# EUROPEAN STANDARDS AND CE MARKING ON STONE CONSTRUCTION PRODUCTS

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## 1. FOREWORD

The European internal market offers to the stone producers the possibility of enlarging their market but it is also a cause of new rules and obligations. This is mainly due to the fact that the technical barriers to the trade can be removed only if a harmonization of the different technical regulations and specifications in use in different European countries is reached.
It is therefore essential for the stone producers to know the general rules set up by the European Community as a basis for this harmonization.

## 2. THE TECHNICAL HARMONIZATION AT EUROPEAN LEVEL

The first attempt of the European Community to remove the technical barriers to the trade was to include detailed technical specifications in directives, but it proved to be ineffective.
The ECC Resolution of 7th May 1985 decided a new approach to this problem, providing that:

- the legislative harmonization by means of directives should be limited to the essential requirements, these being obligatory and formulated in general terms;
- the establishment of the technical specifications necessary for the implementation of directives should be entrusted to the voluntary standards organizations;
- there would be a presumption of conformity with the essential requirements for products manufactured according to harmonized standards.

This resolution stressed the role of voluntary standards organizations in the formation of the European internal market. It must be noted that in 1961 the national standards bodies of some European countries had already set up an association among them: the European Committee for Standardization (CEN) with the aim of preparing entirely new standards justified by needs in Europe. So the European Community decided that CEN was the organization competent to adopt the harmonized standards needed technically to facilitate the achievement of conformity to the EC "new approach" directives. During years CEN has grown: in 2004 the members of CEN are the national standards bodies of twenty-eight European countries: the twenty-five Member States of EU plus Iceland, Norway and Switzerland.

## 3. THE RULES FOR THE ADOPTION OF EUROPEAN STANDARDS

The procedures set up by CEN for the drafting and adoption of European Standards are as follows:

1) the National Members of CEN agree on the development of a set of European Standards with precise scopes, titles and target dates for completion;
2) a Technical Committee (TC) is created with the task of preparing working drafts of this set of standards;
3) once each working draft has been approved by the TC it is proposed as a draft European Standard (pr EN) and circulated within the CEN National Members for a six month public enquiry in order to collect possible technical comments;
4) a final text is then prepared by the TC, taking into account the technical comments received at the public enquiry stage;
5) the approval of the final text of each pr EN (in the three languages versions, namely English, French and German) is done by formal vote of the Members. If the voting result is positive the European Standard (EN) is adopted;
6) once a European Standard has been adopted, Members must implement it by giving it the status of a national standard and by withdrawing any conflicting pre-existing national standards.

The stages 3 to 5 of this procedure can be substituted by the Unique Acceptance Procedure (UAP). The UAP, which aims at achieving a rapid approval of an EN, combines the CEN enquiry and formal vote in a six month voting period. This procedure should only apply if it is reasonable to suppose that the document is acceptable at European level in order to prevent further delays. In case of amendments to an EN, the TC can decide to shorten the UAP to a four months voting period.

Only part of the European standards are harmonized standards, that is product standards giving the rules for the manufacturing of products which conform to the essential requirements of a "new approach" directive. Beside harmonized standards there are also supporting standards (that is standards concerning test methods mentioned in harmonized standards). All other European standards are voluntary standards.

As far as stage 6 of the procedure is concerned, all national standards bodies must implement any adopted European standard within six month of the date when it was published and distributed by CEN Management Centre (date of availability DoA). For all non harmonized standards the withdrawal of any conflicting pre-existing national standards will take place at the same time of the implementation of the new standard. For harmonized standards, however, a period of coexistence of European standards and pre-existing national standards is foreseen in order to allow producers to adapt gradually to conformity assessment procedures and the essential requirements set up by a directive.

More details on the coexistence period in the case of harmonized standards concerning construction products are given in the next paragraph.

## 4. THE "NEW APPROACH" DIRECTIVE FOR CONSTRUCTION PRODUCTS

In the building sector the reference directive is the Directive 89/106/EEC "Construction products" (CPD). According to this directive, construction products may be placed on the marked only if they are suitable for the intended use. That is to say if they have such characteristics that the works in which they are to be incorporated, assembled, applied or installed, can, if properly designed and built, satisfy the following essential requirements:

- mechanical resistance and stability;
- safety in case of fire;
- hygiene, health and the environments;
- safety in use;
- protection against noise;

- energy economy and heat retention.

