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Evaluation of conformity of fly ash for concrete — Guidelines for the application of EN 450-2

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National foreword

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Evaluation de la conformité de cendres volantes pour le béton - Guide pour l'application de l'EN 450-2

Bewertung der Konformität von Flugasche für Beton - Leitlinien für die Anwendung von EN 450-2

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Foreword

This document (CEN/TR 15840:2009) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by DIN.

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Introduction

The purpose of this Guidelines Document is to provide explanatory detail on points not fully elaborated in EN 450-2:2005 "Fly ash for concrete – Part 2: Conformity evaluation". It is intended for use by producers and by certification bodies involved in the certification of fly ash following EN 450-1 and EN 450-2, in particular for the issuing of an EC Certificate of Conformity.

This document does not deal with the necessary internal procedures that the 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 fly ash. 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 450-1:2005 and EN 450-2. 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 certification bodies that is expected from the application of EN 450-2 together with these Guidelines.

This Guidelines Document is based on existing situations for production, evaluation of conformity and certification of fly ashes. It may happen that 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 Certification Body. These specific procedures should always fulfil the requirements of EN 450-1:2005 and EN 450-2 and lead to the same level of confidence in product conformity that would be achieved by application of this Guidelines Document.

The clause numbering system of EN 450-2 is followed. The text of each of the clauses of the Standard is reproduced in full and is followed by guidance, which is provided only for those clauses where clarification or elaboration is needed.

1 Scope

This document specifies the scheme for the evaluation of conformity of fly ash according to EN 450-1:2005.

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

Guidance

EN 450-2 deals with the evaluation of conformity of fly ash 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 Directive. The product for which EN 450-2 applies is defined in EN 450-1:2005 as fly ash for the production of concrete which consists of a fine powder of mainly spherical, glassy particles, derived from burning of pulverised coal, with or without co-combustion materials, which has pozzolanic properties.

2 Normative references

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

EN 196-1*, Methods of testing cement — Part 1: Determination of strength*

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

EN 450-1:2005*, Fly ash for concrete — Part 1: Definition, specifications and conformity criteria*

EN 450-2:2005, *Fly ash for concrete — Part 2: Conformity evaluation*

EN 451-2*, Method of testing fly ash — Part 2: Determination of fineness by wet sieving*

3 Terms and definitions

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

3.1 Specific definitions

3.1.1
certificate of conformity to EN 450-1:2005
document issued under the rules of a certain scheme for the evaluation of conformity indicating that adequate confidence is provided that fly ash is in conformity with EN 450-1:2005

Guidance

The term “certificate of conformity” refers to certificates of conformity issued by a certification body under the rules of EN 450-2. This includes an EC Certificate of Conformity issued in relation to the CPD.

3.1.2
conformity mark
protected mark applied on the basis of the certificate of conformity (see 3.1.1)

Guidance

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

3.1.3
certified fly ash
fly ash for which a certificate of conformity has been issued

3.1.4
initial period
immediate period after the first issuing of the certificate of conformity for a fly ash

3.1.5
certification body
impartial body, governmental or non-governmental, possessing the necessary competence and responsibility to carry out conformity certification according to given rules of procedure and management

3.1.6
production control
permanent internal control of fly ash production exercised by the producer consisting of internal quality control and autocontrol testing

3.1.7
production plant
facility used by a producer for the production of fly ash:

a) power plant with one (several) boiler(s),

b) processing plant, for example for the classification, selection, sieving, drying, blending, grinding and/or carbon reduction of fly ash(es).

In the production plant, equipment has to be used which is suitable for production of fly ash including the necessary silo capacity for the storage and dispatch of the fly ash produced, and equipment to test, evaluate and control the fly ash production. This equipment and the production control applied allow the control of production with sufficient accuracy to ensure that the requirements of EN 450-1:2005 are met

Guidance

Two categories of production plant are recognised:

— traditional power station facility where fly ash is produced as part of the production of electricity;

— processing plants that may or may not be on a power station facility, where ashes are altered in some manner.

3.1.8
new production plant
production plant which is not already producing fly ash certified under this scheme

3.1.9
existing production plant
production plant which is already producing fly ash certified under this scheme

3.1.10
depot
bulk fly ash handling facility (not located at the production plant) used for the dispatch of fly ash (whether in bulk or bagged) after transfer or storage, where the producer has full responsibility for all aspects of the quality of the fly ash

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

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

3.1.11
dispatching centre
bulk fly ash handling facility (not located at the production plant) used for the dispatch of fly ash after transfer or storage where an intermediary has full responsibility for all aspects of the quality of the fly ash

Guidance

See guidance under 3.1.10 and 9.1.

3.1.12
intermediary
natural or legal person who takes from the producer fly ash certified according to EN 450-2 and bearing the conformity mark, who undertakes full responsibility for maintaining in a dispatching centre all aspects of the quality of the fly ash and who supplies the fly ash onwards to a further natural or legal person

3.1.13
confirmation autocontrol testing
continual testing carried out by an intermediary which consists of testing of samples taken by the intermediary at the point(s) of release from the dispatching centre

3.1.14
works' quality manual
document that provides information on the production control which is applied by a producer at a particular production plant to ensure conformity of the fly ash with the requirements of EN 450-1:2005

3.1.15
producer
the operator of the production plant or a person (natural or legal) authorised by the production plant and named in the certificate of conformity

3.2 General definitions

See Annex B (informative).

4 Tasks for the producer

4.1 Factory production control

4.1.1 Concept

Production control means the permanent internal control of fly ash production exercised by the producer. It consists of internal quality control (see 4.2) and autocontrol testing[2] of samples of fly ash taken at the point of release (see 4.3).

NOTE The requirements of EN 450-2 as regards the production control take account of those clauses of EN ISO 9001 [6] which are relevant to the production, process control and testing of fly ash.

Guidance

The purpose of production control is to ensure that the fly ash is manufactured in a controlled way to meet all of the requirements of EN 450-1:2005. In order that a 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 production control system may form part of a wider, integrated management system provided it can be demonstrated that all applicable EN 450-2 requirements are addressed. See also the Note in 4.1.2 of the Standard.

4.1.2 Works' quality manual

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

a) the quality aims and the organisational structure, responsibilities and powers of the responsible staff 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 production 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 production, 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 producer for each production plant shall include an adequate system of documentation (see 4.1.4 and 4.3.4). In case of suitability testing of fly ash from co-combustion of pulverised coal with certain co-combustion materials according to EN 450-1:2005, the procedure of sampling shall be documented in agreement with the certification body.

