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**Manufactured stone masonry units —
Specification**

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS 626 was prepared by Technical Committee RSB/TC 9, *Civil engineering and building materials*.

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

BS EN 771-5: 2011+A1:2015, *Specification for masonry units Part 5: Manufactured stone masonry units*

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

Committee membership

The following organizations were represented on the Technical Committee on *Civil engineering and building materials* (RSB/TC 9) in the preparation of this standard.

ASTRIK International

CAMOSAG Ltd

Cleaner Production and Climate Innovation Centre (CPCIC)

Consulting Engineering Group (CEG Ltd)

HOSHAN LTD

Independent Experts

NPD Ltd

Rwanda Housing Authority (RHA)

Rwanda Inspectorate, Competition and Consumer Protection Authority (RICA)

Rwanda Transport Development Agency (RTDA)

University of Rwanda – College of Science and Technology (UR-CST)

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Manufactured stone masonry units — Specification

1 Scope

This Draft Rwanda Standard specifies the characteristics and performance requirements of manufactured stone masonry units for which the main intended uses are facing or exposed masonry in load bearing or non-load bearing building and civil engineering applications. The units are suitable for all forms of coursed or random masonry walling, including single leaf, cavity, partition, retaining and the external masonry to chimneys. They can provide fire protection, thermal insulation, sound insulation and sound absorption.

This standard covers concrete masonry units manufactured to resemble natural stone using casting or pressing techniques with or without textured surfaces produced, by casting, splitting, washing, blasting or tooling and with or without variable outline effects. It covers homogeneous masonry units and those consisting of different facing and backing concrete mixes, but excludes those manufactured with an adhesive bonded decorative face.

It defines the performance related to e.g. strength, density, dimensional accuracy, surface appearance and provides for the assessment and verification of constancy of performance (AVCP)" of the product to this Standard. The marking requirements for products covered by this Standard are also included.

This Standard does not apply to storey height panels, masonry units used for chimney flues or units manufactured with an adhesive bonded decorative face. It does not include products intended to be used as a damp proof course nor does it specify standard sizes for manufactured stone masonry units or work dimensions and angles of specially shaped units. It does not cover units with an incorporated thermal insulation material bonded to the faces of the unit susceptible to be exposed to fire.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 12491, *Statistical methods for quality control of building materials and components*

RS ISO 12572, *Hygrothermal performance of building materials and products — Determination of water vapour transmission properties — Cup method*

RS 524, *Masonry units test methods — Determination of thermal properties*

RS 543, *Masonry units test methods — Determination of water absorption of aggregate concrete, autoclaved aerated concrete, manufactured stone and natural stone masonry units due to capillary action and the initial rate of water absorption of clay masonry units*

RS 536, *Masonry units test methods — Determination of dimensions*

RS 537, *Masonry units test methods — Determination of compressive strength*

RS 538, *Masonry units test methods — Determination of initial shear strength*

RS 539, *Method of test for masonry — Determination of flexural strength*

RS 547, *Fire classification of construction products and building elements — Classification using data from reaction to fire tests*

3 Terms and definitions

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

3.1

masonry

unit preformed component intended for use in masonry construction

3.2

facing masonry unit masonry

unit intended for use with one or more faces visible in use which may or may not be exposed

3.3

exposed face

face intended to be exposed to external climatic conditions

3.4

manufactured stone masonry unit

facing masonry unit having at least one exposed face with a close structure formed from either one or two homogeneous mixtures of aggregate, cementitious binder and other materials moulded under pressure and/or vibration and with or without further processing, intended to resemble and be used as an alternative to natural stone

3.5

two-part masonry unit masonry

unit manufactured with different facing and backing concretes

3.6

co-ordinating size

size of the co-ordinating space allocated to a masonry unit including an allowance for joints

3.7**work size**

size of a masonry unit specified for its manufacture to which the actual size conforms within permissible deviations

3.8**actual size**

size of a masonry unit as measured

3.9**regular shaped masonry unit**

masonry unit with an overall rectangular parallelepiped shape

3.10**specially shaped masonry unit**

masonry unit which is not a rectangular parallelepiped

3.11**accessory unit**

masonry unit which is shaped to provide a particular function, e.g., to complete the geometry of the masonry

3.12**interlocking features**

shaped, matched projections and indentations on masonry units

EXAMPLE Tongue and groove systems.