According to the CPD all construction products suitable for the intended use must bear the CE mark and be accompanied by an attestation of conformity.

The Construction Products Directive indicates two main ways for the attestation of conformity:

- certification of conformity of the product by an approved certification body (System 1);
- declaration of conformity of the product by the manufacturer.

The declaration of conformity must be based on the results of initial type-testing of the product and on factory production control. There are three different possibilities for the declaration of conformity, which differ in the way these tasks are carried out:

- initial type testing and factory production control carried out by the manufacturer, with certification of the system by an approved certification body (System 2);
- initial type testing of the product by an approved laboratory and factory production control carried out by the manufacturer (System 3)
- initial type testing and factory production control carried out by the manufacturer (System 4).

The characteristics to be controlled on construction products for CE marking and the system for the attestation of conformity are given in the mandates issued by the European Commission to CEN for the drafting of harmonized standards.

These mandates refer to classes of construction products for which these two conditions apply:

- they are likely to be subject to technical barriers to the trade;
- the characteristics of the product have a direct effect on enabling the works to satisfy one or more essential requirements.

Each mandate concerns an end use in the works (e. g. roof coverings, floorings) and has three technical annexes.

Annex 1 is a list of the families of products under the mandate.

Annex 2 gives for each family of products the characteristics to be controlled for CE marking.

Annex 3 indicates the system to be followed for the attestation of conformity.

When a mandate has been issued each CEN technical committee in charge of the standardization of a construction product under mandate must develop harmonized standards. Each harmonized standard must define test methods and requirements for all the characteristics listed in the mandate. It must have a clause “Evaluation of conformity” specifying the procedures for initial type testing and factory production control and an Annex Z “Attestation of conformity” specifying all the information which shall accompany the CE marking

The availability of a harmonized European standard (identified by the date of publication DoA) for a family of construction products will start a series of actions by different bodies. Only when all these actions have been fulfilled the CE marking for that family of products will become effective.

The first action will be the official notification by CEN to the European Commission that the hEN fulfils the conditions necessary for presumption of conformity with the provisions of the CPD.

Then the European Commission shall publish the reference of the hEN in the C series of the Official journal of the European Communities (OJEC) within 9 months after the DoA. At this time, according to CEN general rules, the National standards Bodies must have already implemented the hEN as national standard (six month time allowed after the DoA). So after the publication of the reference in OJEC the coexistence period of the hEN with pre-existing national regulations will begin, during which the producers are free to choose whether to continue to apply the existing national system or to affix the CE marking according to the CPD.

The duration of the period of coexistence is one year, at the end of which any pre-existing national regulation shall be withdrawn. Once the period of coexistence has ended, the family of products to which the hEN applies may no longer be placed on the market if they do not bear the CE marking.

In conclusion the CE marking of a family of construction products will come into force 21 months after the date of availability of the relevant harmonized standard.

## 5. EUROPEAN STANDARDS ON STONE CONSTRUCTION PRODUCTS

In the framework of the Construction Products Directive four CEN technical Committees are working to prepare European Standards in the field of stone construction products. They are:
- CEN/TC 125 "Masonry" whose Working Group 1 has a Task Group dealing with stone products for masonry;
- CEN/TC 128 "Roof covering products for discontinuous laying" whose Sub Committee 8 deals with slate and stone products for roofing;
- CEN/TC 178 "Paving units and kerbs" whose Working Group 2 deals with stone products for paving;
- CEN/TC 246 "Natural stones" in which all other stone construction products (claddings, slabs for floors and stairs, modular tiles, dimension stone works) are considered.

The European standards and draft standards prepared by these committees are here briefly summarized.
The fact that the standards for different end uses of stone construction products have been prepared by different CEN Committees will cause a more difficult approach to the implementation of the CE marking. As a matter of fact the different Committees have worked with different methods, views and timetables and little or no coordination at all: this explains the remarquables differences between the standards. So in qualifying a stone all the possible end uses must be taken into account, referring to the relevant product standards.