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

NOTE In the case of an existing quality management system according to EN ISO 9001 [6], the certification body may examine if the corresponding quality manual meets all the requirements of EN 450-1:2005 which are relevant to the production control of fly ash. Provided all the requirements are included, the quality manual may also be applied for the product certification.

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

Guidance

The Works' quality manual is the fundamental document that describes the production control system operated by the fly ash production plant. It should clearly state the scope of the production control system and must describe how each of the elements of the system, as outlined in Clauses 4.1 to 4.3.4, are controlled and maintained.

The Works' quality manual normally comprises a main document together with associated documents and technical procedures. All these documents are written in the current language of the production plant's country.

To ensure an effective production control system, there needs to be a well defined organisational structure within the fly ash production plant, showing very clearly the lines of reporting. This is best achieved by one or more simple diagrams. The manual should list all personnel who can affect quality within the manufacturing process together with their job titles and refer to a description of their tasks and responsibilities within the quality function. These should pay particular attention to the level of authority to check, assess, verify and pass conforming co-combustion materials and product.

Illustrative Example of Responsibilities - For Information Only

Quality Manager

The Quality Manager has two overall responsibilities: to ensure that adequate quality procedures exist and to ensure that the procedures are carried out. The Quality Manager is responsible to the producer for:

— **the co-ordination, monitoring and updating of the Works' quality manual procedures;**

— **ensuring that** all personnel at every level are 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;

— assessing the conformity of raw materials to the relevant specifications;

— controlling of off-specification fly ashes and criteria for co-combustion materials;

— the identification and resolution of non-conformities in the production control system;

— supervising the recording and processing of relevant data and consequent approval;

— provide senior personnel with periodic reports on the compliance status of the fly ash.

There needs to be a quality plan for the production of conforming fly ash and whilst it must be recognised that the plan can take on one of many forms and include such things as process flow charts and control tables, it must show how each of the parts of the process are connected. There must 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 4.1.2, in the case of an existing quality management system in accordance with EN ISO 9001 [6], it should be clearly stated in the Works' quality manual that the system is also used for factory production control according to EN 450-2.

4.1.3 Management systems

4.1.3.1 Quality policy statement

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

4.1.3.2 Management representative

If the producer is a person authorized by the production plant (see 3.1.15), suitable relations between the producer and the production plant shall be established and documented in order to ensure that the requirements of this document are met.

Guidance

The Management Representative should be clearly shown to have the necessary dedication, time and authority to ensure that fly ash continues to conform to EN 450-1:2005 by the adoption of the requirements of the documented production control system. As he has the ultimate responsibility for the effective operation of 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 fly ash data to EN 450-1:2005 requirements. Effective and unrestricted communication channels to other affected departments must be open to the management representative to discuss possible problems.

The authority and responsibility for the production control system and the quality assurance of fly ash 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 EN 450-1:2005, the producer shall perform at least once per year:

a) internal audits covering the scope of this Clause 4 and 6.1;

b) producer's management review of the 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 must be assessed by the 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.

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 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 must be supported by the 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 of the producer shall be responsible for the control of all documents and data related to the production control and to this scheme for the evaluation of conformity.

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

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

Guidance

The effectiveness of the 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 must 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 must 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 [6], which can therefore be used as guidelines.

4.1.4.2 Quality records

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

Guidance

All 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. Production control records that relate directly to the finished fly ash 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 must 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.

Depending on the installation, the following measures shall be provided:

a) in all types of production plants:

1) in-process testing of fly ash properties;

2) silos of adequate capacity for storage of the fly ash produced allowing a proper identification of the product and giving possibilities of taking spot samples at any time without prior notice;

b) additionally, in production plants using processing facilities:

1) separate and adequate storing facilities for the fly ashes to be processed;

2) controlled proportioning of the fly ashes to be processed in order to achieve the target properties of the produced fly ash;

3) facilities for adequate homogenisation of fly ash;

4) n-process testing of fly ash properties.

Guidance

Process control should be designed to prevent non-conformities arising. This cannot be achieved by testing only. To ensure that fly ash complies with EN 450-1:2005, planning of the production process is required and should address the following:

— a process flow description/diagram to illustrate the important production elements and to show how each stage is interrelated. This should include all stages covered by the selected scope of the 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, which may include parameters that are not included in the product specification standard;

— 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, fly ash and silo changeovers;

— prevention of contamination of fly ash during production, handling and dispatch.

In following the requirements of EN 450-2, all categories of production plant (see guidance under 3.1.7) should have, in particular, the following equipment and procedures:

— all types of production plants:

— silo(s) for each fly ash awaiting dispatch;

— adequate testing and control of fly ashes;

— processing plants.

In addition to the equipment and procedure items listed above for all types of production plant, there should also be:

— separate storage for incoming fly ashes;

— adequate blending and homogenisation equipment and procedures;

— arrangements to ensure that fly ash is produced, supplied and received in accordance with the requirements of the processing plant for the purpose of designing and blending the final product and controlling its properties;

— documented procedures showing full traceability and control of the incoming fly ash.

4.2.1.2 Provisions for processing plants

In production plants for the controlled processing of fly ash, for example by classification, selection, sieving, drying, blending, grinding, and carbon reduction, the relevant information on each consignment of incoming fly ash and all operating steps in the process shall be documented in the Work's quality manual by the producer in agreement with the certification body. The following data shall be at least part of this documentation:

a) the producer and the production location from which the fly ash originates;

b) an acknowledgement that the fly ash is according to 3.2 of EN 450-1:2005;

c) the documented suitability and environmental compatibility as required in EN 450-1:2005, where co-combustion materials have been used;

d) in case of blending only, the properties of each incoming fly ash shall be controlled on a regular basis in order to be able to achieve the target properties of the fly ash blend. On each incoming fly ash the relevant properties listed in Table 2 of EN 450-1:2005, except particle density, activity index, initial setting time and water requirement should be tested by the supplier of the incoming fly ash. The minimum testing frequency should be chosen as indicated in Table 2 of EN 450-1:2005, "Routine situation", and should be documented in the Work's quality manual. Each incoming fly ash should conform to the requirements in Clauses 4 and 5 of EN 450-1:2005 with the exception of loss on ignition, fineness and variation of fineness;

e) if one of the incoming fly ashes is obtained from co-combustion, then the environmental compatibility of the blended fly ash shall be proven, as required by 4.3 of EN 450-1:2005.

Guidance

Incoming fly ash 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 incoming fly ashes. If any material is unsatisfactory, there must be an adequate procedure for disposal and possible controlled use. This is particularly important for off-specification fly ash.

Adequate stocks must be maintained and discrete, protected storage should be available for each incoming fly ash. The target level values of all incoming fly ashes should be specified and recorded.

