BS EN 1343:2012

BSI Standards Publication

Kerbs of natural stone for external paving — Requirements and test methods

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National foreword

This British Standard is the UK implementation of EN 1343:2012. It supersedes BS EN 1343:2001 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/507, Paving units and kerbs.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Kerbs of natural stone for external paving - Requirements and test methods

Bordures de pierre naturelle pour le pavage extérieur - Exigences et méthodes d'essai

Bordsteine aus Naturstein für Außenbereiche - Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 6 October 2012.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN 1343:2012) has been prepared by Technical Committee CEN/TC 178 “Paving units and kerbs”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by May 2013, and conflicting national standards shall be withdrawn at the latest by August 2014.

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 1343:2001.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

The following changes have been made in this new edition:

a) Where possible the requirements refer to separate test methods prepared by CEN/TC 246, "Natural stones". The change was made to allow those placing the products on the market to use the same test results for a number of products.

b) The values to be declared have been clarified and where applicable the declared values are now ‘lower expected values’.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, 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 the performance requirements and the corresponding test methods for all natural stone kerbs used for external paving and road finishes.

External paving use includes all pavements typical of road works, such as pedestrian and trafficked areas, outdoor squares and similar to be used in an outdoor condition that are subject to the weathering agents, such as temperature changes, rain, ice, wind, etc.

This European Standard provides also for the evaluation of conformity and for marking of the natural stone slabs.

This European Standard also covers characteristics that are of importance to the trade.

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 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 12440, *Natural stone — Denomination criteria*

EN 13373:2003, *Natural stone test methods — Determination of geometric characteristics on units*

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
kerb
unit greater than 300 mm in length, commonly used as edging to a road or footpath

Note 1 to entry: See Figure 1.

3.1.1
curved concave kerb
kerb, curved in plan with a concave face

3.1.2
curved convex kerb
kerb, curved in plan with a convex face

3.2
upper face
horizontal surface of a kerb intended to be seen when in use

3.3
bed face
surface of a kerb intended to be in contact with the bedding material when in use

3.4
front face
vertical traffic face of the kerb

3.5
rear face
vertical and facing away from the traffic (probably in contact with the ground)

3.6
actual dimension
dimension of a kerb as measured

3.7
work dimension
size of a kerb as specified

3.8
overall length
length of a kerb measured on the visible face

Note 1 to entry: See Figure 2.

3.9
overall width
shorter side of the rectangle with the smallest area able to enclose the kerb

Note 1 to entry: This only applies to straight kerbs. The overall width of a curved kerb is the widest point of the cross-section of the kerb (see Figure 2).

3.10
height
distance between the upper face and the bed face of the kerb

3.11
batter
intended deviation from the vertical of the traffic face of a kerb

3.12
textured
kerb with a surface finish produced by secondary processing, from a saw or hewn surface

3.13
fine textured
surface finish with a maximum difference of 1,0 mm between peaks and depressions (for example, polished, honed or sawn with a diamond disc or blade)

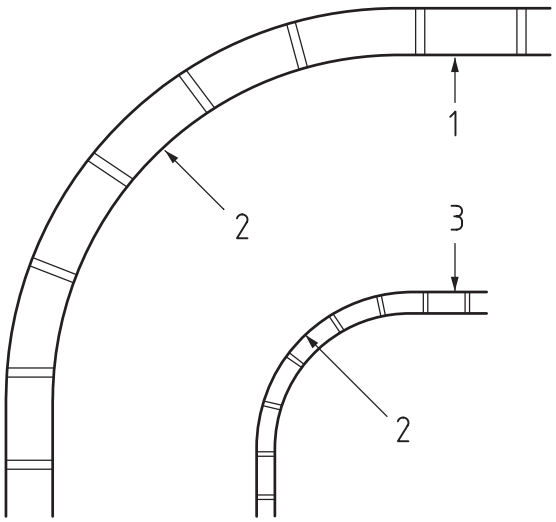
3.14
coarse textured
surface finish with more than 1,0 mm difference between peaks and depressions (for example, dolly pointed, shot blasted or flame textured)

3.15
hewn
kerb with a natural surface finish which has not subjected to secondary processing, for example a riven or split face

3.16
tooled
finish resulting from mechanical surface treatment and showing tool marks

3.17
lower expected value
LEV
value (E_L) which corresponds to the 5 %-quantile of a logarithmic normal distribution for a confidence level of 75 %

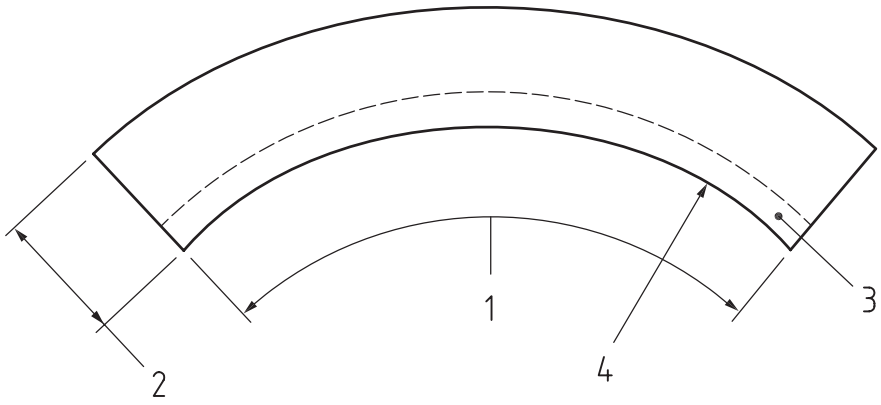
3.18
higher expected value
HEV
value (E_H) which corresponds to the 95 %-quantile of a logarithmic normal distribution for a confidence level of 75 %



