BS EN 1468:2012

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Natural stone — Rough slabs — Requirements

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National foreword

This British Standard is the UK implementation of EN 1468:2012. It supersedes BS EN 1468:2003 which is withdrawn.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 1468:2012) 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of an identical text or by endorsement, at the latest by October 2012, and conflicting national standards shall be withdrawn at the latest by October 2012.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 1468:2003.

This European Standard is one of a series of standards for requirements of natural stone products which includes the following:

— EN 1467, *Natural stone — Rough blocks — Requirements*

— EN 1468, *Natural stone — Rough slabs — Requirements*

— EN 1469, *Natural stone products — Slabs for cladding — Requirements*

— EN 12057, *Natural stone products — Modular tiles — Requirements*

— EN 12058, *Natural stone products — Slabs for floors and stairs — Requirements*

— EN 12059, *Natural stone products — Dimensional stone work — Requirements*

Other standards on natural stone are produced by

a) CEN/TC 178

   1) EN 1341, *Slabs of natural stone for external paving — Requirements and test methods*

   2) EN 1342, *Setts of natural stone for external paving — Requirements and test methods*

   3) EN 1343, *Kerbs of natural stone for external paving — Requirements and test methods*

b) CEN/TC 128

   1) EN 12326-1, *Slate and stone products for discontinuous roofing and cladding — Part 1: Product specification*

   2) EN 12326-2, *Slate and stone products for discontinuous roofing and cladding — Part 2: Methods of test for slate and carbonate slate*

c) CEN/TC 125

   1) EN 771-6, *Specification for masonry units — Part 6: Natural stone masonry units*

Other standards are relevant to stone aggregates for concrete, roads, railways and armourstone.

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 requirements for rough slabs of natural stone from which products for use in buildings or commemorative stones and other similar applications are made.

It does not cover artificially agglomerated stony material nor installation.

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

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

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

EN 12440, *Natural stone — Denomination criteria*

EN 12670:2001, *Natural stone — Terminology*

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*

NOTE Besides the European Standards for test methods mentioned in this clause there exist further standards which can be used for scientific examinations, but which are not relevant for the application in practice according to this European Standard.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12670:2001 and the following apply.

3.1
commercial size of a rough slab
size obtained by reducing net length and net width by 0,03 m

3.2
dimensions of a rough slab
length, width (height) and thickness of a rough slab

Note 1 to entry: Dimensions are given in metres to two decimals places for length and width, and in millimetres for thickness.

3.3
gross size of a rough slab
size corresponding to the minimum circumscribed rectangle

3.4
net size of a rough slab
size corresponding to the greatest inscribed rectangle

3.5
rough slabs
flat surface semi-finished product with unfinished edges obtained by sawing or splitting from a rough block

4 Requirements

4.1 Requirements for geometric characteristics

4.1.1 Measurement criteria

All measurements shall be carried out in accordance with EN 13373 and indicated in metres to two decimals places.

4.1.2 Requirements for thickness

The thickness shall not deviate from the nominal thickness by more than the tolerances given in Table 1.

Table 1 — Tolerances of the nominal thickness

Nominal thickness mm	**Tolerance**
up to 15	± 1,5 mm
more than 15 up to and including 30	± 10 %
more than 30 up to and including 80	± 3 mm
more than 80	± 5 mm

Stricter tolerances may be declared by the manufacturer.

For natural stone cleft/riven faces, the tolerances on thickness shall be declared by the manufacturer.

4.1.3 Requirements for flatness

The deviation of the surface from flatness shall not exceed 0,2 % of the slab length and shall not exceed 3 mm. For split rough slabs, the tolerance on flatness shall be declared by the manufacturer.

Stricter tolerances may also be declared by the manufacturer.

4.1.4 Requirements for surface finish

4.1.4.1 General

Surface finishes shall be carried out at least to the edges of the commercial size of rough slabs.

The surface finishing of some types of stones may typically involve the use of patching, fillers or other similar products for natural holes, faults or cracks, and this is to be considered as part of the normal processing.

In such cases, the type of treatment, as well as the type and nature of additional materials, shall be declared.

The surface profile obtained by splitting shall be within declared tolerances.

4.1.4.2 Requirements for surfaces obtained by sawing

Grooves caused by sawing operations shall not have a depth greater than 2 mm. If the rough slab is to be polished, the grooves' depth shall not be greater than 1 mm.

Deviation from flatness shall be in accordance with 4.1.3.

4.1.4.3 Requirements for surfaces after surface finishing

Surfaces shall have a regular appearance as a function of the finishing process, and shall be worked to meet the specified finish (e.g. making reference to samples, see 4.2.2) on all exposed surfaces.