3.13**recess**

depression or indentation in one or more surfaces of a masonry unit

EXAMPLE Mortar pocket, rendering keyway.

3.14

normalised compressive strength of masonry units

compressive strength of masonry units converted to the air dry compressive strength of an equivalent 100 mm wide × 100 mm high masonry unit

NOTE Procedure given in Annex B of this standard

3.15

declared value

value that a manufacturer is confident of achieving bearing in mind the precision of the test and the variability of the manufacturing process

3.16

profiled surface

surface with pronounced relief

3.17

textured surface

surface which, either during or after manufacture, is subjected to mechanical, physical or chemical processing

3.18

Category I masonry units

units with a declared compressive strength with a probability of failure to reach it not exceeding 5 % NOTE This can be determined via the mean or characteristic value.

3.19

Category II masonry units

units not intended to comply with the level of confidence of Category I units.

3.20

mean compressive strength of masonry units

arithmetic mean of the compressive strengths of masonry units

3.21

characteristic compressive strength of masonry units

compressive strength corresponding to the 5 % fractile of the compressive strength of masonry units

3.22

consignment

shipment from the supplier

4 Materials

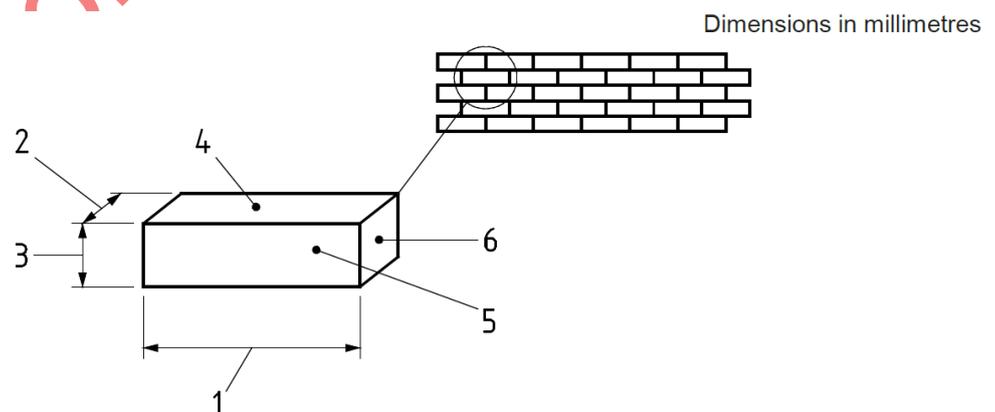
The specifications of the materials to be used shall be included in the production control documentation. If relevant standards available, they shall be used except that aggregate need not comply with the grading requirements. If not available, the manufacturer shall specify the materials and have data on their suitability.

5 Requirements for manufactured stone masonry units**5.1 General**

The requirements and properties specified in this Standard shall be defined in terms of the test methods and other procedures referred to in this Standard. It should be noted that the standard test methods are not always applicable to specially shaped masonry units and accessory units as defined in 3.10 and 3.11 respectively. The conformity criteria given in the following sub-clauses relate to product type determination" (see 8.2) and when relevant to consignment testing (see Annex A). For the compressive strength of Category I units use a 50 % fractile ($p = 0,50$) for mean values or 5 % fractile ($p = 0,05$) for characteristic values and a confidence level of 95 %. For production evaluation the manufacturer shall define the conformity criteria in the factory production control documentation (see 8.3).

5.2 Dimensions and tolerances**5.2.1 Dimensions**

The manufacturer shall declare the dimensions of the manufactured stone masonry units in millimetres for length, width and height, in that order (see Figure 1), and shall declare the tolerance category (see 5.2.2.1).

**Key**

1	Length	3	Height	5	Face
2	Width	4	Bed	6	Header

NOTE This relates to the normal use of the masonry units in the wall.

Figure 1 — Dimensions and surfaces

They shall be given in terms of work size.

NOTE In addition the co-ordinating size can be given.

They shall not exceed 650 mm in any co-ordinating dimension excluding the thickness of any profile on a non-planar face.