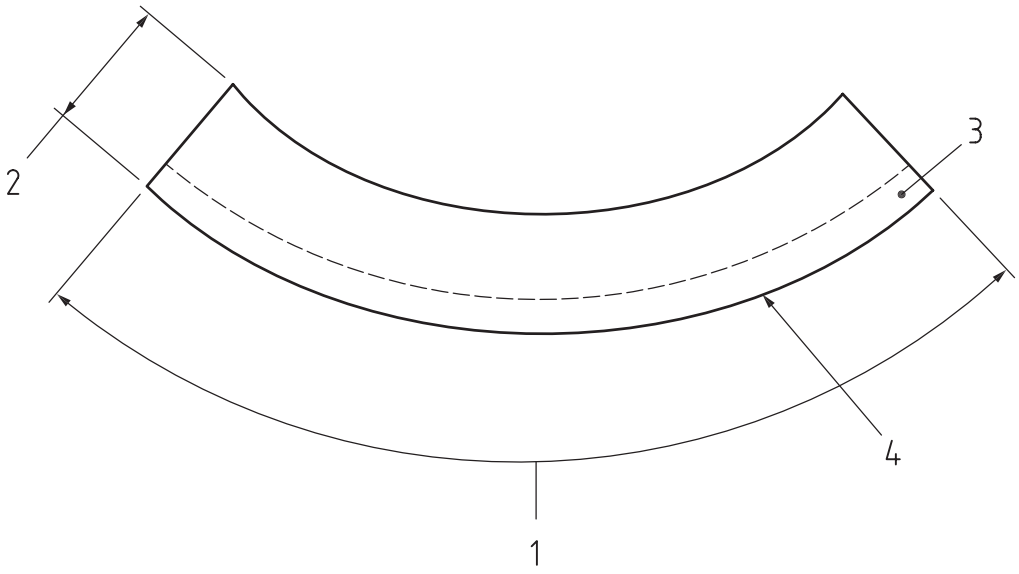
Key

1 = inner radius concave front face
2 = radius
3 = outer radius convex front face

Figure 1 — Diagram showing convex and concave kerbs



a) Concave kerb



b) Convex kerb

Key

1 = overall length
2 = overall width
3 = batter or chamfer
4 = front face

Figure 2 — An example of a curved kerb showing the overall length and width

4 Requirements and test methods for slabs of natural stone

4.1 Introduction

4.1.1 General

Unless otherwise stated, kerbs shall be supplied in free running lengths. For curved kerbs the length is the measured visible face circumference. The manufacturer shall state the minimum and maximum working length of a kerb unit.

The ends of curved kerbs shall be radial.

Curved kerbs shall be identified by the radius of the vertical visible or traffic face. The overall length of a number of curved kerbs shall be measured without the joints on the edge common to the visible faces.

The minimum length of curved kerbs shall be 500 mm.

Nominally square arrises may have a chamfer with vertical and horizontal dimensions not exceeding 2 mm.

The dimensions of larger chamfers, radiused corners and splays, when used, shall be declared by the supplier. Examples of typical kerb cross-sections are shown in Figure 3.

4.1.2 Denomination

The denomination shall always be declared in accordance with EN 12440 (meaning traditional name, petrological family, typical colour and place of origin as precisely as possible for example geo coordinates).

4.1.3 Alteration of physical properties of the natural stone

If during production the natural stone kerbs have been subjected to a treatment that physically alters the properties of the stone (e.g. chemical treatment, patching, or filling or other similar products for natural holes, faults or cracks), then the use of such treatment shall be stated.

In addition, specimens for testing shall be representative of the product and any processes that the stone is subjected to.

