

BS EN 14617-10:2012



BSI Standards Publication

# Agglomerated stone — Test methods

Part 10: Determination of chemical resistance

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**National foreword**

This British Standard is the UK implementation of EN 14617-10:2012. It supersedes BS EN 14617-10:2005 which is withdrawn.

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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## Foreword

This document (EN 14617-10:2012) 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of an identical text or by endorsement, at the latest by October 2012, and conflicting national standards shall be withdrawn at the latest by October 2012.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 14617-10:2005.

4.3, 4.4, 4.5, A.3 and A.4 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*

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## 1 Scope

This European Standard specifies a method for determining the chemical resistance and the resistance to stains of agglomerated stones (see EN 14618) with a polished surface after a prolonged contact with chemical materials.

NOTE It is to be remembered that agglomerated stones containing calcium carbonate aggregates are sensitive to any acid attack.

## 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.

Not applicable.

## 3 Principle

Resistance to a chemical attack is the characteristic which defines the behaviour of a floor/wall covering material in contact with chemically aggressive agents potentially able to react with the surface itself, and thereby either corrode it, penetrate it permanently or alter the visible aspect in some manner.

The deteriorating action of the aggressive chemical can generate two different effects:

- a real chemical action, according to which the alteration of the surface is due to the chemical reaction between the aggressive agent and some constituents of the surface itself;
- a physical absorbing action, according to which the aggressive agent is able to penetrate the surface so that the removal is either extremely difficult or impossible.

Both these actions can involve a modification of the visible appearance of the surface of the chemically attacked material, but only in the first case can the damage also introduce a modification in the physical and mechanical properties of the material itself.

## 4 Determination of the chemical resistance

### 4.1 Chemical reagents

**4.1.1** Water solution containing hydrochloric acid solution, 50 % (V/V), prepared from N hydrochloric acid solution.

**4.1.2** Sodium hydroxide in a 50 % (V/V) water solution, prepared from a normal water sodium hydroxide non-carbonated solution.

### 4.2 Apparatus

Glossmeter, able to measure with an accuracy and precision of 10 %, the brightness degree of the surface.

The glossmeter shall measure the reflection of a light ray incident on a surface. The reflection degree is given by the amount of light specularly reflected in a point of the surface in relationship to the amount of light

reflected by the standard glass plate. A light source representing average daylight shall be used, such as the source CIE<sup>1</sup> D 65, with the lighting intensity allowed by the glossmeter calibration.

The glossmeter shall be equipped with at least two optical systems placed at 60° and 20° angles. This allows for an efficient measurement of the different reflection directions: the 60° angle covers a range of reflection degrees from low to high, while the 20° angle lends greater accuracy to the measurement of the higher reflection directions (see Annex A).

### 4.3 Preparation of the specimens

For each type of material to be tested four samples shall be prepared with a polished surface<sup>2</sup> of at least 300 mm × 300 mm onto which a containing ring (at least 100 mm diameter) is glued. The ring is made of chemically resistant material such as silicone.

The surface to be measured shall be flat in order to permit the positioning of the instrument sensor in contact with the material to be tested. Before testing, the surface shall be cleaned of any possible wax, other finishes or treatment layers using ketone or another appropriate solvent.

### 4.4 Test procedure

The procedure consists of positioning the instrument sensor in contact with the surface to be measured, and of reading the number reported on the display which defines the reflection degree as a reference value of the examined surface.

The test shall be carried out at an ambient temperature of  $(23 \pm 5)$  °C.

On each of the four specimens, it is necessary to carry out the reflection measurement on at least five different points, and to then calculate the average value ( $M_1$ ) of each specimen.

On two specimens placed horizontally within the ring, pour 10 ml to 15 ml of hydrochloric acid solution (4.1.1), avoiding any possible overflowing.

Repeat this operation on the other two specimens using the sodium hydroxide solution (4.1.2).

Keep the specimens, protected with a polyethylene film, on a table for all the time requested for the test.

After  $1 \text{ h} \pm 5 \text{ min}$  draw out one specimen containing hydrochloric acid and one containing sodium hydroxide respectively; wash them carefully with water and remove the ring. Finally, dry them with soft cellulose paper. After  $8 \text{ h} \pm 30 \text{ min}$  draw out the two other specimens and perform the same washing and drying procedure.

Repeat the reflection measurement on at least in 5 points on each of the four specimens, and then calculate the average value for each specimen and the standard deviation of the 5 values. The reflection measurements are to be carried out with the glossmeter under an incident light positioned at 60°.

### 4.5 Expression of the results

a) The effects of the chemical attack are expressed as the loss of the reference reflection value.

This loss is calculated as a percentage of reflection of the material tested with respect to the reference value.

