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Mortar for masonry — Test methods —

Part 3: Determination of consistence of fresh mortar (by flow table)

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Contents

Page

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 211-3 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.

CD 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* (RSB/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)

SJEC Ltd

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

Rwanda Standards Board (RSB) – Secretariat

Introduction

Consistence is a measure of the fluidity and/or wetness of the fresh mortar and gives a measure of the deformability of the fresh mortar when subjected to a certain type of stress. The consistence however is not directly associated with the manner in which the fresh mortar handles when used by a craftsman. Normally there will be a linear correlation between flow value, measured in accordance with this test method, and the plunger penetration value measured in accordance with DRS 211-4, for the same type of mortar with increasing water content, but the slope will differ with different types of mortars.

Mortar for masonry — Test method — Part 3: Determination of consistence of fresh mortar (by flow table)

1 Scope

This Draft Rwanda Standard provides a method for determining the consistence of freshly mixed mortars including those containing mineral binders and both normal weight and lightweight aggregates, which is by means of the flow value.

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: Sampling of mortars and preparation of test mortars*

3 Terms and definitions

No terms and definitions are listed in this document.

4 Principle

The flow value is measured by the mean diameter of a test sample of the fresh mortar which has been placed on a defined flow table disc by means of a defined mould, and given a number of vertical impacts by raising the flow table and allowing it to fall freely through a given height.

5 Apparatus

5.1 A flow table; as indicated on the figure 1 and described in Annex A, consisting of the following main parts:

a) stand;

b) rigid table, plate and disc;

c) horizontal shaft and lifting cam; and

d) lifting spindle.

5.2 A truncated conical mould; Made of stainless steel or brass, 60 mm ± 0.5 mm in height and with internal diameter of 100 mm ± 0.5 mm at the bottom and 70 mm ± 0.5 mm at the top. The inside surface and the edges

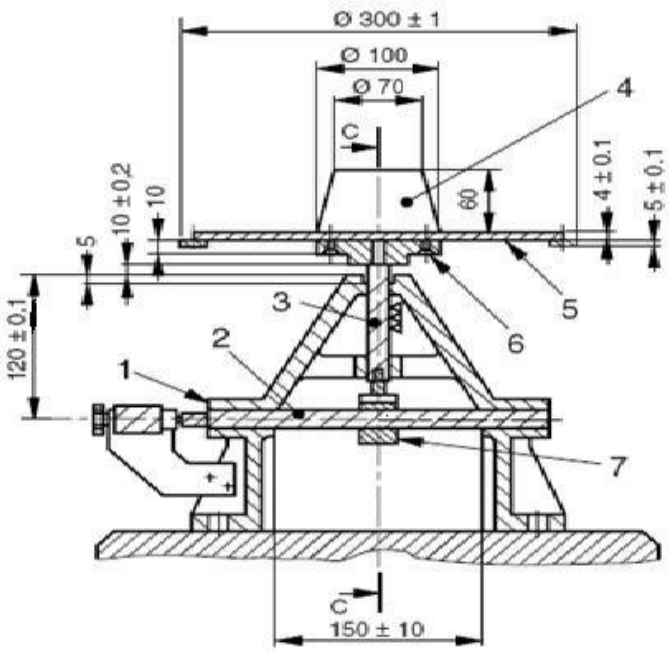
of the mould are smooth. The planes containing the top and bottom edges are at right angles to its axis. The minimum thickness of the mould wall is 2.0 mm.

5.3 A tamper; Consisting of a rigid, non-absorptive rod of circular cross-section, approximately 40 mm in diameter and approximately 200 mm long. The tamping face is flat and at right angles to the length of the tamper. The mass of the tamper is 0.250 kg ± 0.015 kg.

5.4 Callipers; Capable of measuring diameters up to 300 mm with an accuracy of 1 mm.

5.5 Towel

5.6 Palette knife



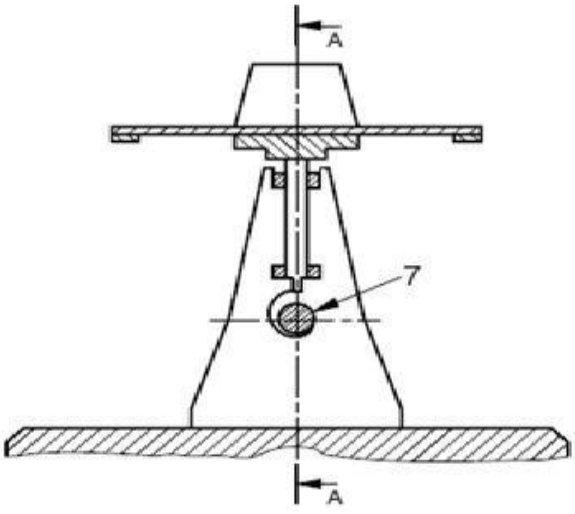


Figure 1 — Flow table

Key

1 Stand

2 Horizontal shaft

3 Lifting spingle

4 Truncated conical mould

5 Disc

6 Rigid table

7 Lifting cam.

6 Sampling, preparation and storage of test samples

6.1 The fresh mortar for this test shall have a minimum volume of 1.5 Land shall be obtained by reduction of the bulk test sample (see RS 211-2) using a sample divider or by quartering.

6.2 Ready to use mortars (factory-made wet mortars which are retarded), and pre-batched air-lime/sand wet mortars when not gauged with hydraulic binders, shall be tested within their specified workable life.

6.3 Mortars that are made from dry constituents and water shall be mixed in accordance with RS 211-2 unless otherwise specified.