4.2.1.3 Provisions for co-combustion materials

In power plants where co-combustion of materials or mixtures of materials, according to Clause 4 of EN 450-1:2005 is conducted, the following measures shall be ensured:

a) different co-combustion materials shall be stored separately;

b) the proportion of co-combustion material(s) related to pulverised coal used in the boiler shall be controlled at regular intervals.

Guidance

Adequate facilities should be available for storage of the different co-combustion materials.

The producer shall set down the proportion of co-combustion material(s) related to pulverized coal.

4.2.1.4 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 producer and off-specifications related to the final fly ash specification required by EN 450-1:2005. The former can be dealt by internal processing e.g. separate storage and controlled re-use, blending, selection, which is designed to bring them back into specification. This may not be possible in the latter case, when 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 must be adequately checked and, where relevant, calibrated to ensure that the percentages of incoming fly ashes 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 production shall be detailed in the Works' quality manual. These shall include procedures for the control of off-specification intermediate materials.

To ensure that only fly ash conforming to EN 450-1:2005 is conveyed to the silo, samples shall be taken from appropriate places prior to the silo for certified fly ash in agreement with the certification body. The sampling places shall be laid down in the Works' quality manual. Spot samples shall be taken for the determination of fineness and loss on ignition in agreement with the certification body.

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.

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 fly ash while under the responsibility of the producer. It shall include a description of the procedures used at depots. Delivery documentation shall allow traceability to the production plants, depots or dispatching centres.

Guidance

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

The Works' quality manual should list all the fly ash silos and their contents. Each silo should be numbered and marked to identify the fly ash. 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 fly ash, an adequate procedure should permit identification and traceability.

Delivery documentation should include at least production plant/depot, quantity, destination and product designation. Internal quality documentation should include in addition the silo of origin. The delivery document and/or the marking on the packaging has to meet the requirements of the Annex ZA of EN 450-1:2005.

A list of the depots associated with the production plant 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 producer shall operate a system of autocontrol testing for each certified fly ash. This system shall be used to demonstrate conformity to the requirements in Clause 8 of EN 450-1:2005. The properties to be tested, the testing methods, the minimum frequency of autocontrol testing during routine testing and initial period of testing and the conformity criteria shall be in accordance with the requirements given in Clause 8 of EN 450-1:2005. For fly ashes not being dispatched continuously, the frequency of testing and the point of sampling shall be as specified in the Works' quality manual.

All test data shall be documented.

Guidance

This requirement establishes that it is necessary to ascertain conformity for released fly ash (see definition in B.4.1) with the criteria contained in the Conformity Criteria clause of EN 450-1:2005.

The sampling plan adopted should take into account all points of release including packaged fly ash and fly ashes from depots. In the case of fly ashes 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 EN 450-1:2005. 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 fly ash, a minimum of 10 samples per 12 months is required to produce any meaningful statistics. A minimum of 2 samples must be taken per production run/period of release from the production plant. In any case, the minimum frequency defined in the reference standard should always be respected when the fly ash is available for dispatch.

Autocontrol testing will normally be undertaken by the producer at the works laboratory but in certain circumstances, which must be agreed with the 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, Clause 4.3.3 will still apply.

The reporting of autocontrol data to the certification body will be by suitable means, the means to be agreed with the certification body. Reporting will be at a frequency requested by the 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 have to be taken into account. Test data include all results of testing spot samples taken by the producer at the point of release. Results of testing of in-process 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 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 fly ash yielding a test result not conforming to the single result limit value conformity criteria specified in EN 450-1:2005, the producer shall immediately determine the affected quantity, take appropriate action to prevent the dispatch of this quantity and inform the affected customer if such fly ash has been released. In addition, the producer shall immediately determine the causes of such non-conformity, take corrective actions and undertake a review of all relevant production control procedures. All such actions and findings shall be appropriately recorded in a report subject to inspection during the management review.

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

Guidance

Paragraph 1:

The occurrence of a non-conformity of the fly ash (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 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 production control is made, have to be documented in the Works' quality manual.

Paragraph 2:

Any non-conformity, when identified, leads the producer 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).

Paragraph 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 fly ash has been produced, stored and, sometimes, even dispatched. This is normally not the case when a test result is outside the specified characteristic value.

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 450-2 are taken when the relevant test results are available. In the case of activity index, some initial actions might be taken on the basis of largely qualitative judgements made by the quality manager using early indicators. Such initial actions would not be mandatory because of the difficulty of forecasting correctly the eventual 90 day activity index. 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 fly ash involved, the intended application of the fly ash, the reliability of the strength development forecast and the expected activity index at greater than 90 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.

NOTE It is current practice, although not mandatory, to draw the attention of the certification body to the fact that a non-conformity has been identified and that appropriate corrective actions are taken. In some cases, the 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 production plant.

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 activity index test results by proficiency testing with another laboratory designated in the Works' quality manual.

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

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 recognised standards. Calibration records should indicate acceptable limits of use and enable verification of the calibration status of the equipment; equipment 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 certification body informed. This will be of importance in situations where adjustment produces a non-conformity.

When an alternative test method is used for routine testing, results should be demonstrated by comparative testing to be equivalent to those of the reference test method.

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

4.3.4 Quality records

The producer 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 must allow traceability of the autocontrol tests to the sampling points.

All records must 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 fro the certification body

5.1 General

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

5.2 Surveillance, assessment and acceptance of the production control

5.2.1 Inspection tasks

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

Inspection shall verify that the production control complies with the requirements as described in 4 and has been carried out according to the Works' quality manual.

Guidance

Clause 5.2.1 deals with routine inspection of what should exist in the 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 Clause 5.5.1.).

Principles given in EN 45011 [3] provide valuable information for the carrying out of inspection according to EN 450-2.

The inspection team is normally composed of one or two persons, at least one of whom is technically competent in production and testing of fly ash. During the inspection, the inspectors may take samples for audit testing.

The Works' quality manual (the main document together with the associated documents) should be in the language of the production plant. In addition, where necessary, it is current practice for the producer to provide an interpreter during the inspections and for the 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 Clause 4 of EN 450-2:2005. The inspection body should use a checklist based on all the subclauses of Clause 4 of EN 450-2:2005 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 inspection body examines the documents and records, interviews the relevant personnel and inspects equipment (including equipment used in production, dispatch and the laboratory). Emphasis is laid on all measures taken by the producer to ensure the required product quality.

Before leaving the production plant, the inspectors normally give a copy of their main observations to the production plant's quality manager. The inspection body may ask the producer to comment and countersign this document before the inspectors leave the production plant.

