PD CEN/TR 14245:2014

BSI Standards Publication

Cement — Guidelines for the application of EN 197-2 Conformity Evaluation

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National foreword

This Published Document is the UK implementation of CEN/TR 14245:2014. It supersedes PD CR 14245:2001 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/516/12, Sampling and testing.

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

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

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Zement - Richtlinien für die Anwendung von EN 197-2 Konformitätsbewertung

This Technical Report was approved by CEN on 18 August 2014. It has been drawn up by the Technical Committee CEN/TC 51.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (CEN/TR 14245:2014) has been prepared by Technical Committee CEN/TC 51 “Cement and building limes”, the secretariat of which is held by NBN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes CR 14245:2001.

Compared with CR 14245:2001, the following changes have been made:

— Guidelines harmonized with EN 197-2:2014 and standard text of EN 197-2:2014 included.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Report: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction to this Guidelines Document

Purpose

The purpose of this Guidelines Document is to provide explanatory detail on points not fully elaborated in EN 197-2. It is intended for use by manufacturers and by product certification bodies involved in the certification of cement following EN 197-2, in particular for the issuing of an EC certificate of constancy of performance.

This document does not deal with the necessary internal procedures that the product certification bodies will have.

It is an objective of this Guidelines Document that its use will assist in the establishment of equivalent procedures for certification of cement. It is expected that, following this document, traditional good procedures and practices that may be different can continue to be used, provided that they are not in contradiction with EN 197-2 and the relevant product specification standard. Such existing good procedures and practices, applied in conjunction with these Guidelines, are not considered to be an impediment to the achievement of the uniform level of certification throughout Europe, and by different product certification bodies, that is expected from the application of EN 197-2 together with these Guidelines.

This Guidelines Document is based on existing situations for production, evaluation of conformity and certification of cements. It may happen that product certification bodies be confronted by a situation different to those included in this document. In such a case, specific procedures should be elaborated on a case by case situation and be approved and fully recorded by the product certification body. These specific procedures should always fulfil the requirements of EN 197-1 and EN 197-2 and lead to the same level of confidence in product conformity that would be achieved by application of this Guidelines Document.

Arrangement

The clause numbering system of EN 197-2 is followed. The text of each of the clauses of the European Standard is reproduced in full and is followed by guidance, which is provided only for those clauses where clarification or elaboration is needed.

Clauses of EN 197-2

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Foreword

This document (EN 197-2:2014) has been prepared by Technical Committee CEN/TC 51 “Cement and building limes”, 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 July 2014, and conflicting national standards shall be withdrawn at the latest by July 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 197-2:2000.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

Compared to the version EN 197-2:2000, the following major changes have been made in this document:

— use of the terminology given by the Construction Products Regulation (Regulation (EU) No 305/2011) and comparison with the earlier terminology according to the Construction Products Directive (Directive 89/106/EEC) (Annex C);

— link between this European Standard and Annexes ZA of European Standards covering cements;

— guidance concerning the uncertainty of measurements in the evaluation of test results;

— numerical criteria for the evaluation procedure for calcium aluminate cement conforming to EN 14647, (Annex A);

— figure describing the procedure for certification of constancy of performance of cement in a new factory or of a new type of cement in an existing factory (Annex B).

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies the scheme for the assessment and verification of constancy of performance (AVCP) of cements to their corresponding product specification standards, including certification of constancy of performance by a product 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 product certification body. It also provides rules for actions to be followed in the event of non-conformity, the procedure for the AVCP and requirements for dispatching centres.

In this European Standard, 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 this European Standard 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.

The guidelines given in the Technical Report CEN/TR 14245 [1][1)] should be used for the application of this European Standard.

This European Standard should be linked with Annexes ZA of European Standards covering cements and binders, i.e. EN 197-1, EN 14216, EN 14647, EN 413-1, EN 15743, in particular for the assignments of tasks to the manufacturer and to the product certification body.

NOTE The reason for having drafted this separate document is that the provisions it includes are applicable to different products covered by different European Standards.

Guidance

EN 197-2 deals with the evaluation of conformity of cements and binders that are submitted for certification. It deals in particular with cases where “further testing” of the product is undertaken, as is the case for attestation system 1+ under the Construction Products Regulation. The products for which EN 197-2 is applicable are: the common cement products and the low heat cements and the sulfate resisting cements, refer to EN 197-1, the very low heat special cements, refer to EN 14216, the supersulfated cements, refer to EN 15743, the calcium aluminate cements, refer to EN 14647, and the masonry cements, refer to EN 413-1.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 196-7, *Methods of testing cement - Part 7: Methods of taking and preparing samples of cement*

EN 413-1, *Masonry cement - Part 1: Composition, specifications and conformity criteria*

EN 14647, *Calcium aluminate cement - Composition, specifications and conformity criteria*

ISO 2854, *Statistical interpretation of data — Techniques of estimation and tests relating to means and variances*

1) CEN/TR 14245 is currently in preparation and will revise CR 14245:2001.

3 Terms and definitions

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

3.1
AVCP
abbreviation for assessment and verification of constancy of performance

3.2
certificate of constancy of performance of the product
document issued under the rules of the scheme for the AVCP indicating that adequate confidence is provided that cement is in conformity with the relevant product specification standard

Guidance

The term “certificate of constancy of performance of the product” refers to certificates of constancy of performance of the product issued by a product certification body under the rules of EN 197-2. This includes an EC certificate of constancy of performance of the product issued in relation to the CPR.

3.3
conformity mark
protected mark applied on the basis of the certificate of constancy of performance of the product (see 3.2)

Guidance

The term “protected mark” includes registered mark, regulated mark and CE marking.

3.4
certified cement
cement for which a certificate of constancy of performance of the product (see 3.2) has been issued

3.5
initial period
immediate period starting after the first issuing of the certificate of constancy of performance of the product for a cement and at the latest from the first dispatching of cement

3.6
product certification body
impartial body, governmental or non-governmental, possessing the necessary competence and responsibility to carry out AVCP according to given rules of procedure and management

3.7
factory production control
documented, permanent and internal control of production in a factory, in accordance with the relevant harmonized technical specifications

3.8
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

Note 1 to entry: 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.

Guidance

According to EN 197-1:2014, Clause 4, common cements (CEM cements) consist of different materials and are statistically homogeneous in composition resulting from quality assured production and material handling processes. A high degree of uniformity in all cement properties is obtained through continuous mass production processes, in particular, adequate grinding and homogenization processes. Similar considerations apply for other cements.

Three categories of "factory" are recognized:

— traditional full cement factories, where clinker and cement are produced on the same site;

— grinding plants, where cement is produced by grinding supplied cement constituents;

— blending plants, where ground cement constituents, which may be received already combined as cement, are blended to produce finished cement.

The following operating steps, which apply for all of these types of factory, are essential in the manufacturing process. These steps are needed to ensure the necessary uniformity, continuity and suitability of the cement properties as well as the ability to meet the other requirements of the relevant product specification standard:

— use of separate and adequate storage for the cement constituents;

— Controlling the cement constituents – including, where relevant, their fineness and particle size distribution, and therefore their grinding – to achieve a performance of the cement compatible with the requirements of the product specification standard;

— proportioning the cement constituents in order to achieve the target composition of the cement;

— homogenization of the cement constituents by grinding, or by mixing where relevant;

— storage of finished product, in silos of adequate capacity, allowing proper identification of mass quantities of product and giving the possibility of taking spot samples at any time without prior notice.

Factories can only be operated by manufacturers which have personnel with sufficient experience and knowledge in all operating steps important for cement quality and which have the people, test procedures and test equipment to test, evaluate and correct the cement being produced. The definition of factory in EN 197-2 takes it, therefore, for granted that all operating steps listed above are carried out in effect under the same quality responsibility.

3.9
new factory
factory which is not already producing cement(s) certified using this European Standard

3.10
existing factory
factory which is already producing cement(s) certified using this European Standard

3.11
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

Guidance

It is important to point out the difference between a depot and a dispatching centre. The difference consists essentially of the linkage to the factory and the responsibility for the quality of the cement. In the case of a depot the facility is strictly linked to the factory and is included in the factory Works' quality manual. The manufacturer has full responsibility for the quality of the cement released from the depot. In a dispatching centre, in contrast, the facility is not at all linked to the factory and it is an intermediary (an entity taking certified cement, acting independently and operating between the manufacturer and a subsequent customer) who has full responsibility for the quality of the cement dispatched. A dispatching centre, being independent from the factory cannot be included in a Works' quality manual, but it has to ensure, using appropriate rules, that the quality of an already certified cement does not undergo any change.