4.2 Dimensions

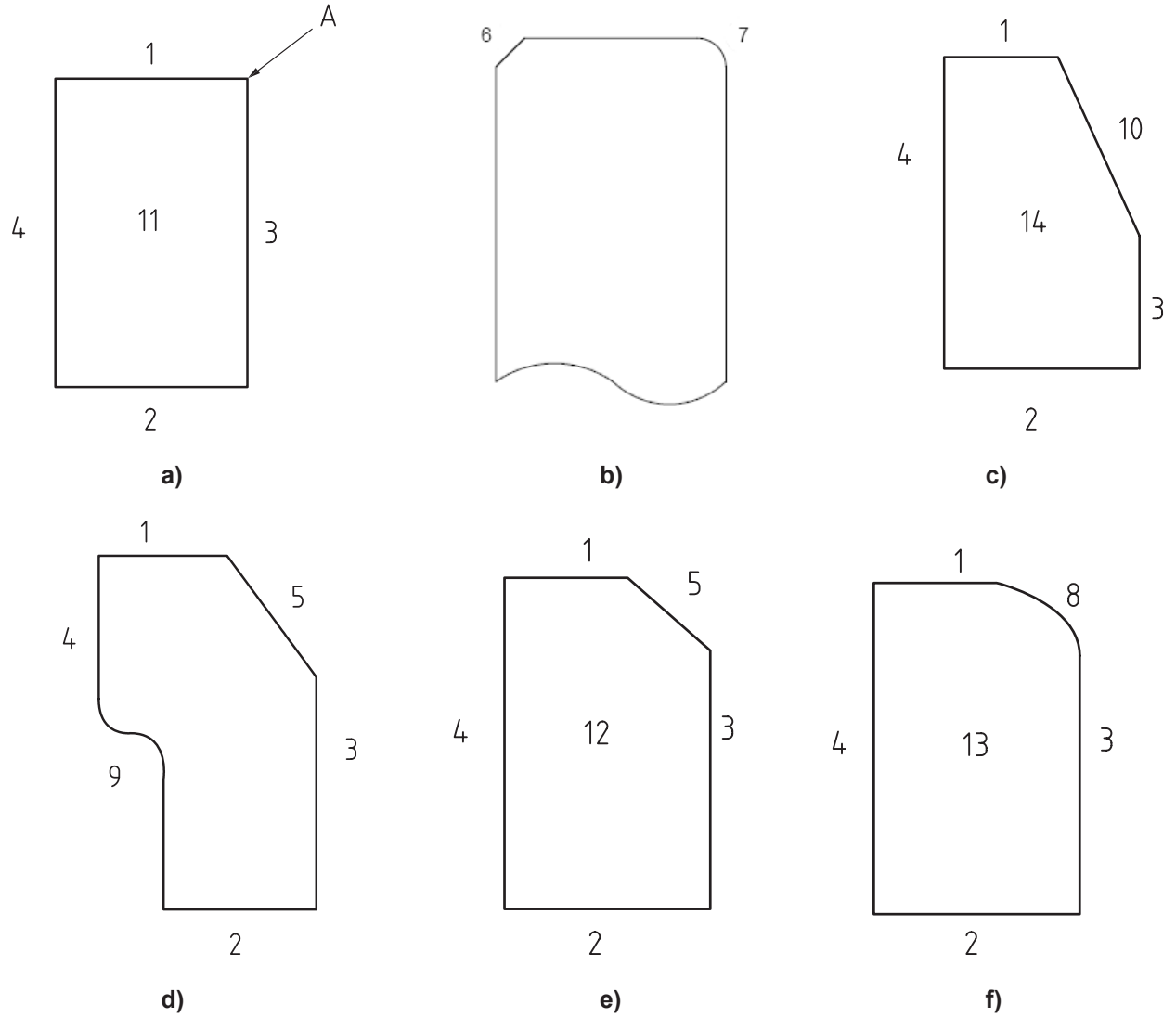
4.2.1 Overall width and height

The overall width and height as laid shall be measured in accordance with EN 13373:2003, 5.2, and the deviations from the declared dimensions shall conform to the tolerances given in Table 1.

Table 1 — Tolerances on nominal overall width and height

<table>
<tr><th>Location</th><th>Width</th><th colspan="3">Height</th></tr>
<tr><th></th><th></th><th>Class 0</th><th>Class 1</th><th>Class 2</th></tr>
<tr><td>Marking designation</td><td></td><td>H0</td><td>H1</td><td>H2</td></tr>
<tr><td>Between two hewn or tooled faces</td><td>± 10 mm</td><td rowspan="3">No requirement</td><td>± 30 mm</td><td>± 20 mm</td></tr>
<tr><td>Between one textured face and one hewn or tooled face</td><td>± 5 mm</td><td>± 20 mm</td><td>± 10 mm</td></tr>
<tr><td>Between two textured faces</td><td>± 3 mm</td><td>± 10 mm</td><td>± 5 mm</td></tr>
</table>

NOTE These apply to straight / square or circular / square – all others are specials and need a template.



There maybe a fillet or chamfer on the arriss.

Key

A = arris

1 = upper face
2 = bed face
3 = front face
4 = back face
5 = splay
6 = chamfer
7 = round fillet
8 = bullnose
9 = undercut
10 = battered face
11 = rectangular kerb
12 = chamfered or splayed kerb
13 = bullnosed kerb
14 = half battered kerb

Figure 3 — Examples of typical kerb cross-sections

4.2.2 Batter

The batter shall be measured in accordance with EN 13373:2003, 5.6 and the deviation from declared dimensions shall conform to the tolerances given in Table 2.

Table 2 — Examples of typical kerb cross sections - tolerances on batter

	Class 0	Class 1	Class 2
Marking designation	No requirement	D1	D2
Fine textured		± 5 mm	± 2 mm
Coarse textured		± 5 mm	± 5 mm
Hewn or tooled		± 15 mm	± 15 mm

4.2.3 Tolerances of faces (straight kerbs only)

The faces of nominally straight and square kerbs measured perpendicular to the upper face and from the line of the upper arris shall be measured in accordance with EN 13373:2003, 5.6 and the deviation from the declared dimensions shall conform to the tolerances given in Table 3.