5.2.2 Frequency of inspections

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

Guidance

The inspection body, when delegated by the certification body, takes an initiative to agree with the producer a date for the inspection.

The 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 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 production plant once per calendar year.

5.2.3 Reports

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

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

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

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 must be made should be clearly mentioned in the report.

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

Within a time specified in the inspection report, the producer has to inform the 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

Surveillance, assessment and acceptance of the production control includes evaluation of the test results of the producer's autocontrol testing to check conformity to the statistical conformity criteria and single result limit values in EN 450-1:2005.

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

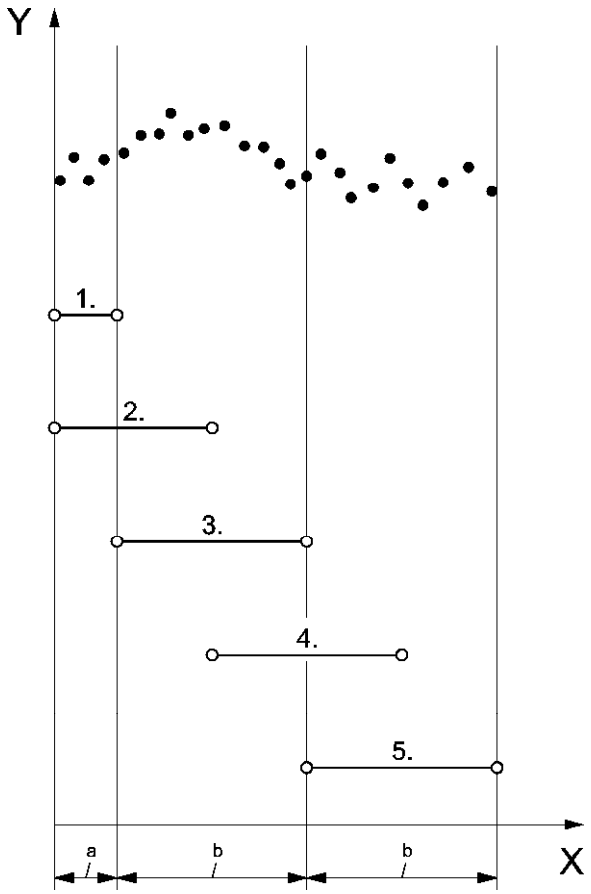
The certification body should specify the frequency for the sending of data by the producer. The frequency and sequence of evaluations should follow a specified procedure. The certification body should establish normal periods of evaluation regularly distributed over the year taking into account the 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 Clause 8 of EN 450-1:2005, or equal to the initial period (see 5.6.1) in the case of a newly certified fly ash.

Guidance

Figure 1 illustrates the sequence of evaluations of autocontrol test results. The length of the control period is fixed to 12 months. The initial period is specified to, as a rule, three 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

Y	Property
X	Time
1.- 5.	Control period
a	Initial
b	12 months

Figure 1 — Typical sequence of evaluations of the autocontrol test results for fly ash (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 fly ash, without selection, taken during the control period preceding the date of the evaluation or during the initial period as the case may be.

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

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

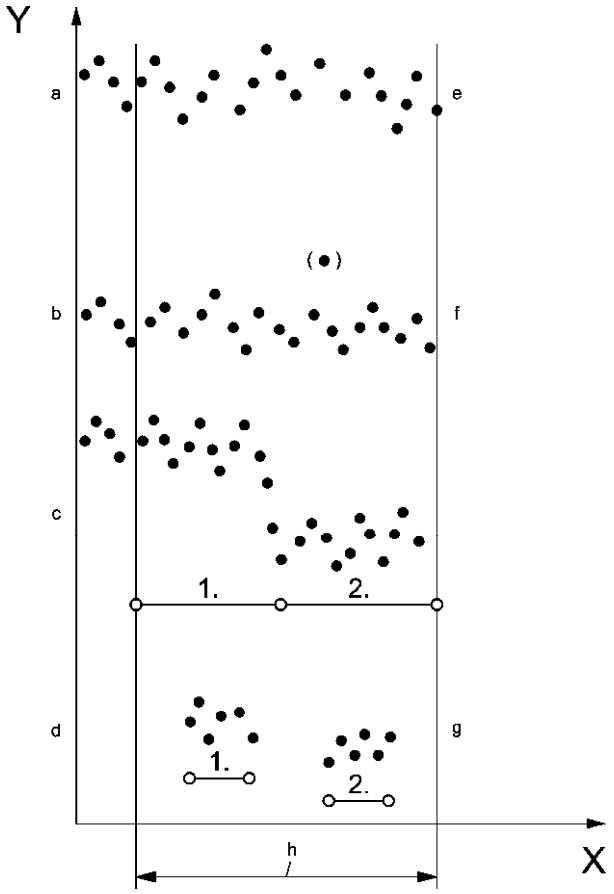
The evaluations may normally be carried out by correspondence and each evaluation shall lead, for the property examined, to a single conclusion in respect of the set of test results as a whole.

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 be taken.

The evaluation has to be carried out as specified in Clause 8 of EN 450-1:2005 entitled "Conformity criteria". Where assessment by variables is the rule but the producer requests assessment by attributes claiming a non-normal distribution of the autocontrol test data, the 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 EN 450-1:2005. The Chi-squared or Epps-Pulley tests given in ISO 5479 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 certification body. For example, this could happen when there is an identified sampling or testing error. Records of the producer should support such findings.



Key

Y	Property	e	Evaluation on the test results of all autocontrol samples
X	Time	f	Exclusion of outliers accepted by the certification body
a	Regular case	g	Separate evaluations of data sets
b	Outliers handled	h	Control period
c	Managed step changes		
d	Limited production/ dispatching runs		

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 certification body, never automatic and must be intentionally designed, controlled and advised to the certification body in advance.

Reason for such a regulation is that, due to altered production conditions of fly ash during the control period, fly ash 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 producer'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 certification body whether the autocontrol test results are evaluated by correspondence or in the production plant.

5.3.5 Reports

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

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 producer. The report should also detail the scope of the response required from the producer and the permissible response time.

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

5.4.1 Sampling

Spot samples shall be taken in the autocontrol scheme under the responsibility of the certification body at the point(s) of release of fly ash from the production plant and/or depots supplied with fly ash by the production plant. These are taken principally in order to provide a check on the accuracy of the producer's test results. Representatives of the certification body shall be granted access to the production plant/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 certification body or its sub-contractor should make arrangements with the production plant about the person(s) and their deputies to be contacted on entering the production plant/depot in case of sampling.