Depots are included in the Works' quality manual. An entity other than the manufacturer may own and operate the depot but it does this on behalf of and under the strict quality management responsibility of the manufacturer.

3.12
dispatching centre
facility (not located at the factory) for handling and dispatching of cement (received in bulk or in any other condition) by activities that shall not modify the characteristics or the integrity of the product received from the manufacturer, where an intermediary has full responsibility for all aspects of the quality of the cement

Guidance

See guidance under 3.11 and 9.1.

3.13
intermediary
natural or legal person who takes from the manufacturer or the importer cement certified using this European Standard and bearing the conformity mark, taking full responsibility for maintaining in a cement handling facility all aspects of the quality of the cement and who supplies the cement onwards to a further person

3.14
determination of the product-type
determination of the set of representative performance levels or classes of a construction product, in relation to its essential characteristics, on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product

3.15
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

3.16
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 this European Standard and the relevant product specification standard

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 release[2)] (see 4.3).

NOTE The requirements of this European Standard as regards factory production control take account of those clauses of EN ISO 9001 [2] which are relevant to the production, process control and testing of cement.

Guidance

The purpose of factory production control is to ensure that the cement is manufactured in a controlled way to meet all of the requirements of the relevant product specification standard. In order that a product certification body can verify such a system it has to be documented in a structured way. This is carried out in a Works' quality manual supported and cross-referenced by a series of procedures, work instructions and other associated and relevant documents. These need to be clear, concise and adopt recommended good practices where applicable. The factory production control system may form part of a wider, integrated management system provided it can be demonstrated that all applicable EN 197-2 requirements are addressed. See also the Note in 4.1.1 of the standard.

As depots are under the direct responsibility of the cement manufacturer, the factory production control system shall include them and appropriate procedures should be produced, where relevant.

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, amongst 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.

In the case of an existing quality management system according to EN ISO 9001, the product certification body may examine if the corresponding quality manual meets all the requirements of this European Standard

2) This testing corresponds also to the "further testing of samples" mentioned in Annex V Section 1.1 point (a) (ii) of the Construction Products Regulation (Regulation (EU) No 305/2011).

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.

Guidance

The procedure for third party certification of conformity in the cases of a new factory (see 3.9) or of a new type of cement (see 5.5.2) in an existing factory (see 3.10) is shown in Annex B.

The steps to achieve the certificate of constancy of performance initially depend on the previous knowledge that the product certification body has from a factory. Therefore, a factory not previously known to the product certification body will have an initial inspection of the factory and a checking of the Works' quality Manual. This inspection will only be necessary in the case of a known factory if the cement to be produced requires special equipment to be introduced for its production.

A certificate of constancy of performance may be cancelled either voluntarily by request from the manufacturer to the product certification body or compulsorily after twelve months without production or if the circumstance for giving the certificate no longer apply (closing down of a company, new company, misuse of the certificate). As regards withdrawal, see EN 197-2:2014, 6.2 and Clause 7.

Separate certificates should be issued when two or more cements of the same type and strength class with controlled differences on the composition or in any chemical or physical property are manufactured in the same factory. These cements shall be marked with the type of cement and strength class followed by an indication in parentheses in order to make clear the difference.

Illustrative Example of Responsibilities – For Information Only

The producer has three overall responsibilities:

— To have an approach for production control and testing (to ensure that adequate quality procedures exist);
— To ensure that the procedures are carried out;
— To ensure that the approach and application are giving the expected results.

Responsibility and authority for personal responsible for the quality of the product and FPC system should be clear, communicated and understood within the organization.

Examples of responsibilities that should be defined are:

— The co-ordination, monitoring and updating of the Works' quality manual procedures;
— Ensuring all personnel at every level is kept informed of working methods, procedures, specifications and quality targets;
— Setting the requirements for process control and supervising their written transmission to the appropriate personnel;
— The system of management of corrective actions for the entire scope of the FPC system;
— Assessing the conformity of raw materials to the relevant specifications;
— Controlling of off-specification constituents and non-conforming cements;
— The identification and resolution of non-conformities in the FPC system;
— Supervising the recording and processing of relevant data and consequent approval;
— Provide the organization with periodic reports on the compliance status of the cement.

There needs to be a quality plan for the production of conforming cement and whilst it must be recognized that the plan can take on one of many forms and include such things as process flow charts and control tables, it shall show how each of the parts of the process are connected. There shall be a clear indication of where samples are taken and at what frequency, together with the tests to be applied. Targets and acceptability criteria should also be documented.

Regarding the NOTE at the end of 4.1.1, in the case of an existing quality management system in accordance with EN ISO 9001, it should be clearly stated in the Works' quality manual that the system is

also used for factory production control according to EN 197-2 and the relevant product specification standard.

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.

Guidance

The quality policy statement is a document signed normally by the managing director of the company or by the manager of the factory, depending on the organization of the company, or by both. It should include the quality aims and its commitment to meeting the requirements of standards and/or of its customers and to ongoing improvement, both internally and externally. It should indicate approval of the factory production control system as outlined in the Works' quality manual and that it is mandatory.

The system by which all personnel are informed of the quality policy should be documented. A route for feedback should be established to aid understanding of the policy.

In the case of an existing quality management system in accordance with EN ISO 9001, the quality policy statement should include a commitment to the attainment of cement quality in relation to the relevant product specification standard.

The Quality Policy should be reviewed periodically to ensure changes in aims are incorporated.

4.1.3.2 Management representative

The manufacturer shall appoint a management representative who, irrespective of other responsibilities, shall have defined and adequate authority and responsibility for ensuring that the requirements of this European Standard for the AVCP are implemented and maintained.

Guidance

The Management Representative should be clearly shown to have the necessary dedication, time and authority to ensure that cement continues to conform to the relevant product specification standard by the adoption of the requirements of the documented factory production control system. As he has the ultimate responsibility for the effective operation of factory production control his responsibilities should at least include maintenance of the Works' quality manual, the operation of process and autocontrol and the evaluation of the cement data to the relevant product specification standard requirements. Effective and unrestricted communication channels to other affected departments shall be open to the management representative to discuss possible problems.

The authority and responsibility for the factory production control system and the quality assurance of cement are not necessarily held by the same person.

The Works' quality manual should state to whom the responsibility is transferred in the absence of the management representative.

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 this European Standard, 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 functioning and the results of the factory production control, taking into account records of the internal audits.

Guidance

For audits to be of value there needs to be evidence that non-conformities raised are progressed to a satisfactory conclusion and this shall be assessed by management during the review. Reviews should be conducted to an established formal agenda by a management team and a record made of the findings, showing actions to be taken and relevant responsibilities. Reviews will need to take account of not only the internal audits but also of customer complaints.

Audits need to be carried out at an established frequency, procedures and plan, by trained personnel independent of the area to be audited.

It is essential that internal audits cover all aspects dealt with in the Works' quality manual, not forgetting compliance of cement constituents and cements with standard requirements and in-process specifications.

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.

Guidance

The adequate training of all personnel engaged in quality related matters and forming part of the factory production control system is of prime importance. It ensures that the exact skills and level of understanding are achieved to allow tasks to be carried out correctly and efficiently.

A training plan, covering all the relevant personnel should be available, listing the essential skills and education required for each element of the task/responsibility to be covered. These need to cover both technical skills and an understanding of the function and operation of quality systems. The training plan shall be supported by management and be continuous. It should indicate the minimum educational level required for each role. Training can be external, as well as internal – details of these should be recorded.

A separate training plan for new starters will be required to cover induction training.

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 AVCP.

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.

The manufacturer shall have a system to identify the current version of documents in order to prevent the use of non-applicable documents.

Guidance

The effectiveness of the factory production control system relies on the availability and use of correctly updated documents and data which include the Works' quality manual, procedures, operating instructions, technical specifications, plans, flowcharts, test methods and data records; this list is not

exhaustive. A procedure shall be available covering the issuing of amendments and updated documents. All documents should be listed, giving proper identification, issue status and approval, holders and locations and mode of disposal of previous issues. If previous issues are to be retained they shall be suitably marked to indicate that they are obsolescent and withdrawn.

The principles of the document control are the same as those of EN ISO 9001, which can therefore be used as guidelines.

4.1.4.2 Quality records

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

Guidance

All factory production control records should be kept for a minimum period of three years and the Works' quality manual will identify retention periods and location of all records. Factory production control records that relate directly to the finished cement should be retained for at least the period necessary to satisfy product liability legislation and for at least a period of ten years.