### 5.1 Standards and draft Standards prepared by CEN TC 246

TC 246 is structured into three Working Groups:
- WG 1 "Terminology and classification"; this Working Group has prepared 2 Standards, EN 12440 on denomination of natural stone and EN 12670 on terminology, both already adopted as European standards (see Table 1);

- WG 2 "Test methods"; this Working Group has prepared 22 test methods: 18 have already been adopted as European standards (see Table 2), 2 are approved but not yet published (see Table 3) and and 2 are between the enquiry and formal vote (see Table 4);

*Table 1 Adopted European Standards on terminology and classification of natural stone*

| | |
|---|---|
| **EN 12440:2000** | Natural stone – Denomination criteria |
| **EN 12670:2001** | Natural stone - Terminology |

*Table 2 Published European Standards on natural stone test methods*

| | |
|---|---|
| **EN 1925:1999** | Natural stone test methods – Determination of water absorption coefficient by capillarity |
| **EN 1926:1999** | Natural stone test methods – Determination of compressive strength |
| **EN 1936:1999** | Natural stone test methods – Determination of real density and apparent density and of total and open porosity |
| **EN 12370:1999** | Natural stone test methods – Determination of resistance to salt crystallisation |
| **EN 12372:1999** | Natural stone test methods – Determination of flexural strength under concentrated load |
| **EN 12407:2000** | Natural stone test methods – Petrographic description of natural stones |
| **EN 12371:2001** | Natural stone test methods – Determination of frost resistance |
| **EN 13161:2001** | Natural stone test methods – Determination of flexural strength under constant moment |
| **EN 13364:2001** | Natural stone test methods – Determination of breaking load at dowel hole |
| **EN 13755:2001** | Natural stone test methods – Determination of water absorption at atmospheric pressure |
| **EN 13919:2002** | Natural stone test methods – Determination of resistance to ageing by $SO_2$ action in presence of humidity |
| **EN 14231:2003** | Natural stone test methods – Determination of the slip resistance by means of the pendulum tester |
| **EN 13373:2003** | Natural stone test methods – Determination of geometric characteristics |
| **EN 14066:2003** | Natural stone test methods – Determination of resistance to ageing by thermal shock |
| **EN 14147:2003** | Natural stone test methods – Determination of resistance to ageing by salt mist |
| **EN 14205:2003** | Natural stone test methods – Determination of Knoop micro hardness |
| **EN 14146: 2004** | Natural stone test methods – Determination of dynamic elastic modulus by means of fundamental resonance frequency |
| **EN 14158: 2004** | Natural stone test methods – Determination of rupture energy |

*Table 3 European Standards on natural stone test methods approved in July 2004*

| | |
|---|---|
| **EN 14157** | Natural stone test methods – Determination of the abrasion resistance |
| **EN 14579** | Natural stone test methods – Determination of sound speed propagation |

*Table 4 Draft European Standards on natural stone test methods at formal vote stage*

| | |
|---|---|
| **pr EN 14580** | Natural stone test methods – Determination of static elastic modulus |
| **pr EN 14581** | Natural stone test methods – Determination of thermal expansion coefficient |

- WG 3 "Product specifications"; the programme of work of this Working group includes six product standards specifying the requirements for rough blocks, rough slabs and finished products, namely slabs for cladding, slabs for floors and stairs, modular tiles and dimensional stone work.

*Table 5 Voluntary European Standards on natural stone products requirements*

| | |
|---|---|
| **EN 1467: 2003** | Natural stone - Rough blocks – Requirements |
| **EN 1468: 2003** | Natural stone - Rough slabs – Requirements |

All of them have been submitted to the CEN enquiry, as voluntary standards.
While they were being revised in preparation for formal vote, the European Commission has issued the Mandates M 119 “Flooring” and M 121 “Wall and ceiling finishes” which were applicable to stone products with these end uses.
TC 246 decided, therefore, to change the specifications concerning products for flooring and cladding into candidate harmonised standards, while the other three standards, concerning products not covered by these mandates, remained voluntary standards.
The three voluntary standards have been submitted to formal vote during the year 2003: two of them, that is, those concerning rough blocks and rough slabs, were approved and are now published standards (see Table 5), while “pr EN 12059 Natural stone – Dimensional stone work – Requirements” was rejected. TC 246 decided to modify the scope of this standard in order to avoid overlapping with the standard on stone masonry units currently being drafted by CEN TC 125. A new version of pr EN 12059 will therefore be prepared by TC 246.
The three candidate harmonized standard were approved at formal vote in July 2004 and are now in press (see Table 6).