5.2.2 Dimensional tolerances

5.2.2.1 Tolerances

The actual dimensions of individual regular units shall conform to the declared work size dimensions subject to the tolerance given in Table 1, except where surfaces are deliberately non-planar, in which case the manufacturer shall declare the tolerances. The manufacturer may declare closer tolerances for one or more dimensions.

Table 1 — Limit deviations in millimetres

Tolerance category	D1	D2	D3
Length	+3	+1	Declared values
	-5	-3	
Width	+3	+1	
	-5	-3	
Height	+3	+1	
	-5	-3	

Tolerances for specially shaped and accessory units shall be declared by the manufacturer.

If sampled in accordance with A.2 and tested in accordance with RS 536, the mean value of the measurements taken of any one dimension of a single unit shall not vary from the manufacturer's work size by more than the tolerances given above for the declared tolerance category.

5.2.2.2 Flatness of bed faces

When manufactured stone masonry units are intended to be used with thin layer mortar, the manufacturer shall declare the maximum deviation from flatness of the bed faces.

If sampled in accordance with A.2 and tested in accordance with the relevant applicable standard, the deviation from flatness of the bed faces shall not exceed the declared value.

5.2.2.3 Parallelism of bed faces

When manufactured stone masonry units are intended to be used with thin layer mortar, the manufacturer shall also declare the maximum deviation from plane parallelism of the bed faces.

If sampled in accordance with A.2 and tested in accordance with RS 536, the deviation from plane parallelism shall not exceed the declared value.

5.3 Configuration and appearance

5.3.1 General

Units may be homogenous or two-part, but, in the case of two-part masonry units, the facing mix shall have a thickness of not less than 20 mm. There shall be no delamination between the facing and the backing concretes.

5.3.2 Configuration

When relevant to the uses for which manufactured stone masonry units are put on the market, the configuration shall be declared, including the maximum area of voids on a bed face as a percentage of the length × width of the unit. The declaration may be made using a drawing or an illustration.

Units intended for use in structural applications shall contain not more than 60 % by volume of all formed voids and may be provided with or without recesses or interlocking features. Such units containing not more than 25 % by volume of formed voids and having no single void greater than 12,5 % of the total volume of the unit may be declared as Group 1 masonry units, in accordance with the applicable design standard.

When conformity with the declared configuration cannot be assessed by visual inspection, masonry units shall be sampled in accordance with A.2, measured in accordance with RS 536 and the values calculated.

5.3.3 Surface appearance

The exposed surfaces of manufactured stone masonry units shall be plain, profiled or textured as declared by the manufacturer. Compliance of textured or profiled surfaces may be established on the basis of comparison with any approved samples. Comparison shall be made from a distance of 3 m in normal daylight conditions.

5.3.4 Flatness of surfaces

Where the surfaces of the unit are declared by the manufacturer to be plain (see 5.3.3), they shall not deviate from a plane by more than $(0,1 \sqrt{Ld})$ mm or 2 mm whichever is the greater, where Ld is the length of the diagonal of the surface declared plain. If sampled in accordance with A.2 and tested in accordance with the applicable standard, no individual measurement of the deviation from a plane shall exceed the value given above.

5.4 Density

When relevant to the uses for which the unit is put on the market, and in all cases for masonry units intended to be used in elements subject to acoustic requirements, the manufacturer shall declare its gross dry density. For two-part units the net dry density of each part shall be declared.

NOTE This declaration can be made for the evaluation of:

— loading;

— sound insulation;

— thermal insulation; — fire resistance.

The deviation from the manufacturer's declared mean gross dry density and mean net dry density shall not be more than 7,5 %.

For the gross dry density of homogeneous units and of two-part units, whole units or representative samples shall be used. For the net dry density of the constituent concretes of two-part units samples of the unformed mix may be taken and moulded in a manner to obtain a level of compaction similar to that attained in the units.

The mean value of the dry density (gross or net) of the six units tested shall be within 7,5 % of the manufacturer's declared value.

