

Ground granulated blast furnace slag for use in concrete, mortar and grout —

Part 1: Definitions, specifications and conformity criteria

The European Standard EN 15167-1:2006 has the status of a
British Standard

ICS 91.100.15; 01.040.91

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 15167-1:2006. Together with BS EN 15167-2 it supersedes BS 6699:1992 which will be withdrawn on 1 May 2008.

EN 15167-1 is a candidate “harmonized” European standard and fully takes into account the requirements of the European Commission Mandate M/128, *Products related to concrete, mortar and grout*, given under the EU Construction Products Directive (89/106/EEC), and is intended to lead to CE marking. The date of applicability of EN 15167-1 as a harmonized European standard, i.e. the date after which this standard may be used for CE marking purposes, is subject to an announcement in the Official Journal of the European Communities.

The Commission in consultation with Member States has agreed a transition period for the coexistence of harmonized European Standards and their corresponding national standard(s). It is intended that this period will comprise a period, usually nine months, after the date of availability of the European Standard, during which any required changes to national regulations are to be made, followed by a further period, usually of 12 months, for the implementation of CE marking. At the end of this coexistence period, the national standard will be withdrawn.

In the UK, the corresponding national standard is:

- BS 6699: 1992, *Specification for ground granulated blastfurnace slag for use with Portland cement*, and based on this transition period of 21 months, BS 6699:1992 will be withdrawn on 1 May 2008

NOTE This date is approximate. Users of this standard should contact BSI Customer Services for confirmation of withdrawal.

The UK participation in its preparation was entrusted by Technical Committee B/517, Cement and lime, to Subcommittee B/517/4, Additions for concrete. A list of organizations represented on B/517/4 can be obtained on request to its secretary.

Additional information

In most cases, ground granulated blastfurnace slag that conforms to BS 6699 will also conform to BS EN 1567-1, and vice-versa. The requirements for: fineness, glass content, sulfide, sulfate, loss-on-ignition, chloride and moisture content are essentially identical. The limit in BS EN 15167-1 for magnesia is higher than in BS 6699. Unlike BS 6699, BS EN 15167-1 contains no limits for manganese, insoluble residue or soundness. The 7- and 28-day strength requirements in BS EN 15167-1 are expressed as “activity indices” (% of strength of test cement) and are based on tests with 50% ground granulated blastfurnace slag (compared to 70% ground granulated blastfurnace slag in BS 6699), and the strength requirements cannot be directly compared. Comparative testing suggests that the strength requirements in BS EN 15167-1 are slightly less onerous than those in BS 6699. BS EN 15167-1 contains a requirement for the initial setting time to be not more than twice as long as the test cement on its own, whereas the requirement in BS 6699 is for the setting time to be not less than that of the test cement.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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English Version

Ground granulated blast furnace slag for use in concrete, mortar
and grout - Part 1: Definitions, specifications and conformity
criteria

Laitier granulé de haut-fourneau moulu pour utilisation dans
le béton, mortier et coulis - Partie 1: Définitions, exigences
et critères de conformité

Hüttensandmehl zur Verwendung in Beton, Mörtel und
Einpressmörtel - Teil 1: Definitionen, Anforderungen und
Konformitätskriterien

This European Standard was approved by CEN on 26 June 2006.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, 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 United Kingdom.



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Foreword

This document (EN 15167-1:2006) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by DIN.

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 February 2007, and conflicting national standards shall be withdrawn at the latest by May 2008.

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 Construction Products Directive (89/106/EEC).

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

The standard EN 15167 is composed of two parts:

- Part 1: Definitions, specifications and conformity criteria
- Part 2: Conformity evaluation

The preparatory work was carried out by WG15 of CEN/TC 104 since November 2003 in which the following countries participated: Austria, Belgium, Czech Republic, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Poland, Spain, Sweden, Switzerland and the United Kingdom.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, 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 United Kingdom.

1 Scope

This European Standard specifies requirements for the chemical and physical properties as well as quality control procedures for ground granulated blastfurnace slag for use as a type II addition in the production of concrete, including in particular cast-in-situ or prefabricated structural concrete conforming to EN 206-1. Ground granulated blastfurnace slag conforming to this European Standard may also be used in mortars and grouts.

Ground granulated blastfurnace slag containing any added materials other than grinding aids, is not within the scope of this European Standard. It is also not within the scope of this European Standard to specify provisions governing the practical application of ground granulated blastfurnace slag in the production of concrete, mortar or grout, i.e. requirements concerning composition, mixing, placing, curing etc. As regards such provisions, reference should be made to other European or national standards, such as EN 206-1.

