



SLOVENSKI STANDARD

SIST EN 13161:2002

01-maj-2002

Preskušanje naravnega kamna – Ugotavljanje upogibne trdnosti z obremenitvijo na tretjinah razpona

Natural stone test methods - Determination of flexural strength under constant moment

Prüfverfahren für Naturstein - Bestimmung der Biegefestigkeit unter Drittlinienlast

Méthodes d'essai pour pierres naturelles - Détermination de la résistance en flexion sous moment constant

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Ta slovenski standard je istoveten z: EN 13161:2001

ICS:

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

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ICS 73.020; 91.100.15

English version

Natural stone test methods - Determination of flexural strength under constant moment

Méthodes d'essai pour pierres naturelles - Détermination
de la résistance en flexion sous moment constant

Prüfverfahren für Naturstein - Bestimmung der
Biegefestigkeit unter Drittlinienlast

This European Standard was approved by CEN on 29 September 2001.

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 Management Centre 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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EN 13161:2001 (E)

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Foreword

This European Standard has been prepared by TC 246 "Natural Stone", 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 April 2002, and conflicting national standards shall be withdrawn at the latest by December 2002.

This draft standard is one of the series of draft standards for tests on natural stone. Test methods for natural stone consist of the following parts:

EN 1925	<i>Natural stone test methods – Determination of water absorption coefficient by capillarity.</i>
EN 1926	<i>Natural stone test methods – Determination of compressive strength.</i>
EN 1936	<i>Natural stone test methods – Determination of real density and apparent density and of total porosity and open porosity.</i>
EN 12370	<i>Natural stone test methods – Determination of resistance to salt crystallisation.</i>
EN 12372	<i>Natural stone test methods – Determination of flexural strength under concentrated load.</i>
prEN 12371	<i>Natural stone test methods – Determination of frost resistance.</i>
prEN 12407	<i>Natural stone test methods – Petrographic description.</i>
prEN 13364	<i>Natural stone test methods – Determination of the breaking load at a dowel hole.</i>
prEN 13373	<i>Natural stone test methods – Determination of geometric characteristics.</i>
prEN 13755	<i>Natural stone test methods – Determination of water absorption at atmospheric pressure.</i>
prEN 13919	<i>Natural stone test methods – Determination of resistance to ageing by SO₂ action in the presence of humidity.</i>
prEN 14066	<i>Natural stone test methods – Determination of thermal shock resistance.</i>
prEN 14147	<i>Natural stone test methods – Determination of resistance to ageing by salt mist.</i>
prEN 14157	<i>Natural stone test methods – Determination of abrasion resistance.</i>
prEN 14158	<i>Natural stone test methods – Determination of rupture energy.</i>
prEN ...(WI 00246011)	<i>Natural stone test methods – Determination of thermal dilatation coefficient.</i>
prEN ...(WI 00246012)	<i>Natural stone test methods – Determination of sound – speed propagation.</i>
prEN ...(WI 00246015)	<i>Natural stone test methods – Determination of Knoop hardness.</i>
prEN ...(WI 00246017)	<i>Natural stone test methods – Determination of slip coefficient.</i>
prEN ...(WI 00246018)	<i>Natural stone test methods – Determination of static elastic modulus.</i>
prEN ...(WI 00246030)	<i>Natural stone test methods – Determination of surface finishes (rugosity).</i>

It is intended that other European Standards should call up this European Standard as the basis of evaluation of conformity.

NOTE Nevertheless it is not intended that all natural stones products should be subjected regularly to all the listed tests. Specifications in other standards should call up only relevant test methods.

The Annex A contained in this European Standard is normative.

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

1 Scope

This European Standard specifies a method to determine the flexural strength of natural stones under constant moment. The standard contains provision for both an identification test and for a technological test.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 12390-4 *Testing hardened concrete - Part 4: Compressive strength - Specification for testing machines.*

EN 12390-5 *Testing hardened concrete - Part 5: Flexural strength of test specimens.*

3 Principle

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After appropriate preparation a specimen of the rock to be tested is laid and centred between two supports. Thereafter the specimen is subjected to two line loads acting on the top of the specimen and so that each load is located at a distance of one third of the length of span. The loads are steadily increased until failure.

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4 Symbols

R_{tc}	flexural strength at constant moment, in Megapascal
F	load at failure in newton
B	specimen width in millimetres
h	specimen thickness in millimetres
L	specimen length in millimetres
ℓ	distance between the supporting rollers, in millimetres

5 Apparatus

- 5.1 A **balance capable** of weighing the specimen with a reading up to 0,01% of the mass to be weighed.
- 5.2 A **ventilated oven** capable of maintaining a temperature of $(70\pm 5)^{\circ}\text{C}$.
- 5.3 A **linear measuring device** with a reading up to 0,05 mm.
- 5.4 A **test machine** of appropriate force, in accordance with EN 12390-4 and calibrated according to this standard.
- 5.5 A **device** for applying loads on the specimen by a two-points load, in accordance with EN 12390-5. It consists of two upper rollers (load-applying rollers) and two lower rollers (supporting rollers): see Figure 1. The distance between the two supporting rollers shall be reported as requested in 6.2.2.
- 5.6 A **room** which can be maintained at a temperature of $(20\pm 5)^{\circ}\text{C}$.