5.5 Compressive strength

5.5.1 Declared value

The normalised strength of the manufactured stone masonry units in compression shall be declared by the manufacturer (declared value — for definition see 3.15). Either the mean or the characteristic (5 % fractile) value may be declared but it shall be clearly stated which has been declared. The declaration shall relate to and indicate the intended orientation(s) of the masonry units as tested, the method(s) of bedding the units and whether any voids present are intended to be fully filled with mortar. In addition, the manufacturer shall declare whether the manufactured stone masonry unit is classified as Category I or Category II. The manufacturer shall declare the conditioning regime and the surface preparation to be used in establishing compliance with the declared compressive strength of the units. The procedure for normalising the compressive strength of a unit is given in Annex B. The compressive strength shall be determined by testing either whole masonry units or cubes of dimension 100 mm or 150 mm. Cubes may be cut from a unit or may be prepared from samples of the unformed mix moulded in a manner to obtain a level of compaction similar to that attained in the unit.

If sampled in accordance with A.2 and tested in accordance with RS 537, then:

— Conformity with the declared Mean Value of the normalised compressive strength shall be met if the mean of the normalised compressive strengths of the six units tested is not less than the manufacturer's declared value and no individual normalised compressive strength is less than $0,8 \times$ the declared value;

— Conformity with the declared Characteristic Value of the normalised compressive strength shall be met if the individual normalised compressive strengths of the first six units tested are not less than the declared value except that if only one of the tested units is less than the declared value but not less than $0,9 \times$ the declared value, the remaining 6 units shall be tested and all of the individual normalised compressive strengths of the six units shall be not less than the declared value.

5.5.2 Minimum value

The minimum strength of manufactured stone masonry units meeting the requirements of this standard shall be as given in Table 2.

Table 2 — Normalised compressive strength of manufactured stone masonry units

Type of masonry unit	Mean compressive strength N/mm ²	Characteristic compressive strength N/mm ²
----------------------	--	--

Homogeneous	20	17,5
Two-part: facing mix	20	17,5
backing mix	15	13
NOTE 1 The compressive strength values in this table are based on durability and other considerations.		
NOTE 2 When the compressive strength of two-part units is required to establish the strength of walls in accordance with design codes, only results obtained from testing whole masonry units should be used.		
^a for the normalised compressive strength, see Annex B.		

5.6 Thermal properties

When relevant to the uses for which the unit is put on the market and in all cases for masonry units intended to be used in elements subject to thermal insulation requirements, the manufacturer shall provide the mean $\lambda_{10,dry,unit}$ -value and the determination model as prescribed in RS 524, or alternatively the unit density and configuration.

Additionally, another fractile may be provided. In such cases both the additional fractile and the corresponding $\lambda_{10,dry,unit}$ -value shall be given.

When manufactured stone masonry units are sampled in accordance with Annex A and tested in accordance with RS 524 following the model provided, the λ -value of the specified number of manufactured stone masonry units shall not be greater than the λ -value provided.

When relevant to the uses for which units are put on the market, the value of specific heat capacity given in RS 524 may be provided.

5.7 Durability

When relevant to the uses for which the units are put on the market the manufacturer shall evaluate and declare the freeze/thaw resistance of the units by reference to the provisions valid in the intended place of use of the units until an appropriate Standard is available.

5.8 Water absorption by capillarity

5.8.1 Declared value

The manufacturer shall declare the water absorption due to capillary action of the exposed face of a manufactured stone masonry unit. Units shall be sampled in accordance with A.2 and tested in accordance with RS 543 with an immersion time of $(10 \pm 0,2)$ min.

5.8.2 Maximum value

The water absorption due to capillary action of the exposed face of a unit shall not exceed $9,0 \text{ g/m}^2\text{s}$.

5.9 Moisture movement

When relevant to the uses for which the unit is put on the market, and in all cases for masonry units intended to be used in elements subject to structural requirements, the moisture movement of manufactured stonemasonry units shall be declared by the manufacturer. The mean value of the moisture movement shall not exceed the manufacturer's declared value.

5.10 Water vapour permeability

When relevant to the uses for which the unit is put on the market, the manufacturer shall provide information on the water vapour permeability through the water vapour diffusion coefficient tabulated values given in RS 524, or determined in accordance with RS ISO 12572.

