SLOVENSKI STANDARD
oSIST prEN 14157:2016

01-oktober-2016

Naravni kamen - Ugotavljanje odpornosti proti obrabi

Natural stone test methods - Determination of the abrasion resistance

Pierres naturelles - Détermination de la résistance à l'usure

Ta slovenski standard je istoveten z: **prEN 14157**

ICS:

73.020	Rudarstvo in kamnolomsko izkopavanje	Mining and quarrying
91.100.15	Mineralni materiali in izdelki	Mineral materials and products

oSIST prEN 14157:2016 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 14157

August 2016

ICS

Will supersede EN 14157:2004

English Version

Natural stone test methods - Determination of the abrasion resistance

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 246.

If this draft becomes a European Standard, 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.

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

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European foreword

This document (prEN 14157:2016) has been prepared by Technical Committee CEN/TC 246 “Natural stones”, the secretariat of which is held by UNI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 14157:2004.

This draft document is one of the series of draft documents for tests on natural stone.

Test methods for natural stone consist of the following parts:

EN 1925, *Natural stone test methods – Determination of water absorption coefficient by capillarity*

EN 1926, *Natural stone test methods – Determination of compressive strength*

EN 1936, *Natural stone test methods – Determination of real density and apparent density, and of total and open porosity*

EN 12370, *Natural stone test methods – Determination of resistance to salt crystallization*

EN 12371, *Natural stone test methods – Determination of frost resistance*

EN 12372, *Natural stone test methods – Determination of flexural strength under concentrated load*

EN 12407, *Natural stone test methods – Petrographic examination*

EN 13161, *Natural stone test methods – Determination of flexural strength under constant moment*

EN 13373, *Natural stone test methods – Determination of geometric characteristics on units*

EN 13755, *Natural stone test methods – Determination of water absorption at atmospheric pressure*

EN 13919, *Natural stone test methods – Determination of resistance to ageing by SO2 action in the presence of humidity*

EN 14066, *Natural stone test methods – Determination of resistance to ageing by thermal shock*

EN 14147, *Natural stone test methods – Determination of resistance to ageing by salt mist*

EN 14231, *Natural stone test methods – Determination of the slip resistance by means of the pendulum tester*

EN 14158, *Natural stone test methods – Determination of rupture energy*

EN 14205, *Natural stone test methods – Determination of Knoop hardness*

EN 14579, *Natural stone test methods – Determination of sound speed propagation*

EN 14580, *Natural stone test methods – Determination of static elastic modulus*

EN 14581, *Natural stone test methods – Determination of linear thermal expansion coefficient*

It is intended that other ENs should call up this EN 14157 as the basis of evaluation of conformity. Nevertheless it is not intended that all natural stones products should be subjected regularly to all the listed tests. Specifications in other documents should call up only relevant test methods.

1 Scope

This European Standard specifies two test methods to determine the abrasion resistance of natural stones used for flooring in buildings.

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 10025 (all parts), *Hot rolled products of structural steels - Technical delivery conditions*

EN 13373, *Natural stone test methods - Determination of geometric characteristics on units*

EN ISO 6506-1, *Metallic materials - Brinell hardness test - Part 1: Test method (ISO 6506-1)*

3 Method A – Wide Wheel Abrasion Test

3.1 Principle

The test is carried out by abrading the face of a specimen which will be exposed in use with an abrasive material under standard conditions.