A class of resistance to acids and alkali shall be attributed as follows:

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<sup>1</sup> Commission Internationale de l'Éclairage (Central Bureau, Kagelpasse 27, A-1030 Vienna-AT).

<sup>2</sup> Obtained by polishing with abrasive grit, grain size F500, according to ISO 8486-2:2007, *Bonded abrasives — Determination and designation of grain size distribution: Part 2: Microgrits F230 to F2000*.

- C<sub>4</sub>: materials, which keep at least 80 % of the reflection reference value after 8 h ± 30 min of acid and basic attack (or if only in one specimen the attack is between 60 % and 80 %);
- C<sub>3</sub>: materials, which keep between 60 % and 80 % of the reflection reference value after 8 h ± 30 min of acid and basic attack;
- C<sub>2</sub>: materials, which keep between 60 % and 80 % of the reflection reference value after 1 h ± 30 min of acid and basic attack;
- C<sub>1</sub>: materials, which keep less than 60 % of the reflection reference values after 1 h ± 30 min of basic and acid attack.

b) The values are calculated on the basis of 5 measurements and the dispersion is declared.

#### 4.6 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 14617-10:2012;
- 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) 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) water solutions preparation and concentration and chemical agents used;
- k) type of glossmeter used and the kind and intensity of the light source;
- l) reflection directions of the light;
- m) results obtained, using the following table:



Table 1 — Results

Chemical resistance	Sample N	Reference value	Class
- Hydrochloric acid solution			
- Sodium hydroxide solution			

- n) statement on measurement uncertainty (where appropriate);
- o) all deviations from the standard and their justification;
- p) 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.

## **Annex A** (normative)

### **Determination of the resistance to stains**

#### **A.1 Principle**

This test is a reference method used to determine the potential damage caused by staining agents that could reasonably enter into contact with the surface of a material.

The stain effect is dependent on the viscosity of the fluid that could enter the part of the material under test.

At the least, substances of common use shall be poured onto the surface to evaluate the generic resistance to stains of agglomerated stones.

#### **A.2 Staining agent**

The staining agent shall be chosen among the substances proposed by the client or selected through agreement between the interested parties.

#### **A.3 Preparation of the specimens**

The specimens shall have dimensions of 70 mm × 70 mm and a flat polished surface.

Prepare at least 3 pieces for each chemical agent to be tested on the product.

Before testing, the surface shall be cleaned of any possible wax, other finishes or treatment layers using ketone or another appropriate solvent.

#### **A.4 Test procedure**

The test shall be carried out at an ambient temperature of  $(23 \pm 5)$  °C.

For each agent, take two specimens and pour 4 ml or 5 ml of the chemical agent to test be tested, avoiding any possible overflowing.

Keep the specimens, protected with a watch glass, in a horizontal position for all the time requested for the test.

After  $1 \text{ h} \pm 5 \text{ min}$  draw out one of the two specimens with every staining agent tested; remove the watch glass and wash them carefully with water. Finally, dry them with soft cellulose paper. After  $24 \text{ h} \pm 1 \text{ h}$  draw out the other specimens and perform the same washing and drying procedure.

Visually examine the samples after the test. Assess the degree of variation of colour by comparing with samples not submitted to testing and/or using an atlas of colour under daylight-controlled conditions, according to CIE<sup>3</sup> recommendations.

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<sup>3</sup> Commission Internationale de l'Eclairage (Central Bureau, Kagelpasse 27, A-1030 Vienna-AT).

## A.5 Expression of the results

- a) The effects of staining damage are expressed as alterations of colour and as stains remaining on the polished surface appreciable with the naked eye (as in the case of coffee, wine, cola, cement or grout). As a reference, use the scale of samples not submitted to contact, or the reference elements of an atlas of colour.
- b) The values are calculated on the basis of 5 measurements and the dispersion is declared.

## A.6 Test report

Following the criteria given in 4.6, the test report shall contain the following information:

- a) unique identification number of the report;
- b) number, title and date of issue of this European Standard and reference to the annex;
- 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) description of the staining agent used (e.g. by chemical formula and/or description of the mix of substances used and/or giving the origin of the products, etc.);
- k) kind and intensity of daylight source used;
- l) directions of visual inspection of specimens;
- m) description of sampling criteria, preparation of sampling and results obtained, using the following table:

**Table A.1 — Results**

Type of agglomerated stones	Description of the staining agent	Variation of colour
	1)	after 1 h: after 24 h:
	2)	after 1 h: after 24 h:
	3)	after 1 h: after 24 h:
	4)	after 1 h: after 24 h:

## Bibliography

- [1] EN 14618, *Agglomerated stone — Terminology and classification*
- [2] ISO 8486-2:2007, *Bonded abrasives — Determination and designation of grain size distribution: Part 2: Microgrits F230 to F2000*





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