*Table 6 Candidate harmonised European Standards on natural stone products approved in July 2004*

| | |
|---|---|
| **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 |

### 5.2 Standards and draft Standards prepared by other CEN Technical Committees

A draft harmonized Standard (prEN 771-6 Specification for masonry units – Part 6: Natural stone masonry units) was submitted to the CEN enquiry during the year 2001. In June 2004 CEN TC 125 has prepared the final version which will presently be submitted to formal vote.
CEN TC 128 SC8 ("Slate and stone products for discontinuous roofing and cladding") has finished its work programme comprising a two part standard. The two parts have been adopted in different times: Part 2, concerning the methods of test has been adopted during the year 2000, while the product specification (Part 1) is a candidate harmonized standard published in July 2004 (see Table7).

*Table 7 – European Standards on slate and stone products for discontinuous roofing and cladding*

| | |
|---|---|
| **EN 12326-1:2004** | Slate and stone products for discontinuous roofing and cladding – Part 1: Product specification |
| **EN 12326-2:2000** | Slate and stone products for discontinuous roofing and cladding – Part 2: Methods of test |

The three draft standards on stone products for external paving prepared by TC 178 WG 2 have been adopted as harmonized European Standards in December 2001 (see table 8).

*Table 8 – European harmonized Standards on stone products for external paving adopted in December 2001*

| | |
|---|---|
| **EN 1341:2001** | Slabs of natural stone for external paving. Requirements and test methods |
| **EN 1342:2001** | Setts of natural stone for external paving. Requirements and test methods |
| **EN 1343:2001** | Kerbs of natural stone for external paving. Requirements and test methods |

## 6. THE CE MARKING OF STONE CONSTRUCTION PRODUCTS

### 6.1 Products for external paving

In December 2001 the harmonized European Standards on stone products for external paving have been published. The CE marking has come into force twenty-one months after the date of availability (that is in October 2003). After this date it is not possible to place on the market stone products for external paving without CE marking.
The main tasks related to the CE marking are here summarized. The system to be followed for the attestation of conformity is System 4 (declaration of conformity by the manufacturer on the basis of the results of initial type testing and factory production control both carried out by the manufacturer itself under its responsibility).

Tables 9,10 and 11 give the characteristics to be controlled in initial type testing of stone slabs, setts and kerbs for external paving. They are divided into two categories: essential characteristics, that is characteristics which shall accompany the CE marking, and other characteristics, that are important to the trade but are not relevant to the CE marking. They are requested by the voluntary part of the Standard and are therefore indicated as voluntary characteristics. It is anyway advisable that the producers determine also these parameters for a more thoroughly characterization of their products.
Initial type testing shall be carried out at the first application of the corresponding standard or when a new product type is developed and whenever a significant change occurs in the raw material or the production process.
On the basis of the results of initial type testing for the determination of the essential characteristics the manufacturer shall prepare the declaration of conformity which authorizes the affixing of the CE marking. The latter will be affixed only on finished products but initial type testing can also be performed on samples taken from the raw material used to manufacture the product. The slip resistance, however, being a function of the surface finish, must be determined on finished products.

*Table 9– Characteristics to be controlled and declared for slabs for external paving*

| A – Essential characteristics (relevant for CE marking) | Test method |
|---|---|
| Flexural strength | EN 12372 |
| Slip/skid resistance | EN 1341 Annex D |
| Abrasion resistance | EN 1341 Annex C |
| Frost resistance | EN 12371 |
| B - Other characteristics (voluntary) | Test method |
| Petrographic name | EN 12407 |
| Water absorption at atmospheric pressure | EN 13755 |
| Plan dimensions | EN 1341 Annex A3 |
| Thickness | EN 1341 Annex A4 |
| Face irregularities | EN 1341 Annex A5 |
| Flatness and straightness | EN 1341 Annex A6 |
| Visual aspect | Comparison with a reference sample |

*Table 10 – Characteristics to be controlled and declared for setts for external paving*

