

Specification for

Portland blastfurnace cements

Spécification des ciments Portlands de haut
-fourneau

Spezifikation für Hochofen Portlandzementes

Committees responsible for this British Standard

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Association of Consulting Engineers
 Association of Quality Pulverised Fuel Ash Suppliers
 Brick Development Association
 British Aggregate Construction Materials Industries
 British Cement Association
 British Precast Concrete Federation
 British Ready Mixed Concrete Association
 British Steel Industry
 Cementitious Slag Makers' Association
 Concrete Society
 County Surveyors' Society
 Department of the Environment (Building Research Establishment)
 Department of the Environment (Property Services Agency)
 Department of Transport
 Electricity Supply Industry in United Kingdom
 Federation of Civil Engineering Contractors
 Institute of Concrete Technology
 Institution of Civil Engineers
 Institution of Structural Engineers
 Mortar Producers' Association
 Royal Institution of Chartered Surveyors
 Society of Chemical Industry
 Water Services Association of England and Wales

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Foreword

This revision of this British Standard is published under the authority of the Technical Sector Board for Building and Civil Engineering. It was revised to align it more closely with developments in the work of Technical Committee 51, Cement and building limes, of the European Committee for Standardization (CEN), which is preparing a European Prestandard for cements. As an intrinsic part of this activity, CEN has published EN 196, a series of methods for testing cement, which the UK is obliged to implement by the withdrawal of the relevant Parts of BS 4550. In consequence, this British Standard specifies requirements in terms of the EN 196 test procedures. It supersedes BS 146 : Part 2 : 1973 which is withdrawn.

This revision introduces the following changes.

- (a) The two methods of producing Portland blastfurnace cements, i.e. by intergrinding and by dry blending, have been retained (see 5.3). A procedure for combining Portland cement and ground granulated blastfurnace slag in the concrete mixer is included in BS 5328 : Part 1.
- (b) Compositional requirements are expressed as a percentage of the total mass of the constituents but exclude calcium sulfate and any additives. This departure from the traditional method of calculation in the UK is fully explained in appendix B.
- (c) The proportion of blastfurnace slag is specified as 6 % (m/m) to 35 % (m/m) for Portland slag cement or as 36 % (m/m) to 65 % (m/m) for blastfurnace cement, expressed as a percentage of the total mass of the constituents but excluding calcium sulfate and any additives. (A cement with a proportion of slag of 50 % (m/m) to 85 % (m/m) is specified in BS 4246.)
- (d) The addition of minor constituents is permitted up to a level of 5 % (m/m), expressed as a percentage of the total mass of the constituents but excluding calcium sulfate and any additives, i.e. about 4.8 % (m/m) expressed as a percentage of the final cement.
- (e) Additives to improve the manufacture or the properties of the cement are permitted up to a level of 1.0 % (m/m) without declaration by the manufacturer.
- (f) The requirements are, in general, based on the results of tests on cement according to EN 196, which consists of the following Parts¹⁾.

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
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⁾ These European Standards will be published as Parts of BS EN 196.

(g) The requirements are specified as characteristic values and conformity is assessed by means of a statistical procedure for continuous inspection operated by the cement manufacturer (autocontrol) (see appendix A). This includes the concept of 'major defects' which are 'likely to reduce materially the usability of the cement for its intended purpose'. However, the 1989 draft European Prestandard is considered to be inappropriate for the manufacture of cement in the UK and the appendix therefore incorporates several footnotes identifying specific aspects. In particular, it is assumed, for this revision of this British Standard, that some limits are required for acceptance inspection, corresponding to those specified in BS 146 : Part 2 : 1973. Clause 11 therefore gives appropriate values which in several cases are more stringent than those for major defects given in appendix A.

(h) The strength requirements are based on the EN 196 : Part 1 mortar prism test in place of the BS 4550 concrete cube test and the concept of a maximum value for the strength at 28 days has been introduced. In addition to the two classes of standard strength, 32.5 and 42.5, with two and three subclasses respectively of early strength, this British Standard includes a higher class of standard strength 52.5, with two subclasses of early strength, to cover all Portland blastfurnace cements available in the UK. It should be noted that for prescribed or standard mixes, as described in BS 5328 : Part 1, unless the cement content is increased appropriately, the use of cements of the 32.5 standard strength class will lead to concrete of lower compressive strength and may reduce durability, compared with cements of a higher strength class.

(i) The test for initial setting time is essentially unchanged, but a requirement is not specified for the final setting time.

(j) Requirements are not specified for fineness limits, but the limit in BS 6699 is applicable to the blastfurnace slag constituent where the dry blending method is used (see 5.3).

(k) The limit for insoluble residue has been changed to an autocontrol maximum of 5.0 % (m/m) (corresponding to an acceptance inspection limit of 5.1 % (m/m) of the final cement) where a minor additional constituent is included in the cement. For cements not containing a minor additional constituent the current limit of 1.5 % (m/m) has been changed to an autocontrol maximum (corresponding to an acceptance inspection limit of 1.6 % (m/m) of the final cement).

(l) The 7.0 % (m/m) limit for magnesium oxide content of the cement has been changed to a maximum of 5.0 % (m/m) for the clinker.

(m) The limit for total sulfur (expressed as SO₃) has been changed to an autocontrol maximum limit for sulfate of 3.5 % (m/m) (corresponding to an acceptance inspection limit of 3.6 % (m/m) of the final cement).

(n) The limit for loss on ignition has been changed to an autocontrol maximum of 5.0 % (m/m) (corresponding to an acceptance inspection limit of 5.1 % (m/m) of the final cement) where a calcareous minor additional constituent is included in the cement. For cements not containing a calcareous minor additional constituent the current limit of 3.0 % (m/m) has been changed to an autocontrol maximum (corresponding to an acceptance inspection limit of 3.1 % (m/m) of the final cement).

(o) A limit for chloride content has been introduced.

(p) Guidance on the use of cement has been included in appendix C and attention is drawn to the safety precautions recommended therein when working with cement. Cement will partially hydrate when exposed to water vapour; appendix C also includes guidance on storage.

(q) Purchasers are recommended to specify cement manufactured and supplied to a nationally recognized third party product certification scheme.

Other British Standards for cement, i.e. BS 12, BS 4027, BS 4246, BS 6588 and BS 6610, have been revised at the same time.

Product certification. Users of this British Standard are advised to consider the desirability of third party certification of product conformity with this British Standard based on testing and continuing surveillance, which may be coupled with assessment of a supplier's quality systems against the appropriate Part of BS 5750.

Enquiries as to the availability of third party certification schemes will be forwarded by BSI to the Association of Certification Bodies. If a third party certification scheme does not already exist, users should consider approaching an appropriate body from the list of Association members.

Compliance with a British Standard does not of itself confer immunity from legal obligations.