DUS 310-2

DRAFT UGANDA STANDARD

Second Edition
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Cement — Part 2: Conformity evaluation

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Contents

Page

Foreword

Uganda National Bureau of Standards (UNBS) is a parastatal under the Ministry of Trade, Industry and Cooperatives established under Cap 327, of the Laws of Uganda, as amended. UNBS is mandated to co-ordinate the elaboration of standards and is

(a) a member of International Organisation for Standardisation (ISO) and

(b) a contact point for the WHO/FAO Codex Alimentarius Commission on Food Standards, and

(c) the National Enquiry Point on TBT Agreement of the World Trade Organisation (WTO).

The work of preparing Uganda Standards is carried out through Technical Committees. A Technical Committee is established to deliberate on standards in a given field or area and consists of representatives of consumers, traders, academicians, manufacturers, government and other stakeholders.

Draft Uganda Standards adopted by the Technical Committee are widely circulated to stakeholders and the general public for comments. The committee reviews the comments before recommending the draft standards for approval and declaration as Uganda Standards by the National Standards Council.

DUS 310-2 was prepared by Technical Committee TC3, *Cement, lime, clay and related products*.

In the preparation of this Uganda Standard, reference was made to the following standard:

EN 197-2: 2014; *Cement – Part 2; Conformity evaluation*

The assistance derived from the above source is hereby acknowledged with thanks.

This second edition cancels and replaces the first edition (*US 310-2:2000*), which has been technically revised.

DUS 310 consists of the following parts, under the general title: *Cement.*

— *Part 1: Composition, specification and conformity criteria for common cement*

— *Part 2: Conformity evaluation*

Cement — Part 2: Conformity evaluation

1 Scope

This Draft Uganda Standard specifies the scheme for the assessment and verification of constancy of performance (AVCP) of cements to their corresponding product specification standards, including certification of constancy of performance by a product certification body.

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

NOTE 1 In this standard the word "cement" is used to refer both to common cements as defined in DUS 310-1 and to other cements and binders for which the relevant product specification standard makes reference to this Uganda standard and which are submitted for certification. Such cement is produced at a given factory and belongs to a particular type and a particular strength class, as defined and specified in the relevant product specification standard.

NOTE 2 This standard should be linked with other standards covering cements and binders, in particular for the assignments of tasks of the manufacturer and the product certification body.

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.

ASTM C 91 *Specification for Masonry Cement*

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

DUS 310-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

DUS 100-1, *Cement — Test methods — Part 1: Determination of strength*

DUS 100-2, *Cement-Test methods — Part 2: Chemical analysis of cement*

DUS 100-3, *Cement-Test methods — Part 3: Determination of setting time and soundness*

DUS 100-5, *Cement-Test methods — Part 5: pozzolanity test for pozzolanic cements*

DUS 100-7, *Cement — Test methods — Part 7: Methods of taking and preparing samples of cement*

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

ISO/IEC 17020*, Conformity assessment — Requirements for the operation of various types of bodies performing inspection*

ISO 17025*, General requirements for the competence of testing and calibration laboratories*

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

ISO/IEC 17065*, Conformity assessment — Requirements for bodies certifying products, processes and services*

3 Terms and definitions

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

3.1
AVCP
assessment and verification of consistency of performance

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

3.3
conformity mark
protected mark applied on the basis of the certificate of conformity

3.4
certified cement
cement for which a certificate of conformity has been issued

3.5
initial period
immediate period after the first issuing of the certificate of conformity for a cement

3.6
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

3.7
factory production control
permanent internal control of cement production exercised by the manufacturer consisting of internal quality control complemented by autocontrol testing

3.8
factory
facility used by a manufacturer for the production of cement using equipment which is suitable for continuous mass production of cement including, in particular, equipment for adequate grinding and homogenization and the necessary silo capacity for the storage and dispatch of each cement produced. This equipment and the production control applied allow the control of production with sufficient accuracy to ensure that the requirements of the relevant product specification standard are met

3.9
new factory
factory which is not already producing cement(s) certified under this scheme

3.10
existing factory
factory which is already producing cement(s) certified under this scheme