All records shall be legible, identifiable, retrievable and protected from damage, deterioration or loss. Where records have been transferred to electronic or optical storage media, suitable back-up copies should be taken.

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.

Guidance

Process control should be designed to prevent non-conformities arising. This cannot be achieved by testing only. To ensure that cement complies with the relevant product specification standard, planning of the production process is required and should address the following:

— A process flow description/diagram to illustrate the important production elements and show how each stage is interrelated. This should include all stages covered by the selected scope of the factory production control. It should also indicate measurement points, sampling points for the relevant tests and storage areas;

— Targets and control limits (and subsequent actions if these are not met) for each process stage, including parameters that are not included in the product specification standard, for example, specific surface area;

— Method and frequency of data collecting and processing;

— Procedures to cover 4.2.1 to 4.3.4 with particular reference to those in the cases of changing conditions such as start/stop operations, cement and silo changeovers;

— Prevention of contamination of cement, cement constituents (including clinker) and all materials covered by the selected scope of the factory production control, during production, handling and dispatch.

In following the requirements of EN 197-2, all categories of factory (see guidance under 3.8) should have, in particular, the following equipment and procedures:

— Separate storage for incoming materials, normally silos for powdered materials and adequate other forms of storage for granular materials;

— Testing and control of all cement constituents, the degree of which being adapted to the level of influence of the constituent to the ultimate quality of the product;

— Adequate blending and homogenization equipment and procedures;

— Silo(s) for each product awaiting dispatch;

— Adequate testing and control of intermediate products.

For grinding plants and full factories there should also be:

— Adequate grinding equipment and procedures.

In the case of blending plants, because the grinding facilities are located at a site that is remote from the plant, special consideration has to be given, on a case by case basis, to the equipment and to the factory production control to verify their suitability for producing cement in accordance with the requirements of the relevant product specification standard. For this purpose, the effectiveness of mixing and homogenization equipment should also be periodically assessed and verified. For blending plants, in addition to the equipment and procedure items listed above for all types of factory, there should also be:

— Arrangements to ensure that cement constituents are produced, supplied and received in accordance with the requirements of the relevant product standard and of the blending plant for the purpose of designing the cement and controlling its properties; when the constituents are received already combined as cement, the CE marking of the cement should be required as a possibility to prove compliance with the requirements; the composition of any incoming pre-mixed constituents including cement should be documented by the supplier;

— Documented procedures showing full traceability and control of the cement constituents whether received separately or in a combined form, for instance as cement; the quality manual should list all the relevant parameters for the control of the cement constituents, e.g. their fineness.

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.

Guidance

Incoming supply should be assessed against a previously agreed specification and will generally involve sampling and testing. Procedures may include those to establish suitability of different sources of all constituents including additives.

Adequate stocks shall be maintained and discrete, suitable storage should be available for each constituent. If any material is unsatisfactory, there shall be an adequate procedure for disposal and possible controlled use. This is particularly important for off-specification clinker or clinker and blastfurnace slag that have been stored outside.

Determination of cement composition also includes the amount of minor additional constituent.

The target level values and the allowed variation of all constituents should be specified and recorded.

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.

Guidance

It is necessary to make a distinction between the off-specification material within the production process that has to meet internal specifications fixed by the cement manufacturer (e.g. kiln feed, clinker, milled cement, ground cement constituents), and off-specifications related to the final cement specification required by EN 197-1. The former can be dealt by internal processing e.g. separate storage and controlled re-use, blending, which is designed to bring them back into specification. This may not be possible in the latter case. 4.3.2 will then be invoked.

Procedures should clearly indicate the measure to take, case by case, the identification of the off-specification products and where they are stored. The responsibility for the control release and re-use of these materials should be clearly defined and documented.

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.

Guidance

All equipment should be uniquely identified and verified to a programme prescribed in the Works' quality manual. Equipment used to control and monitor standard properties should be checked and calibrated. Verification and calibration records should enable verification of the calibration status of the equipment and that out of specification or calibration should be marked "not for use" and isolated. Verification and calibration procedures should be documented.

Feeding equipment shall be adequately checked and, where relevant, calibrated, to ensure constituent additions/percentages meet the requirements of the product specification standard.

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.

Guidance

The quality system and procedures should ensure that all required inspections and tests are carried out. The system needs to provide a way of showing these have been done and the particular status of materials at each stage of the process. This is probably best achieved by the signing-off of results in the operating logbooks by the quality manager or his appointee, supported by designated storage areas for the various materials.

Off-specification material should be suitably isolated and the procedures for re-use should be documented.

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.

Guidance

The means of handling and storage should prevent contamination or deterioration and allow different cements to remain separate, identifiable and protected through to release from the factory. Vehicle inspection, cleaning requirements and loading procedures should be documented in those situations the manufacturer has the responsibility to maintain the quality of the cement during delivery.

The Works' quality manual should list all the cement silos and their contents. Each silo should be numbered and marked to identify the cement. The marking should be placed at any position where it is required for production, dispatch or inspection purposes. A diagram of silos showing connection points, delivery and sampling outlets is also required. In the case of bagged cement, an adequate procedure should permit identification and traceability.

Delivery documentation should include at least factory/depot, quantity, destination and product designation. Internal quality documentation should include in addition the silo of origin. The delivery document and/or the bag marking have to meet the requirements of the Annex ZA of the relevant product specification standard.

A list of the Depots associated with the factory will be held in the Works' quality manual and the lines of responsibility clearly shown.

Weighing equipment should be uniquely identified and calibrated to a prescribed programme, and should carry a corresponding calibration certificate.

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 "Assessment and verification of constancy of performance – AVCP" 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 requirements given in the clause entitled "Assessment and verification of constancy of performance – AVCP" 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.

NOTE In earlier versions of product standards the title of the clause "Assessment and verification of constancy of performance – AVCP" is or was "Conformity criteria".

All test data shall be documented.

Guidance

This requirement establishes that it is necessary to ascertain conformity for released cement with the criteria contained in the clause "Assessment and verification of constancy of performance – AVCP" of the relevant product specification standard.

The sampling plan adopted should take into account all points of release including bag cement and depots. In the case of cements from depots, the amount of testing should be based on the proportion of each product dispatched, but having regard to the overall practicality and effectiveness of the autocontrol

testing and the rate of testing specified in the relevant product specification standard. It is essential that samples can be taken conveniently at any time at the point of release.

In the case of the non-continuous dispatch of a cement type, a minimum of 20 samples per 12 months is required to produce any meaningful statistics. A minimum of 2 samples shall be taken per production run/period of release from the factory. In any case, the minimum frequency defined in the reference standard should always be respected when the cement is available for dispatch.

Autocontrol testing will normally be undertaken by the manufacturer at the works laboratory but in certain circumstances, which shall be agreed with the product certification body beforehand, it may be carried out at a nominated laboratory, as documented in the Works' quality manual. In these cases, procedures are required to control sample dispatch and the integrity of reported data. In any case 4.3.3 will still apply.

The reporting of autocontrol data to the product certification body will be by the Web or by computer disk or by other suitable means, the means to be agreed with the product certification body. Reporting will be at a frequency requested by the product certification body and will be of at least two times per year (see 5.3.2).

For the documentation of the autocontrol test results the requirements of the relevant test standard (e.g. EN 196) have to be taken into account. Test data include all results of testing spot samples taken by the manufacturer at the point of release. Results of testing of in-process samples (milling samples) and of composite samples have to be excluded. The results of repeated tests of identical samples should be recorded.

The reporting of test results may include the determination of the statistical characteristics for the relevant control period, i.e. number of test results, mean, minimum and maximum value, number of test results exceeding the characteristic and limit values, standard deviation and relevant fractiles.

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.

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

Guidance

The occurrence of a non-conformity of the cement (whether in relation to the specified characteristic value or to the single result limit value) gives, as a rule, rise to a review of and, sometimes, to an adjustment of the factory production control. Specific procedures relating to the circumstances where a review is needed, how this review is carried out, and how the adjustment of the factory production control is made, have to be documented in the Works' quality manual.

Any non-conformity, when identified, leads the manufacturer to take corrective actions in order to correct problems that might cause non-conformities again. These corrective actions are detailed in a report in

order that their relevance is checked by the management during routine or specific management reviews (see 4.1.3.3).

It has to be highlighted that a non-conformity to a single result limit value implies, when the validity of the test result is proven, that a certain amount of non-conforming cement has been produced, stored and, sometimes, even dispatched. This is normally not the case when a test result outside the specified characteristic value occurs.