5.11 Reaction to fire

For units intended to be used in elements subject to fire requirements the manufacturer shall declare the reaction to fire classification of the masonry unit. For masonry units containing a mass or volume fraction of $\leq 1,0\%$ (whichever is the most onerous) of homogeneously distributed organic materials, the declaration may be fire Class A1 without the need to test.

Masonry units containing a mass or volume fraction of $> 1,0\%$ (whichever is the most onerous) of homogeneously distributed organic materials shall be classified in accordance with RS 547 and the appropriate reaction to fire class declared.

5.12 Shear bond strength

5.12.1 General

For manufactured stone masonry units intended to be used in elements subjected to structural requirements the shear bond strength of the unit in combination with mortar shall be declared in terms of the characteristic initial shear strength in accordance with RS 538. The declaration may be made either on the basis of fixed values as in 5.12.2 or tests as in 5.12.3. The manufacturer shall declare whether the value of bond strength has been obtained from the fixed values or from test.

NOTE In most cases it is expected that the use of fixed values will be sufficient.

5.12.2 Declaration based on fixed values

When no declaration is made in accordance with 5.12.3, the characteristic initial shear strength of the unit in combination with mortar may be declared.

5.12.3 Declaration based on tests

The characteristic initial shear strength of the unit in combination with one or more specific mortars in accordance with RS 538 may be declared based on tests on masonry units sampled in accordance with Annex A and tested in accordance with RS 538. The characteristic initial shear strength shall not be less than the declared value.

NOTE Bond strength depends on the mortar, the masonry unit and the workmanship.

5.13 Flexural bond strength

When relevant for the intended place of use and the intended application, the flexural bond strength of units and mortar shall be declared. The declaration shall give the characteristic flexural strength of the masonry either in the plane of failure perpendicular to the bed joints or the plane of failure parallel to the bed joints or both, as relevant together with the mortar specification for which the declaration is valid. When manufactured stone masonry units are sampled in accordance with Annex A and tested in accordance with RS 539, the characteristic flexural strength shall not be less than the value declared.

5.14 Dangerous substances

National regulations on dangerous substances may require verification and declaration on release, and sometimes content, when construction products covered by this standard are placed on those markets.

In the absence of harmonized test methods, verification and declaration of release/content should be done taking into account national provisions in the place of use.

6 Description, designation and classification of manufactured stone masonry units

6.1 Description and designation

The description and designation of a manufactured stone masonry unit shall comprise at least the following:

- a) the number, title and date of issue of this Standard;
- b) work size dimensions and tolerance category (see 5.2);
- c) configuration, shape and features including whether homogeneous or two-part, description of surface and if units are Group 1 (see 5.3);
- d) normalized compressive strength of unit or materials and whether mean or characteristic value (see 5.5);
When relevant to the uses for which the unit is put on the market, the description and designation shall include:
- e) mean gross dry density (see 5.4);
- f) mean net dry density (of each concrete for two-part units) (see 5.4);
- g) moisture movement (see 5.9);
- h) thermal properties (see 5.6);
- i) durability (see 5.7).

6.2 Classification

Specification of the properties of manufactured stone masonry units may be given by reference to classification systems provided those systems are based only on single properties included in this standard and do not themselves constitute a barrier to trade. This does not remove the requirement that all manufacturers claiming compliance with this standard shall state declared values of the properties of their products, when required.

7 Marking

The following particulars shall be clearly marked on one of the following: the packaging, the delivery note, any certificate supplied with the masonry units, or 5 % of the units with a maximum of 4 per pack:

- a) the name, trademark or other means of identification of the manufacturer;
- b) a means of identifying the date of manufacture;
- c) means of identifying the masonry units and relating them to their description and designation.

8 Assessment and verification of constancy of performance (AVCP)

8.1 General

The manufacturer shall demonstrate conformity for the product to the requirements of this Standard and with the declared performance for the product properties by carrying out both:

- a) product type determination" (see 8.2), which can be physical testing, calculation, reference to tabulated values or combinations of these methods;
- b) factory production control (see 8.3). Alternative methods of test to the reference methods specified in this Standard may be adopted except for the product type determination tests" and in case of dispute, provided that these alternative methods satisfy the following:
 - i. a correlation can be shown to exist between the results from the reference method and those from the alternative method; or
 - ii. a safe relationship can be demonstrated when using the alternative method compared to the reference methods; and
 - iii. the information on which the relationship is based is available.