3.11
depot
bulk cement handling facility (not located at the factory) used for the dispatch of cement (whether in bulk or bagged) after transfer or storage, where the manufacturer has full responsibility for all aspects of the quality of the cement

3.12
dispatching centre
bulk cement handling facility (not located at the factory) used for the dispatch of cement after transfer or storage, where an intermediary has full responsibility for all aspects of the quality of the cement

3.13
intermediary
natural or legal person, who takes from the manufacturer bulk cement certified according to DUS 310-2 and bearing the conformity mark, who undertakes full responsibility for maintaining in a bulk handling facility all aspects of the quality of the cement and, who supplies the cement onwards to a further person

3.14
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

3.15
works' quality manual
document that provides information on the factory production control which is applied by a manufacturer at a particular factory to ensure conformity of the cement with the requirements of the relevant product specification standard.

4 Requirements for factory production control by the manufacturer

4.1 General requirements

4.1.1 Concept

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

NOTE The requirements of this standard as regards factory production control take account of those clauses of ISO 9001 which are relevant to the production, process control and testing of cement.

4.1.2 Works' quality manual

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

a) the quality aims and the organizational structure, responsibilities and powers of the management with regard to product quality and the means to monitor the achievement of the required product quality and the effective operation of the internal quality control (see 4.1.3);

b) the manufacturing and quality control techniques, processes and systematic actions that shall be used (see 4.2.1, 4.2.3 and 4.3.2); and

c) the inspections and tests that shall be carried out before, during and after manufacture, and the frequency with which they shall be carried out (see 4.2.2, 4.3.1 and 4.3.3).

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

4.1.2.3 The Works' quality manual shall address and document the procedures operated to ensure that the manufactured cement conforms to the technical specifications. The manual may reference associated documents which provide further details of the autocontrol testing of samples and the internal quality control.

4.1.2.4 For the purpose of this scheme, the term Works' quality manual shall be considered to include these associated documents.

4.1.2.5 In the case of an existing quality management system according to ISO 9001, the product certification body may examine if the corresponding quality manual meets all the requirements of this standard which are relevant to the factory production control of cement. Provided all the requirements are included, this quality manual may also be applied for product certification.

4.1.3 Management systems

4.1.3.1 Quality policy statement

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

4.1.3.2 Management representative

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

4.1.3.2 Internal audits and management review

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

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

b) a management review of the functioning and result of the factory production control, taking into account records of the internal audits.

4.1.3.3 Training

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

4.1.4 System of documentation

4.1.4.1 Document control

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

4.1.4.1.2 The 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.

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

4.1.4.2 Quality records

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

4.2 Internal quality control

4.2.1 Process control

4.2.1.1 General

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

4.2.1.2 Constituents and composition of cement

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

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

4.2.1.3 Control of off-specification production

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

4.2.2 Measuring and testing

4.2.2.1 Inspection, measuring and test equipment

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

4.2.2.2 Inspection and test status

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

4.2.3 Handling, storage, packaging and delivery

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

4.3 Autocontrol testing of samples

4.3.1 Sampling and testing

4.3.1.1 The manufacturer shall operate a system of autocontrol testing for each certified cement. This system shall be used to demonstrate conformity to the requirements in the relevant clause concerning AVCP in the relevant product specification standard. The properties to be tested, the testing methods, the minimum frequency of autocontrol testing during routine testing and initial period testing and the conformity criteria shall

be in accordance with the basic requirements given in the relevant clause concerning AVCP in the relevant product specification standard. For cements not being dispatched continuously, the frequency of testing and the point of sampling shall be as specified in the Works' quality manual.

4.3.1.2 All test data shall be documented.

4.3.2 Corrective action

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

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

4.3.2.3 In the event of cement yielding a test result not conforming to the single result limit value conformity criteria specified in the relevant product specification standard, the manufacturer shall immediately determine the affected quantity, take appropriate action to prevent the dispatch of this quantity and inform the affected customer if such cement has been released. In addition, the manufacturer shall immediately determine the causes of such non-conformity, take corrective actions and undertake a review of all relevant factory production control procedures. All such actions and findings shall be appropriately recorded in a report subject to inspection during the management review.

