



Cement—

Part 2: Conformity evaluation

The European Standard EN 197-2:2000 has the status of a British Standard

ICS 91.100.10

National foreword

This British Standard is the official English language version of EN 197-2:2000. It converts and supersedes DD ENV 197-2:1996 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee B/516, Cement and lime, to Subcommittee B/516/13, Conformity, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

This British Standard describes a scheme for the evaluation of conformity of a number of cements to their product specification standards, including certification of conformity. In so doing it complements BS EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*, and other relevant product specification standards which, when implemented in the UK, will make appropriate reference to this British Standard.

In addition, this British Standard acts as a supporting standard, by describing the tasks required for demonstrating legal attestation of conformity, to those British Standards which transpose harmonized European Standards for cements and other relevant products, mandated by the European Commission (EC) to be specified under a system of attestation of 1+, and which also make appropriate reference to this British Standard. Attestation of conformity is a legal means for demonstrating that a product meets the requirements of a harmonized European technical specification, as defined in the Construction Products Directive (89/106/EEC). In the case of a system 1+, it is supported by an EC certificate of conformity, issued by an EU notified body, enabling the manufacturer to issue an EC declaration of conformity and to affix the CE marking.

The CE marking indicates a presumption of conformity with the minimum legal health, safety and environmental requirements in the EU Member States; it is not a quality mark.

It should be noted that European Standards do not deal with acceptance at delivery. Recommended acceptance inspection procedures are, however, given in national annexes to British Standard specifications for cement which transpose European Standards.

This British Standard, having been prepared under the direction of the Sector Committee for Building and Civil Engineering, was published under the authority of the Standards Committee and comes into effect on 15 September 2000

© BSI 09-2000

ISBN 0 580 36455 0

Amendments issued since publication

Amd. No.	Date	Comments

This British Standard constitutes the first British Standard for the evaluation of conformity of cements and accordingly no British Standard is superseded.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 25 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

English version

Cement - Part 2: Conformity evaluation

Ciment - Partie 2: Evaluation de la conformité

Zement - Teil 2: Konformitätsbewertung

This European Standard was approved by CEN on 26 May 2000.

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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Contents

	Page
Foreword	3
1 Scope	3
2 Normative references	3
3 Definitions	4
3.1 Specific definitions	4
3.2 General definitions	5
4 Factory production control by the manufacturer	6
4.1 General requirements	6
4.2 Internal quality control	7
4.3 Autocontrol testing of samples	8
5. Tasks for the certification body	9
5.1 General	9
5.2 Surveillance, assessment and acceptance of the factory production control	9
5.3 Evaluation of the results of autocontrol testing of samples	10
5.4 Audit testing of samples taken at the factory/depot and initial type testing	11
5.5 Initial inspection of the factory and the factory production control	12
5.6 Evaluation of test results during the initial period	13
6 Actions in the event of non-conformity	13
6.1 Actions to be taken by the manufacturer	13
6.2 Actions to be taken by the certification body	14
7 Procedure for third party certification of conformity	14
8 Certificate of conformity and conformity mark	15
8.1 Indication of conformity	15
8.2 Certificate of conformity	15
8.3 Conformity mark	15
9 Requirements for dispatching centres	16
9.1 General requirements	16
9.2 Tasks for the intermediary	16
9.3 Tasks for the third party	17
Table 1 — Actions to be taken by the certification body in the event of non-conformity of the results of autocontrol and/or audit testing	18
Table 2 — Confirmation and audit testing of samples of certified cement taken at dispatching centres: properties and minimum testing frequencies	19
Annex A (normative) Evaluation of the representativeness and the accuracy of the 28 day strength test results	20
Annex B (informative) General definitions	23
B.4 Definitions from EN 197-1 and EN 196-7	24
Bibliography	25

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 51, Cement and building limes, the Secretariat of which is held by IBN.

This European Standard replaces ENV 197-2:1995

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 December 2000, and conflicting national standards shall be withdrawn at the latest by December 2000.

Annex A of EN 197-2 is normative, annex B is informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

EN 197-2 specifies the scheme for the evaluation of conformity of cements to their corresponding product specification standards, including certification of conformity by a certification body.

The standard provides technical rules for factory production control by the manufacturer, including autocontrol testing of samples, and for the tasks of the certification body. It also provides rules for actions to be followed in the event of non-conformity, the procedure for the certification of conformity and requirements for dispatching centres.

In EN 197-2 the word "cement" is used to refer both to common cements as defined in EN 197-1 and to other cements and binders for which the relevant product specification standard makes reference to EN 197-2 and which are submitted for certification. Such a cement is produced at a given factory and belongs to a particular type and a particular strength class, as defined and specified in the relevant product specification standard.

