

BS EN 14617-5:2012



BSI Standards Publication

Agglomerated stone — Test methods

Part 5: Determination of freeze and thaw resistance

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee B/545, Natural stone.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Agglomerated stone - Test methods - Part 5: Determination of freeze and thaw resistance

Pierre agglomérée - Méthodes d'essai - Partie 5:
Détermination de la résistance au gel et au dégel

Künstlich hergestellter Stein - Prüfverfahren - Teil 5:
Bestimmung der Frost-Tau-Wechselbeständigkeit

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Foreword

This document (EN 14617-5:2012) has been prepared by Technical Committee CEN/TC 246 “Natural stones”, the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2012, and conflicting national standards shall be withdrawn at the latest by October 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14617-5:2005.

6.2, 7.3 and Clause 8 have been modified since the last edition of this European Standard.

This European Standard is one of a series of standards for test methods for agglomerated stones which includes the following:

EN 14617-1, *Agglomerated stone — Test methods — Part 1: Determination of apparent density and water absorption*

EN 14617-2, *Agglomerated stone — Test methods — Part 2: Determination of flexural strength (bending)*

EN 14617-4, *Agglomerated stone — Test methods — Part 4: Determination of the abrasion resistance*

EN 14617-5, *Agglomerated stone — Test methods — Part 5: Determination of freeze and thaw resistance*

EN 14617-6, *Agglomerated stone — Test methods — Part 6: Determination of thermal shock resistance*

EN 14617-8, *Agglomerated stone — Test methods — Part 8: Determination of resistance to fixing (dowel hole)*

EN 14617-9, *Agglomerated stone — Test methods — Part 9: Determination of impact resistance*

EN 14617-10, *Agglomerated stone — Test methods — Part 10: Determination of chemical resistance*

EN 14617-11, *Agglomerated stone — Test methods — Part 11: Determination of linear thermal expansion coefficient*

EN 14617-12, *Agglomerated stone — Test methods — Part 12: Determination of dimensional stability*

EN 14617-13, *Agglomerated stone — Test methods — Part 13: Determination of electrical resistivity*

EN 14617-15, *Agglomerated stone — Test methods — Part 15: Determination of compressive strength*

EN 14617-16, *Agglomerated stone — Test methods — Part 16: Determination of dimensions, geometric characteristics and surface quality of modular tiles*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies a method to assess the effect of freeze/thaw cycles on agglomerated stones. It contains provisions for a technological test to be carried out to assess the effect of freeze/thaw cycles on the flexural strength characteristics of the stone.

2 Normative references

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

EN 14617-2:2008, *Agglomerated stone — Test methods — Part 2: Determination of flexural strength (bending)*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the following term and definition applies.

3.1.1

freeze/thaw resistance

ability of the agglomerated stone product saturated by water to resist the effect of freeze/thaw cycling

3.2 Symbols

KM_{f25} coefficient of freeze/thaw resistance in flexural strength (after 25 freeze/thaw cycles);

R_f flexural strength average value (MPa) of dried, unfrosted specimens;

RM_f flexural strength average value (MPa) of specimens after 25 freeze/thaw cycles.

4 Principle

The principle of this test method is the determination of the ratio between the flexural strength of specimens after 25 freeze/thaw cycles and that of unfrosted specimens. One freeze/thaw cycle includes a freezing part, when a water saturated specimen is loaded into a freezer (temperature $(-20 \pm 5)^\circ\text{C}$), and a thawing part, when a frosted specimen is immersed in tap water (temperature $(20 \pm 5)^\circ\text{C}$).

5 Apparatus

5.1 A freezing chamber of sufficient capacity to hold the required number of specimens, possibly with an automatic control system to programme the freezing and thawing cycles within the chamber, capable of maintaining the temperature at $(-20 \pm 5)^\circ\text{C}$.

5.2 A temperature recording system or thermometer capable of measuring temperatures to $\pm 0,1^\circ\text{C}$.

5.3 A linear measuring device with an accuracy of 0,5 mm (for the flexural measurement).

5.4 A desiccator.

5.5 A ventilated oven capable of maintaining a temperature of (40 ± 5) °C.

5.6 Tap water.

6 Preparation of the specimens

6.1 Sampling

6.1.1 The sampling is not the responsibility of the test laboratory, except when specially requested.

6.1.2 For the tests at least 5 specimens shall be selected from a homogeneous batch, having surface finish, dimension and tolerances according to EN 14617-2:2008, 6.2.2. Two sets of specimens are required: one to be tested by determination of flexural strength according to EN 14617-2 after being subjected to the freeze/thaw cycles; the other to be tested by determination of flexural strength according to EN 14617-2 without freeze/thaw cycling. Each set shall be randomly selected from the body of the batch to be tested.

6.2 Conditioning before testing

The specimens shall be conditioned at room temperature (40 ± 5) °C for (24 ± 2) h.

Constant mass is reached when the difference between two weightings carried out (24 ± 2) h apart is no greater than 0,1 % of the first of the two masses.

After drying and prior to testing, the specimens shall be stored at (20 ± 5) °C. Once thermal equilibrium is reached, the test shall be performed within 24 h.

7 Test procedure

7.1 Water saturation

Specimens for freeze/thaw cycling are immersed completely in tap water at (20 ± 5) °C to obtain constant mass, i.e. difference < 0,1 mass % by consecutive weighing/24 h.

7.2 Freeze/thaw cycling

Water saturated specimens are placed into the freezer. The specimens should be loaded into the freezer in a wire grate, so as not to touch each other or the freezer walls. When $(- 20 \pm 5)$ °C temperature is reached, the specimens shall be placed in the freezer for at least 4 h.

Then the frosted specimens are unloaded and immersed in tap water at (20 ± 5) °C. When this temperature is reached, the specimens shall be immersed for at least 2 h.

25 of these freeze/thaw cycles have to be performed. After the last cycle is finished, the specimens are removed from the water.

7.3 Flexural strength determination

After 25 freeze/thaw cycles and after conditioning according to 6.2, the flexural strength test is performed on the samples according to EN 14617-2.

8 Expression of results

The change in performance is determined from the individual results using the following formula:

$$KM_{f25} = \frac{RM_f}{R_f} \times 100$$

9 Test report

The test report shall contain the following information:

- a) unique identification number of the report;
- b) number and year of issue of this European Standard, i.e. EN 14617-5:2012;
- c) name and address of the test laboratory, and the address where the test was carried out if different from the test laboratory;
- d) name and address of the client;
- e) date of delivery of the sample or of the specimens;
- f) date when the specimens were prepared (if relevant) and the date of testing;
- g) number of specimens in the sample;
- h) dimensions of the specimens;
- i) freeze and thaw cycle;
- j) statement on measurement uncertainty (where appropriate);
- k) all deviations from the standard and their justification;
- l) remarks.

The test report shall contain the signature(s) and role(s) of the person(s) responsible for the testing and the date of issue of the report. It shall also state that the report shall not be partially reproduced without the written consent of the test laboratory.

It is the responsibility of the client to supply the following information:

- name of the supplier;
- name of the person or organization which carried out the sampling;
- surface finish of the specimens (if relevant to the test);
- nature of the binders.

Bibliography

- [1] EN 12440, *Natural stone — Denomination criteria*
- [2] EN 14618, *Agglomerated stone — Terminology and classification*

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