Table 3 — Tolerances on faces of straight kerbs

	Hewn or tooled	Textured
Edge straightness parallel to the plane of the upper face	± 6 mm	± 3 mm
Edge straightness perpendicular to the upper face	± 6 mm	± 3 mm
Perpendicularity between the upper and front faces, when nominally square	± 10 mm	± 7 mm
Distortion of the upper face	± 10 mm	± 5 mm
Perpendicularity between the upper face and the end surface	All kerbs ± 5 mm	

4.2.4 Curved kerbs

The curvature of the kerbs to the tooled face shall be checked for compliance with the required shape by use of a specified template, the deviation at any point shall conform to the tolerances given in Table 1.

4.2.5 Face irregularities

The face of kerbs shall be free from drill holes.

Surface protrusions and cavities, measured perpendicular to the upper face and from the line of the upper arris in accordance with EN 13373:2003, 5.3, shall conform to the tolerances given in Table 4. If the kerb is hewn then irregularities on the end of the kerb may not protrude by more than 5 mm.

Table 4 — Tolerances on face irregularities

	End face	Front and back faces
Hewn or tooled	+ 3 mm, - 10 mm	+ 10 mm, - 15 mm
Coarse textured	+ 3mm, - 10 mm	+ 5 mm, - 10 mm
Fine textured	+ 3mm, - 3 mm	+ 3 mm, - 3 mm

Tolerances may not be added to each other, for example, protrusions and perpenduclarities.

4.3 Freeze/thaw resistance

4.3.1 Freeze- thaw under normal conditions

When the kerbs are intended to be used in areas subjected to freeze-thaw requirements, the freeze/thaw resistance shall be determined using the test method in EN 12371. The results shall be expressed and declared as the mean flexural strength before and after 56 cycles of freeze/thaw (technological test).

The frost damage, which a natural stone may suffer when installed, depends on the climatic conditions of the place of use, the relative position in the works (which determines the degree of saturation) and the predicted service life of the works. This number of cycles is appropriate to a specific project and may help to provide guidance for the interpretation of the test results. The selection of the stones is subjected to climatic zones and/or to codes of practice.

For some specific uses, for example in locations that are subject to temperatures below - 12 °C, it may be appropriate to use different test cycles, e.g. freezing in water, freezing to a lower temperature, or testing specimens embedded in non-porous siliceous granules or a different number of cycles, e.g. the identification test as defined in EN 12371.

4.3.2 Freeze-thaw in the presence of de-icing salts

Where required, freeze-thaw resistance with the effect of de-icing salts shall be determined and declared. In the absence of a European test method, freeze-thaw resistance with the effect of de-icing salts shall be determined and declared according to national provisions valid in the place of use of the product.

4.4 Breaking strength — Flexural strength

The flexural strength shall be determined using the test method in EN 12372 and the lower expected value (E_L) shall be declared.

An identification test as defined in EN 12372 is normally carried out. However, where the surface finish of the delivered product is known, the test may be carried out with this finish, in accordance with the technological tests defined in EN 12372.

NOTE 1 Guidance on the appropriate breaking load for different classes of use is given in Annex A.

For some specific uses where a load under constant momentum is required, it may be appropriate to determine the flexural strength in accordance with EN 13161.

NOTE 2 An example of the calculation used to determine the lower expected value is given in Annex C.

4.5 Appearance

4.5.1 General

The colour, veining, texture, etc. of the natural stone shall be identified visually, typically by a reference sample of the same stone suitable for providing a general description of visual appearance.

A reference sample shall be provided by the supplier according to 4.5.2.

4.5.2 Reference sample, visual inspection and acceptance criteria

A reference sample shall be an adequate number of kerbs or parts of kerbs of sufficient size to indicate the general appearance of the finished work. They shall indicate the range of appearance regarding the colouring,

the vein pattern, the physical structure and the surface finish. In particular the reference sample shall show specific characteristics of the stone, such as holes for travertine, worm holes, glass seams, spots, crystalline veins and rusty spots.

The reference sample does not imply strict uniformity between the sample itself and the actual supply; natural variations may always occur.

If the processing of the stone involves the use of patching, fillers or other similar products for natural holes, faults or cracks, then the reference sample shall similarly display the impact of the same on the finished surface.

All the characteristics as shown by the reference sample shall be considered typical of the stone and not as flaws, therefore they shall not become a reason for rejection, unless their concentration becomes excessive and the typical character of the stone is lost.

The name and address of the manufacturer or the supplier of the stone, as well as the denomination of the stone in accordance with 4.1 and/or information on the treatment in accordance with 4.1.2 above shall be indicated on the reference sample.

Any comparison between production sample and reference sample shall be carried out by placing the reference sample against the production samples and viewing them at a distance of about 2 m under normal daylight conditions and recording any visible differences in the characteristics of the stones.

4.6 Water absorption

Where required the water absorption shall be determined using the test method in EN 13755 and the higher expected value (E_{H}) shall be declared.

4.7 Apparent density and open porosity

The apparent density and open porosity shall be determined using the test method in EN 1936 and the mean values declared.

4.8 Petrographic description

A petrographic description shall be provided, including a petrographic name, of the stone type, in accordance with EN 12407.

4.9 Dangerous substances

National regulations on dangerous substances may require verification and declaration on release, and sometimes content, when construction products covered by this standard are placed on those markets.