2 Normative references

EN 197-2 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 EN 197-2 only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- | | |
|---------------|---|
| EN 196-1, | <i>Methods of testing cement - Part 1: Determination of strength.</i> |
| EN 196-7, | <i>Methods of testing cement - Part 7: Methods of taking and preparing samples of cement.</i> |
| EN 197-1, | <i>Cement - Part 1: Composition, specifications and conformity criteria for common cements.</i> |
| ENV 413-1, | <i>Masonry cement - Part 1: Specification.</i> |
| EN ISO 17025, | <i>General requirements for the competence of testing and calibration laboratories.</i> |

- EN 45004, *General criteria for the operation of bodies performing inspection.*
- EN 45011, *General criteria for certification bodies operating product certification (ISO/IEC Guide 65:1996).*
- ISO 2854, *Statistical interpretation of data - Techniques of estimation and tests relating to means and variances.*

3 Definitions

For the purposes of EN 197-2, the following definitions apply:

3.1 Specific definitions

3.1.1

certificate of conformity

document issued under the rules of this scheme for the evaluation of conformity indicating that adequate confidence is provided that cement is in conformity with the relevant product specification standard

3.1.2

conformity mark

protected mark applied on the basis of the certificate of conformity (see 3.1.1)

3.1.3

certified cement

cement for which a certificate of conformity (see 3.1.1) has been issued

3.1.4

initial period

immediate period after the first issuing of the certificate of conformity for a cement

3.1.5

certification body

impartial body, governmental or non-governmental, possessing the necessary competence and responsibility to carry out conformity certification according to given rules of procedure and management

3.1.6

factory production control

permanent internal control of cement production exercised by the manufacturer consisting of internal quality control complemented by autocontrol testing

3.1.7

factory

facility used by a manufacturer for the production of cement using equipment which is suitable for continuous mass production of cement including, in particular, equipment for adequate grinding and homogenization and the necessary silo capacity for the storage and dispatch of each cement produced. This equipment and the production control applied allow the control of production with sufficient accuracy to ensure that the requirements of the relevant product specification standard are met

3.1.8

new factory

factory which is not already producing cement(s) certified under this scheme

3.1.9

existing factory

factory which is already producing cement(s) certified under this scheme

3.1.10

depot

bulk cement handling facility (not located at the factory) used for the dispatch of cement (whether in bulk or bagged) after transfer or storage where the manufacturer has full responsibility for all aspects of the quality of the cement

3.1.11

dispatching centre

bulk cement handling facility (not located at the factory) used for the dispatch of cement after transfer or storage where an intermediary has full responsibility for all aspects of the quality of the cement

3.1.12

intermediary

natural or legal person who takes from the manufacturer bulk cement certified according to EN 197-2 and bearing the conformity mark, who undertakes full responsibility for maintaining in a bulk handling facility all aspects of the quality of the cement and who supplies the cement onwards to a further person

3.1.13

confirmation autocontrol testing

continual testing carried out by an intermediary which consists of testing of samples taken by the intermediary at the point(s) of release from the dispatching centre

3.1.14

works' quality manual

document that provides information on the factory production control which is applied by a manufacturer at a particular factory to ensure conformity of the cement with the requirements of the relevant product specification standard

3.2 General definitions

See annex B (informative).

4 Factory production control by the manufacturer

4.1 General requirements

4.1.1 Concept

Factory production control means the permanent internal control of cement production exercised by the manufacturer and consists of internal quality control (see 4.2) complemented by autocontrol testing of samples of cement taken at the point of release¹⁾ (see 4.3).

NOTE: The requirements of EN 197-2 as regards factory production control take account of those clauses of EN ISO 9002 which are relevant to the production, process control and testing of cement.

4.1.2 Works' quality manual

The manufacturer's documentation and procedures for factory production control shall be described in a Works' quality manual, which shall adequately describe, among other things:

- a) the quality aims and the organizational structure, responsibilities and powers of the management with regard to product quality and the means to monitor the achievement of the required product quality and the effective operation of the internal quality control (see 4.1.3);
- b) the manufacturing and quality control techniques, processes and systematic actions that will be used (see 4.2.1, 4.2.3 and 4.3.2);
- c) the inspections and tests that will be carried out before, during and after manufacture, and the frequency with which they will be carried out (see 4.2.2, 4.3.1 and 4.3.3).

The Works' quality manual prepared by the manufacturer for each factory shall include an adequate system of documentation (see 4.1.4 and 4.3.4).

The Works' quality manual shall address and document the procedures operated to ensure that the manufactured cement conforms to the technical specifications. The manual may reference associated documents which provide further details of the autocontrol testing of samples and the internal quality control. For the purpose of this scheme, the term Works' quality manual shall be considered to include these associated documents.

NOTE: In the case of an existing quality management system according to EN ISO 9002, the certification body may examine if the corresponding quality manual meets all the requirements of EN 197-2 which are relevant to the factory production control of cement. Provided all the requirements are included, this quality manual may also be applied for product certification.

4.1.3 Management systems

4.1.3.1 Quality policy statement

The Works' quality manual shall include a statement by management defining its quality policy, objectives and commitments to the attainment of product quality.

¹⁾ This testing corresponds also to the "further testing of samples" mentioned in Annex III Section 2 point (i) of the Construction Products Directive 89/106/EEC.