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

The representative must convince himself that:

— there is no doubt about the identity of the fly ash;

— sampling and subdividing into sub-samples takes place according to the procedures of the production plant and in conformity with EN 196-7.

The producer should supply appropriate containers for shipping the sample to the testing laboratory. The containers must have the possibility for attaching a seal. Removal of the seal before the sample is received by the testing laboratory, will render the sample void and the certification body must be informed as soon as possible by the testing laboratory. Arrangements must be made about the responsibility for

shipment of the container(s) to the testing laboratory and, in case of sampling at a depot, also to the production plant laboratory.

The certification body should inform the testing laboratory in writing about the test(s) to be carried out on each individual sample.

5.4.2 Number of samples

The number of samples taken shall be at least six per year for each certified fly ash sent out continuously from the production plant. When certified fly ash is not dispatched continuously, this frequency and the point of sampling may be altered by mutual agreement between the certification body and the producer.

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

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

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.

All samples are taken at the point of release. This can be at the production plant or at the depot(s). Where sampling occurs at depots, the number of samples taken in each control period must not exceed a level consistent with the volume of fly ash dispatched from the depot compared with the production plant.

5.4.3 Properties and test methods

The physical and chemical properties specified for testing in Clause 8 of EN 450-1:2005 shall be determined according to the indicated test methods.

The source of the EN 196-1 CEN standard sand to be used for autocontrol and audit activity index testing shall be as agreed between the producer and the certification body.

Guidance

Other test methods than indicated may be used provided that it is demonstrated that this method yields equivalent results on the fly ash in question. Verification of the correlation should take place at a frequency agreed between the producer and the certification body or on the finding of discrepancies during the inspection or proficiency testing. The correlation studies should be documented.

The use of the same method of compaction of standard mortar bars 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 producer and the certification body. However, it is convenient if the same source can be used by both as this removes one cause of variation. Also, the test cement used should be the same and from one source.

5.4.4 Testing

Unless otherwise specified, 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 producer for testing under the autocontrol scheme and one shall be packed, sealed, clearly labelled and forwarded to the testing laboratory for audit testing. The third sub-sample shall be sealed and retained by the producer for a minimum period of six 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 of the two sub-samples shall be tested, when relevant, by the producer and the other one by the testing laboratory, for the required properties as listed in EN 450-1:2005, using the test methods indicated in that standard.

The samples taken for audit testing may be part of the autocontrol testing of samples according to 4.3.

Guidance

The possible use of the third sample is decided by the 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 certification body.

5.4.5 Evaluation of test results

The results obtained shall be evaluated by the certification body. The procedures described in Annex A shall be used for the evaluation of the representativeness and accuracy of the fineness test results.

Guidance

The production plant and the testing laboratory should report their results to the 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 Annex A of EN 450-2:2005 takes place when the results of the autocontrol of the producer become available. As a minimum twice a year, 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 producer.

5.4.7 Proficiency testing

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

Guidance

The reason for the testing laboratory engaging in proficiency testing is to verify that the testing results remain within a range that allows the certification of fly ash to be equivalent independent of the laboratory involved. To meet the requirements of 5.4.7 of EN 450-2:2005, proficiency testing programmes should have the following features:

— A sufficient number of participating laboratories (at least 6, 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". The laboratories can be from different countries.

— For fly ash, a frequency of one exercise per year may be sufficient as a minimum, using different fly ashes every year (varying type of ash and, where possible and relevant, source).

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

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

In addition, it is recommended that the programmes also include all properties called up in EN 450-1.

The programmes look at the result obtained, by each laboratory, in relation to the population of results of all the laboratories participating in the particular programme following the principles given in ISO/IEC Guide 43[a)]. Each exercise provides one test result from each participating laboratory.

ISO 5725[b)] 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 laboratory may be an outlier in the set of all results of the testing programme exercise, it nevertheless counts as the result for that laboratory on the occasion of the particular exercise. Following the statistical interpretation, the result for a 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 organising the programme.

The approved testing laboratory, in agreement with the 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 fly ash and test 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 organisation of on-going inter-laboratory comparative testing, designed to maintain adequate internal repeatability, in co-operation with other laboratories testing fly ash (whether approved testing laboratories or other laboratories).

5.5 Initial inspection of the production plant and the production control

5.5.1 Inspection of a new production plant

In the case of a new production plant, an initial inspection of the plant and the production control shall be made, based on information on the production control and the equipment to be used to produce the fly ash. The inspection shall, among other things:

a) verify that the Works' quality manual complies with the requirements of 4.1.2;

b) verify that the equipment used to produce and test the fly ash meets the criteria in 5.5.3 and 5.5.4.

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a) ISO/IEC Guide 43-1 "Proficiency testing by inter-laboratory comparisons – Part 1: Development and operation of proficiency testing schemes". ISO/IEC Guide 43-2 "Proficiency testing by inter-laboratory comparisons – Part 2: Selection and use of proficiency testing schemes by laboratory accreditation bodies".

b) ISO 5725 "Application of statistics – Accuracy (trueness and precision) of measurement methods and results".

Guidance

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

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

General guidance on inspection is given under 5.2.1.

5.5.2 Inspection of an existing production plant

In case of any significant changes concerning the production control and the equipment, it has to be decided, 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 fly ash at an existing production plant, a new inspection of the production plant is rarely necessary, except when fundamental changes have been necessary to produce the new type of fly ash. The 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 EN 450-1:2005. The following criteria shall be considered:

a) Equipment shall be provided which is suitable for the production of fly ash, in particular for adequate homogenisation, allowing control of production with sufficient accuracy to ensure that the requirements of EN 450-1:2005 are met.

b) Each fly ash 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 (indication of the fly ash, reference to EN 450-1:2005). For products going under CE-marking, see EN 450-1:2005, Annex ZA.3.

c) Points where fly ash is released from the production plant 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 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 producer's production control.

Guidance

In-process control should be carried out in the production plant laboratory or by an external laboratory in agreement with the certification body.

5.5.5 Reports

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

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 3.1.4 and 7) shall be, as a rule, three months.

Guidance

In case of continuous production and shipment of the fly ash under investigation the frequencies of sampling and testing by the production plant during the initial period will give, in the case of testing of fly ash, 120 results for loss on ignition and fineness in the autocontrol and three audit samples.

In case of non-continuous production and shipment of fly ash, for example when only a limited amount of a fly ash is available, arrangements must be made with the producer 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 for loss on ignition and fineness are available. The sampling frequency is tuned to the production and shipment frequency. Audit sampling should only take place when newly produced fly ash of this type is available for shipment.

5.6.2 Evaluation of test results

The evaluation of test results on the fly ash shall be based on the autocontrol test results (see 4.3.1) and the audit test results (see 5.4.2) obtained during the initial period.