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

4.3.3 Measuring and test equipment for autocontrol testing

The equipment used for autocontrol testing shall be regularly checked and calibrated in accordance with procedures and frequencies laid down in the Works' quality manual. These procedures may include comparison of compressive strength test results by proficiency testing according to ISO/IEC 17043.

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

4.3.4 Quality records

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

5 Tasks for the product certification body

5.1 General

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

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

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

5.2.1 Inspection tasks

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

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

5.2.2 Frequency of inspections

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

5.2.3 Reports

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

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

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

5.3 Evaluation of the results of autocontrol testing of samples

5.3.1 Evaluation tasks

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

5.3.2 Number and timing of evaluations

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

5.3.3 Control period

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

5.3.4 Evaluation of test results

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

5.3.4.2 The evaluation of test results should exclude any test result accepted as an outlier by the product certification body, for example in the case of identifying the sampling and testing errors.

5.3.4.3 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.

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

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

5.3.5 Reports

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

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

5.4.1 Sampling

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

5.4.2 Number of samples

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

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

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

5.4.3 Properties and test methods

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

5.4.4 Testing

5.4.4.1 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 DUS 100-7. One sub-sample shall be retained by the manufacturer for testing and one shall be packed, sealed, clearly labeled and forwarded to the product certification body. The third sub-sample shall be sealed and retained by the manufacturer for a minimum period of three months. It is intended for use if:

a) one of the first two sub-samples is lost, deteriorates or becomes contaminated;

b) further testing is needed in the event of a dispute.

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

5.4.5 Evaluation of test results

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

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

5.4.6 Reports

5.4.6.1 Following each evaluation of audit test results, a confidential report shall be prepared without delay and a copy sent to the manufacturer by the product certification body.

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

5.4.7 Proficiency testing

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

5.5 Initial inspection of the factory and the factory production control

5.5.1 Inspection of a new factory

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

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

b) verify that the equipment used to produce and test the cement(s) meets the criteria in 5.5.3 and 5.5.4.

5.5.2 Inspection of an existing factory

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

5.5.3 Criteria for the assessment of the production equipment

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

a) the constituents as described in the relevant product specification standard shall be protected against contamination within the factory

b) equipment shall be provided which is suitable for continuous mass production of cement, in particular for adequate grinding and homogenization, allowing control of production with sufficient accuracy to ensure that the requirements of the relevant product specification standard are met

c) measures shall be taken to prevent the mixing of different cements during conveying and storage

d) each cement shall be stored in one or more separate silos, protected to prevent contamination and deterioration. The silos may include or take the form of fully enclosed separated air-tight subdivisions. Silos and/or discharge points shall be clearly marked with an indication of the cement type, strength class and any additional identification required; and

e) points where cement is released from the factory and/or depot shall allow samples to be taken in accordance with the methods in DUS 100-7.

5.5.4 Criteria for the assessment of laboratories

5.5.4.1 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)

5.5.4.2 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).

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

5.5.5 Reports

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

5.6 Evaluation of test results during the initial period

5.6.1 Initial period

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

5.6.2 Evaluation of test results

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

5.6.3 Reports

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

6 Actions in the event of non-conformity

6.1 Actions to be taken by the manufacturer

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

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

6.2 Actions to be taken by the product certification body

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

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

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

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

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

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

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

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

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

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

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

7.3 During the initial period, the results of the audit testing obtained by the Product certification body and the results of the autocontrol testing obtained by the manufacturer shall be evaluated by the product certification body (see 5.6). For a new factory this shall include an evaluation according to A3.

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

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

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

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

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

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

8.1 indication of constancy of performance of the product

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

8.2 Certificate of constancy of performance of the product

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

a) the name and address of the certification body;

b) the name and address of the manufacturer and of the factory;

c) the standard designation of the cement according to the relevant product specification standard and any additional identification required;

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

e) the certificate's number.

8.3 Conformity mark

The certificate of conformity shall entitle the manufacturer to use the conformity mark on packaging and documentation used for the certified cement. The conformity marking shall consist of the conformity symbol and shall be followed by:

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

b) the name or identifying mark of the manufacturer and of the factory;

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

d) the number of the certificate of conformity; and

e) the standard designation of the cement according to the relevant product specification standard and any additional identification required.