NOTE 1 Surfaces obtained by means of hammer type tools are, for example:

— bush hammered surfaces (see EN 12670:2001, Definition 2.3.8 [1)]);

— trimmed surfaces: finish obtained by using a pointed chisel and mallet or a grooving machine;

— striated surfaces: finish obtained by using a claw chisel (percussion tool for roughening a surface, with the cutting end covered by several teeth of various sizes) or a ruling machine.

NOTE 2 Surfaces obtained by other finishing operations are, for example:

— flamed finish (see EN 12670:2001, Definition 2.3.22 [2)]);

— sand blasted finish (see EN 12670:2001, Definition 2.3.46 [3)]);

— water jet streamed finish: a matt textured surface finish, accomplished by exposing the surface to a steady jet of water under pressure;

— machine tooled finish (see EN 12670:2001, Definition 2.3.54 [4)]);

— riven cut finish: rugged surface produced by splitting stone with a guillotine or chisel.

4.2 Requirements of natural stones for rough slabs

4.2.1 General

The following characteristics shall be declared where requested by this European Standard, or with reference to use conditions.

The declared values shall be representative of the current production. However, due to natural variations of the stone materials, deviations from the declared values may occur. Expected deviations shall be indicated by the manufacturer.

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1) EN 12670:2001, Definition 2.3.8: Finish obtained by using a bush hammer (percussion tool for roughening a surface, with a square head and with few pyramidal percussion teeth or points) or a bush hammering machine (machine consisting of feed rolls and an overhanging beam, supporting a pneumatic bush hammer).

2) EN 12670:2001, Definition 2.3.22: Surface texture obtained by thermal treatment of the stone using a high temperature flame.

3) EN 12670:2001, Definition 2.3.46: A matt finishing resulting from the impact of the sand or other abrasive grains expelled by a sand jet.

4) In EN 12670:2001, Definition 2.3.54, this term has two different meanings:

   a) finish resulting from the mechanical surface treatment with tools;

   b) dressed finish clearly showing tool marks.

Rough slabs of natural stones may be back reinforced and glued by artificial resins.

The possibility that stone processing is likely to change the characteristics of the raw material (e.g. in consequence of strong bush hammering of the surface, of flaming or heating, of back reinforcing the slabs, or because of the use of artificial patching, fillers or other similar products for natural holes, faults, cracks and similar) shall be considered when determining the characteristics requested by this European Standard.

4.2.2 Denomination

The denomination (traditional name, petrological family, typical colour and place of origin) shall always be declared in accordance with EN 12440.

NOTE The place of origin can be given by GPS coordinates.

The petrographic definition shall be determined in accordance with EN 12407.

4.2.3 Visual appearance

This characteristic shall be declared upon request.

The colour, veining, texture, etc. of the stone shall be identified visually (for example by a polished reference sample). The reference sample shall be provided by the supplier.

Any visual variations, for example inclusions and veins, are permissible, provided that they are characteristic of the relevant type of natural stone and provided that they do not adversely affect the performances of the slabs.

Visible cracks and fissures shall be marked on rough slabs.

4.2.4 Apparent density and open porosity

This characteristic shall always be declared.

The apparent density and open porosity shall be determined using the test method in EN 1936 and the results expressed accordingly.

4.2.5 Flexural strength

This characteristic shall always be declared.

The flexural strength shall be determined using the test method in EN 12372 or EN 13161, and the mean value, lower expected value and standard deviation shall be declared.

4.2.6 Other requirements

Where required, for example when the derived product is to be used for a specific purpose, additional tests may be requested in accordance with relevant product standard (see EN 1469 [1], EN 12057 [2], EN 12058 [3], etc.).

5 Marking, packaging

As a minimum of identification, each consignment shall carry the following indications:

— the denomination of the natural stone, in accordance with EN 12440;

— the mass and the quantities of the rough slabs;

— the dimensions (including at least gross and commercial sizes) of the rough slabs.

The slabs shall be clean before packaging.

The supplier shall ensure safety against contamination caused by packaging materials, in wet or dry conditions. Packaging and tapes which are likely to stain shall not be used. The sensitive polished surfaces shall be protected by an appropriate means (for example plastic foil). Products with caustic properties shall not be used.

6 Evaluation of conformity and factory production control

6.1 Evaluation for conformity

The compliance with the requirements of this European Standard and with the stated values shall be demonstrated by carrying out initial type testing. Additionally, the manufacturer shall exercise a permanent factory production control (FPC) and keep record of the results for at least 2 years.