6.4 The length of the mixing period shall be measured from the moment all the constituents are introduced into the mixer.

6.5 Before testing, the batch shall be gently stirred by hand using a trowel or palette knife in 5 – 10 sec to counteract any false setting etc., but without any additional mixing of the batch.

6.6 Any deviation from the mixing procedure shall be noted.

6.7 Two test samples shall be tested.

7 Procedure

7.1 Before each test, wipe the disc and the inner surface and edges of the mould (see 5.2) clean with a damp cloth and let it dry. If the table has not been used within the last 24 h, operate it for ten revolutions before use.

7.2 Place the mould centrally on the disc of the flow table (see 5.1) and introduce the mortar in two layers, each layer being compacted by at least 10 short strokes of the tamper (see 5.3) to ensure uniform filling of the mould.

7.3 During filling, hold the mould firmly on the disc, using one hand.

7.4 Skim off the excess mortar with a palette knife and wipe the free area of disc clean and dry, being especially careful to remove any water from around the bottom edge of the mould. After approximately 15 s, slowly raise the mould vertically and spread out the mortar on the disc by jolting the flow table 15 times at a constant frequency of approximately one per second.

7.5 Measure the diameter of the mortar in two directions at right angles to one another using calipers (see 5.4).

7.6 State the results in mm to the nearest mm.

8 Calculation and expression of results

8.1 Calculate the mean value of the two measurements. This mean value is the flow value for the test sample.

8.2 If the individual flow values from the two test samples deviate from their mean use this mean value as the flow value of the mortar. If the two individual flow values deviate from their mean value by more than 10 %, repeat the test using further mortar from the reduced bulk test sample (see 6) and if the results deviate from the mean value by less than 10 % use the mean value from the repeat test as the flow value of the mortar. If the results differ by more than 10 % consider the measurements unsatisfactory and take fresh test samples from the bulk test sample or laboratory prepared mortar and repeat the test.

9 Test report

The test report shall include the following information:

a) the place, date and time of taking the bulk test sample;

b) the method used for taking the bulk test sample (if known) and the name of the organization that took it;

c) the type, origin and designation of the mortar by reference to RS 108;

d) preparation (mixing, casting) and storage (curing) conditions;

e) the date and time of preparing test samples for test (i.e. date and time of any mixing, casting, moulding, or demoulding procedure, if appropriate);

f) the date and time of testing;

g) test results (individual measurements and the flow values in mm for each test sample); and h) remarks, if any.

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

Annex A
(normative)

Details of flow table

A.1 General

A.1.1 Details of the flow table defined in this Rwanda Standard are shown in Figure 1.

A.1.2 The stand for the flow table shall be made of steel or cast iron. The flow table shall be mounted without any other support directly on a horizontal, non-sprung and non-plastic, stable base.

NOTE A concrete pedestal with a mass of more than 25 kg is suitable.

A.1.3 The horizontal shaft with the mounted lifting cam when turned at a constant velocity shall raise the lifting spindle and the flow table by 10 mm/s ± 0.2 mm/s.

A.1.4 The lifting cam shall be an even steady rising spiral constructed such that it will resume permanent contact with the lifting spindle from 120° after the impact has occurred and through the following 240° rotation up to the next impact.

A.1.5 The vertical lifting spindle shall be fastened at top in the middle of a rigid table plate. Both of these shall be made of steel or cast iron. The lifting spindle shall be stabilised by bearings spaced minimum 60 mm vertical in the stand, the bearings having a tolerance in diameter of 0.05 mm - 0.1 mm.

Note The contact faces of the lower end of the lifting spindle and of the lifting cam should be constructed to ensure long term performance. A rotatable roller in the lower end of the lifting spindle is suitable.

A.1.6 The edge of the lifting cam and the lower end of the lifting spindle may alternatively be hardened to a Brinell hardness of 500 kg/mm^2.

A.1.7 The rigid table plate shall carry a disc 300 mm ± 1 mm in diameter and 4 mm ± 0.1 mm in thickness centrally attached to the supporting table plate by means of suitable fixing devices uniformly spaced along the periphery of the disc.

A.1.8 The disc shall be made of a material resistant to corrosion by mortar and with a smooth surface of maximum 0.005 mm coarseness, the surface cleaned and lightly lubricated with very low viscosity non-resin mineral oil prior to testing.

A.1.9 The upper surface of the disc shall have engraved a circle of 100 mm diameter and 0.5 mm deep to facilitate centring of the mould. The disc shall be kept horizontal during the test.

A.1.10 The total mass (M) of the movable parts of the table, i.e. lifting spindle, rigid table and circular disc, shall be 4.2 ≤ M ≤ 4.5 kg.

A.1.11 The flow table shall not be constructed in any way which inhibits its rotation, however the manufacturing precision of the movable parts of the flow table shall be such that the rotation is restricted to less than one revolution per 15 jolts.

A.1.12 The lifting spindle shall fall without hindrance. It shall be kept clean and lightly coated with very low viscosity non-resin mineral oil.

A.1.13 At the lowest point, the lifting cam shall clear the end of the lifting spindle such that the boss of the table plate firmly strikes the counter boss of the table stand. The boss and the counter-boss shall have contact on the total circular ring, both kept free of any adhering dust or moisture (water, oil etc.).

NOTE A 45 ° slope with a width of 1 mm at the inner diameter of the counter-boss, and an enlargement of the diameter of the upper bearing of 1 mm with a depth of 3 mm is suitable.

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