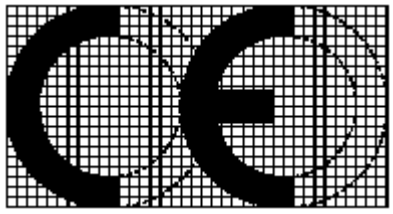
| A – Essential characteristics (relevant for CE marking) | Test method |
|---|---|
| Compression strength | EN 1926 |
| Slip/skid resistance | EN 1342 Annex C |
| Abrasion resistance | EN1342 Annex B |
| Frost resistance | EN12371 |
| B - Other characteristics (voluntary) | Test method |
| Petrographic name | EN 12407 |
| Water absorption at atmospheric pressure | EN 13755 |
| Plan dimensions | EN 1342 Annex A2 |
| Thickness | EN 1342 Annex A2 |
| Face irregularities | EN 1342 Annex A2 |
| Perpendicularity of a side | EN 1342 Annex A3 |
| Visual aspect | Comparison with a reference sample |

*Table 11 – Characteristics to be controlled and declared for kerbs for external paving*

| A – Essential characteristics (relevant for CE marking) | Test method |
|---|---|
| Flexural strength | EN 12372 |
| Frost resistance | EN12371 |
| B - Other characteristics (voluntary) | Test method |
| Petrographic name | EN 12407 |
| Water absorption at atmospheric pressure | EN 13755 |
| Width and height | EN 1343 Annex A3 |
| Deviation of faces (straight kerbs only) | EN 1343 Annex A3 |
| Radius (curved kerbs only) | EN 1343 Annex A3 |
| Face irregularities | EN 1343 Annex A3 |
| Visual aspect | Comparison with a reference sample |

The CE marking shall be accompanied by general information (name of the manufacturer, last two digits of the year in which the mark was affixed, intended use and description of the product, reference to the relevant harmonized standard) and by the declared values of the essential characteristics. The label with the CE marking shall appear on any packaging and/or accompanying commercial documentation. Examples of CE marking of slabs, setts and kerbs for external paving are given in Figure 1, 2 and 3.

*Figure 1 Example of CE marking of stone slabs for external paving*



**AnyCo Ltd**, P.O. Box 21, B-1050
Year:03

Reference standard : EN 1341 : 2001
Product: Natural stone slabs for external paving (pedestrian and vehicular use)

| Characteristics: | Declared values |
|---|---|
| Flexural strength | 3,6 MPa |
| Flexural strength (after frost test) | 3,2 MPa |
| Slip resistance | 45 |
| Abrasion resistance | 22 mm |

*Figure 2 Example of CE marking of stone setts for external paving*

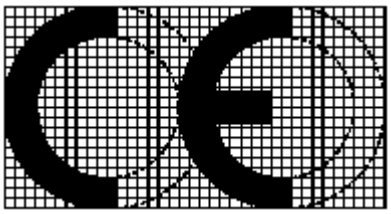
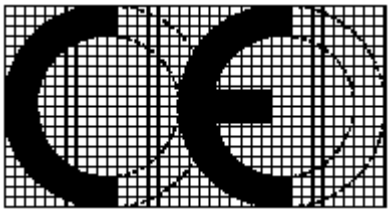
| |
|---|
|  |
| **AnyCo Ltd**, P.O. Box 21, B-1050<br>Year:03 |
| Reference standard : EN 1342 : 2001<br>Product: Natural stone setts for external paving (pedestrian and vehicular use)<br>Characteristics: Declared values<br>Compression strength 42 MPa<br>Compression strength (after frost test) 40 MPa<br>Slip resistance Not slippery (riven setts)<br>Abrasion resistance 22 mm |

*Figure 3 Example of CE marking of stone kerbs for external paving*

| |
|---|
|  |
| **AnyCo Ltd**, P.O. Box 21, B-1050<br>Year:03 |
| Reference standard : EN 1343 : 2001<br>Product: Natural stone kerbs for external paving (pedestrian and vehicular use)<br>Characteristics: Declared values<br>Flexural strength 3,6 MPa<br>Flexural strength (after frost test) 3,2 MPa |

It must be underlined that the declared values of the essential characteristics shall be representative of the current production, for example the lower expected value or the minimum test value in normal production.
To ensure that products placed on the market conform with the declared values a factory production control system shall be established and documented. This shall consist of procedures for regular inspections and tests on raw material, equipment, production process and finished products. A sampling plan for the testing of finished products shall be defined and the results be recorded and available for inspection. Alternative test methods to the reference methods given in the corresponding standard can be used but only if the correlation of their results to the results of the reference tests is documented and available for inspection.
The establishment of a factory production control system is the qualifying point of the procedures for the CE marking. As matter of fact for many years now stone producers have been in the habit of testing their products but these tests are in general performed on best quality products and the results are assumed as characteristics of the whole production. But now all products bearing the CE marking shall conform to the declared values. The responsibility of the manufacturer on the declared values is clearly stated: a finished product is accepted only if the test results for any of the specimens as far as the essential characteristics are concerned, are equal or better than the declared values.