Guidance

If the number of audit test results is less than six, then Annex A of EN 450-2:2005 is not valid for comparison of the testing laboratory and the producer'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 certification body and a copy sent to the producer.

6 Actions in the event of non-conformity

6.1 Actions to be taken by the producer

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

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

Guidance

In the event of a non-conformity, it is the responsibility of the producer 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 certification body to check whether these measures are appropriate and commensurate with the technical problem that 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 producer. 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 fly ash has gone back to conformity and therefore that the measures and corrective actions which were taken by the producer are adequate and appropriate.

Doubling the frequency of auto-control testing is often one of the adequate measures decided by the producer himself and, in this case, there is no reason for the 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 certification body

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

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

In the event that the results of the producer's autocontrol testing indicate that the requirements given in Clause 8 of EN 450-1:2005 are not met, the actions taken by the certification body shall be as shown in Table 1. The certification body shall check that in the event of a complaint plus warning the minimum frequency of autocontrol testing of non-conforming properties has been doubled for a period of two months following the warning (see 6.1).

Guidance

Non-compliance in the application of the production control by a given production plant is not a non-conformity according to EN 450-2 when it is not associated with a non-conformity of a fly ash. However, the certification body should take appropriate actions to ensure that the production control is correctly applied and could even cancel the certificate for the fly ash in case of continuing non-compliance.

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

Depending on the adequate measures and appropriate actions taken by the producer, the 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 EN 450-1:2005 are not met, the certification body normally applies Table 1 and takes the appropriate action. At the discretion of the certification body, when a set of results which causes 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 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 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 production plant/depot (see 5.4 and Annex A)

If comparisons for physical and chemical properties show deviations indicating sampling or testing errors, the reasons shall be identified. The certification body shall establish whether appropriate actions have been taken to correct 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 below or above the specified characteristic value, the inspection body shall evaluate the results of the producer's autocontrol testing over an appropriate period and make a report to the certification body. If the autocontrol testing is found to be satisfactory, no further action is necessary. If the autocontrol testing confirms the findings of the audit testing, the actions taken by the certification body shall be as shown in Table 1.

If the results of the audit testing do not meet the single result limit value conformity criteria specified in Clause 8 of EN 450-1:2005, the actions taken by the 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 fly ash results from an exceptional situation with regards to the application of the Works' quality manual or when actions taken by the producer are not found to be appropriate, the 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 conformity

When a producer applies for certification of a fly ash, the certification body shall arrange for an initial inspection of the production plant and the production control (if required) (see 5.5) and for the testing of a first audit sample of the fly ash by the testing laboratory according to 5.4.1 to 5.4.4.

Given that the inspection (if any) indicates that the requirements of 5.5 are met, the results from the first sample conform to the requirements of EN 450-1:2005 and that in case of the production of fly ash from co-combustion of pulverised coal with certain co-combustion material the suitability according to EN 450-1:2005 is proven, then the certification body shall issue a certificate of conformity.

During the initial period, the results of the audit testing obtained by the testing laboratory and the results of the autocontrol testing obtained by the producer shall be evaluated by the certification body (see 5.6).

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

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

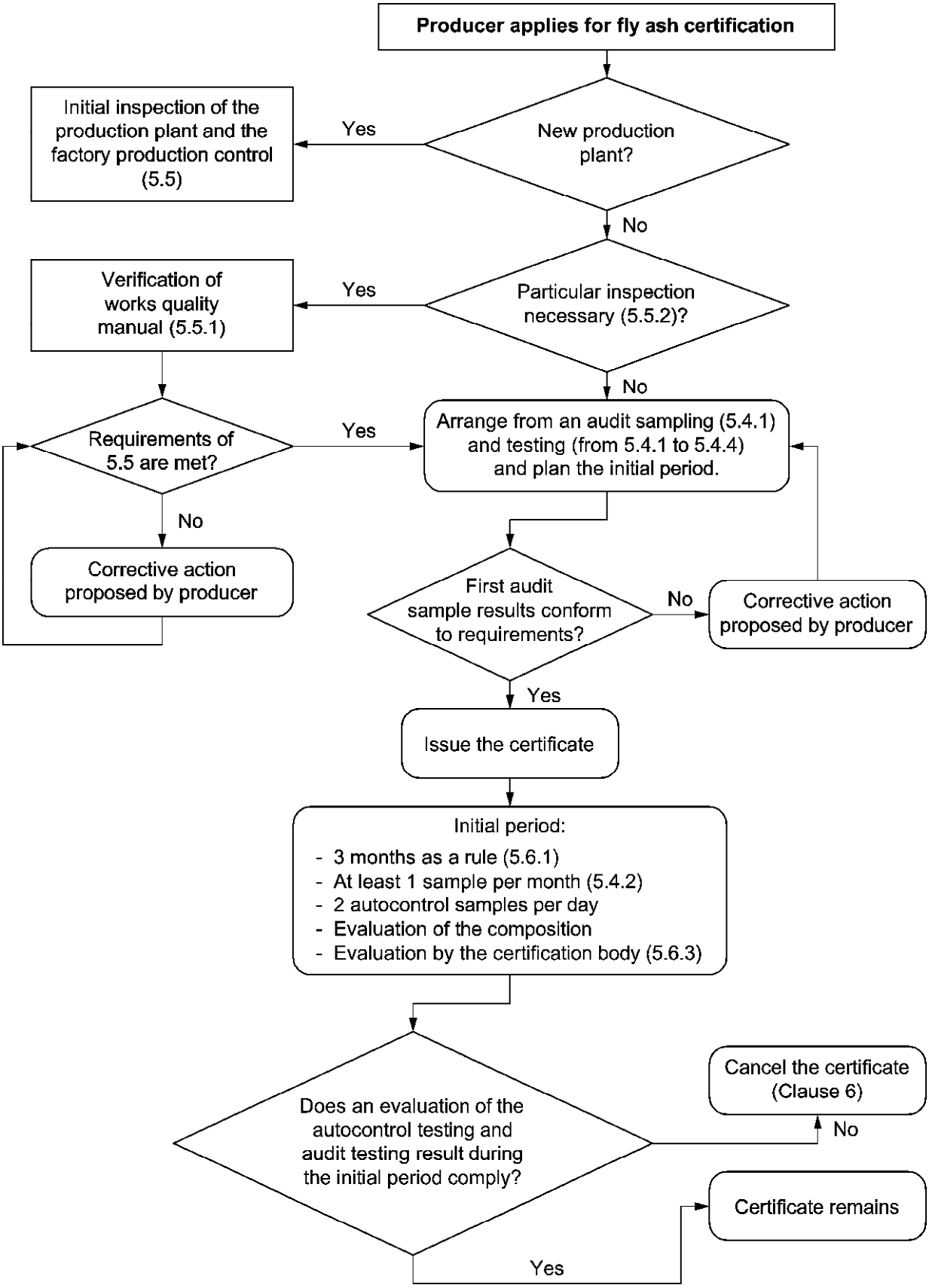
Guidance

Some fly ashes in CEN member countries, prior to the introduction of CE marking based on a harmonised standard, benefit from certification under a national scheme. When audit testing is already being carried out, the procedure described in the first four paragraphs of Clause 7 of EN 450-2:2005 does not apply for already certified fly ashes. The four paragraphs apply only to fly ashes 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 production plant (see 3.1.8) or of a new type of fly ash (see 5.5.2) in an existing production plant (see 3.1.9) is shown in Figure 3.