The declared values shall be representative of the current production, for example the lowest expected value or the minimum test value in normal production.

For sampling see Annex A.

When the rough slabs manufacturer declares conformity with some characteristics included in a product standard (see EN 1469 [1], EN 12057 [2], EN 12058 [3], etc.), the evaluation of conformity of the rough slab shall include initial type testing and factory production control as described in the appropriate product standard.

6.2 Initial type testing

Initial type testing of a natural stone rough slab, as given in Table 2, shall be carried out

— on the first application of this European Standard or at the beginning of production of a new type of stone;

— when significant variations occur in the material that are determined visually or by significant changes in FPC results.

Tests previously performed in accordance with the provisions of this European Standard (same type of stone, same characteristic measured with the same test method, same sampling procedure and system of attestation of conformity) may be taken into account.

The declaration of the values may be supported by a "test report" supplied with the block, provided that tests have been performed according to the requirements and test methods of this European Standard.

The results of the selected tests shall be expressed as referred to in 4.2.

Table 2 — List of properties of rough slabs for initial type testing

Reference to subclauses for applicability [a]	Properties/Characteristics	Test method in accordance with
4.2.1	Denomination	EN 12440 and EN 12407
4.2.2	Visual appearance	Visual
4.2.3	Apparent density and open porosity	EN 1936
4.2.4	Flexural strength	EN 12372 or EN 13161

[a] Reference shall be made to these subclauses in order to decide which tests need to be declared.

6.3 Factory production control

6.3.1 A factory production control system (FPC) shall be established and documented. The factory production control system shall consist of procedures for the internal control of production. The results of the tests carried out during FPC shall demonstrate that products placed on the market conform with this European Standard and with the manufacturer's declared values in accordance with 4.1 and 4.2.

In cases when the processing of the stone is likely to change the characteristics of the rough slab (e.g. in consequence of the type of processing or because the use of patching, fillers or other similar products for natural holes, faults, cracks and similar), then this shall be considered within the FPC, as requested by this European Standard.

6.3.2 The internal control shall consist of regular inspection checks and tests, and the utilisation of the results to control materials, equipment, the production process and the rough slabs.

6.3.3 The tests and inspection checks shall be in accordance with Table 3.

Table 3 — Control frequency of Factory production control

Reference to subclauses for applicability [a]	Characteristics	Control frequency	Test method in accordance with
4.1	Geometric characteristics	Every production lot [c]	EN 13373
4.2.2	Visual appearance		Visual
4.2.3	Apparent density and open porosity [b]	In accordance with FPC system but at least every 2 years	EN 1936
4.2.4	Flexural strength		EN 12372 or EN 13161

[a] Reference shall be made to these subclauses in order to decide which tests need to be declared.

[b] When the tests carried out on initial material are significant for the final product, the manufacturer could refer to them.

[c] The dimension or amount of a production lot shall be determined by the manufacturer, having as reference the daily production quantity and the number of deliveries of the considered quantity of slabs.

The results of the tests carried out during FPC shall demonstrate conformity to the requirements declared in accordance with 4.1 and 4.2.

6.3.4 Records

Manufacturers' records shall include at least the following:

a) identification of the product tested;

b) information on sampling (see Annex A):
   - place and date of sampling;
   - identification of the production lot sampled;
   - frequencies of sampling;
   - size and number of samples;

c) the test methods applied;

d) the results of the tests carried out;

e) calibration records of apparatus.

Annex A
(informative)

Sampling

A.1 General

This annex specifies methods for obtaining samples of natural stone from quarries, plants or buildings. Sampling from buildings may be necessary if the delivered natural stone product has already been applied in a building.

The aim of sampling is to obtain a bulk sample that is representative of the average properties of the batch and of its variabilities.

The methods described are based on manual procedures, and are limited to building and civil engineering purposes.

It is important that samplers are trained accordingly in the application of the methods set out in this document.

In the case of a dispute, or if tests are to be done by more than one organization, all interested parties shall have the opportunity to observe the sampling and shall agree upon the number of sampling increments to be taken.

A.2 Principles of sampling

Proper and careful sampling and sample transport is a prerequisite for an analysis that will give reliable results. An adequate number of samples have to be taken in order to obtain a good estimation of the natural heterogeneity of the batch.

The sampler shall be informed of the aim of the sampling.

A.3 Taking bulk samples

The number and size of samples depend on the test methods for which they are taken. The number and shape of specimens are given in the relevant test methods.