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 196-6, *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 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 15167-2:2006, *Ground granulated blast furnace slag for use in concrete, mortar and grout — Part 2: Conformity evaluation*

3 Terms and definitions

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

3.1

activity index

ratio (in percent) of the compressive strength of mortar prisms made from 50 % by mass test cement and 50 % by mass ground granulated blastfurnace slag, relative to the compressive strength of equivalent mortar prisms made from 100 % test cement, tested at the same age

3.2

allowable probability of acceptance CR

for a given sampling plan, the allowed probability of acceptance of ground granulated blastfurnace slag with a characteristic value outside the specified characteristic value

3.3**autocontrol**

continual statistical quality control of the ground granulated blastfurnace slag based on the testing of samples taken by the manufacturer or their agent at point(s) of release from the ground granulated blastfurnace slag factory

3.4**characteristic value**

value of the required property outside of which lies a specified percentage, the percentile P_k , of all the values of the population

3.5**control period**

period of manufacture and/or dispatch identified for the evaluation of the autocontrol test results

3.6**granulated blastfurnace slag**

vitrified material made by rapid cooling of a slag melt of suitable composition, obtained by smelting iron ore in a blastfurnace, consisting of at least two thirds by mass of glassy slag and possessing hydraulic properties when suitably activated

NOTE Rapid cooling includes quenching in water (granulation) and projecting through water and air (pelletisation).

3.7**ground granulated blastfurnace slag**

fine powder made by grinding granulated blastfurnace slag

3.8**sampling plan**

specific plan which states the (statistical) sample size(s) to be used, the percentile P_k (on which the characteristic value is based) and the allowable probability of acceptance CR

3.9**single result limit value**

value of a mechanical, physical or chemical property which – for any single test result – in the case of an upper limit is not to be exceeded or in the case of a lower limit is, as a minimum, to be reached

3.10**specified characteristic value**

characteristic value of a chemical or physical property which in the case of an upper limit is not to be exceeded or in the case of a lower limit is, as a minimum, to be reached

3.11**spot sample**

sample taken at the same time and from one and the same place, relating to the intended tests. It can be obtained by combining one or more immediately consecutive increments (see EN 196-7)

3.12**test cement**

selected batch of Portland cement, to be used for carrying out the tests needed to evaluate conformity to the requirements of 5.3.2.2 and 5.3.2.3

3.13**type II addition**

finely divided inorganic, pozzolanic or latent hydraulic material that may be added to concrete in order to improve certain properties or to achieve special properties (see EN 206-1)

4 Constituents

The main constituent shall be granulated blastfurnace slag, as defined in 3.6. Its chemical composition shall consist of at least two-thirds by mass of the sum of calcium oxide (CaO), magnesium oxide (MgO) and silicon dioxide (SiO₂). The remainder shall be aluminium oxide (Al₂O₃) together with small amounts of other compounds. The ratio by mass (CaO + MgO)/(SiO₂) shall exceed 1,0.

Ground granulated blastfurnace slag conforming to this European Standard shall contain no added materials except grinding aids to assist in the manufacture. The total quantity of grinding aid shall not exceed 1,0 % and the organic content of any grinding aid(s) shall not exceed 0,2% (both by mass of the ground granulated blastfurnace slag). Grinding aids shall not promote corrosion of the reinforcement or impair the properties of the ground granulated blastfurnace slag or the concrete, mortar or grout, made from it.

5 Specifications

5.1 General

The chemical and physical requirements in 5.2 and 5.3 are specified as characteristic values. Conformity to a characteristic value is assessed by means of a statistical quality control procedure as described in Clause 8. The test methods prescribed in this European Standard are reference methods. In factory production control (see EN 15167-2), other methods may be used provided they give results equivalent to those obtained with the reference method. In case of a dispute, only the reference method shall be used.

5.2 Chemical requirements

The chemical properties of the ground granulated blastfurnace slag shall conform to the requirements in Table 1.

Table 1 — Chemical requirements given as characteristic values

Property	Test reference	Requirements ^a
magnesium oxide	EN 196-2	≤ 18 %
sulfide	EN 196-2	≤ 2,0 %
sulfate	EN 196-2	≤ 2,5 %
loss on ignition, corrected for oxidation of sulfide	EN 196-2	≤ 3,0 %
chloride ^b	EN 196-2	≤ 0,10 %
moisture content	Annex A	≤ 1,0 %
^a Requirements are given by mass of the ground granulated blastfurnace slag. ^b Ground granulated blastfurnace slag may contain more than 0,10 % chloride but in that case the maximum chloride content, as a value not to be exceeded, shall be stated on the packages or the documents (see Clause 6).		