This difference justifies that specific procedures including urgent corrective actions, be documented in the Works quality manual, in case of non-conformity to a single result limit value.

Any mandatory actions required according to EN 197-2 are taken when the relevant test results are available. In the case of 28 day strengths, some initial actions might be taken on the basis of largely qualitative judgements made by the manufacturer using early indicators. Such initial actions would not be mandatory because of the difficulty of forecasting correctly the eventual 28 day strength. The initial actions could include informing the customer if it is anticipated that preventative actions need to be taken by him. Account would be taken of the size of the quantity of cement involved, the intended application of the cement, the reliability of the strength development forecast and the expected strengths at greater than 28 days.

The corrective actions mentioned are measures intended to eliminate the causes that gave rise to a non-conformity in relation to the single result limit value, thereby avoiding any repetition and should be judged in that way. Corrective actions imply changes in the procedures and the system and these should be documented, clearly defining the responsibilities.

It is current practice, although not mandatory, to draw the attention of the product certification body to the fact that a non-conformity has been identified and that appropriate corrective actions are taken. In some cases, the product certification body may require, once informed, and depending on the seriousness of the technical problems, to receive at short notice, detailed information on the corrective actions and, possibly, may decide to carry out a specific inspection of the factory.

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 according to ISO/IEC 17043 [6], see also 5.4.7.

Guidance

All equipment used for conducting autocontrol testing should be uniquely identified and calibrated to a prescribed programme. Equipment and/or materials used as references during these calibrations need to be referenced to national or other recognized standards. Calibration records should indicate acceptable limits of use and enable verification of the calibration status of the equipment; that out of calibration should be marked “not for use” and isolated. Calibration procedures should be documented. If it is found necessary to adjust data following re-calibrations, this should be documented and the product certification body informed. This will be of importance in situations where adjustment produces a non-conformity.

Any other methods may be used provided they are calibrated, either against the reference methods or against internationally accepted reference materials, in order to demonstrate their equivalence.

Appropriate actions should be taken when proficiency testing shows deviating results and these should be documented.

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.

Guidance

Regulations valid in the country of manufacture define the minimum period of retention of all autocontrol and test equipment records and additionally this should be for at least a period of ten years. The Works' quality manual will identify retention periods and location of all records. The records shall allow traceability of the autocontrol tests to the sampling points.

All records shall be legible, identifiable, retrievable and protected from damage, deterioration or loss. Where records have been transferred to electronic or optical storage media, suitable back-up copies should be taken.

5 Tasks for the product certification body

5.1 General

The product certification body (see 3.6) has responsibility for the certification of constancy of performance of the product.

NOTE Details of the tasks are given in Annex ZA of the relevant product standard.

The product certification body should comply with those clauses of EN ISO/IEC 17065, EN ISO/IEC 17020 and EN ISO/IEC 17025 which are relevant to this European Standard.

5.2 Continuous surveillance, assessment and evaluation of the factory production control

5.2.1 Inspection tasks

The inspection tasks include continuous surveillance, assessment and evaluation 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 product 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 and has been carried out according to the Works' quality manual.

Guidance

Subclause 5.2.1 deals with routine inspection of what should exist in the factory production control arrangements as required by Clause 4. See the guidance relating to the various sections of Clause 4 for details of what is required. (For initial inspection, see guidance relating to 5.5.3).

Principles given in EN ISO 19011[3)] provide valuable information for the carrying out of inspection according to EN 197-2.

The inspection team is normally composed of one or two persons, at least one of whom is technically competent in production and testing of cement. The inspection normally takes between one and two days depending on the complexity of the plant and the extent covered by the factory production control. During the inspection, the inspectors may take samples for audit testing.

3) EN ISO 19011, Guidelines for auditing management systems

The Works' quality manual (the main document together with the associated documents) should be in the language of the factory. The product certification body can request a translation of the main document of the Works' quality manual in a language of its choice. In addition, where necessary, it is current practice for the manufacturer to provide an interpreter during the inspections and for the product certification body to ask for translation of parts of associated documents, in case of doubt or conflicting situations.

The inspection is based on the requirements of EN 197-2:2014, Clause 4. The product certification body should use a checklist based on all the sub-clauses of Clause 4 of EN 197-2:2014 and which refers to the totality of the points which are mentioned in the standard and in the guidance of the present document relating to the corresponding clauses.

The product certification body examines the documents and records, interviews the relevant personnel and inspects equipment (including equipment used in production and dispatch and in the laboratory). Emphasis is laid on all measures taken by the manufacturer to ensure the required product quality.

Before leaving the factory, the inspectors normally give a copy of their main observations to the manufacturer (management of the factory or management representative). The product certification body may ask the manufacturer to comment and countersign this document before the inspectors leave the factory.

5.2.2 Frequency of inspections

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

Guidance

The product certification body takes an initiative to agree with the manufacturer a date for the inspection.

The product certification body, at its own discretion, may request to be included in the distribution list of the controlled versions of the Works' quality manual. When the product certification body is not on the distribution list it is appropriate that it requests an up-to-date copy of the Works' quality manual before the date of the inspection.

The interval between two consecutive visits should be about 12 months; nevertheless, one inspection is to be made in every certified factory once per calendar year.

5.2.3 Reports

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

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

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

Guidance

The confidential report should not be restricted to discrepancies but should contain all relevant observations.

The importance of any observations and the time within which corrections shall be made should be clearly mentioned in the report.

The report should be sent to the factory as soon as possible after the inspection, taking account of any needs for urgent action.

Within a time specified in the inspection report, the manufacturer has to inform the product certification body in writing about the corrective actions that he has taken or that he intends to take and the time for their implementation.

5.3 Evaluation of the results of autocontrol testing of samples

5.3.1 Evaluation tasks

Continuous surveillance, assessment and evaluation 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.

Guidance

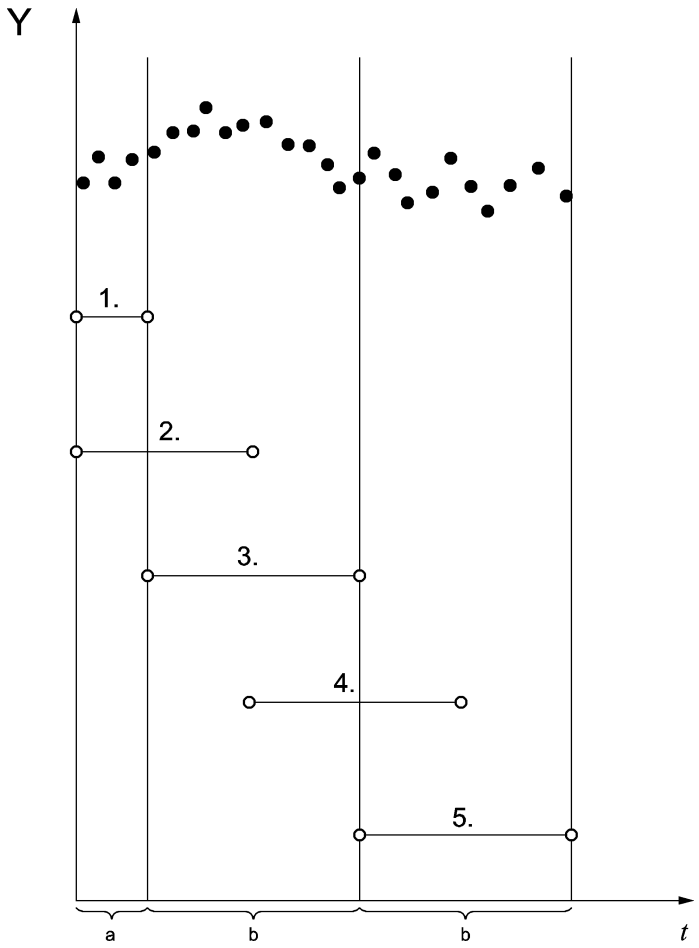
The product certification body should specify the frequency for the sending of data by the manufacturer. The frequency and sequence of evaluations should follow a specified procedure. The product certification body should establish normal periods of evaluation regularly distributed over the year taking into account the minimum frequency of two evaluations per year. In the case of a non-conformity (statistical or single result) or when test results from the autocontrol or from the audit testing lead to doubtful interpretation, the number of evaluations may be increased for a certain time to identify the reasons and monitor the effectiveness of corrective actions if needed.

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 “Assessment and verification of constancy of performance – AVCP” in the relevant product specification standard, or equal to the initial period (see 5.6.1) in the case of a newly certified cement.