### 6.2 Roofing and external cladding slates

The harmonized Standard concerning these products was published in July 2004. Therefore the CE marking for roofing and external cladding slates will come into force in May 2006. The system for the attestation of conformity will be System 4. The characteristics to be controlled and declared are given in Table 12.

*Table 12 – Characteristics to be controlled and declared for roofing and external cladding slates.*

| A – Essential characteristics (relevant for CE marking) | Test method |
|---|---|
| Length and width | EN 12326-2 cl.5 |
| Edge straightness | EN 12326-2 cl.6 |
| Rectangularity | EN 12326-2 cl.7 |
| Nominal thickness | declared value |
| Individual thickness | EN 12326-2 cl.8.2 |
| Bending strength | EN 12326-2 cl.10 |
| Water absorption | EN 12326-2 cl.11 |
| Frost resistance (*) | EN 12326-2 cl.12 |
| Non carbonate carbon content | EN 12326-2 cl.13 |
| Carbonate content | EN 12326-2 cl.14 |
| Resistance to $SO_2$ (**) | EN 12326-2 cl.15 |
| Thermal shock resistance | EN 12326-2 cl.16 |
| Defects | EN 12326-2 cl.17.6.1 |
| External fire performance | Deemed to satisfy, without testing |
| Reaction to fire | Class A1, without testing |
| **B - Other characteristics (voluntary)** | **Test method** |
| Packed thickness | EN 12326-2 cl.8.1 |
| Flatness | EN 12326-2 cl.9 |
| Petrographic name | EN 12326-2 cl.17 |

(*) The frost test shall be performed only if the slate has a water absorption >0,6%

(**) Two different test methods are given: one to be used for slates having a calcium carbonate content ≤20% and the other for slates having a calcium carbonate content >20%

An example of CE marking is given in Figure 4.

*Figure 4 Example of CE marking of roofing and external cladding slates*

| | | | | | |
|---|---|---|---|---|---|
| CE | | | | | |
| Any Co Ltd. PO Box 21, B-1050 | | | | | |
| 05 | | | | | |
| EN 12326-1:2004 | | | | | |
| Roofing and external cladding slate | | | | | |
| Dimensions and dimensional variation | | Complies | | | |
| Nominal thickness and variation | | Complies | | | |
| Mechanical resistance | Characteristic MoR | Transverse | 38MPa | Longitudinal | 85MPa |
| | Mean failure load | Transverse | 593 N | Longitudinal | 1115 N |
| Water permeability – water absorption | | Complies<0,6% | | | |
| Carbonate content | | ≤20% | | | |
| Durability water absorption | | Complies<0,6% | | | |
| Durability freeze thaw cycling | | Not required | | | |
| Durability thermal cycling | | Complies with code T2 | | | |
| Durability sulfur dioxide exposure | | Complies with code S2 | | | |
| Durability non-carbonate carbon content | | Complies equal or less than 2% | | | |
| Release of dangerous substances | | None in conditions of use as roofing or external cladding | | | |
| External fire performance | | Deemed to satisfy | | | |
| Reaction to fire | | Deemed to satisfy class A1 | | | |

**6.3 Stone products for cladding and flooring**

The standards concerning these products (see Table 6) were approved in July 2004 and are now in press. It is foreseen that they will be available in November 2004. Therefore the CE marking of slabs and modular tiles for cladding and flooring will come into force in September 2006.

The system for the attestation of conformity will be the same as in the case of stone external paving, that is System 4 (declaration of conformity by the manufacturer on the basis of initial type testing and factory production control both carried out by the manufacturer itself under its responsibility), with the following exceptions:

- stones that have to be tested for reaction to fire;
- elements to be used in suspended ceilings.

