next, and so on. For the lettering system, the letters shall be chosen in such a way as to avoid confusion.

Low heat cement in accordance with 7.2.3 of EN 197-1:2011 shall be additionally designated by the notation LH.

EXAMPLE 1

Portland-composite cement CEM II/C-M containing in total a quantity of silicious fly ash (V) of between 16 % and 44 % by mass and a quantity of limestone (LL) of between 6 % and 20 % by mass and of strength class 32,5 with high early strength and a low heat of hydration is designated by:

Portland-composite cement EN 197-5 – CEM II/C-M (V-LL) 32,5 R – LH

EXAMPLE 2

Portland-composite cement CEM II/C-M containing in total a quantity of granulated blast furnace slag (S) of between 6 % and 44 % by mass and a quantity of silicious fly ash (V) of between 6 % and 44 % by mass and of strength class 42,5 with ordinary early strength and a low heat of hydration is designated by:

Portland-composite cement EN 197-5 – CEM II/C-M (S-V) 42,5 N – LH

EXAMPLE 3

Composite cement CEM VI containing in total a quantity of granulated blast furnace slag (S) of between 31 % and 59 % by mass and limestone (L) of between 6 % and 20 % by mass and of strength class 32,5 with high early strength is designated by:

Composite cement EN 197-5 – CEM VI (S-L) 32,5 R

EXAMPLE 4

Composite cement CEM VI containing in total a quantity of granulated blast furnace slag (S) of between 31 % and 59 % by mass and natural pozzolana (P) of between 6 % and 20 % by mass and of strength class 42,5 with low early strength is designated by:

Composite cement EN 197-5 – CEM VI (S-P) 42,5 L

7 Conformity criteria

For cements covered by this document the conformity criteria specified in Table 2 and in Clause 9 of EN 197-1:2011 shall apply. In particular, conformity criteria specified for “all cements” in EN 197-1:2011 shall also apply for cement covered by this document.

The conformity of cements covered by this document should be demonstrated by:

- factory production control, including product assessment, in accordance with Clause 4 of EN 197-2:2020;
- assessment of the performance of the cement in accordance with 5.1 of EN 197-2:2020;
- initial inspection of the manufacturing plant and of factory production control in accordance with 5.2 of EN 197-2:2020;
- continuing surveillance, assessment and evaluation of factory production control in accordance with 5.3 of EN 197-2:2020;
- audit-testing of samples taken at the factory/depot in accordance with 5.4 of EN 197-2:2020.

Information concerning reports is given in 5.5 of EN 197-2:2020. Actions to be taken in the event of non-conformity are specified in 5.6 of EN 197-2:2020.

8 Attestation of conformity

For the attestation of conformity of cements covered by this document the procedure specified in Clause 6 of EN 197-2:2020 shall apply. When compliance with the conditions of this document is achieved, a certificate of conformity should be issued. The certificate shall include:

- name, address and identification number of the certification body;
- standard designation of the cement;
- name and address of the manufacturer or distributor and place of production;
- provisions to which the product conforms (i.e. this EN 197-5);
- conditions of validity of the certificate, where applicable;
- the number of the certificate;
- name of, and position held by, the person empowered to sign the certificate.

NOTE The terms “assessment and verification of constancy of performance (AVCP)” and “certificate of constancy of performance” are used in EN 197-2:2020 following the Commission Delegated Regulation (EU) No 568/2014. The use of these terms is not possible for cements covered by this document which is not a harmonized European standard.

The procedures to be used to evaluate the representativeness and the accuracy of the 28-day strength test results are described in the normative Annex A of EN 197-2:2020.

Information concerning the procedure for certification of constancy of performance of cement is given in the informative Annex B of EN 197-2:2020.

9 Marking and labelling

The choice of cement covered by this document, particularly as regards type and strength class for different applications and exposure classes, as well as the marking and labelling shall follow the appropriate standards and/or regulations valid in the place of use.

On the packaging, or for bulk product on the delivery documents, at least the following information shall be given:

- standard designation of the cement;
- manufacturer or distributor (name and address, plant);
- weight (nominal weight of bags or net weight of bulk cement);
- name or symbol of the product certification body.

Bibliography

- [1] EN 413-1, *Masonry cement — Part 1: Composition, specifications and conformity criteria*
- [2] EN 14216, *Cement — Composition, specifications and conformity criteria for very low heat special cements*
- [3] EN 14647, *Calcium aluminate cement — Composition, specifications and conformity criteria*
- [4] EN 15743, *Supersulfated cement — Composition, specifications and conformity criteria*
- [5] Doc CEN/TC 51/WG 6 N 333, *Joint report CRIC – Lafarge, Development of new ternary Cements with reduced Clinker content*¹
- [6] Doc CEN/TC 51 N 1232, *Technical dossier K-S-V cements and Letter of TC 51 Chairman*¹
- [7] Doc CEN/TC 51 N 1382, *Dossier KSP Cements*¹
- [8] Commission Delegated Regulation (EU) No 568/2014 of 18 February 2014 amending Annex V to Regulation (EU) No 305/2011 of the European Parliament and of the Council as regards the assessment and verification of constancy of performance of construction products

¹ The document can be provided on request by the [secretariat of the CEN Technical Committee CEN/TC 51](#).

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