In the absence of European harmonised test methods, verification and declaration on release/content should be done taking into account national provisions in the place of use.

NOTE An informative database covering European and national provisions on dangerous substances is available at the Construction website on EUROPA accessed through: http://ec.europa.eu/enterprise/construction/cpd-ds/.

5 Evaluation of conformity

5.1 General

The conformity of the product (i.e. natural stone kerbs) to the requirements of this standard and with the declared performances (e.g. values, classes) for the characteristics relevant for the intended use of the product shall be demonstrated by:

a) initial type testing,

b) factory production control by the manufacturer, including product assessment.

For the purposes of testing, the products may be grouped into product families, where it is considered that the results for one or more characteristics from any product within the family are representative for the same characteristics for all products within that family.

A product may be in more than one family for different characteristics.

5.2 Initial type testing (ITT) and Type Testing (TT)

Initial type testing and type tests, if any, shall be performed for all characteristics included in this standard for which the performances are to be declared:

— when a new product type is developed (and before it is placed on the market or

— at the beginning of a new or modified method of production where this may affect the declared performances.

The declared performances should be representative of the current production, e.g. the lower expected value in normal production.

Whenever a significant change occurs in the raw material or the production process, which could change any of the declared performance of the product, this shall be considered as a new product and any of such characteristic shall be re-assessed for a new declared performance.

Initial type testing of the product, as given in Table 5, shall be carried out on:

— first application of this document or at the beginning of the production with a new type of stone;

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

Tests previously performed in accordance with the provisions of this document (i.e. 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 for the purpose of ITT.

Table 5 — List of properties of kerbs for paving for initial type testing

Requirements Subclause	Characteristics (properties)	Test method in accordance with:	Expression of results
4.4	Breaking strength - Flexural strength	EN 12372	Declared value
4.3.1	Durability of flexural strength against freeze/thaw resistance – normal conditions	EN 12371	2 declared values
4.3.2	Durability of flexural strength against freeze/thaw resistance – de-icing salts	See 4.3.2	Declared value(s)
4.2.1	Tolerances – Plan Dimension	EN 13373:2003, 5.2	Table 1
4.2.1	Dimensions	EN 13373	Declared value
4.6	Water absorption	EN 13755	Declared value
4.7	Apparent density and open porosity	EN 1936	Declared values
4.8	Petrographic description	EN 12407	Declared description
4.9	Dangerous substances	See 4.9	Declared value or class, as relevant

Assessment of compliance should be undertaken using the same method (identification or technological) as used in determining the declared value.

The declared performances may be supported by a test report supplied with the block or raw slabs provided that test 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 Clause 4.

5.3 Factory Production Control

5.3.1 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 to this document and with the declared performances of the product's characteristics, established under ITT in accordance with Clause 4.

In cases when the processing of the natural stone is likely to change any of these declared performances, relative to the initial stone (e.g. as a consequence of the type of processing or because the physical properties have been modified by impregnation, use of patching, fillers or other similar products for natural holes, faults, cracks and similar), then this shall be considered within FPC as requested by this document.

5.3.2 The factory production control shall consist of regular inspection checks and tests and the utilisation of the results to control incoming materials (i.e. stone), equipment, the production process and the product.

When alternative tests to the reference tests are used for the test procedure, their correlation to the reference test shall be determined and available for inspection.

All test equipment shall be calibrated and the procedure, frequency and acceptance criteria stated.

5.3.3 A sampling plan for the testing of products shall be defined and the results shall be recorded and available for inspection.

NOTE Guidance on sampling is given in Annex B.

5.3.4 The stock control of the products, together with procedures for dealing with non-conforming products, shall be detailed.

5.3.5 Manufacturers' records shall include at least the following:

a) identification of the product tested;

b) information on sampling:

   1) place and date of sampling;

   2) identification of the production lot sampled;

   3) frequencies of sampling;

   4) size and number of samples;

c) test methods applied;

d) test and inspection results;

e) calibration records of apparatus.

5.3.6 Any testing procedure (reference or alternative tests) adopted for the FPC shall include the relevant acceptance criteria. In case of non-compliance, a specific action plan shall be defined as part of the FPC. As a rule this plan shall include the repetition of the FPC procedure on an extended quantity of specimens or of products. In cases when the results of these tests do not conform with the declared performances, final assessment of compliance shall be provided adopting the same test method (identification or technological) as used in determination of declared performances and making reference to Table 6.

Table 6 — Characteristics of natural stone kerbs for paving for factory production control

Requirements subclause	**Characteristics (properties)**	**Verification during production**	**Test method in accordance with:**	**Minimum testing frequency** (see 1) and 3) below)	**Acceptance criteria**
4.2.1	Dimensions	Continuous verification in accordance with manufacturer's factory production control (see 2))	EN 13373	Each lot	Within the tolerance range [a]
4.2.1	Tolerances – Plan Dimension		EN 13373:2003, 5.2		
4.4	Flexural strength		EN 12372	Every 2 years [b]	> 80 % of the individual results >declared value
4.6	Water absorption		EN 13755		> 80 % of the individual results <declared value
4.7	Apparent density and open porosity		EN 1936		No requirement
4.3.1	Freeze/thaw resistance – normal conditions		EN 12371	Every 10 years [b]	Within the tolerance range [a] for 2 declared values
4.3.2	Freeze/thaw resistance – de-icing salts		See 4.3.2		Within the tolerance range [a] for declared value(s)
4.8	Petrographic description		EN 12407		Complies with declared description
4.9	Dangerous substances		See 4.9		Individual results complying with declared value or class

1) The testing frequency should be established so that it represents a means to guarantee consistency of the product's performance and a reliable declaration for both the users and the manufacturer.