4.1.3.2 Management representative

The manufacturer shall appoint a management representative who, irrespective of other responsibilities, shall have defined authority and responsibility for ensuring that the requirements of EN 197-2 for the evaluation of conformity are implemented and maintained.

4.1.3.3 Internal audits and management review

In order to ensure the continuing suitability and effectiveness of the Work's quality manual to meet the requirements of EN 197-2, the manufacturer shall perform at least once per year:

- a) internal audits covering the scope of this clause 4 and 6.1;
- b) a management review of the factory production control, taking into account records of the internal audits.

4.1.3.4 Training

The Works' quality manual shall describe the measures taken to ensure that all the personnel involved in operations that can affect internal quality control and product quality have appropriate experience or training. Appropriate records shall be retained.

4.1.4 System of documentation

4.1.4.1 Document control

The management representative shall be responsible for the control of all documents and data related to factory production control and to this scheme for the evaluation of conformity.

This control shall ensure that the appropriate issues of all documents are available at essential locations, that obsolete documents are withdrawn and that changes or modifications to any document are effectively introduced.

A master list shall be established to identify the current version of documents in order to prevent the use of non-applicable documents.

4.1.4.2 Quality records

The manufacturer shall retain records of factory production control for at least the period required to comply with relevant legislation.

4.2 Internal quality control

4.2.1 Process control

4.2.1.1 General

The Works' quality manual shall describe the parameters for process planning, process control and testing, inspection, corrective action, verification, dispatch and the associated records.

4.2.1.2 Constituents and composition of cement

The manufacturer shall establish documented procedures and appropriate test methods to ensure that the constituents meet the requirements of the relevant product specification standard and are suitable to enable cement to be produced meeting the technical specification.

The Works' quality manual shall describe the methods used by the manufacturer to ensure that the composition of the cement produced conforms to the relevant product specification standard, including appropriate test methods.

4.2.1.3 Control of off-specification production

The Works' quality manual shall contain procedures to ensure that off-specification production is adequately managed.

4.2.2 Measuring and testing

4.2.2.1 Inspection, measuring and test equipment

The equipment for in-process inspection and testing shall be regularly checked and calibrated in accordance with the procedures and frequencies laid down in the Works' quality manual.

4.2.2.2 Inspection and test status

Procedures for the inspection and test status through the stages of manufacture shall be detailed in the Works' quality manual. These shall include procedures for the control of off-specification intermediate materials.

4.2.3 Handling, storage, packaging and delivery

The Works' quality manual shall describe the precautions taken for the protection of the quality of the cement while under the responsibility of the manufacturer. It shall include a description of the procedures used at depots. Delivery documentation shall allow traceability to the producing works.

4.3 Autocontrol testing of samples

4.3.1 Sampling and testing

The manufacturer shall operate a system of autocontrol testing for each certified cement. This system shall be used to demonstrate conformity to the requirements in the clause entitled "Conformity criteria" in the relevant product specification standard. The properties to be tested, the testing methods, the minimum frequency of autocontrol testing during routine testing and initial period testing and the conformity criteria shall be in accordance with the basic requirements given in the clause entitled "Conformity criteria" in the relevant product specification standard. For cements not being dispatched continuously, the frequency of testing and the point of sampling shall be as specified in the Works' quality manual.

All test data shall be documented.

4.3.2 Corrective action

The Works' quality manual shall document procedures for the review and adjustment of the factory production control in case of non-conformity (see 6.1).

The actions taken in the event of non-conformity shall be recorded in a report subject to inspection during the management review.

In the event of cement yielding a test result not conforming to the single result limit value conformity criteria specified in the relevant product specification standard, the manufacturer shall immediately determine the affected quantity, take appropriate action to prevent the dispatch of this quantity and inform the affected customer if such cement has been released. In addition, the

manufacturer shall immediately determine the causes of such non-conformity, take corrective actions and undertake a review of all relevant factory production control procedures. All such actions and findings shall be appropriately recorded in a report subject to inspection during the management review.

NOTE: The certification body may require to be kept informed of these actions and findings.

4.3.3 Measuring and test equipment for autocontrol testing

The equipment used for autocontrol testing shall be regularly checked and calibrated in accordance with procedures and frequencies laid down in the Works' quality manual. These procedures may include comparison of compressive strength test results by proficiency testing with another laboratory designated in the Works' quality manual.

The Works' quality manual shall document procedures to ensure that all personnel involved in autocontrol testing have appropriate experience and training. Appropriate records shall be retained.

4.3.4 Quality records

The manufacturer shall retain records of the autocontrol test results and appropriate records on test equipment for at least the period required to comply with relevant legislation.

5. Tasks for the certification body

5.1 General

The certification body (see 3.1.5) has responsibility for three separate functions - certification, inspection and testing. These three functions may be carried out by one body or by more than one body. The inspection function may be carried out by an inspection body (see B.1.1) and the testing function by a testing laboratory (see B.1.2). Reference to the certification body includes reference to any sub-bodies it has.

The certification body should comply with those clauses of EN 45011, EN 45004 and EN ISO 17025 which are relevant to this scheme for the evaluation of conformity.