8.2 Product type determination

8.2.1 After completion of the development of a new product type and before placing on the market, appropriate product type determination shall be carried out to confirm that the properties predicted from the development meet the requirements of this standard and the performance of the characteristics to be declared for the product.

8.2.2 Whenever a major change in the source, blend, or nature of raw materials occurs, or when there is a change in processing conditions, leading to what the manufacturer considers will constitute a new product type being produced, the appropriate product type determination shall be repeated."

8.2.3 The manufacturer may define product groups. The product group may differ according to the characteristics in question.

8.2.4 In the product type determination process a manufacturer may take into consideration pre-existing results. A manufacturer may use the product type determination results carried out by someone else (e.g., another manufacturer or a research, technology and development service provider) to justify his own declaration of performance regarding a product that is manufactured according to the same design and with raw materials, constituents and manufacturing methods of the same kind, provided that permission is given by the owner of the results, and the results are valid for both products.

8.2.5 The tests to be conducted shall be the tests or calculations as described in Table A.1 for the properties selected from the following list relevant to the manufacturer's declaration for the product type's intended use:

- dimensions;
- dimensional tolerances, including flatness and plane parallelism of bed faces;
- configuration;
- dry density and tolerances;
- compressive strength;
- thermal properties;
- durability;
- water absorption;
- water vapour permeability;
- flatness of surfaces;
- moisture movement;
- reaction to fire;
- bond strength.

Sampling for product type determination shall be in accordance with Annex A. The results of product type determination shall be recorded

8.3 Factory production control

8.3.1 General

8.3.1.1 The manufacturer shall establish, document and maintain a factory production control system to enable continuing conformity with this Standard and the declared performance of the characteristics of the products placed on the market.

8.3.1.2 The factory production control system may consist of procedures related to the process only (full process control and consequently no finished product testing, i.e., 8.3.6 does not apply), to finished products only (consequently no process control, i.e., 8.3.5 does not apply) or any combination of both. Consequently, conformity criteria depend on the individual factory production procedures. As appropriate, the responsibility, authority and interrelation of all personnel who manage, perform and verify work affecting the quality of masonry unit products shall be established. The factory production control system shall describe the control procedure of production, the regular checks by the manufacturer and his testing, depending on the combination of the procedures related to process control and/or finished product testing. Controls and tests may include the characteristics of raw materials and finished products, the procedure of production, the production equipment or the production machines, the test equipment or the testing instruments and the marking of the product.

8.3.1.3 The test results shall be recorded. Actions to be taken when the control test values or criteria do not meet those specified should be documented by the manufacturer. For Category I masonry units the factory production control system shall be designed so that the probability of failure to reach the declared compressive strength is not exceeding 5 % corresponding to 95 % confidence level.

8.3.2 Testing and measuring equipment

All relevant weighing, measuring and testing equipment, that has an influence on the declared values, shall be verified and regularly inspected.

8.3.3 Production equipment

When the factory production control system includes process control procedures all production equipment, that forms part of these procedures and has an influence on the declared values, shall be regularly inspected.

8.3.4 Raw materials

As appropriate, the manufacturer shall define the acceptance criteria of raw materials and the procedures operated to ensure that these are met.

8.3.5 Production process

As appropriate, the relevant features of the production processes shall be defined giving the frequency of the manufacturer's checks together with the required criteria. Actions to be taken when the criteria are not achieved shall be specified by the manufacturer.

8.3.6 Finished product testing

As appropriate, the factory production control system shall incorporate a sampling plan and the frequency of testing of the finished product. The results of sampling and testing shall be recorded.

8.3.7 Statistical techniques

When reasonably practicable and applicable, the results of checks and testing shall be interpreted by means of statistical techniques, by attributes or by variables, to verify the product characteristics and to determine if the production conforms to the compliance criteria and the product conforms to the declared values. One method of satisfying this conformity criterion is to use the approach given in ISO 12491.