2) The control testing of each of these characteristics is to be carried out using the most appropriate indirect test/check method(s), which is to be detailed in the manufacturer's quality control plan for the parameter(s), set up under ITT, if any, and related to the performance of such characteristic (e.g. incoming materials, composition).

3) In cases when the processing of the stone is likely to change the characteristics of the finished product relative to the initial material (e.g. as a 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 has to be considered in determining the frequency of testing.

[a] Usually referred to in the requirements subclause.

[b] These represent the upper limits of the testing frequency (see 1)).

6 Marking, labelling and packaging

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

a) the denomination of the natural stone in accordance with EN 12440 (see 4.1.2);

b) quantities and dimensions of the kerbs.

Additional information is advisable:

c) the mass of the kerbs;

d) dimensions and mass of packaging.

These indications shall be given on labels, packaging or on accompanying documents.

An identification system may be used in order to identify individual kerbs; in such a case individual stones shall be clearly marked accordingly. Marking usually consists of alphanumeric codes and symbols (e.g. to define proper orientation at installation).

The kerbs shall be clean before packaging.

Packaging shall allow adequate, solid and durable protection for packed kerbs, both during transport and during handling and storage. Movement of kerbs inside the packaging shall be prevented by securing individual pieces.

Packaging shall be of appropriate mass and size in consideration of transportation and lifting facilities; the top and bottom of the packaging as well as stacking possibility shall be indicated.

Safety against contamination, caused by packaging materials, in wet or dry conditions, shall be ensured. Packaging and tapes which are likely to stain shall not be used. Sensitive polished surfaces of the kerbs shall be protected by appropriate means (e.g. plastic foil). Products with caustic properties shall not be used.

Annex A
(informative)

Calculation of height for kerbs for kerbs with a square cross section

The height of a kerb should be calculated from flexural strength and the expected load P (in kN) from the equation:

$$h = \sqrt{\frac{1\,500.P.L.F_S}{W.R_f}}$$

where:

h is the height of the kerb (mm);

P is the breaking load of the kerb for different uses in kN;

NOTE Guidance on expected breaking loads for different uses is given in Table A.1.

L is the length of the kerb (mm);

W is the width of the kerb (mm) (the distance between the front face and the back face);

R_f is the lower expected value (E_L) for flexural strength (MPa) according to EN 12372;

F_S is a safety factor for the flexural strength, in the case of kerbs is assumed to be 1,6 unless an alternative higher value is specified.

Table A.1 — Breaking load

Class	**Minimum breaking** kN	**Typical use**
0	No requirement	Decoration
1	0,75	Kerbs bedded in mortar, pedestrian area only
2	3,5	Pedestrian and cycles areas.
3	6,0	Occasional car, light vehicle and motorcycle access. Garage entrances.
4	9,0	Walking areas, market places occasionally used by delivery vehicles and emergency vehicles
5	14,0	Pedestrian areas often used by heavy lorries
6	25,0	Roads and streets, petrol stations

Annex B
(informative)

Guidance on sampling

B.1 General

This annex specifies methods for obtaining samples of natural stone from quarries, plants and construction works. Sampling from construction works may be necessary if the delivered natural stone product is already applied in a construction works.

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

The methods described are based on manual procedures. The methods described are limited to construction works and civil engineering purposes.

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

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

B.2 Principles of sampling

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

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

B.3 Taking bulk samples

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

B.4 Preparing a sampling plan

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

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

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

— identification of sampling points;

— orientation of samples relative to resource or bed, etc;

— approximate size of samples;

— number of samples;

— sampling apparatus to be used;

— methods of sampling;

— marking, packaging and dispatch of the samples.

B.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.

B.6 Sampling methods

B.6.1 General

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

B.6.2 Sampling from quarries

B.6.2.1 General

The main objective of sampling from such deposits is to establish, where possible, the average, the range of variations and the differences in the structure and properties of the rock, taking account of the fabric and geological structure and the anticipated mining conditions.

B.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 which characterise 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 and hand specimens shall be used as samples, their number and location depending on the results of the petrographic analysis and the test methods required.

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.

The sample blocks shall be broken as carefully as possible. It is recommended that they are taken from larger natural stones which have been least affected by blasting. Care has to be taken to ensure that neither the sample blocks nor the hand specimens 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 depending on the particular test method.

B.6.3 Sampling from production units and consignments

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

B.6.4 Sampling from construction works

Sampling points should 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 kerb to assess the mechanical properties of kerbs should be sufficient.

The location of the sample in the construction works shall be reported.

B.7 Marking, packaging and dispatch of the samples

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

a) unique code; or

b) identification of the laboratory samples, 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.

B.8 Sampling report

B.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 document and state:

a) sampling report identification (serial number);

b) laboratory sample identification mark(s);

c) date and place of sampling;

d) sampling point or identification of the batch sampled;

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

f) name of the sampler(s).