5.2 Surveillance, assessment and acceptance of the factory production control

5.2.1 Inspection tasks

The inspection tasks include surveillance, assessment and acceptance of the factory production control operated by the manufacturer. Inspection shall include checking that any major change in the Works' quality manual which is relevant to the factory production control of cement has been reported to the certification body by the manufacturer within one month of its implementation.

Inspection shall verify that the factory production control complies with the requirements of clause 4 of EN 197-2 and has been carried out according to the Works' quality manual.

5.2.2 Frequency of inspections

The inspections shall normally be carried out once per year and the certification body shall inform the manufacturer in advance when an inspection is to be made.

5.2.3 Reports

Following each inspection, a confidential report shall be prepared and sent to the manufacturer.

The manufacturer shall, if appropriate, advise the certification body of any corrective actions taken or planned to be taken following receipt of the report.

The certification body shall then make a decision on its final assessment.

5.3 Evaluation of the results of autocontrol testing of samples

5.3.1 Evaluation tasks

Surveillance, assessment and acceptance of the factory production control includes evaluation of the test results of the manufacturer's autocontrol testing to check conformity to the statistical conformity criteria and single result limit values in the relevant product specification standard.

5.3.2 Number and timing of evaluations

The number of evaluations of the results of autocontrol testing of samples shall be at least two per year. The timing of the evaluations should be decided in advance.

5.3.3 Control period

The length of the control period for evaluation of the autocontrol test results shall be as specified in the clause entitled "Conformity criteria" in the relevant product specification standard, or equal to the initial period (see 5.6.1) in the case of a newly certified cement.

5.3.4 Evaluation of test results

Each evaluation shall be made on the test results obtained on all autocontrol samples of a given certified cement, without selection, taken during the control period preceding the date of the evaluation or during the initial period as the case may be.

NOTE: The evaluation of the test results should exclude any test result accepted as an outlier by the certification body.

In the case of managed step changes in product properties or in the case of limited production or dispatching runs during the control period the corresponding data sets may be evaluated separately.

The evaluations may normally be carried out by correspondence and each evaluation shall lead, for the property examined, to a single conclusion in respect of the set of test results as a whole.

5.3.5 Reports

Following each evaluation a confidential report shall be prepared and a copy sent to the manufacturer.

5.4 Audit testing of samples taken at the factory/depot and initial type testing

5.4.1 Sampling

Spot samples shall be taken under the responsibility of the certification body at the point(s) of release of cement from the factory and/or depots supplied with cement by the factory. These are taken principally in order to provide a check on the accuracy of the manufacturer's test results. Representatives of the certification body shall be granted access to the factory/depots at any time without giving prior notice in order to allow the samples to be taken.

5.4.2 Number of samples

The number of samples taken shall be at least six per year for each certified cement dispatched continuously from the factory. When certain certified cements are not dispatched continuously, this frequency and the point of sampling may be altered by mutual agreement between the certification body and the manufacturer.

The first sample of a cement to be certified is used for initial type testing.

The number of samples to be taken during the initial period (see 5.6.1) shall be at least one per month.

5.4.3 Properties and test methods

The mechanical, physical and chemical properties specified for testing in the clause entitled "Conformity criteria" in the relevant product specification standard shall be determined according to the indicated test methods.

The source of the EN 196-1 CEN Standard sand to be used for autocontrol and audit strength testing shall be as agreed between the manufacturer and the certification body.

5.4.4 Testing

Each sample taken shall be homogenized and divided into three sub-samples. The methods used to take and prepare samples shall be in accordance with EN 196-7. One sub-sample shall be retained by the manufacturer for testing and one shall be packed, sealed, clearly labelled and forwarded to the testing laboratory. The third sub-sample shall be sealed and retained by the manufacturer for a minimum period of three months. It is intended for use if:

- a) one of the first two sub-samples is lost, deteriorates or becomes contaminated;
- b) further testing is needed in the event of a dispute.

The first two sub-samples shall be tested, one by the manufacturer and one by the testing laboratory, for the required properties as listed in the relevant product specification standard, using the test methods indicated in that standard.

5.4.5 Evaluation of test results

The results obtained shall be evaluated by the certification body. The procedures described in annex A shall be used for the evaluation of the representativeness and accuracy of the 28 day strength results.

5.4.6 Reports

Following each evaluation of audit test results a confidential report shall be prepared without delay and a copy sent to the manufacturer.

5.4.7 Proficiency testing

The testing laboratory should carry out regular proficiency testing involving comparison of at least the compressive strength test results with other approved testing laboratories in order to maintain the accuracy required.

5.5 Initial inspection of the factory and the factory production control

5.5.1 Inspection of a new factory

In the case of a new factory, an initial inspection of the factory and the factory production control shall be made, based on information on the factory production control and the equipment to be used to produce the cement(s). The inspection shall, among other things:

- a) verify that the Works' quality manual complies with the requirements of 4.1.2;
- b) verify that the equipment used to produce and test the cement(s) meets the criteria in 5.5.3 and 5.5.4.