Guidance

Figure 1 illustrates the sequence of evaluations of autocontrol test results. The length of the control period as fixed in the relevant product specification standard amounts, for example, for common cements to 12 months and for masonry cements to 24 months. The initial period is specified to, as a rule, 3 months (see 5.6.1). Several evaluations have to be carried out per year (at least two) resulting in overlapping periods of evaluations with each evaluation leading to separate conclusions concerning the conformity of the test results.



Key

1. – 5.	control period	*t*	time
a	initial period	Y	property
b	12 months		

Figure 1 — Typical sequence of evaluations of the autocontrol test results for common cements (control period 12 months, based on the minimum frequency of two evaluations per year)

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.

The evaluation of the test results should exclude any test result accepted as an outlier by the product certification body, e.g. in the case of identified sampling and testing errors.

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.

The product certification body shall take into account whether all necessary corrective actions and measures to prevent non-conforming cement from delivery have been taken by the manufacturer.

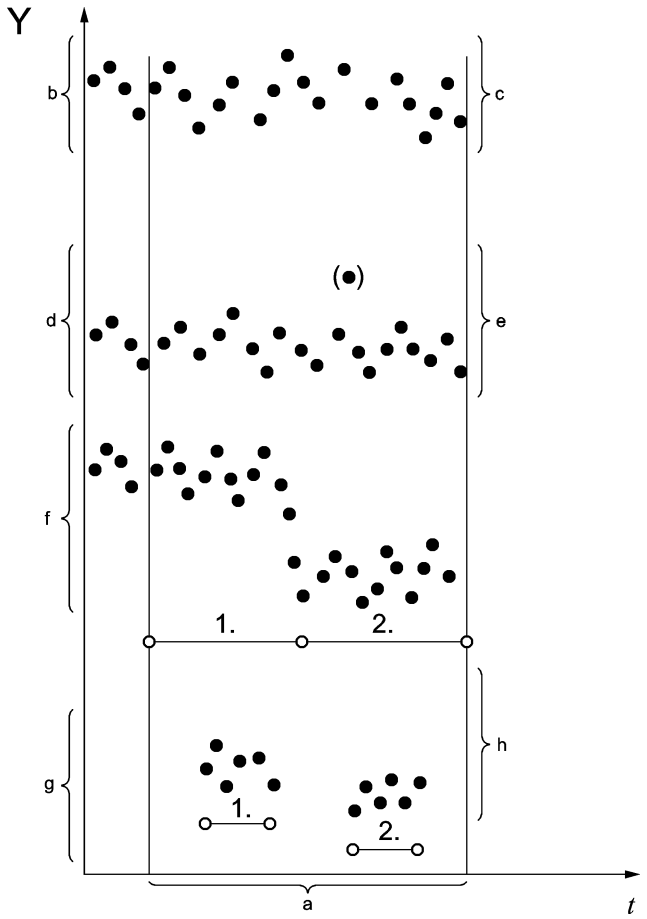
Guidance

It should be checked whether all results of autocontrol testing are correctly documented (see 4.3.1). If there are obvious omissions or typing errors these should be remedied before carrying out the evaluation. If differences to the results of audit testing occur, actions according to 6.2.2 have to been taken.

The evaluation has to be carried out as specified in the clause entitled "Assessment and verification of constancy of performance – AVCP" in the relevant product specification standard. Where assessment by variables is the rule but the manufacturer requests assessment by attributes claiming a non-normal distribution of the autocontrol test data, the product certification body may wish to confirm that the distribution is non-normal before considering such an application, which is then decided on a case-by-case basis according to the relevant product specification standard. The Chi-squared or Epps-Pulley tests given in ISO 5479[4)] are appropriate statistical procedures.

In the regular case all autocontrol test results of the considered control period are evaluated in total. As Figure 2 demonstrates, under certain circumstances exceptions are possible. Outliers can only be excluded if agreed by the product certification body. For example, this could happen when there is an identified sampling or testing error. Records of the manufacturer should support such findings.

4) ISO 5479, *Statistical interpretation of data — Tests for departure from the normal distribution*



Key

a	control period	f	managed step changes
b	regular case	g	limited production/dispatching run
c	evaluation on the on the test results of all autocontrol samples	h	separate evaluations of data sets
d	outliers handled	*t*	time
e	exclusion of outliers accepted by the certification body	Y	property

Figure 2 — Typical evaluations of autocontrol test results (see 5.3.4)

In particular cases, i.e. managed step changes in product properties or limited production or dispatching runs, the test results during a considered control period may be subdivided in different data sets and evaluated separately. To allow a statistical interpretation for testing by variables, at least 20 test results are necessary in each data set. Managed step changes in production are at the discretion of the product certification body, never automatic and shall be intentionally designed and controlled and advised to the product certification body in advance.

Reason for such a regulation is that, due to altered production conditions of cement during the control period, cement properties can change leading to different populations of test results. Precondition to assume managed step changes is that the reasons for changes in the test results can be identified on the basis of manufacturer's documentation. Managed step changes can be the result of corrective actions after the occurrence of a non-conformity (see 6.1).

It is given to the choice of the product certification body whether the autocontrol test results are evaluated by correspondence or in the factory.

5.3.5 Reports

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

Guidance

The report should give the conclusions of the evaluation. It should identify any non-conformities and other remarkable results and refer to necessary corrective actions by the manufacturer. The report should also detail the scope of the response required from the manufacturer and the permissible response time.

5.4 Audit testing of samples taken at the factory/depot and determination of the product-type by testing

5.4.1 Sampling

Spot samples shall be taken under the responsibility of the product 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 product 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.

Guidance

In order to make it possible that sampling can take place without prior notice, the product certification body or its sub-contractor should make arrangements with the factory about the person(s) and their deputies to be contacted on entering the factory/depot in case of sampling.

It is essential that sampling should be carried out in the presence of the representative of the product certification body by the employees of the factory/depot that normally carry out that task. The sampling point is decided by this representative taking into account the manufacturer's autocontrol sampling plan and should comply with the requirement "taken at the point of release of the factory."

The representative must convince himself that:

- there is no doubt about the identity of the cement;
- sampling and subdividing into sub-samples takes place according to the procedures of the factory and in conformity with EN 196-7.

The manufacturer should supply appropriate containers for shipping the sample to the product certification body. The containers shall have the possibility for attaching a seal. Removal of the seal before the sample is received by the product certification body will render the sample void. Arrangements shall be made about the responsibility for shipment of the container(s) to the product certification body and, in case of sampling at a depot, also to the factory laboratory.

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 product certification body and the manufacturer.

The first sample of a cement to be certified is used for determination of the product-type.

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

Guidance

Once the initial period has been completed a minimum of six samples per year is considered necessary to allow a valid comparison between the audit sample and autocontrol sample data sets. It has been current practice in cement certification to take between six and twelve samples per year.

All samples are taken at the point of release. This can be at the factory or at the depot(s). Where sampling occurs at depots, the number of samples taken in each control period shall not exceed a level consistent with the volume of cement despatched from the depot compared with the factory.

5.4.3 Properties and test methods

The mechanical, physical and chemical properties specified for testing in the clause entitled “Assessment and verification of constancy of performance – AVCP” in the relevant product specification standard shall be determined according to the indicated test methods.

Guidance

Any other methods may be used provided they are calibrated, either against the reference methods or against internationally accepted reference materials, in order to demonstrate their equivalence.

The use of the same method of compaction by both laboratories during preparation of the specimens will eliminate a possible source of difference in test results between the two laboratories.

The standard allows the use of CEN Standard sand from different sources by the manufacturer and the product certification body. However, it is convenient if the same source can be used by both as this removes one cause of variation.

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 product certification body. 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 product certification body, for the required properties as listed in the relevant product specification standard, using the test methods indicated in that standard.

Guidance

The possible use of the third sample is decided by the product certification body only. Removal of the seal of the sample and possible division in sub-samples may only occur in the presence of a nominated representative of the product certification body.

5.4.5 Evaluation of test results

The results obtained shall be evaluated by the product 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.

The results obtained consist of single values with an uncertainty associated. For evaluation, only the obtained test result shall be considered without taking into account the associated uncertainty of measurement, as this is implicitly covered by the AVCP procedures.

Guidance

The factory should report its results to the product certification body as soon as they are available. Evaluation of the differences between the results of both laboratories should take place immediately after receipt. Action to investigate the problem should be taken if differences between individual test results are greater than those expected from the precision of the test, as given in the corresponding test standard.