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

Table B.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:…… …… ……

Annex C
(informative)

Example of calculation of Lower Expected Value

C.1 Scope

This annex establishes a method for the lower expected value (E_L).

C.2 Symbols and definitions

Measured values $x_1, x_2, .. x_i .., x_n$

Number of measured values n

Mean value $\bar{x} = \frac{1}{n}\sum_i x_i$

Standard deviation $s = \pm\sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}}$

Coefficient of variation $v = \frac{s}{\bar{x}}$ (for individual values)

Logarithmic mean $\bar{x}_{\ln} = \frac{1}{n}\sum_i \ln x_i$

Logarithmic standard deviation $s_{\ln} = \pm\sqrt{\frac{\sum(\ln x_i - \bar{x}_{\ln})^2}{n-1}}$

Maximum value Max

Minimum value Min

Lower expected value $E = e^{(\bar{x}_{\ln} - (k_s \cdot s_{\ln}))}$ where k_S (quantile factor) is given in Table C.1

Quantile factor k_S; see Table C.1

C.3 Calculation of Lower Expected Value

For the calculation of the lower expected value (E_L) a logarithmic normal distribution is assumed. The lower expected value (E_L) corresponds to the 5 % quantile of a logarithmic normal distribution for a confidence level of 75 %.

Table C.1— Quantile factor (k_S) in dependence on the number of measured values (n) in correspondence to the 5 % quantile for a confidence level of 75 %

n	k_s
3	3,15
4	2,68
5	2,46
6	2,34
7	2,25
8	2,19
9	2,14
10	2,10
15	1,99
20	1,93
30	1,87
40	1,83
50	1,81
∞	1,64
Quantile factor (ks) dependent on the number of measured values (n) in correspondence to the 5 % quantile for a confidence level of 75 %.	

The following examples should help to clarify the method:

EXAMPLE 1:

Calculation of mean value, standard deviation, maximum value and minimum value of six measured values

Table C.2 — Calculation of mean and standard deviation

Measurement no	Measured value *x*
1	2 000
2	2 150
3	2 200
4	2 300
5	2 350
6	2 400

Mean value	2 333
Standard deviation	147
Maximum value	2 400
Minimum value	2 000

EXAMPLE 2:

Calculation of mean value, standard deviation, coefficient of variation and lower expected value of 10 measured values

Table C.3 — Calculation of lower expected value

Measurement no	Measured value *x*	(ln *x*)
1	2 000	(7,60)
2	2 150	(7,67)
3	2 200	(7,70)
4	2 300	(7,74)
5	2 350	(7,76)
6	2 400	(7,78)
7	2 600	(7,86)
8	2 750	(7,92)
9	2 900	(7,97)
10	3 150	(8,06)
	---------	---------
Mean value	2 480	(7,807)
Standard deviation	363	(0,143)
Variation coefficient	0,15	

From Table C.1 for: n = 10 ks = 2,1 and the Lower expected value 1 819

Annex ZA
(informative)

Clauses of this European Standard addressing the provisions of the EU Construction Products Directives

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under a Mandate M/119, as amended, given to CEN by the European Commission and the European Trade Association.

The clauses of this European Standard shown in this annex meet the requirements of the Mandate M/119, as amended, given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the construction products covered by this annex for their intended uses indicated therein; reference shall be made to the information accompanying the CE marking.

This annex establishes the conditions for the CE marking of the natural stone kerbs intended for the uses indicated in Table ZA.1 and shows the relevant clauses applicable.

This annex has the same scope as Clause 1 of this standard.

Table ZA.1 — Scopes and relevant clauses

Construction products: Kerbs of natural stone **Intended uses:** Paving units for external uses and road finishes			
Essential characteristics	**Requirement clauses in this standard**	**Levels and/or classes**	**Notes**
RELEASE OF DANGEROUS SUBSTANCES	4.9	-	as relevant
BREAKING STRENGTH, dealt with by:			
- **flexural strength**	4.3	-	tested for acc. to EN 12372 and declared as the lower expected value (E_L)(in MPa)
		-	
DURABILITY of breaking strength, dealt with by:			
- freeze/thaw resistance- general	4.3.1	-	mean values of flexural strength before & after 56 freeze/ thaw cycles (technological test acc. to EN 12371) (in MPa)
- freeze/thaw resistance- de-icing salts	4.3.2		declared according to national provisions valid in the place of use of the product

The requirement on a certain characteristic is not applicable in those Members States (MSs) where there are no regulatory requirements on that characteristic for the intended use of the product. In this case, manufacturers placing their products on the market of these MSs are not obliged to determine nor declare the

performance of their products with regard to this characteristic and the option “No performance determined” (NPD) in the information accompanying the CE marking (see ZA.3) may be used.

ZA.2 Procedure for the attestation of conformity of kerbs of natural stone

ZA.2.1 System of attestation of conformity

The system of attestation of conformity of natural stone kerbs indicated in Table ZA.1, in accordance with the Decision of the Commission 97/808/EC of 1997-11-20 *(see OJEC L331 of 1997-12-03)*, as amended firstly by 1999/453/EC of 1999-06-18 *(see OJEC L178 of 1997- 07-14)*, secondly by 2001/596/EC of 2001-01-08 *(see OJEC L209 of 2001-08-02)* and thirdly by 2006/190/EC of 2006-03-01 *(see OJEC L66 of 2006-03-08)*, as given in Annex III of the Mandate M/119 for "Floorings", as amended, is shown in Table ZA.2 for the indicated intended uses and relevant level(s) or classes.

