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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 14617-5

March 2005

ICS 91.100.15

English version

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

This European Standard was approved by CEN on 3 February 2005.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 14617-5:2005) 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of an identical text or by endorsement, at the latest by September 2005, and conflicting national standards shall be withdrawn at the latest by September 2005.

Test methods for agglomerated stones consist of 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)*

prEN 14617-3, *Agglomerated stone - Test methods – Part 3: Determination of slipperiness*

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*

prEN 14617-7, *Agglomerated stone – Test methods – Part 7: Determination of ageing*

prEN 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*

prEN 14617-14, *Agglomerated stone – Test methods – Part 14: Determination of surface hardness*

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*

prEN 14617-17, *Agglomerated stone – Test methods – Part 17: Determination of biological resistance*

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

EN 14617-5:2005 (E)**1 Scope**

The document specifies a method to assess the effect of freeze/thaw cycles on agglomerated stones. The standard contains provision for technological test to assess the effect of freeze/thaw cycles on the flexural strength characteristic.

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.

EN 14617-2:2004, Agglomerated stone – Test Methods – Part 2: Determination of flexural strength (bending)

3 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 freezing part, when water saturated specimen is loaded into freezer (temperature $-20\text{ °C} \pm 5\text{ °C}$) and thaw part, when frosted specimen is immersed in tap water (temperature $20\text{ °C} \pm 5\text{ °C}$).

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4 Terms, definitions and symbols

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4.1 Terms and definitions

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

4.1.1**freeze/thaw resistance**

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

4.2 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.

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 $(-20 \pm 5)\text{ °C}$.

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

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 $(70 \pm 5)\text{ °C}$.

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 where specially requested.

6.1.2 For tests at least 5 specimens shall be selected from a homogeneous batch, having surface finish, dimension and tolerances according to 6.2.2 of EN 14617-2:2004. 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 one 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 batch to be tested.

6.1.3 The specimens are dried at a temperature of (70 ± 5) °C to constant mass. Constant mass is reached when the difference between two weight readings carried out (24 ± 2) h apart is not greater than 0,1 % of the first of these two masses. After drying, the specimens shall be stored in a dessicator at (20 ± 5) °C until thermal equilibrium is reached. After that the test shall be performed within 24 h according to relevant standards.

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 for a wire grate not to touch each other or the freezer walls. When (-20 ± 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 last cycle is finished, the specimens are removed from water. The specimens surface is wiped by a damp cloth and flexural strength is immediately measured at room temperature (20 ± 5) °C.

7.3 Flexural strength determination

Immediately after 25 freeze/thaw cycles 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 formula

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

9 Test report

The test report shall contain the following information:

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- a) unique identification number of the report;
- b) number, title and date of issue of this document;
- 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) 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
- f) date of delivery of the sample or of the specimens;
- g) date when the specimens were prepared (if relevant) and the date of testing;
- h) number of specimens in the sample;
- i) dimensions of the specimens;
- j) freeze and thaw cycle
- k) statement on measurement uncertainty (where appropriate);
- l) all deviations from the standard and their justification;
- m) remarks.

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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.