A.4 Preparing a sampling plan

A sampling plan shall be prepared prior to sampling, taking into account the following:

— the type of the natural stone (following EN 12440 and EN 12670);

— the aim of the sampling including a list of the properties to be tested;

— the identification of sampling points;

— the approximate size of samples;

— the number of samples;

— the sampling apparatus to be used;

— the methods of sampling;

— the marking, packaging and dispatch of the samples.

A.5 Sampling apparatus

Any suitable cutting equipment for natural stone may be used for sampling. In addition, drills, which are suitable for taking drill cores, may be used.

A.6 Sampling methods

A.6.1 General

The sampling methods will inevitably involve the samplers working at a quarry, plant or building. Regulations for safety and ergonomics shall be followed.

A.6.2 Sampling from quarries

A.6.2.1 General

The sample shall be taken by a qualified specialist, experienced in the examination of natural stone deposits. The main objective of sampling from such deposits is to establish the average, the range of variations and the differences in the structure and properties of the natural stone, taking into account the fabric, geological structure and the anticipated quarrying conditions.

A.6.2.2 Sampling of solid rock

a) Identification of anisotropy and orientation of samples

If the exploratory work reveals a pronounced fabric or geological structure which is not necessarily visible at the sample scale (e.g. stratification, massive bedding, lamination, cleavage or rift), the sample shall be marked accordingly.

b) Sampling for petrographic analysis

For petrographic analysis, hand specimens shall be taken from all distinct types and varieties that characterize the rock in terms of mineral composition, fabric and geological structure.

Samples from drilling (cores and pieces) may also be used.

In addition to samples of fresh material, samples shall also be taken to illustrate the effects of weathering.

c) Sampling for physical testing

For physical testing, sample blocks shall be used as samples, their number and location dependent on the results of the petrographic analysis and the required test methods.

The sample blocks shall measure approximately 0,40 m x 0,25 m x 0,25 m or more where a coarse-grained and/or a large-pored rock is to be sampled.

It is recommended that samples be taken from larger natural stones which have been the least affected by blastings. Care shall be applied to ensure the sample blocks do not show any hairline cracks resulting from the removal process.

Samples may also be cut from rough blocks, slabs or dimension stones, the number and size of samples dependent on the particular test method.

A.6.3 Sampling from plants

A representative sample of adequate size and characteristic of the natural stone in terms of mineral composition, fabric and geological structure, shall be taken from the material to be tested (e. g. slabs, dimension stones), taking into account the intended use of the material.

A.6.4 Sampling from buildings

Sampling points shall be selected according to the rules for obtaining a representative sample, taking into consideration any differences in properties visible to the naked eye. Where necessary, taking a single slab to assess the mechanical properties in situ will be sufficient.

The location of the sample in the building shall be reported.

A.7 Marking, packaging and dispatch of the samples

The samples or containers shall be clearly and durably marked. Marking shall include:

a) a unique code, or

b) identification of the laboratory samples, including place of sampling, date of sampling and denomination of the material.

The laboratory samples shall be packed and transported in such a way that they are protected from damage.

A.8 Sampling report

A.8.1 The sampler shall prepare a sampling report for each laboratory sample or for each group of laboratory samples from a single source. The sampling report shall refer to this European Standard and state the following:

a) the sampling report identification (serial number);

b) the laboratory sample identification mark(s);

c) the date and place of sampling;

d) sampling point(s) or identification of the batch sampled;

e) a reference to the sampling plan prepared according to A.4;

f) the name of the sampler(s).

A.8.2 Depending on the circumstances, other information might be relevant. Table A.1 shows an example of a comprehensive sampling report.

Table A.1 — Example of a sampling report

Sampling report identification (serial n°):
Laboratory sample identification mark: no. of package

Description of the natural stone and sampling places

Name of the quarry or production plant or building:
Name of producer:
Origin of batch:
Purpose for which the natural stone is to be used:
Location of sampling point(s):
Identification of the batch:
Size of the batch:
Other comments (e. g. warnings, if appropriate):

Description of the sampling method

Date and time of sampling:
Reference to sampling plan used:
Sampling procedure (drilling, cutting, etc.)
Purpose of the sampling

Samples

No. and dimensions of samples:
Other comments:
Dispatch of the samples:
Sampler(s) (print name):

Contract details

Contract identification:
Name and address of party requesting the sampling:…….. ……
Name of person(s) present at sampling:……. ……
Signatures:…… …… ……

Bibliography

[1] EN 1469, *Natural stone products — Slabs for cladding — Requirements*

[2] EN 12057, *Natural stone products — Modular tiles — Requirements*

[3] EN 12058, *Natural stone products — Slabs for floors and stairs — Requirements*

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