The steps to achieve the Certificate of Conformity initially depend on the previous knowledge that the certification body has from a production plant. Therefore, a production plant not previously known to the certification body will have an initial inspection of the production plant and a checking of the Works' quality manual.

A certificate of conformity may be cancelled either voluntarily by request from the producer to the certification body or compulsorily after twelve months without production or if the circumstances for giving the certificate no longer apply (closing down of a company, new company, misuse of the certificate). As regards withdrawal, see 6.2 and 7 of EN 450-2:2005.



8 Certificate of conformity and conformity mark

8.1 Indication of conformity

Conformity of a fly ash to EN 450-1:2005 shall be indicated by a certificate of conformity issued by the certification body and the related use of a conformity mark by the producer.

Guidance

Clause 8 does not apply in the case of an EC certificate of conformity nor for the CE marking. Instead, the details given in Annex ZA of EN 450 -1:2005 should be followed.

The Annex ZA gives details of the EC certificate of conformity and the EC declaration of conformity. Suggested formats for these two documents are as follows.

Illustrative Example of EC certificate of conformity - For Information Only

EC-CERTIFICATE OF CONFORMITY

XXXX - CPD – YYYY

In compliance with the Directive 89/106/EEC of the Council of European Communities of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to the construction products (Construction Products Directive - CPD), amended by the Directive 93/68/EEC of the Council of European Communities of 22 July 1993, it has been stated that the

Fly ash to be used as type II addition in concrete, mortars and grout

placed on the market by
<Name of the producer or its authorised representative>
<Full address>

and produced in the production plant
<Production plant>

is submitted by the producer to a factory production control and to the further testing of samples taken at the factory in accordance with a prescribed test plan and that the approved body

<Name of the certification body>

has performed the initial type-testing for the relevant characteristics of the product, the initial inspection of the factory and of the factory production control and performs the continuous surveillance, assessment and approval of the factory production control.

This certificate attests that all provisions concerning the attestation of conformity and the performances described in *<EN XXX:YYYY>* resp. *<ETA XYZ>* were applied and that the product fulfils all the prescribed requirements, including the properties mentioned in Table ZA.1 of EN 450-1:2005.

This certificate was first issued on *<date>* and remains valid as long as the conditions laid down in the harmonised technical specification in reference or the manufacturing conditions in the factory or the factory production control itself are not modified significantly, and latest on *<date>.*

<City, Date> *<Authorized signature>* *<Title, Position>*

Illustrative Example of EC declaration of conformity - For Information Only

EC declaration of conformity

<Name of the producer or its authorised representative>
<Full address>

We declare, in accordance with Article 14 of the Construction Products Directive (89/106/EEC), that the product according to this product specification delivered of the *<production plant>* conforms to *<CUAP (ETA request No 03.01/34) and/or EN 450-1:2005>* with conformity established according to EN 450-2 as given in Annex ZA of EN 450-1:2005.

The factory production control system is controlled by the *<approved body>* and certificate of conformity number:

XXX-CPD-XXX
is < *date*> issued.

<City, Date> *<Authorized signature>* *<Title, Position>*

8.2 Certificate of conformity

The certificate of conformity shall include, in particular:

a) the name and address of the certification body;

b) the name and address of the producer and of the production plant;

c) the designation of the fly ash according to EN 450-1:20051 and any additional identification required;

d) statement that the fly ash conforms to the requirements of EN 450-1:20051 and that the conformity is established according to EN 450-2;

e) the certificate's number.

The certificate of conformity shall entitle the producer to use the conformity mark on packaging and documentation used for the certified fly ash.

NOTE For EC certificate of conformity, see Annex ZA of EN 450-1:2005.

8.3 Conformity mark

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

a) the identification number of the certification body responsible for certification of conformity;

b) the name or identifying mark of the producer and of the production plant;

c) the last two digits of the year in which the conformity mark was affixed;

d) the number of the certificate of conformity;

e) the standard designation of the fly ash according to EN 450-1:2005 and any additional identification required.

NOTE For CE conformity marking, see Annex ZA of EN 450-1:2005.

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 the certified fly ash (certified under a certificate of conformity issued according to EN 450-2 to the producer and bearing a conformity mark). The intermediary shall demonstrate that the conformity of the certified fly ash received is maintained during transport, reception, storage, packaging and dispatch and that the quality and the identity of the fly ash is assured from the producer to the user after dispatch. This should be shown by meeting the specifications given in 9.2 and 9.3.

Guidance

EN 450-1:2005, ZA.2, gives guidance on the purpose of this clause. This Clause 9 is not part of the procedure of attestation of conformity for the affixing of the CE marking under the CPD.

Where and when this Clause 9 applies, it is essential to demonstrate not only the conformity of the fly ash at the point of release of the dispatching centre but also the identity of the fly ash, 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 fly ash 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 fly ash. All decisions should be taken on a case by case basis. Systematic application of those requirements given in Clause 8 of EN 450-1:2005 and of those actions given in Clause 6 of EN 450-2:2005 should be avoided.

9.2 Tasks for the intermediary

9.2.1 Measures to maintain the fly ash quality

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

In particular these measures shall include appropriate acceptance and identification testing in order to demonstrate that the bulk certified fly ash delivered to the dispatching centre has not suffered from contamination and corresponds to the fly ash specified in the purchasing or delivery contracts. In addition, appropriate measures shall be taken to ensure that different fly ashes are kept separate and are stored in separate silos and that contamination of fly ash is avoided.

The minimum frequency of the reception identification testing is one test per delivery, but at least one test per 1 000 tonnes. The properties to be determined for rapid identification (e.g. fineness, loss on ignition or colour) may be chosen by the intermediary, subject to approval by the inspection body.