9 Requirements for dispatching centres

9.1 General requirements

9.1.1 Intermediaries operating dispatching centres have a responsibility to maintain the quality, the identity and the conformity of certified cements (certified under a certificate of constancy of performance of the product issued according to this standard to the manufacturer or importer and bearing the conformity mark).

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

9.2 Tasks for the intermediary

9.2.1 Measures to maintain the cement quality

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

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

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

9.2.2 Confirmation autocontrol testing of samples taken at the dispatching centre

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

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

9.2.2.3 The individual results of confirmation autocontrol testing carried out by an intermediary in respect of each certified cement shall remain within the range of the maximum and minimum values of the relevant manufacturer's autocontrol results in any given control period. The individual results of the confirmation autocontrol testing shall at no time exceed the limit values for single results of the relevant specification standard.

9.3 Tasks for the third party

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

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

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

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

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

9.3.2 Audit testing of samples taken at the dispatching centre

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

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

9.3.3 Decisions to be taken

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

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

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

	testing		of the single result limit value conformity criteria specified in the relevant product specification standard	result	same property within 12 [f] months [e]	same property within 12 [f] months [e]

[a] Non-conformities for different properties are treated separately.

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

[c] Withdrawal is always based on a case by case assessment.

[d] In the case of the upper limit of the standard strength the issuing of a complaint plus warning should be based on a case by case decision.

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

[f] 24 months for masonry cement conforming to ASTM C 91

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

Properties to be tested [b, c]	Minimum testing frequencies		
	Confirmation autocontrol by the intermediary		Audit testing by the third party
	Cement unloaded and stored at the dispatching centre	Cement transshipped at the dispatching centre	
Early strength	1/week	1 per delivered lot but at least 1 per 500 tonnes	6/year
Standard strength			
Initial setting time	1/week		
Insoluble residue	1/week		
Loss on ignition			
SO_3 content	1/week		
Heat of hydration	1/every 2 months		
Pozzolanicity	2/month		
C_3A in clinker	1/month		
Air content	1/fortnight		

[a] The methods used to take and prepare samples shall be in accordance with the requirements of DUS 100-7

[b] If required by the relevant product specification standard

[c] Using the test methods referred to in the relevant product specifications standard

Annex A
(normative)

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

A.1 General

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

A.2 Sets of results considered

A.2.1 The evaluation procedure considers the following three sets of test results:

-A all test results from the autocontrol testing during the period under consideration;

-B the result of tests carried out by the manufacturer on samples taken for audit testing; and

-C the results of tests carried out by the testing laboratory on samples taken for audit testing.

A.2.2 The number of results in each of the sets B and C is at least six. They should be equally distributed throughout the period under consideration.

A.3 Evaluation procedure

A.3.1 Introduction

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

A.3.2 Symbols

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

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

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

a) Where $M_A - M_B \leq 2.0$ MPa

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

b) Where $|M_A - M_B| > 2.0$[2] MPa,

1) if $|M_A - M_B| \leq 2.58 \times S_A / (N_B^{1/2})$

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

2) If $|M_A - M_B| > 2.58 \times S_A / (N_B)^{1/2}$

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

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

A.3.4.1 Two conditions should be satisfied:

a) $S_D \leq 3.4$ Mpa; and

b) $|M_B - M_C| \leq 4.0$ MPa

NOTE There are values applicable for cement conforming to DUS 310-1. The values for masonry cement are given in A.3.5. Values for other cements are indicated in the relevant product specification standard.

A.3.4.2 If either or both of these conditions are not satisfied the reasons shall be identified by the manufacturer and the inspection body.

A.3.5 Masonry cement

For masonry cement (see ASTM C 91) the following numerical criteria given in table A2 shall apply in place of the values given in A.3.3 and A.3.4:

Table A.2 — Numerical criteria for masonry cement conforming to ASTM C 91

Criterion	Masonry cement, type /class		
	MC5	MC12.5/MC12.5X	MC 22.5X
$\lvert M_A - M_B \rvert$	1	1.0	2.0
S_D	1.7	2.4	3.4
$\lvert M_B - M_C \rvert$	2.0	2.0	4.0