Full evaluation as described in EN 197-2:2014, Annex A takes place when the results of the autocontrol of the manufacturer come available. As soon as these results are available, the evaluation using the most recent data of the audit testing will take place.

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 by the product certification body.

The manufacturer shall have provided his own test results to the product certification body prior to its release of the product certification body data.

5.4.7 Proficiency testing

The laboratory of the product certification body should carry out regular proficiency testing with other testing laboratories in order to maintain the accuracy required.

Guidance

Various programmes exist in CEN member countries dealing with proficiency testing by inter-laboratory comparisons. The reason for the laboratory of a product certification body engaging in proficiency testing is to verify that the testing results remain within a range that allows the certification of cement to be equivalent independent of the product certification body involved. To meet the requirements of EN 197-2:2014, 5.4.7, proficiency testing programmes should have the following features:

- A sufficient number of participating laboratories (at least six, better more than 10) in order to allow an adequate statistical assessment. These should be experienced laboratories and at least two of them should be approved "testing laboratories".

- For common cements, a frequency of two exercises per year as a minimum, using different common cements for each exercise (varying type and strength class and, where possible and relevant, source). One exercise per year may be sufficient but in this case testing laboratories should also participate in another programme.

- Each proficiency testing programme should have a link with at least one other programme and all the various programmes should be inter-linked. The links rely on some testing laboratories taking part in more than one programme. To provide a link between a pair of programmes, there should be participation by at least one testing laboratory in both programmes. The links are normally completed by appropriate exchange of information by those operating the programmes.

- The reports on the exercises should use coded identification of the testing laboratories.

- The programmes, designed to estimate the reproducibility of the test results, should, in each exercise, allow comparison of the result of a testing laboratory with the population of results obtained by all the testing laboratories.

The programmes look at the result obtained, by each testing laboratory, in relation to the population of results of all the testing laboratories participating in the particular programme following the principles given in EN ISO/IEC 17043 „Conformity assessment – General requirements for proficiency testing“. Each exercise provides one test result from each participating testing laboratory. ISO 13528[5)] may be used to assist the statistical interpretation. Outliers are excluded from the final set of accepted results used to establish the mean and the standard deviation of the set of results of the exercise. While the single result for a particular testing laboratory may be an outlier in the set of all results of the testing programme exercise, it nevertheless counts as the result for that testing laboratory on the occasion of the particular exercise. Following the statistical interpretation, the result for a testing laboratory in the comparison exercise can be graded as; satisfactory, questionable or unsatisfactory.

The result of the proficiency testing is (a) used by the approved testing laboratory for internal quality purposes and (b) should be available to the authority responsible for the assessment of the approved testing laboratory. The authority will normally get the assessment from the laboratory itself and not from the entity organizing the programme.

The approved testing laboratory, in agreement with the product certification body, should decide about the proficiency testing to be carried out, taking into account any proficiency testing programmes that may be accessible. This decision should be based on, among other things; the number of tests carried out by that laboratory and the possible opportunities that laboratory has for detecting systematic errors in their test results during the audit testing.

Each testing laboratory should apply internal quality assurance measures to ensure sufficient repeatability of test results. For strength testing, one approach consists of regular testing of sealed cement samples. For those approved testing laboratories that carry out a small number of tests it is normal practice to extend the participation in proficiency testing by the organization of on-going inter-laboratory comparative testing, designed to maintain adequate internal repeatability, in co-operation with other laboratories testing cement (whether approved testing laboratories or other laboratories).

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 and test the cement(s). The inspection shall, amongst 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.

Guidance

The initial inspection of a new factory should include an examination of the whole Works’ quality manual and all the related procedures.

The initial inspection can take more than two days because of the necessity to examine if the Works’ quality manual takes into account the totality of the points mentioned in Clause 4 and 5.5.3 and 5.5.4.

General guidance on inspection is given under 5.2.1.

5) ISO 13528, *Statistical methods for use in proficiency testing by interlaboratory comparisons*

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.

Guidance

In the case of a new type of cement at an existing factory, a new inspection of the factory is rarely necessary, except when fundamental changes have been necessary to produce the new type of cement. The product certification body should decide if a new inspection is necessary, taking into account the modifications of the Works' quality manual and of the relevant procedures.

General guidance on inspection is given under 5.2.1.

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.

Guidance

This subclause 5.5.3 deals with inspection of the production equipment, being the equipment required by Clause 4, see particularly the guidance under 4.2.1.1, and the specific equipment as elaborated in 5.5.3.

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 procedures and 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.

Guidance

In-process control should be carried out in the factory laboratory.

5.5.5 Reports

Following any initial inspection, a confidential report shall be prepared by the product certification body and shall be sent to the manufacturer.

Guidance

See guidance under 5.2.3.

5.6 Evaluation of test results during the initial period

5.6.1 Initial period

The duration of the initial period (see 3.5 and Clause 7) shall be, as a rule, three months.

Guidance

In case of continuous production and shipment of the cement under investigation the frequencies of sampling and testing by the factory during the initial period will give, in the case of the strength testing of common cements, at least 52 results in the autocontrol and three audit samples.

In case of non-continuous production and shipment, for example when only a limited amount of a cement is available, arrangements shall be made with the manufacturer to avoid multiple sampling and testing of the same lot as far as possible. In this case the duration of the initial period can be extended to enable the sampling and testing of additional production until at least 20 test results are available. The sampling frequency is tuned to the production and shipment frequency. Audit sampling should only take place when newly produced cement of this type is available for shipment.

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.

Guidance

If the number of audit test results is less than six, then EN 197-2:2014, Annex A, is not valid for comparison of the laboratory of the product certification body and the manufacturer's audit test results and the autocontrol test results and hence is not valid for the evaluation. In this situation, the evaluation should be done on a case-by-case basis giving priority to the autocontrol results.

5.6.3 Reports

Following the evaluation a confidential report shall be prepared, considered by the product certification body and shall be 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 product 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.

Guidance

In the event of a non-conformity it is the responsibility of the manufacturer to take adequate measures in accordance with the relevant detailed procedures documented in the Works' quality manual (see 4.3.2). It is afterwards the responsibility of the product certification body to check whether these measures are appropriate and commensurate with the technical problem which has been identified as source of the non-conformity.

Doubling the minimum frequency of auto-control testing should not be understood as a penalty to the manufacturer. The purpose of such an increase of frequency of auto-control testing is to obtain, in a reasonably short period of time, a sufficient number of test results to confirm by a statistical interpretation that the cement has gone back to conformity and therefore that the measures and corrective actions which were taken by the manufacturer are adequate and appropriate.

Doubling the frequency of auto-control testing is often one of the adequate measures decided by the manufacturer himself and, in this case, there is no reason for the product certification body to ask for further doubling of testing frequency immediately after issuing a complaint plus warning (which is generally received after the problem has been resolved).

6.2 Actions to be taken by the product certification body

6.2.1 Following continuous surveillance, assessment and evaluation 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 product certification body and shall be considered on a case by case basis.

In the event of non-compliances of the factory production control, the product certification body should take appropriate decisions/actions to ensure that the factory production control is correctly applied by the manufacturer. Cancellation of the certificates may be considered in the event of a continuing non-conformity of the factory production control.

In the event that the results of the manufacturer's autocontrol testing indicate that the requirements given in the clause entitled “Assessment and verification of constancy of performance – AVCP” in the relevant product specification standard are not met, the actions taken by the product certification body shall be as shown in Table 1. The product 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).

Guidance

The product certification body should take appropriate actions to ensure that the factory production control is correctly applied and could even cancel the certificates for the cements in case of continuing non-compliance.

In the event of a non-conformity of a cement, it is normal practice for the product certification body to consider the reports issued after inspection of the factory production control, together with the results of auto-control testing.

Depending on the adequate measures and appropriate actions taken by the manufacturer, the product certification body may request specific amendments of the Works' quality manual within a given period of time, i.e. one or two months, and may decide to carry out an additional inspection. In doing so, it is essential to focus on the product itself and not on the quality system.

When the requirements of the relevant product specification standard are not met, the product certification body normally applies Table 1 and takes the appropriate action. At the discretion of the product certification body, when a set of results, which cause a non-conformity in one period, has carried over in the following second period, this set of results may be disregarded if it causes a non-conformity also in the following second period. In addition, the product certification body may decide to increase the number of evaluations of the results of auto-control testing.

In some cases the non-conformity may occur in a situation where the Works' quality manual has not been followed. In such a case, and where this can be demonstrated, the product certification body may decide to take other actions than the ones included in Table 1 (e.g. more severe and/or with a shorter timing).