9.2.2 Confirmation autocontrol testing of samples taken at the dispatching centre

For certified fly ash, the intermediary shall carry out confirmation autocontrol testing of samples to verify that the fly ash maintains its properties. The frequency of sampling and testing, the properties to be tested 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 production plant supplying the certified fly ash shall be compared.

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

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

9.3 Tasks for the third party

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

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

The third party shall check by inspection at least once 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 production plant for a relevant control period, the right to continue to use the conformity mark shall be based on a case by case assessment. Following the inspection, the third party shall prepare a confidential report on its assessment and send this to the intermediary.

9.3.2 Audit testing of samples taken at the dispatching centre

Sampling and testing shall be carried out under the responsibility of the third party as in 5.4.1, 5.4.3 and 5.4.4.

Each sample shall be packed, clearly labelled and forwarded to the testing laboratory.

The frequency of audit testing, the properties to be tested 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 to grant the intermediary the right to continue the use of the conformity mark.

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

Criterion	Item		Non-conformity of test result(s)[a]	Action to be taken by certification body		
				Issue of a complaint	Issue of a complaint plus warning[b]	Withdrawal of Certificate of Conformity[c]
Specified characteristic value	Auto-control testing	All results in control period	Non-conformity of the test results with the requirements of the statistical conformity criteria specified in the relevant product specification standard	First non-conformity of the test results	Non-conformity of the test results for the same property in 2 consecutive statistical assessments	Non-conformity of the test results for the same property in 3 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 months[d]	Third non-conformity of a test result for the same property within 12 months[d]

a Non-conformities for different properties are treated separately.

b The minimum frequency of autocontrol testing shall be doubled for a period of 2 months following receipt of a complaint plus warning, unless it can be demonstrated to the satisfaction of the certification body that adequate measures were taken from the time of the initial occurrence of the non-conformity until its resolution, including doubling the minimum frequency of autocontrol testing for a minimum period of two months.

c Withdrawal is always based on a case by case assessment of the history.

d Only if information on the preceding non-conforming test result has been available at the time of sampling.

Table 2 — Confirmation and audit testing of samples of certified fly ash taken at dispatching centres: properties and minimum testing frequencies[a]

	Minimum testing frequencies		
Properties to be tested [b]	Confirmation autocontrol by the intermediary		Audit testing by the third party
	Fly ash unloaded and stored at the dispatching centre	Fly ash transhipped at the dispatching centre	
Loss on ignition	1/week		
Fineness	1/week	1 per delivered lot but at least 1 per 1 000 tonnes	3/year
Activity index at 28 days	1/month		

[a] The methods used to take and prepare samples shall be in accordance with the requirements of EN 196-7.

[b] Using the test methods referred to in EN 450-1:2005.

Annex A
(normative)

Evaluation of the representativeness and the accuracy of the fineness test results

A.1 General

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

Guidance

The criteria given below are action limits requiring corrective actions in all cases. They were agreed on the basis of test data available. Depending on the experience gained and possible improvements of the test standard EN 451-2, the criteria may be optimised in the future.

In addition to the specified criteria, it may be useful that the certification body and the producer 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 the fineness. If for these properties unusual differences between the sets of test results are observed, an assessment of 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 (set A);

b) the results of tests carried out by the producer on samples taken for audit testing, if any, when relevant (set B);

c) the results of tests carried out by the testing laboratory on samples taken for audit testing (set C).

The number of results in each of the sets B, when relevant, 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. The symbols used are listed in A.3.2.

A.3.2 Symbols

The symbols used in A.3.3 and A.3.4 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 producer on the samples taken for audit testing
M_C	is the average of the results of the tests carried out by the testing laboratory on samples taken for audit testing
N_B	is the number of the samples taken for audit testing
S_A	is the standard deviation of all results of the autocontrol testing during the period under consideration
S_D	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 producer** C_i **is the corresponding individua**l test result by the testing laboratory
	$S_D = [(\Sigma d_i^2 - (\Sigma d_i)^2 / N_B) / (N_B - 1)]^{1/2}$

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

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

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

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

the reason shall be identified by the producer (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 [7]).

Guidance

This check gives information whether the results of testing audit samples by the producer (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 %.

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

Set B and set C shall be compared on the basis of the requirements on the reproducibility specified in EN 451-2.

Guidance

This check gives information on whether the results of the producer (set B) and the testing laboratory (set C) coincide with sufficient accuracy. Criterion b) indicates systematic differences in the test results 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.

Annex B
(informative)

General definitions

B.1 Definitions based on the Construction Products Directive[3]

B.1.1
inspection body
impartial body having the organisation, staffing, competence and integrity to perform according to specified criteria functions such as assessing, recommending for acceptance and subsequent audit of producers' quality control operations, and selection and evaluation of products on site or in factories or elsewhere, according to specific criteria

B.1.2
testing laboratory
laboratory which measures, examines, tests, calibrates or otherwise determines the characteristics or performance of materials or products

B.2 Definitions from or based on EN 45020

B.2.1
certification
procedure by which a third party gives written assurance that a product, process or service conforms to specified requirements

B.2.2
test
technical operation that consists of the determination of a characteristic of a product according to a specified procedure

B.2.3
test method
specified technical procedure for performing a test

B.3 Definition from EN ISO 9000

B.3.1
quality control
operational techniques and activities that are used to fulfil requirements for quality

3 89/106/EEC

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

B.4.1
autocontrol testing[4]
continual testing by the producer of fly ash spot samples taken at the point(s) of release from the production plant or depot

B.4.2
control period
period of production and dispatch identified for the evaluation of the autocontrol test results

B.4.3
spot sample
sample taken at the same time and from one and the same place, relating to the intended tests; it can be obtained by combining one or more immediately consecutive increments

B.4.4
specified characteristic value
characteristic value of a mechanical, physical or chemical property which in the case of an upper limit is not to be exceeded or in the case of a lower limit is, as a minimum, to be reached

B.4.5
single result limit value
value of a mechanical, physical or chemical property which – for any single test result – in the case of an upper limit is not to be exceeded or in the case of a lower limit is, as a minimum, to be reached

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

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[2] EN 45004, General criteria for the operation of various types of bodies performing inspection

[3] EN 45011, General requirements for bodies operating product certification systems (ISO/IEC Guide 65:1996)

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[5] EN ISO 9000, Quality Management systems – Fundamentals and vocabulary (ISO 9000:2005)

[6] EN ISO 9001: 2008, Quality Management systems – Requirements (ISO 9001:2008)

[7] ISO 2854, Statistical interpretation of data – Techniques of estimation and tests relating to means and variances

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