5.5.2 Inspection of an existing factory

In the case of a new type of cement at an existing factory, information on any significant changes concerning the factory production control and the equipment, caused by the production of the new cement, shall be considered. This shall form the basis to decide, based on the importance of the changes to the Works' quality manual, whether a particular inspection is necessary. In this case any new equipment which has caused a major change in the Works' quality manual shall be inspected to verify that it meets the relevant criteria in 5.5.3 and 5.5.4.

5.5.3 Criteria for the assessment of the production equipment

The inspection shall assess the suitability of the production equipment in relation to the Works' quality manual and in relation to providing the ability to meet the requirements of the relevant product specification standard. The following criteria shall be considered:

- a) The constituents as described in the relevant product specification standard shall be protected against contamination within the factory.
- b) Equipment shall be provided which is suitable for continuous mass production of cement, in particular for adequate grinding and homogenization, allowing control of production with sufficient accuracy to ensure that the requirements of the relevant product specification standard are met.
- c) Measures shall be taken to prevent the mixing of different cements during conveying and storage.
- d) Each cement shall be stored in one or more separate silos, protected to prevent contamination and deterioration. The silos may include or take the form of fully enclosed separated air-tight subdivisions. Silos and/or discharge points shall be clearly marked with an indication of the cement type, strength class and any additional identification required.
- e) Points where cement is released from the factory and/or depot shall allow samples to be taken in accordance with the methods in EN 196-7.

5.5.4 Criteria for the assessment of laboratories

The laboratory responsible for carrying out the tests required for internal quality control shall have at least the equipment needed to carry out the relevant tests indicated or referred to in the Works' quality manual (see also 4.2.2).

The laboratory responsible for carrying out autocontrol testing shall have at least the equipment needed to carry out tests for the properties listed in the relevant product specification standard using the test methods indicated (see 4.3.3).

The laboratories shall demonstrate the ability to provide results within a time and in a manner suitable for the manufacturer's factory production control.

5.5.5 Reports

Following any initial inspection, a confidential report shall be prepared and a copy sent to the manufacturer.

5.6 Evaluation of test results during the initial period

5.6.1 Initial period

The duration of the initial period (see 3.1.4 and clause 7) shall be, as a rule, three months.

5.6.2 Evaluation of test results

The evaluation of test results on the cement shall be based on the autocontrol test results (see 4.3.1) and the audit test results (see 5.4.2) obtained from the first sample and from further samples taken during the initial period.

5.6.3 Reports

Following the evaluation a confidential report shall be prepared, considered by the certification body and a copy sent to the manufacturer.

6 Actions in the event of non-conformity

6.1 Actions to be taken by the manufacturer

The control of non-conforming cement and the corrective actions to be taken are dealt with in 4.3.2. These are the full responsibility of the manufacturer, who shall document the detailed procedures in the Works' quality manual.

In the event of a complaint plus warning the minimum frequency of autocontrol testing of non-conforming properties shall be doubled for a period of two months following the warning, unless it can be demonstrated to the satisfaction of the certification body that adequate measures were taken from the time of the initial occurrence of the non-conformity until its resolution, including doubling the minimum frequency of autocontrol testing for a minimum period of two months.

6.2 Actions to be taken by the certification body

6.2.1 Following surveillance, assessment and acceptance of the factory production control (see 5.2) and evaluation of the results of autocontrol testing (see 5.3)

The reports made following the assessment of the factory production control (see 5.2.3) and the evaluation of the results of the autocontrol testing (see 5.3.5) shall form the basis for any decisions/actions taken by the certification body and shall be considered on a case by case basis.

In the event that the results of the manufacturer's autocontrol testing indicate that the requirements given in the clause entitled "Conformity criteria" in the relevant product specification standard are not met, the actions taken by the certification body shall be as shown in Table 1. The certification body shall check that in the event of a complaint plus warning the minimum frequency of autocontrol testing of non-conforming properties has been doubled for a period of two months following the warning (see 6.1).

6.2.2 Following evaluation of the results of the audit testing of samples taken at the factory/depot (see 5.4 and annex A)

If comparisons carried out of 28 day strengths according to A.3 show deviations indicating sampling or testing errors, the reasons shall be identified. Any differences in other properties which could lead to non-conformity should be identified and appropriate action taken. The certification body shall establish whether appropriate actions have been taken to correct for these deviations and shall specify any further actions required including, if necessary, correction of all relevant results.

If the results of the audit testing include a test result outside the specified characteristic value, the inspection body shall evaluate the results of the manufacturer's autocontrol testing over an appropriate period and make a report to the certification body. If the autocontrol testing is found to be satisfactory no further action is necessary. If the autocontrol testing confirms the findings of the audit testing the actions taken by the certification body shall be as shown in Table 1.

If the results of the audit testing do not meet the single result limit value conformity criteria specified in the clause entitled "Conformity criteria" in the relevant product specification standard, the actions taken by the certification body shall be as shown in Table 1.

7 Procedure for third party certification of conformity

When a manufacturer applies for certification of a cement, the certification body shall arrange for an initial inspection of the factory and the factory production control (if required) (see 5.5) and for the initial type testing of a first audit sample of the cement by the testing laboratory according to 5.4.1 to 5.4.4 and including evaluation of composition.