8.3.8 Marking and stock control of products

The marking and stock control shall be documented. Individual products or/and a defined quantity of products (e.g., a consignment of products) should be identifiable and traceable.

8.3.9 Traceability

As appropriate, systems of traceability shall be given in the factory production control system.

8.3.10 Nonconforming products

The procedure for dealing with nonconforming products shall be documented. Products that do not conform with the requirements or the performance of the product type shall be segregated and marked accordingly. However, these products may be reassessed by the manufacturer and assigned to a different product type."

The manufacturer shall take action to avoid a reoccurrence of the nonconformity.

Annex A

(normative)

Sampling for determination of product type and for independent testing of consignments

A.1 General

This sampling procedure shall apply for product type determination" and in the event that there is a requirement for an assessment of product compliance. For independent testing, representatives of all parties shall have the opportunity to be present at the time of sampling.

Only those characteristics" declared by the manufacturer shall be assessed by this procedure. The number of units required to determine compliance with the specification shall be sampled from a consignment of up to 100 m³ or part thereof (see Table A.1).

NOTE Masonry units manufactured to this Standard which have been the subject of third-party inspection of their assessment and verification of constancy of performance" procedures are not normally subjected to independent testing of consignments after delivery.

A.2 Sampling procedure

A.2.1 General

NOTE The choice of the method of sampling will normally be dictated by the physical form of the consignment in question.

A.2.2 Random sampling

Whenever possible, the random sampling method shall be used, in which every masonry unit in the consignment has an equal chance of being selected for the sample. The appropriate number of units shall be selected at random from positions throughout the consignment without any consideration being given to the quality of those selected except that units damaged in transit shall not be selected.

NOTE In practice, random sampling is normally only convenient either when the masonry units forming the consignment are being moved in a loose (unpacked) form from one place to another or when they have been split into a large number of small stacks, e.g. on scaffolding awaiting laying.

A.2.3 Representative sampling

A.2.3.1 General

When random sampling is impracticable or not convenient, e.g., when the masonry units form a large stacks with ready access to only a limited number, a representative sampling procedure shall be used.

A.2.4 Sampling from a stack

The consignment shall be divided into at least six real or imaginary sections, each of a similar size. An equal number of masonry units shall be selected at random from within each section in order to give the required number without any consideration being given to the quality of those selected except that units damaged in transit shall not be selected.

NOTE It will be essential to remove some sections of the stack or stacks in order to gain access to masonry units within the body of such stacks when taking samples.

A.2.5 Number of units required for testing

The number of sizes required shall be in accordance with Table A.1.

Table A.1 — Sample size

Property	Clause number	Test method	Number of units ^a	
Dimensions	5.2 and 5.3.2	RS 536	6	
Flatness of bed faces	5.2.2.2		3	
Plane parallelism of bed faces	5.2.2.3	RS 536	3	
Flatness of surfaces	5.3.4		6	
Net and gross dry density	5.4		6	
Compressive strength (mean)	5.5.1	RS 537	6	
Compressive strength (characteristic)	5.5.1	RS 537	12	
Water absorption	5.8	RS 543	3	
Thermal properties	5.6	RS 524	3 when obtained by testing	
Water vapour permeability	5.10	ISO 12572 or RS 524		
Reaction to fire	5.11	RS 547	3 except for Euroclass A1 without testing	
Moisture movement	5.9		6	
Bond strength	5.12	RS 538 Procedure A Procedure B	Type I specimen 27 18	Type II specimen 18 12
^a If appropriate, e.g. when units are not affected by a test procedure, the same units may be used for different tests.				

Annex B (normative)

Normalised compressive strength

The value of mechanical strength called up in 5.5 is the normalised compressive strength. To reach this from the value obtained by testing in accordance with RS 537, it shall be brought to the air-dry equivalent if conditioned by immersion, by multiplying by 1,2, and then further multiplied by the factor δ given in Table B.1 to allow for the height and width of the specimens tested.

Table B.1 — Values of factor δ

Height of unit mm	Least horizontal dimension of unit mm				
	50	100	150	200	250 or greater
50	0,85	0,75	0,70	—	—
65	0,95	0,85	0,75	0,70	0,65
100	1,15	1,00	0,90	0,80	0,75
150	1,30	1,20	1,10	1,00	0,95
200	1,45	1,35	1,25	1,15	1,10
250 or greater	1,55	1,45	1,35	1,25	1,15

NOTE Linear interpolation is permitted.