For the doubling of the minimum frequency of auto-control testing, see guidance in 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 product 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 product certification body shall evaluate the results of the manufacturer's autocontrol testing over an appropriate period. 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 product 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 “Assessment and verification of constancy of performance – AVCP” in the relevant product specification standard, the actions taken by the product certification body shall be as shown in Table 1.

Guidance

Actions shown in Table 1 are valid for routine situations.

When it is identified that a non-conformity of the cement results from an exceptional situation with regards to the application of the Works' quality manual or when actions taken by the manufacturer are not found to be appropriate, the product certification body may decide to carry out an additional inspection and take actions different from those shown in Table 1.

7 Procedure for third party certification of constancy of performance of the product

When a manufacturer applies for certification of a cement, the product certification body shall arrange for an initial inspection of the factory and the factory production control (if required) (see 5.5) and for the testing of a product type determination sample of the cement by the product certification body 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 testing of a product type determination sample conform to the requirements of the relevant product specification standard, then the product certification body shall issue a certificate of constancy of performance of the product.

During the initial period, the results of the audit testing obtained by the product certification body and the results of the autocontrol testing obtained by the manufacturer shall be evaluated by the product certification body (see 5.6). For a new factory this shall include an evaluation according to A.3.

If this evaluation is satisfactory, the certificate of constancy of performance of the product 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 product certification body accordingly and the relevant certificate of constancy of performance of the product 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 constancy of performance of the product, 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 constancy of performance of the product shall be issued on the basis of the manufacturer's autocontrol testing (see 4.3.1) and the first audit sample tested by the product certification body (see 5.4).

NOTE The procedure for certification of constancy of performance of cement in a new factory (see 3.9) or of a new type of cement (see 5.5.2) in an existing factory (see 3.10) is shown in Annex B.

Guidance

The first four paragraphs of Clause 7 of EN 197-2:2014 apply only to cements that are not already certified under a national scheme at the time when CE marking based on the harmonised standard is to be brought into use.

The procedure for third party certification of conformity in the cases of a new factory (see 3.9) or of a new type of cement (see 5.5.2) in an existing factory (see 3.10) is shown in Annex B.

The steps to achieve the certificate of constancy of performance of the product initially depend on the previous knowledge that the product certification body has from a factory. Therefore, a factory not previously known to the product certification body will have an initial inspection of the factory and a checking of the Works' quality manual. This inspection will only be necessary in the case of a known factory if the cement to be produced requires special equipment to be introduced for its production.

A certificate of constancy of performance of the product may be cancelled either voluntarily by request from the manufacturer to the product certification body or compulsorily after twelve months without production or if the circumstance for giving the certificate no longer apply (closing down of a company, new company, misuse of the certificate). As regards withdrawal, see EN 197-2:2014, 6.2 and Clause 7.

Separate certificates should be issued when two or more cements of the same type and strength class with controlled differences on the composition or in any chemical or physical property are manufactured

in the same factory. These cements shall be marked with the type of cement and strength class followed by an indication in parentheses in order to make clear the difference.

8 Certificate of constancy of performance of the product and conformity mark

8.1 Indication of constancy of performance of the product

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

Guidance

Clause 8 does not apply in the case of an EC certificate of constancy of performance of the product nor for the CE marking. Instead, the details given in the Annex ZA of the relevant product specification standard should be followed. The Annex ZA gives details of the declaration of performance and the CE marking and labelling of cement.

8.2 Certificate of constancy of performance of the product

The certificate of constancy of performance of the product shall include, in particular:

a) the name and address of the product 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 by the same product standard;

d) statement that the cement conforms to the requirements of the relevant product specification standard and that the conformity is established according to this European Standard;

e) the certificate's number.

NOTE For CE conformity marking and labelling, see Annex ZA of the relevant product specification standard.

Guidance

The EC certificate of constancy of performance of cement may have the following format. However, the format of the certificate should follow the latest examples given in the relevant position paper of the Group of Notified Bodies.

Illustrative example of certificate of constancy of performance of cement — For information only

Logo of the product certification body	***Name and address of the product certification body***

Certificate of constancy of performance[6)]
< nnnn-CPR-zzzz >

In compliance with Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 (Construction Products Regulation), this certificate applies to the construction product

< Standard designation of the cement[7)] **>**
< Additional identification of the cement[8)] **>**

placed on the market by

< Manufacturer with full address >

and produced in the manufacturing plant(s)

< Manufacturing plant(s) with full address(es) >

This certificate attests that all provisions concerning the assessment and verification of constancy of performance
and the performances described in Annex ZA of the standard

EN 197-1:2011

under system 1+ are applied and that the cement fulfils all the prescribed requirements set out above.

This certificate was first issued on < date > and will remain valid as long as the test methods and/or factory production control requirements included in the harmonised standard, used to assess the performance
of the declared characteristics, do not change, and the product, and the manufacturing conditions in the plant

6) This document shall be presented in the official language or languages of the Member State of the EU in which the cement is to be used.

7) According to EN 197-1.

8) Some examples of additional identification are: “White Cement”, “Cement with particular particle size distribution for customer x”, “Cement with 28 day compressive strength controlled to range 40 MPa - 50 MPa”.

are not modified significantly. < City, Date > < Authorized signature > < Title, Position >

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 constancy of performance of the product issued according to this European Standard to the manufacturer or importer and bearing the conformity mark).

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

Guidance

EN 197-1:2011, ZA 2, gives guidance on the purpose of this Clause 9. This Clause 9 is not part of the procedure of attestation of constancy of performance of the product.

Where and when this Clause 9 applies, it is essential to demonstrate not only the conformity of the cement at the point of release of the dispatching centre but also the identity of the cement, which means that the original composition and properties are carefully maintained through the operations carried out under the responsibility of the dispatching centre.

When packaging is considered, it refers only to cement received in bulk and then bagged at the dispatching centre.

It is essential when applying this Clause 9 to consider that it specifies those minimum rules valid for the dispatch of an already certified cement. All decisions should be taken on a case by case basis. Systematic application of those requirements given in EN 197-1, Clause 9 and of those actions given in EN 197-2, Clause 6 should be avoided.

9.2 Tasks for the intermediary

9.2.1 Measures to maintain the cement quality

The intermediary shall demonstrate that he has measures in place 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 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 product certification 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 shall be compared. The dispatching centre shall ensure that the factory's autocontrol results are made available according to an adequate frequency.

The confirmation autocontrol testing may be carried out in the laboratory of the intermediary or in an external laboratory. Representatives of the product certification 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. The individual results of the confirmation autocontrol testing shall at no time exceed the limit values for single results of the relevant specification standard.

9.3 Tasks for the third party

9.3.1 Continuous surveillance, assessment and evaluation of the measures to maintain the cement quality and of the confirmation autocontrol

The task of the third party is the continuous surveillance, assessment and evaluation of the measures applied by the intermediary to maintain the cement quality; the product certification body shall carry out an initial inspection and, thereafter once per year, an inspection.

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. The dispatching centre shall make the necessary provisions for allowing the third party to make the assessment.

The observation of a non-conformity to a single result limit value shall lead to a decision from the third party (9.3.3).

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 product certification body.

The frequency of confirmation and 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 product 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 product certification body		
				Issue of a complaint	Issue of a complaint plus warning [b]	Withdrawal of certificate of constancy of performance of the product [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 product certification body that adequate measures were taken from the time of the initial occurrence of the non-conformity until it's 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 conforming to EN 413-1.

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	1 per delivered lot but at least 1 per 500 tonnes	6/year
Standard strength			
Initial setting time	1/week		
Insoluble residue	1/week		
Loss on ignition			
SO_3 content	1/week		
Heat of hydration	1/every 2 months		
Pozzolanicity	2/month		
C_3A in clinker	1/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 product certification body. For a new type of cement the evaluation shall be made when the necessary data are available.

Guidance

In addition to the specified criteria, it may be useful that the product certification body and the manufacturer agree on a procedure to use the available data to detect possible deviations as soon as possible.

No corresponding criteria are specified for other properties than 28 day strength. If for these properties unusual differences between the sets of test results are observed an assessment on possible sampling or testing errors should be made taking into account the precision data in the relevant test standard (see guidance under 5.4.5).

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 product certification body 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 conforming to EN 413-1, see also A.3.5. For calcium aluminate cement conforming to EN 14647, see also A.3.6.

A.3.2 Symbols

The symbols used in A.3.3 to A.3.6 are given in Table A.1.