Given that the inspection (if any) indicates that the requirements of 5.5 are met and that the results of the initial type testing of the first sample conform to the requirements of the relevant product specification standard, then the certification body shall issue a certificate of conformity.

During the initial period, the results of the audit testing obtained by the testing laboratory and the results of the autocontrol testing obtained by the manufacturer shall be evaluated by the certification body (see 5.6.3).

If this evaluation is satisfactory, the certificate of conformity remains valid unless cancelled (or withdrawn as a result of actions taken in the event of non-conformity, see clause 6).

In the event that a manufacturer permanently ceases production of a particular certified cement, he shall advise the certification body accordingly and the relevant certificate of conformity shall be cancelled. A manufacturer shall be deemed to have permanently ceased production of a cement when a period of twelve months has elapsed since the date of the last autocontrol sample.

Within a given type or strength class of cement which is already produced at the same factory and for which the manufacturer has obtained a certificate of conformity, a particular cement with an intentionally different composition, physical or chemical properties or compressive strengths may, if requested by the manufacturer, be assessed, certified and identified as a different cement. In such cases, the certificate of conformity shall be issued on the basis of the manufacturer's autocontrol testing (see 4.3.1) and the first audit sample tested by the testing laboratory (see 5.4).

8 Certificate of conformity and conformity mark

8.1 Indication of conformity

Conformity of a cement to the relevant product specification standard shall be indicated by a certificate of conformity issued by the certification body and the related use of a conformity mark by the manufacturer.

8.2 Certificate of conformity

The certificate of conformity shall include, in particular:

- a) the name and address of the certification body;
- b) the name and address of the manufacturer and of the factory;
- c) the standard designation of the cement according to the relevant product specification standard and any additional identification required;
- d) statement that the cement conforms to the requirements of the relevant product specification standard and that the conformity is established according to EN 197-2;
- e) the certificate's number.

The certificate of conformity shall entitle the manufacturer to use the conformity mark on packaging and documentation used for the certified cement.

NOTE: For EC Certificate of Conformity, see annex ZA of EN 197-1.

8.3 Conformity mark

The conformity marking shall consist of the conformity symbol and shall be followed by:

- a) the identification number of the certification body responsible for certification of conformity,
- b) the name or identifying mark of the manufacturer and of the factory;
- c) the last two digits of the year in which the conformity mark was affixed;
- d) the number of the certificate of conformity;
- e) the standard designation of the cement according to the relevant product specification standard and any additional identification required.

NOTE: For CE conformity marking, see annex ZA of EN 197-1.

9 Requirements for dispatching centres

9.1 General requirements

Intermediaries operating dispatching centres have a responsibility to maintain the quality, the identity and the conformity of certified cements (certified under a certificate of conformity issued according to EN 197-2 to the manufacturer and bearing the conformity mark).

The intermediary shall demonstrate that the conformity of the bulk certified cement received is maintained during transport, reception, storage, packaging and dispatch and that the quality and the identity of the cement is assured from the manufacturer to the user after dispatch. This should be shown by meeting the requirements given in 9.2 and 9.3.

9.2 Tasks for the intermediary

9.2.1 Measures to maintain the cement quality

The intermediary shall demonstrate that he operates measures to maintain the quality of the certified cement and shall have a quality manual which describes the quality aims and the organizational structure and which adequately covers purchasing, transport, reception, handling, storage, testing and dispatch of the cement, taking into account the principles given for the manufacturer in clause 4.

In particular these measures shall include appropriate acceptance and identification testing in order to demonstrate that the bulk certified cement delivered to the dispatching centre has not suffered from contamination or ageing and corresponds to the cement specified in the purchasing or delivery contracts. In addition appropriate measures shall be taken to ensure that different cements (different types, strength classes and/or origin) are kept separate and are stored in separate silos and that contamination of cement is avoided.

The minimum frequency of the reception identification testing is one test per delivery, but at least one test per 500 tonnes. The properties to be determined for rapid identification (e.g. fineness, loss on ignition or colour) may be chosen by the intermediary, subject to approval by the inspection body.

9.2.2 Confirmation autocontrol testing of samples taken at the dispatching centre

For certified cement, the intermediary shall carry out confirmation autocontrol testing of samples to verify that the cement maintains its properties. The frequency of sampling and testing, the test properties and the test methods shall be at least as specified in Table 2. The results of the autocontrol testing carried out at the dispatching centre and at the factory supplying the certified cement should be compared.

The confirmation autocontrol testing may be carried out in the laboratory of the intermediary or in an external laboratory. Representatives of the inspection body shall be granted access to the laboratory in order to verify that the equipment used to test the cement meets the criteria of 5.5.4 and 4.3.3.

The individual results of confirmation autocontrol testing carried out by an intermediary in respect of each certified cement shall remain within the range of the maximum and minimum values of the relevant manufacturer's autocontrol results in any given control period.