Annex C (informative)

Guidance for testing frequencies for designing a FPC system to demonstrate conformity of finished products with the requirement of the standard and the declaration of the manufacturer

Table C.1 — Checking of finished products

Subject	Purpose of checking	Reference method	Frequency of checking by the manufacturer for a product group
Dimensions	Conformity with the declared dimensions and the permissible dimensional	RS 536	— 6 units/week of production or — As given in the FPC documentation
Configuration	Conformity with the declared values	— Shell thickness and frogs according to RS 536 — Holes according to RS 536	— 6 units at appropriate time intervals or — As given in the FPC documentation
Flatness of bed faces ^b	Conformity with the declared value and the deviation		— 3 units/week of production or — As given in the FPC documentation
Plane parallelism of bed faces ^b	Conformity with the declared value and the deviation	RS 536	— 3 units/week of production or — As given in the FPC documentation
Gross dry density	Conformity with the declared gross dry density and the permissible deviations		— 6 units/week of production or — As given in the FPC documentation
Net dry density	Conformity with the declared net dry density and the permissible deviations		— 6 units/week of production or — As given in the FPC documentation
Compressive strength	Conformity with the declared compressive strength	RS 537	— At least 6 units/week of production or — As given in the
Durability	Conformity with the declared freeze/thaw resistance	Reference to the provisions valid in the intended place of use of the units	— Once a year or — As given in the FPC documentation
Flatness of surfaces	Conformity with the declared value and the deviation		— 3 units/week of production or — As given in the FPC documentation
Thermal resistance or	Conformity with declared value	RS 524	— Once a year or

thermal conductivity ^a			— As given in the FPC documentation
Bond	Conformity with declared value	RS 538	— As given in the FPC documentation
Subject	Purpose of checking	Reference method	Frequency of checking by the manufacturer for a product group
strength ^a			
Water Absorption ^a	Conformity with the declared water absorption coefficient	RS 543	— As given in the FPC documentation
Water vapour Permeability ^a	Conformity with declared value	ISO 12572	— Once a year or — As given in the FPC documentation
Reaction to Fire ^a	Conformity with declared value	RS 547	— Every 5 years or — As given in the FPC documentation
Moisture Movement ^a	Conformity with declared moisture movement		— Once a year or — As given in the FPC documentation

^a Only when declared by the manufacturer based on testing. The manufacturer does not necessarily have to declare a value against every property and some may be on the basis of, for example, a tabulated values. When the declared value is from a tabulated value, no testing is required.

In these cases certification can be based on evidence that the tables are being used correctly.

^b Applies only where units are intended to be used with thin layer mortar. The tests should be carried out in accordance with the reference methods mentioned in the standard or by applying alternative test methods with a proven correlation or a safe relationship to the reference methods.

Bibliography

- [1] EN 772-1, *Methods of test for masonry units — Part 1: Determination of compressive strength*
- [2] EN 772-11, *Methods of test for masonry units — Part 11: Determination of water absorption of aggregate concrete, autoclaved aerated concrete, manufactured stone and natural stone masonry units due to capillary action and the initial rate of water absorption of clay masonry units*
- [3] EN 772-13, *Methods of test for masonry units — Part 13: Determination of net and gross dry density of masonry units (except for natural stone)*
- [4] EN 772-14, *Methods of test for masonry units — Part 14: Determination of moisture movement of aggregate concrete and manufactured stone masonry units*
- [5] EN 772-16:2011, *Methods of test for masonry units — Part 16: Determination of dimensions*
- [6] EN 772-20, *Methods of test for masonry units — Part 20: Determination of flatness of faces of aggregate concrete, manufactured stone and natural stone masonry units*
- [7] EN 1052-2, *Methods of test for masonry — Part 2: Determination of flexural strength*
- [8] EN 1052-3, *Methods of test for masonry — Part 3: Determination of initial shear strength*
- [9] EN 1745, *Masonry and masonry products — Methods for determining thermal properties*
- [10] EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

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