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**Mortar for masonry — Test methods —
Part 1: Determination of particle size
distribution (by sieve analysis)**

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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 211-1 was prepared by Technical Committee RSB/TC 009, *Civil engineering and building materials*.

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

- 1) BS EN 998-1, *Specification for mortar for masonry – Part 1: Rendering and plastering mortar with inorganic binding agents*
- 2) BS EN 998-2, *Specification for mortar for masonry – Part 2: Masonry mortar*
- 3) BS EN 1015-2, *Methods of test for mortar for masonry – Part 2: Bulk sampling of mortars and preparation of test mortars*

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

DRS 211 consists of the following parts, under the general title *Mortar for masonry — Test methods*:

- *Part 1: Determination of particle size distribution (by sieve analysis)*
- *Part 2: Bulk sampling of mortars and preparation of test mortars*
- *Part 3: Determination of consistence of fresh mortar (by flow table)*
- *Part 4: Determination of consistence of fresh mortar (by plunger penetration)*
- *Part 5: Determination of flexural and compressive strength of hardened mortar*
- *Part 6: Determination of adhesive strength of hardened rendering and plastering mortars on substrates*
- *Part 7: Determination of water absorption coefficient due to capillary action of hardened mortar*

Committee membership

The following organizations were represented on the Technical Committee on *Civil engineering and building materials* (RBS/TC 009) in the preparation of this standard.

CIMERWA

Enabel

EGC Ltd

GECO Africa

Mass Design Group

Rwanda Housing Authority (RHA)

Rwanda Inspectorate, Competition and Consumer Protection Authority (RICA)

Standard Geotechnical Engineering and Construction Ltd (STAGECO Ltd)

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

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Mortar for masonry — Test methods — Part 1: Determination of particle size distribution (by sieve analysis)

1 Scope

This Draft Rwanda Standard provides two methods of determining the particle size distribution of dry mixed or nonhardened wet mixed mortars:

- a) wet sieving which is applicable to mortars containing normal weight aggregates; and
- b) dry sieving which is applicable to mortars containing lightweight aggregates.

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.

RS 108, *Mortar for masonry — Specification*

RS 211-2, *Mortar for masonry — Methods of test — Part 2: Bulk sampling of mortars and preparation of test mortars*

3 Terms and definitions

No terms and definitions are listed in this document.

4 Principle

A series of test sieves (see 5.2) with increasing aperture size are nested on top on one another on a bottom pan. The sample is placed on the top sieve and the stack of sieves is then agitated until further agitation causes no change in the mass retained on each sieve, which is weighed.

NOTE For samples with particles of different densities the sieve analysis only gives the particle size distribution in percentage of total mass.

5 Apparatus

5.1 Weighing instrument, with a capacity of 1 kg capable of weighing to an accuracy of 0.1 g.

5.2 Test sieves, with square apertures, conforming to Table 1.

NOTE For aperture sizes of 4.00 mm and above perforated plate sieves are recommended.

Table 1 — Test sieves aperture sizes

Aperture sizes mm
4.75
4.00
2.00
1.00
0.500
0.250
0.125
0.063

5.3 Mechanical sieve shaker

5.4 Well-fitting pan and lid, for the sieves

5.5 Shallow trays, made of corrosion-resistant metal, height

5.6 Containers, suitable for holding fresh mortar samples to which water can be added for the creation of a suspension

5.7 A ventilated oven, capable of maintaining temperature of $105\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and $60\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ respectively

6 Preparation and storage of test samples from the bulk test sample.

6.1 The bulk test taken in accordance with RS 211-2 shall be reduced using a sample divider or by quartering, and shall yield a test sample of mass larger than the minimum, but not of an exact predetermined value. The minimum dry mass of the test sample shall be as follows:

- 0.2 kg for $d_{\text{max}} \leq 4\text{ mm}$; and
- 0.6 kg for $d_{\text{max}} > 4\text{ mm}$.

6.2 Mortars containing particles passing aperture size 0.125 mm may be wetted before reduction to minimize segregation and loss of dust. If the sample contains hydraulic binders, the following preparation under wet conditions shall be executed as quickly as possible. If dry sieving is required, the wetting of mortars containing hydraulic binders shall be omitted.

7 Procedure

7.1 General

Mortars shall be tested by dry sieving unless it is anticipated that may contain agglomerates when wet sieving shall be used.

NOTE Mortars containing lightweight or organic aggregates may become statically charged by the motion of the material on the sieve, resulting in agglomeration, or sticking to the sieve base. Should such a phenomenon occur, suitable measures should be taken.

7.2 Wet sieving

Place the test sample in a container (see 4.6) and cover it with water. Mix the suspension up quickly, and pour it with the wash water on the nested sieves (see 5.2). Carry out sieving with the aid of a water jet until the wash water remains clean. Remove the fraction retained on each sieve and from the pan and spread each fraction in a thin layer into separate shallow trays (see 5.5). Dry each in the oven at a temperature of $105\text{ °C} \pm 5\text{ °C}$. Continue the drying process until two consecutive weighing of each fraction at 2 h intervals do not differ by more than 0.2 g.

7.3 Dry sieving

Spread the sample in a thin layer in shallow trays (see 5.5) and dry in the oven (see 5.7) at a temperature of $105\text{ °C} \pm 5\text{ °C}$. For samples with organic constituents, e.g. expanded polystyrene aggregate or exfoliated vermiculite, use a drying temperature of $60\text{ °C} \pm 5\text{ °C}$. Continue the drying process until two consecutive weighing of the sample at 2 h intervals do not differ by more than 0.2 % of the total sample mass will pass any individual sieve during continuous hand for 1 min. Do not force any material through the sieve.

7.4 Weighing

7.4.1 Determine the mass of each fraction (m_r) retained on the individual sieves and sum them to give the mass of the total sample. The difference between the total and the sample weight is the amount of fine particles. On sieves with apertures smaller than 4.00 mm, the mass of each fraction retained at the end of the sieving operation shall not exceed:

$$m_r = A \frac{\sqrt{d}}{200}$$

where

m_r is the mass of the fraction retained on the sieve (g);

A is the area of the sieve (mm²); and

d is the nominal aperture size of the sieve (mm);

7.4.2 If any of the mass fractions retained exceeds this amount, use one of the two following procedures:

- a) divide the fraction into portions smaller than the specified maximum and sieve these one after the other; or
- b) divide the portion of the sample passing the 4.00 mm sieve with the aid of a sample divider or by quartering, and continue the sieve analysis on the reduce sample.

8 Calculation and expression of results

Calculate the individual fractions, as percentages of the total mass of the sample, and calculate the total percentage of material passing each sieve. If a dividing operation as described in 6.4 was performed, take this into account in the calculation.

9 Test report

The test report shall include the following information:

- a) place, date and time of taking the bulk test sample;
- b) method used for taking the bulk test sample (if known);
- c) name of the organization that took it;
- d) date and time of testing;
- d) type, origin and designation of the mortar by reference to RS 108;
- e) total mass of each individual test sample;
- f) method of sieving (dry or wet);
- g) percentage of the mass of the total sample passing each of the sieves, to the nearest 1 %;
- h) a graphical presentation of the results; and
- i) remarks, if any.

NOTE 1 This information is contained in the certificate of sampling (see RS 211-2)

NOTE 2 This is the sample taken from the bulk supply that is to be used for all of the tests in RS 211.

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