3.2 Abrasive material

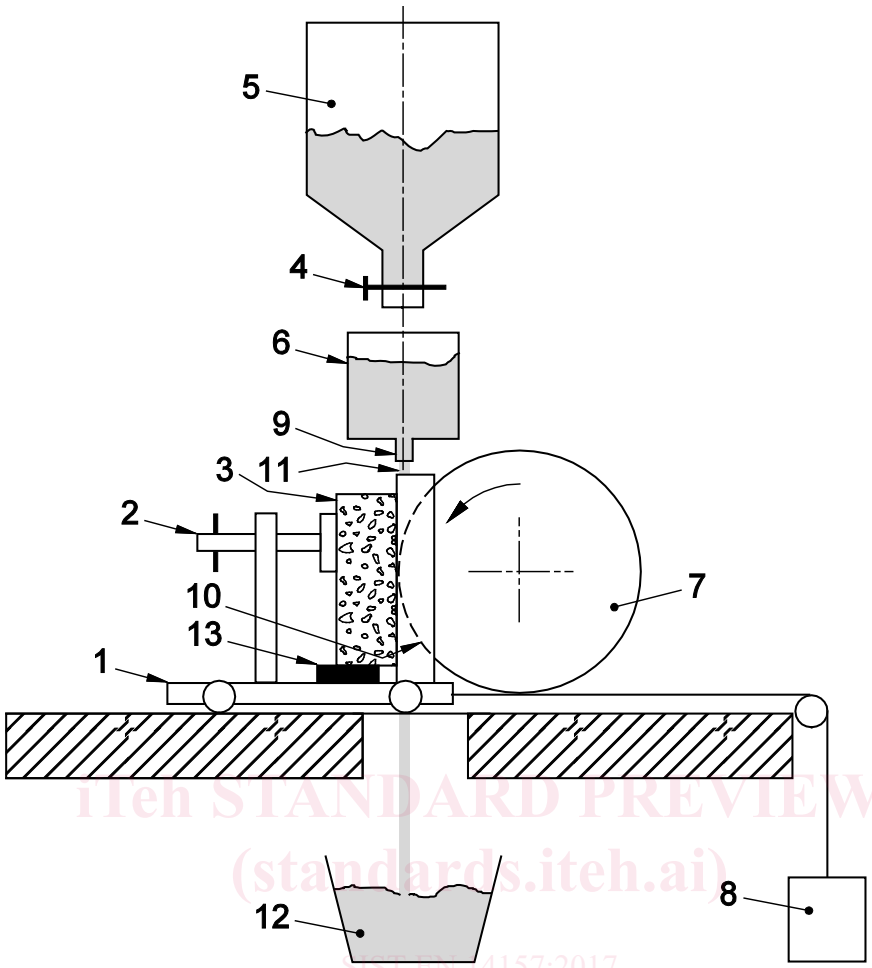
The abrasive required for this test is corundum (white fused alumina) with grit size of 80 in accordance with standard FEPA 42 F 1984. It shall not be used for more than three times.

3.3 Apparatus

3.3.1 The ‘wearing’ machine

The wearing machine (see Figure 1) is essentially made of a wide abrasion wheel, a storage hopper with one or two control valves to regulate the output of the abrasive material, a flow guidance hopper, a clamping trolley and a counterweight.

When two valves are used, one shall be used to regulate the rate of flow and can be permanently set while the other is used to turn the flow on and off.



Key

1 Clamping trolley	8 Counterweight
2 Fixing screw	9 Slot
3 Specimen	10 Groove
4 Control valve	11 Abrasive material flow
5 Storage hopper	12 Abrasive collector
6 Flow guidance hopper	13 Wedge
7 Wide abrasion wheel	

Figure 1 — Principle of the wearing machine

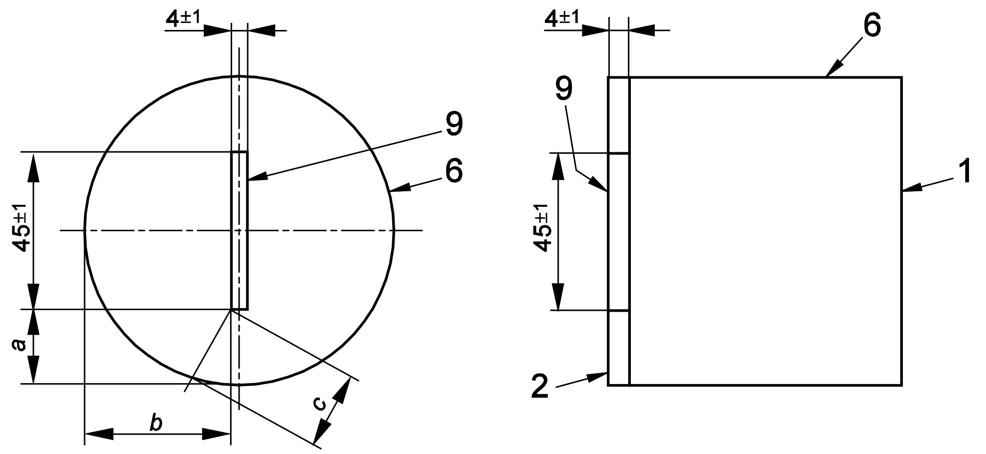
The wide abrasion wheel shall be made of steel Fe 690 according to EN 10025. The hardness of the steel shall be between 203 HB and 245 HB. Its diameter shall be (200 ± 1) mm and its width shall be (70 ± 1) mm. It shall be driven to rotate 75 revolutions in (60 ± 3) seconds.

A mobile clamping trolley is mounted on bearings and forced to move forwards to the wheel by a counterweight having a mass of (14 ± 0,01) kg.

The storage hopper containing the abrasive material feeds a flow guidance hopper.

The flow guidance hopper may have a cylindrical or rectangular cross-section and shall have a slotted outlet. The length of the slot shall be (45 ± 1) mm and the width shall be (4 ± 1) mm. The body of the flow guidance hopper shall be at least 10 mm bigger than the slot in all directions. In the case of a hopper with a rectangular cross section and at least one of the sides inclined down to the length of the slot, these dimensional limitations are not necessary (see Figure 2).