Table ZA.2 — System of attestation of conformity

Product(s)	Intended use(s)	Level(s) or classes(s)	Attestation of conformity system
Rigid flooring products Paving units (with flat or tactile surface) including pavers; flags; kerbs; blocks; pavement lights; self finished decking of metal sheet; rigid floor tiles; slate; tiles; mosaics; quarry tiles; terrazzo tiles; expanded metal or grid floor decking; floor gratings.	For external uses and road finishes to cover external pedestrian and vehicular circulation areas		4 [a]
[a] System 4: See Directive 89/106/EEC (CPD) Annex III.2(ii), Third possibility.			

The attestation of conformity of the kerbs of natural stone in Table ZA.1 shall be according to the evaluation of conformity procedures indicated in Table ZA.3 resulting from application of the clauses of this European Standard indicated therein.

Table ZA.3 — Assignment of evaluation of conformity tasks for kerbs of natural stone under AoC system 4

Tasks		Content of the task	Evaluation of conformity subclauses to apply
Tasks under the responsibility of the manufacturer	Factory production control (FPC)	Parameters related to characteristics of Table ZA.1, the performance of which are to be declared for the intended used	5.3
	Initial type testing by the manufacturer	Characteristics of Table ZA.1, the performance of which are to be declared for the intended used	5.2

ZA.2.2 EC declaration of conformity

When compliance with this annex is achieved, the manufacturer or his agent established in the EEA shall prepare and retain a declaration of conformity (i.e. EC declaration of conformity) which authorises the affixing of the CE marking. This declaration shall include:

— name and address of the manufacturer or their authorised representative established in the EEA, and place of production;

NOTE 1 The manufacturer may also be the person responsible for placing the product onto the EEA market, if he takes responsibility for CE marking.

— description of the product (type, identification, use…), and a copy of the information accompanying in the CE marking;

NOTE 2 Where some of the information required for the Declaration is already given in the CE marking information, it does not need to be repeated.

— provisions to which the products conforms (e.g. Annex ZA of this EN);

— particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions, etc.);

— name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or of his authorised representative.

The above mentioned declaration shall be presented in the official language or languages of the Member State in which the product is intended to be used.

ZA.3 CE marking and labelling

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol to affix shall be in accordance with Directive 93/68/EEC and shall be shown on the label attached to each kerb of natural stone, on the packaging of these kerbs or in the commercial documents, accompanying the such packaging (e.g. a delivery note). The information could also be communicated by the mean of all other modern communication tools (such as e-mail and website) with the agreement of the user.

The following information shall accompany the CE marking symbol:

a) name or identifying mark of the manufacturer (see Note 1 in ZA.2.2);

NOTE Registered address of the manufacturer may also be added.

b) last two digits of the year in which the marking was affixed;

c) reference to this European Standard and the year of its publication (i.e. EN 1343:2012);

d) description of the product and its intended use:

1) generic name: “natural stone kerbs”,

2) traditional name, petrological family, typical colour and place of origin,

3) intended use: “for external pedestrian and/or vehicular circulation areas”,

4) surface treatment of the stone (if any).

e) performance on the essential characteristics listed in Table ZA.1, which are to be declared for the relevant intended use, as classes or values, including "Pass" for pass/fail requirements (where necessary), or as "No performance determined" (i.e. NPD) for characteristic(s), where this is relevant, namely:

1) release of dangerous substances: where relevant (see 4.9),

2) breaking strength, dealt with by : flexural strength,

3) durability of breaking strength, dealt with by:

i) freeze/thaw resistance, measured as the mean flexural strength (in MPa) after 56 freeze/thaw cycles,

ii) freeze/thaw resistance with de-icing salts.

The “No performance determined” (NPD) option may be used when and where the characteristic, for a given intended use, is not subject to regulatory requirements in the Member State of destination.

Figure ZA.1 contains an example of CE marking to be given on the packaging of kerbs of natural stone.

CE	*CE-marking symbol given in Directive 93/68/EEC*
AnyCo Ltd. **12**	*Name or identifying mark of the manufacturer* *NOTE Registered address of the manufacturer may also be added.* *Last two digits of the year in which the marking was affixed*
EN 1343:2012 Natural stone kerbs Gunnersbury Buff, Sandstone, Brown Chiswick, England for external pedestrian and/or vehicular circulation areas	*Number of European Standard and the year of its publication* *Description of product and its intended use*
RELEASE OF DANGEROUS SUBSTANCES	NPD
BREAKING STRENGTH, as:	
- **flexural strength**, as: (lower expected value)	12,2 MPa
DURABILITY, as:	
- **of flexural strength against: freeze/thaw**	(12,2/10,0) MPa
Freeze-thaw with de-icing salts	(9.4) MPa

Performances of the regulated essential characteristics, which are to be declared for the relevant intended use

Figure ZA.1 — Example of CE marking on a packaging of kerbs of natural stone

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