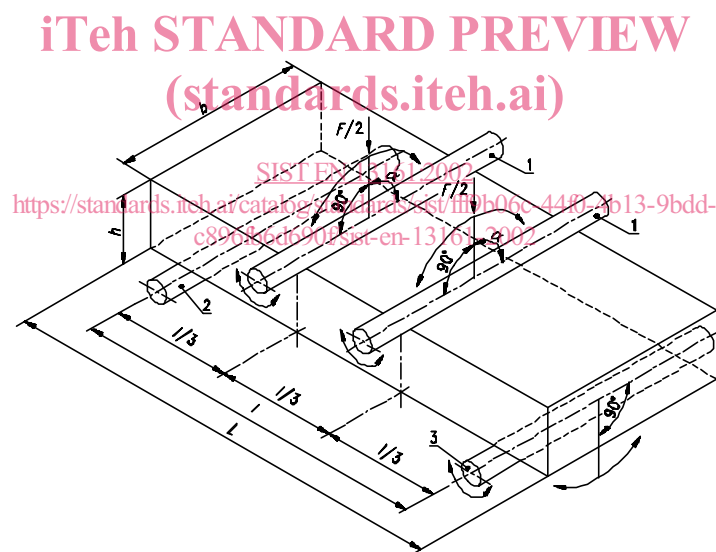


Figure 1 - Arrangement of loading of a test specimen (two point loading)

6 Preparation of specimens

6.1 Sampling

The sampling is not the responsibility of the testing laboratory except when it is especially requested. At least 10 specimens shall be selected from an homogeneous batch (see also 6.2.4)

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6.2 Test specimens

6.2.1 Surface finish

As a standard reference, the surface finish of the faces of the specimens shall be sawn, honed or polished (identification test). When it is necessary to carry out the test on final products (technological test) the surface finish of the specimens may be flamed, sandblasted etc., depending on the final use. For the technological test the specimens may be final products or sawn from final products. The surface intended for use shall be in contact with the two supporting rollers (facing downwards). However the kind of surface finish shall be stated in the report.

6.2.2 Dimensions

The dimensions of the specimens are determined by their thickness h :

- the thickness h shall be between 25 mm and 100 mm and shall be greater than twice the size of the largest crystal in the stone
- the total length L shall be equal to six times the thickness
- the distance between the supporting rollers ℓ shall be equal to five times the thickness
- the width b shall be between 50 mm and three times the thickness ($50 \text{ mm} \leq b \leq 3h$), and in no case it shall be less than the thickness.

6.2.3 Limit deviations

The limit deviation on the dimensions h , b , L and ℓ shall be ± 1 mm of the nominal dimensions. In the case of identification test the faces shall not depart from perpendicularity to the axis of the specimen by more than 2% with a maximum of 2 mm difference, when measured in any direction.

6.2.4 Planes of anisotropy

6.2.4.1 Identification test

If the stone shows planes of anisotropy (e.g. bedding, foliation) the specimens are to be prepared in accordance with at least one of the arrangements shown in Figures from 2 to 4 and the direction of the planes of anisotropy is to be marked on each specimen by at least two parallel lines.

If the use of the stone in respect of the position of the planes of anisotropy is known, the test shall be carried out with the force applied to the face that will be loaded during use.

If the way of use of the stone is not known but the position of the planes of anisotropy is indicated on the specimens (by means of at least two parallel lines), the test shall be carried out on each of the three arrangements shown in Figures from 2 to 4; the total number of specimens will then be 3 times 6.

6.2.4.2 Technological test

The specimens shall be tested only for the relevant product direction that is, with the force applied to the face which will be loaded during use.

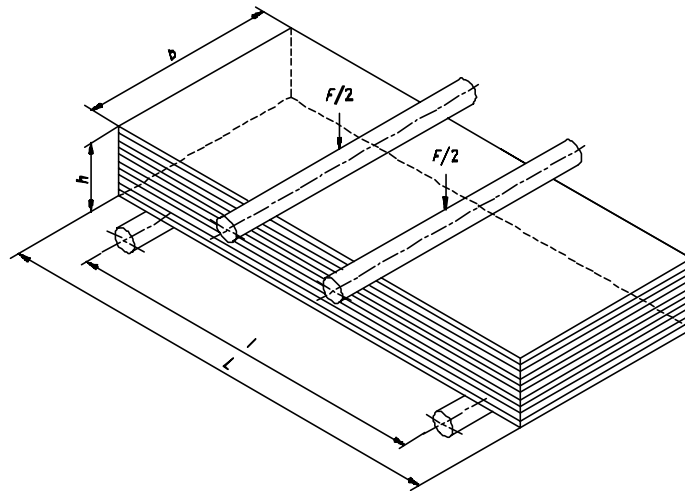


Figure 2 - Test arrangement for a specimen with the load applied perpendicular to the planes of anisotropy

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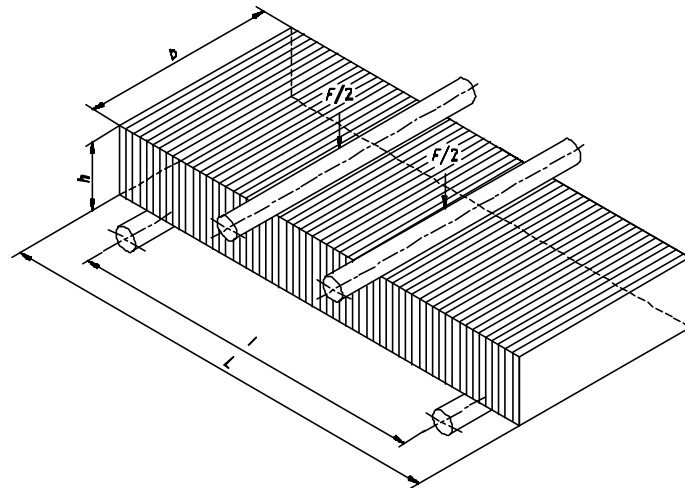


Figure 3 - Test arrangement for a specimen with the load applied parallel to the planes of anisotropy