9.3 Tasks for the third party

9.3.1 Surveillance, assessment and acceptance of the measures to maintain the cement quality and of the confirmation autocontrol

The third party shall carry out an initial inspection and, thereafter once per year, a surveillance, assessment and acceptance of the measures to maintain the quality of the certified cement by the intermediary. Among other things, the inspection shall assess whether the equipment is suitable, taking account of 5.5.3 and 5.5.4 where relevant, and shall examine the unloading system, the storage facilities, the reclaiming and loading system and the laboratory. In particular the procedures adopted to avoid wrong routing of cements or mixing of different cements shall be considered with special care.

The third party shall check by inspection at least twice a year that the results of the intermediary's confirmation autocontrol testing conform to 9.2.2. If the results of the autocontrol testing are outside the range of the maximum and minimum values of the autocontrol testing at the factory for a relevant control period the right to continue to use the conformity mark shall be based on a case by case assessment.

Following the inspection, the third party shall prepare a confidential report on its assessment and send this to the intermediary.

9.3.2 Audit testing of samples taken at the dispatching centre

Sampling and testing shall be carried out under the responsibility of the third party as in 5.4.1, 5.4.3 and 5.4.4. Each sample shall be packed, clearly labelled and forwarded to the testing laboratory.

The frequency of audit testing, the test properties and the test methods shall be at least as specified in Table 2.

9.3.3 Decisions to be taken

The third party shall decide on the basis of all its findings whether the intermediary has met the requirements of 9.1 to maintain the quality, the identity and the conformity of the certified cement so that the continuation of the use of the conformity mark is justified.

Table 1 — Actions to be taken by the certification body in the event of non-conformity of the results of autocontrol and/or audit testing

Criterion	Item		Non-conformity of test result(s) ^{a)}	Action to be taken by certification body		
				Issue of a complaint	Issue of a complaint plus warning ^{b)}	Withdrawal of certificate of conformity ^{c)}
Specified characteristic value	Auto-control testing	All results in control period	Non-conformity of the test results with the requirements of the statistical conformity criteria specified in the relevant product specification standard	First non-conformity of the test results	Non-conformity of the test results for the same property in two consecutive statistical assessments ^{d)}	Non-conformity of the test results for the same property in three consecutive statistical assessments
Single result limit value	Auto-control testing and audit testing	Individual results	Non-conformity of any result with the requirements of the single result limit value conformity criteria specified in the relevant product specification standard	First non-conformity of a test result	Second non-conformity of a test result for the same property within 12 ^{f)} months ^{e)}	Third non-conformity of a test result for the same property within 12 ^{f)} months ^{e)}

a) Non-conformities for different properties are treated separately.
b) The minimum frequency of autocontrol testing shall be doubled for a period of two months following receipt of a complaint plus warning, unless it can be demonstrated to the satisfaction of the certification body that adequate measures were taken from the time of the initial occurrence of the non-conformity until its resolution, including doubling the minimum frequency of autocontrol testing for a minimum period of two months.
c) Withdrawal is always based on a case by case assessment.
d) In the case of the upper limit of the standard strength the issuing of a complaint plus warning should be based on a case by case decision.
e) Only if information on the preceding non-conforming test result has been available at the time of sampling.
f) 24 months for masonry cement.

Table 2 — Confirmation and audit testing of samples of certified cement taken at dispatching centres: properties and minimum testing frequencies ^{a)}

Properties to be tested ^{b) c)}	Minimum testing frequencies		
	Confirmation autocontrol by the intermediary		Audit testing by the third party
	Cement unloaded and stored at the dispatching centre	Cement transhipped at the dispatching centre	
Early strength	1/week	—	—
Standard strength	—	—	—
Initial setting time	1/week	1 per delivered lot but at least	6/year
Loss on ignition	1/week		
Insoluble residue		1 per 500 tonnes	—
Pozzolanicity	2/month	—	—
Air content	1/fortnight	—	—

^{a)} The methods used to take and prepare samples shall be in accordance with the requirements of EN 196-7.

^{b)} If required by the relevant product specification standard.

^{c)} Using the test methods referred to in the relevant product specification standard.

Annex A (normative)

Evaluation of the representativeness and the accuracy of the 28 day strength test results

A.1 General

This annex describes the procedures to be used to evaluate the representativeness and the accuracy of the 28 day strength test results. The evaluation shall preferably be made in connection with the routine yearly inspection by the inspection body.

A.2 Sets of results considered

The evaluation procedure considers the following three sets of test results:

- A all test results from the autocontrol testing during the period under consideration;
- B the results of tests carried out by the manufacturer on samples taken for audit testing;
- C the results of tests carried out by the testing laboratory on samples taken for audit testing.

The number of results in each of the sets *B* and *C* is at least six. They should be equally distributed throughout the period under consideration.

A.3 Evaluation procedure

A.3.1 Introduction

The evaluation procedure includes two parts, as described in A.3.3 and A.3.4. For masonry cement see also A.3.5. The symbols used are listed in A.3.2.

A.3.2 Symbols

The symbols used in A.3.3 to A.3.5 are given in Table A1.