Table A.1 — 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 product certification body 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	is the standard deviation of the differences between the corresponding results of the samples taken for audit testing as defined by $d_i = B_i - C_i$ where B_i is the individual test result by the manufacturer C_i is the corresponding individual test result by the product certification body $S_D = \left[\left(\sum d_i^2 - \left(\sum d_i\right)^2 / N_B\right) / (N_B - 1)\right]^{1/2}$

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

a) Where $|M_A - M_B| \leq 2{,}0$ [9] MPa,

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

b) Where $|M_A - M_B| > 2{,}0$ [9] MPa,

1) 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,

2) 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).

Guidance

This check gives information whether the results of testing audit samples by the manufacturer (set B) are representative for all results of autocontrol testing (set A). If the criterion is not fulfilled a sampling error is indicated with a confidence level of 99 %.

[9] These are values applicable for cement conforming to EN 197-1. The values for masonry cement conforming to EN 413-1 are given in A.3.5 and for calcium aluminate cement conforming to EN 14647 in A.3.6. 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) $s_D \leq 3{,}4$ [9)] MPa;

b) $|m_B - m_C| \leq 4{,}0$ [9)] MPa.

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

Guidance

This check gives information on whether the results of the manufacturer (set B) and the product certification body (set C) coincide with sufficient accuracy. Criterion b) indicates systematic differences in the strength levels of the two laboratories; criterion a) unsystematical scatter of results both requiring corrective actions. Testing errors according to criterion a) especially require careful examination of the reasons for such variations.

A.3.5 Masonry cement

For masonry cement conforming to EN 413-1 the numerical criteria given in Table A.2 shall apply in place of the values given in A.3.3 and A.3.4:

Table A.2 — Numerical criteria for masonry cement conforming to EN 413–1

Criterion	Masonry cement, type/class		
	MC5	MC12,5/MC12,5X	MC 22,5/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

A.3.6 Calcium aluminate cement

For calcium aluminate cement conforming to EN 14647 the numerical criteria given in Table A.3 shall apply in place of the values given in A.3.3 and A.3.4:

Table A.3 — Numerical criteria for calcium aluminate cement conforming to EN 14647

Criterion	Calcium aluminate cement
$\|m_A - m_B\|$	3,0
s_D	5,0
$\|m_B - m_C\|$	5,0

Annex B
(informative)

Procedure for certification of constancy of performance of cement

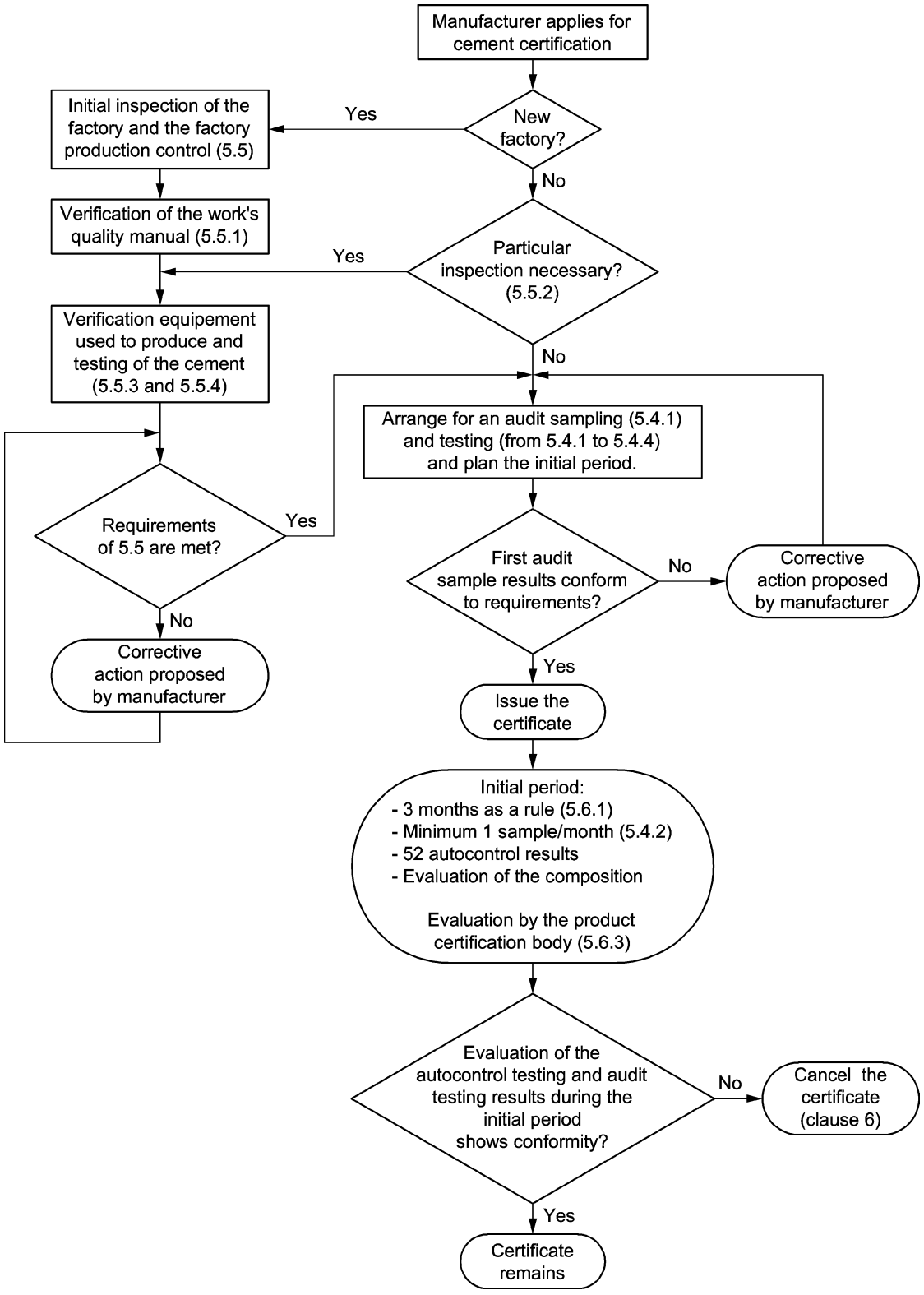


Figure B.1 — Procedure for certification of constancy of performance of cement in a new factory (see 3.9) or of a new type of cement (see 5.5.2) in an existing factory (see 3.10)

Annex C
(informative)

Comparison of terminology according to the CPD and the CPR

Table C.1 gives examples for the comparison of the earlier terminology according to the Construction Products Directive CPD (Directive 89/106/EEC) and the new terminology according to the Construction Products Regulation CPR (Regulation (EU) No 305/2011).

Table C.1 — Comparison of terminology according to the CPD and the CPR

Terminology according to the CPD	Terminology according to the CPR
evaluation of conformity	assessment and verification of constancy of performance (abbr.: AVCP)
certificate of conformity	certificate of constancy of performance of the product
certification body	product certification body (for system 1+) or production control certification body (for system 2+)
inspection body	- (no longer defined)
initial type testing (ITT)	determination of the product-type
surveillance, assessment and acceptance (e.g. of the factory production control)	continuous surveillance, assessment and evaluation (e.g. of the factory production control)

Bibliography

[1] CEN/TR 14245, *Cement - Guidelines for the application of EN 197-2 Conformity evaluation*[10)]

[2] EN ISO 9001, *Quality management systems - Requirements (ISO 9001)*

[3] Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

[4] EN 45020, *Standardization and related activities - General vocabulary (ISO/IEC Guide 2)*

[5] EN ISO 9000, *Quality management systems - Fundamentals and vocabulary (ISO 9000)*

[6] ISO/IEC 17043, *Conformity assessment — General requirements for proficiency testing*

[7] EN 196-1, *Methods of testing cement - Part 1: Determination of strength*

[8] EN 197-1, *Cement - Part 1: Composition, specifications and conformity criteria for common cements*

[9] EN 14216, *Cement - Composition, specifications and conformity criteria for very low heat special cements*

[10] EN 15743, *Supersulfated cement - Composition, specifications and conformity criteria*

[11] EN ISO/IEC 17020, *Conformity assessment - Requirements for the operation of various types of bodies performing inspection (ISO/IEC 17020)*

[12] EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025)*

[13] EN ISO/IEC 17065, *Conformity assessment - Requirements for bodies certifying products, processes and services (ISO/IEC 17065)*

[10)] CEN/TR 14245 is currently in preparation and will revise CR 14245:2001.

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