A.3.6 Calcium aluminate cement

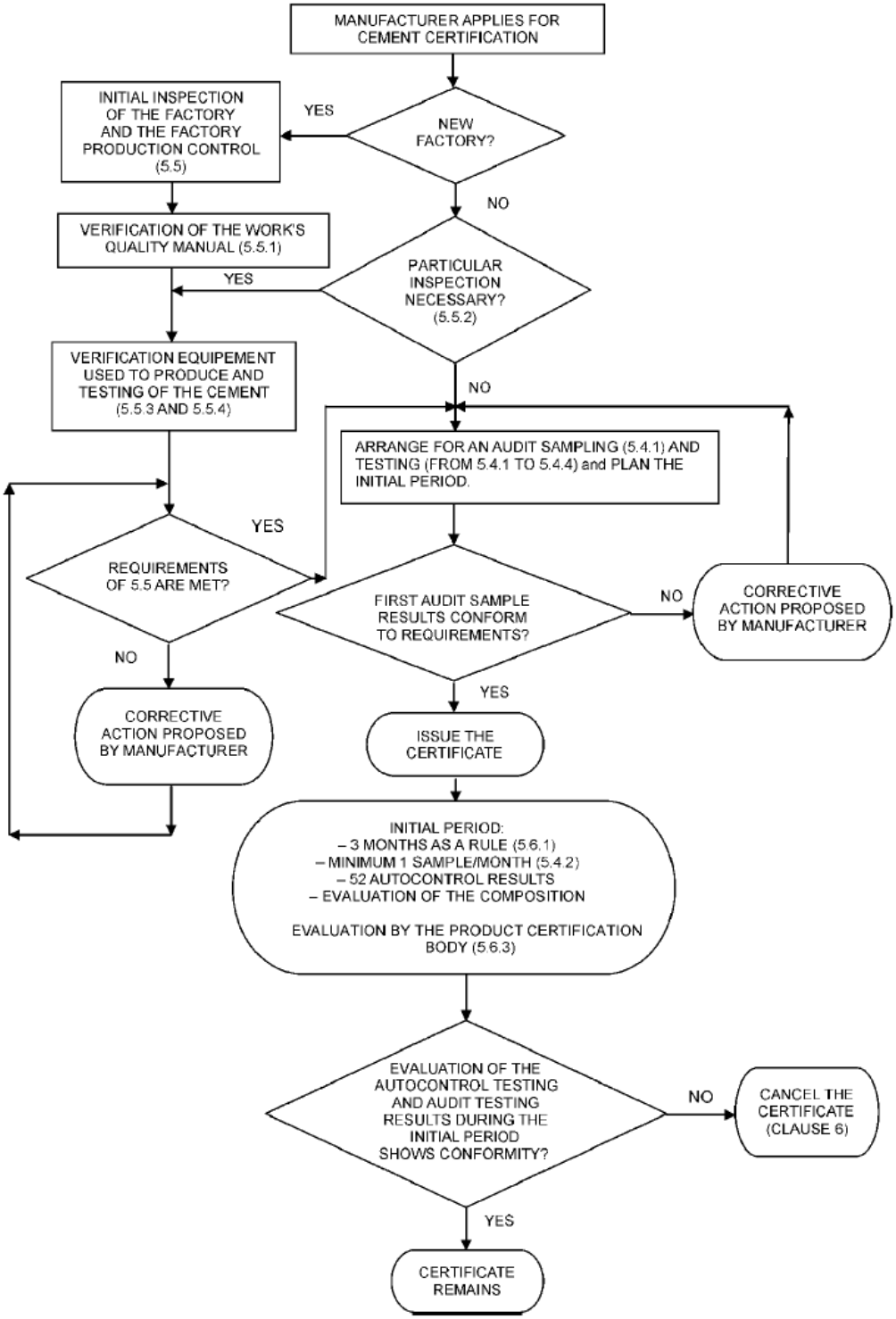
For calcium aluminate cement conforming to EN 14647 the numerical criteria given in Table A.3 shall apply in place of the values given in A.3.3 and A.3.4.

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

Criterion	Calcium aluminate cement
$\lvert M_A - M_B \rvert$	3.0
S_D	5.0
$\lvert M_B - M_C \rvert$	5.0

Annex B
(informative)

Procedure for certification of constancy of performance of cement



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