Table A1 — Symbols

Symbol	Meaning
M_A	is the average of all results of the autocontrol testing during the period under consideration
M_B	is the average of the results of the tests carried out by the manufacturer on the samples taken for audit testing
M_C	is the average of the results of the tests carried out by the testing laboratory on samples taken for audit testing
N_B	is the number of the samples taken for audit testing
S_A	is the standard deviation of all results of the autocontrol testing during the period under consideration
S_D	<p>is the standard deviation of the differences between the corresponding results of the samples taken for audit testing as defined by $d_i = B_i - C_i$</p> <p>where B_i is the individual test result by the manufacturer C_i is the corresponding individual test result by the testing laboratory.</p> $S_D = [(\sum d_i^2 - (\sum d_i)^2 / N_B) / (N_B - 1)]^{1/2}$

A.3.3 Evaluation of whether set A and set B belong to the same population (sampling error check)

a) Where $|M_A - M_B| \leq 2,0$ ²⁾ MPa,

the two sets of results may be considered to belong to the same population.

b) Where $|M_A - M_B| > 2,0$ ²⁾ MPa,

if $|M_A - M_B| \leq 2,58 \times S_A / (N_B)^{1/2}$

the two sets of results are considered to belong to the same population,

if $|M_A - M_B| > 2,58 \times S_A / (N_B)^{1/2}$

the reason shall be identified by the manufacturer. (In this case the two sets of test results can be considered to belong to different populations with a confidence level of 99 % as described in ISO 2854).

²⁾ These are values applicable for cement conforming to EN 197-1. The values for masonry cement are given in A.3.5. Values for other cements may be indicated in the relevant product specification standard.

A.3.4 Comparison between set *B* and set *C* in order to check the accuracy of the autocontrol testing (testing error check)

Two conditions should be satisfied:

- a) $S_D \leq 3,4$ ²⁾ MPa;
- b) $|M_B - M_C| \leq 4,0$ ²⁾ MPa.

If either or both of these conditions are not satisfied the reasons shall be identified by the manufacturer and the inspection body.

A.3.5 Masonry cement

For masonry cement (ENV 413-1) the following numerical criteria shall apply in place of the values given in A.3.3 and A.3.4:

Criterion	Masonry cement, type/class		
	MC5	MC12,5 / MC12,5X	MC 22,5X
$ M_A - M_B $	1,0	1,4	2,0
S_D	1,7	2,4	3,4
$ M_B - M_C $	2,0	3,0	4,0

²⁾ These are values applicable for cement conforming to EN 197-1. The values for masonry cement are given in A.3.5. Values for other cements may be indicated in the relevant product specification standard.

Annex B (informative)

General definitions

B.1 Definitions based on the Construction Products Directive (89/106/EEC)

B.1.1

inspection body

impartial body having the organization, staffing, competence and integrity to perform according to specified criteria functions such as assessing, recommending for acceptance and subsequent audit of manufacturers' quality control operations, and selection and evaluation of products on site or in factories or elsewhere, according to specific criteria

B.1.2

testing laboratory

laboratory which measures, examines, tests, calibrates or otherwise determines the characteristics or performance of materials or products

B.2 Definitions from or based on EN 45020

B.2.1

certification

procedure by which a third party gives written assurance that a product, process or service conforms to specified requirements

B.2.2

test

technical operation that consists of the determination of a characteristic of a product according to a specified procedure

B.2.3

test method

specified technical procedure for performing a test

B.3 Definition from EN ISO 8402

quality control

operational techniques and activities that are used to fulfil requirements for quality

B.4 Definitions from EN 197-1 and EN 196-7

B.4.1

autocontrol testing³⁾

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

B.4.2

control period

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

B.4.3

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

B.4.4

specified characteristic value

characteristic value of a mechanical, physical or chemical 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

B.4.5

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⁾ This testing corresponds also to the "further testing of samples" mentioned in Annex III Section 2 point (i) of the Construction Products Directive (89/106/EEC).

Bibliography

- 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 time and soundness*
- EN 196-5 *Methods of testing cement – Part 5: Pozzolanicity test for pozzolanic cements*
- EN 196-21⁴⁾ *Methods of testing cement – Part 21: Determination of the chloride, carbon dioxide and alkali content of cement*
- EN ISO 9002 *Quality systems – Model for quality assurance in production, installation and servicing (ISO 9002:1994)*
- EN 45020 *Standardization and related activities – General vocabulary (ISO/IEC guide 2:1996)*
- EN ISO 8402 *Quality management and quality assurance – Vocabulary (ISO 8402:1994)*

⁴⁾ EN 196-21 is currently being incorporated into EN 196-2.

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

Copyright subsists in all BSI publications. BSI also holds the copyright, in the UK, of the publications of the international standardization bodies. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI.

This does not preclude the free use, in the course of implementing the standard, of necessary details such as symbols, and size, type or grade designations. If these details are to be used for any other purpose than implementation then the prior written permission of BSI must be obtained.

If permission is granted, the terms may include royalty payments or a licensing agreement. Details and advice can be obtained from the Copyright Manager. Tel: 020 8996 7070.