Dimensions in millimetres



Key

For key see Figure 1

1 Inclined side

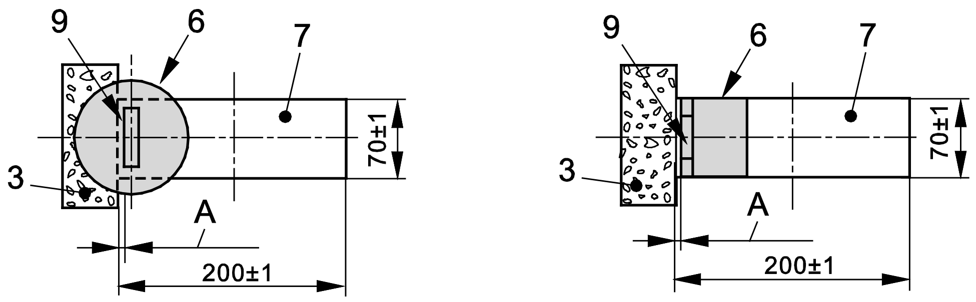
2 Vertical side

a, b, c > 10

Figure 2 — Position of the slot at the base of the flow guidance hopper in case of cylindrical cross section (left) and of rectangular cross section (right)

The distance of the fall between the slot and the axle of the wide abrasion wheel shall be (100 ± 5) mm and the flow of abrasive shall be (1 - 5) mm behind the leading edge of the wheel (see Figure 3).

Dimensions in millimetres



Top front view

Bottom plan view

Key

For key see Figure 1

A distance of the flow of abrasive from the leading edge of the wheel (from 1 to 5).

Figure 3 — Position of the slot relative to the wide abrasion wheel for a cylindrical cross section of the flow guidance hopper (left) and for a rectangular cross section of the flow guidance hopper (right)

The flow of the abrasive material from the flow guidance hopper shall be at a minimum rate of 2,5 l per minute onto the wide abrasion wheel. The flow of abrasive shall be constant and the minimum level of the abrasive in the flow guidance hopper shall be 25 mm (see Figure 3).

3.3.2 Magnifying glass

A magnifying glass having at least 2 × magnification and preferably equipped with a light.

3.3.3 Ruler

A steel ruler.

3.3.4 Calliper

A digital calliper, having an accuracy of at least 0,05 mm.

3.4 Calibration

The apparatus shall be calibrated after grinding 400 grooves or every two months whichever is sooner and every time there is a new operator, a new batch of abrasive, or a new abrasion wheel.

The abrasive flow rate shall be verified by pouring the material from a height of approximately 100 mm into a pre-weighed rigid container with a smooth rim, of height (90 ± 10) mm and of known volume when filled to the top, this shall be approximately 1 l. As the container fills, the pourer shall be raised to approximately maintain the 100 mm fall. When the container is filled, the top shall be struck off level and weighed to determine the mass of abrasive for a known volume, i.e. the density. The abrasive shall be run through the wearing machine for (60 ± 1) s and collected below the abrasion wheel in a pre-weighed container of at least 3 l capacity. The filled container shall be weighed and from the density determined above, the rate of abrasive flow can be verified as not less than 2,5 l per minute.

The apparatus shall be calibrated against a reference sample of “Boulonnais Marble” using the procedure in 3.6.1 and the counterweight adjusted so that after 75 revolutions of the wheel in (60 ± 3) seconds the length of the groove produced is (20,0 ± 0,5) mm. The counterweight shall be increased or decreased to increase or decrease the groove length respectively. The clamping trolley/counterweight assembly shall be checked for undue friction.

NOTE The “Boulonnais Marble” reference is: Lunel demi-clair, thickness: 5 cm, c/passe 2 faces ground with a diamond grit size 100/120, with a rugosity class Ra = (1,6 ± 0,4) µm in accordance with EN ISO 4288.

The groove shall be measured using the procedure in 3.6.2 to the nearest 0,1 mm and the three results averaged to give the calibration value.

An alternative material may be used for the reference sample if a good correlation (that is where the r^2 is greater than 0,8 has established with the reference material “Boulonnais Marble”.

At every calibration of the apparatus the squareness of the sample supports shall be checked.

The groove on the reference sample shall be rectangular with a difference between the measured length of the groove at either side not exceeding 0,5 mm. If necessary check that:

— the sample has been held square to the wheel;

— the clamping trolley and the slot from the flow guidance hopper are parallel to the wheel axle;

— the flow of abrasive is even across the slot;

— the friction in the trolley/counterweight assembly is not undue.