In these two cases System 3 will be followed, that is the initial type tests for reaction to fire and/or flexural strength shall be performed by a notified laboratory.

It must be noted however that natural stones are considered reaction to fire Class A1 without testing, following Commission Decision 96/603/EEC. Only in the following two cases testing according to EN 13501-1 will be required:

- natural stones containing asphalt at greater than 1% by mass or volume, whichever is the more onerous;
- whenever processing of natural stone involves the use of patching, fillers or other similar products at greater than 1% by mass or volume, whichever is the more onerous.

The characteristics to be controlled in initial type testing of products for cladding are given in table 13 while table 14 gives the characteristics to be controlled in stone products for floors and stairs.

Finally it must be noted that the information previously given concerning the responsibility of the manufacturer on the declared values and the establishment of a factory production control system of products for external paving, also apply in the case of products for cladding and flooring.

Examples of CE marking are given in figures 5 and 6.

*Table 13 – Characteristics to be controlled and declared for slabs and modular tiles for cladding.*

| A - Essential characteristics (relevant for CE marking) | Test method |
|---|---|
| Petrographic name | EN 12407 |
| Flexural strength | EN 12372 or EN13161 |
| Resistance to fixing (only for slabs to be mechanically fixed) | EN13364 |
| Apparent density and open porosity | EN1936 |
| Frost resistance (*) | EN12371 |
| Thermal shock resistance (*)(**) | EN14066 |
| Reaction to fire (***) | Class A1, without testing |
| (*) only for external use (**)where subject to regulatory requirements (***) only for internal use | |
| B - Other characteristics (voluntary) | Test method |
| Visual appearance | Comparison with a reference sample |
| Water absorption at atmospheric pressure | EN13755 |
| Water absorption by capillarity | EN1925 |
| Thickness | EN13373 |
| Length and width | EN13373 |
| Flatness | EN13373 |
| Location of dowel holes (only for slabs to be mechanically fixed) | EN13373 |
| Surface finish | Comparison with a reference sample |

*Table 14 – Characteristics to be controlled and declared for slabs and modular tiles for floors and stairs.*

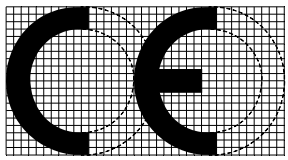
| A - Essential characteristics (relevant for CE marking) | Test method |
|---|---|
| Petrographic name | EN 12407 |
| Flexural strength | EN 12372 or EN13161 |
| Slip resistance (excluding risers) | EN 14231 |
| Frost resistance (*) | EN12371 |
| Thermal shock resistance (*)(**) | EN14066 |
| Reaction to fire (***) | Class A1, without testing |
| (*) only for external use (**)where subject to regulatory requirements (***) only for internal use | |
| B - Other characteristics (voluntary) | Test method |
| Visual appearance | Comparison with a reference sample |
| Water absorption at atmospheric pressure | EN13755 |
| Water absorption by capillarity | EN1925 |
| Apparent density and open porosity | EN1936 |
| Abrasion resistance (excluding risers) | EN14157 |
| Thickness | EN13373 |
| Length and width | EN13373 |
| Flatness | EN13373 |
| Surface finish | Comparison with a reference sample |

*Figure 5 Example of CE marking of slabs for external cladding*

| | |
|---|---|
| CE<br>Year: 2005 | Reference standard: **EN 1469**<br>Product: **Slabs of natural stone for cladding**<br>Denomination of the stone in accordance with EN 12440:<br>-Traditional name: Groznjan<br>-Petrological name: limestone<br>-Typical colour: yellowish<br>-Place of origin: Groznjan (Buje, Istra), Republic of Croatia<br>End uses: **External wall finishes** |
| AnyCo Ltd, P.O. Box 21, B - 1050 | |

| **List of the characteristics** | **Declared values** | **Test method** |
|---|---|---|
| **Reaction to fire** | Class A1 | Without testing |
| **Flexural strength**<br>-Lower expected value<br>-Mean value<br>-Standard deviation | <br>16,0MPa<br>19,1MPa<br>1,5MPa | EN 12372 |
| **Resistance to fixing**<br>-Lower expected value<br>-Mean value<br>-Standard deviation | <br>1550N<br>1950N<br>200N | EN 13364 |
| **Frost resistance**<br>Change in mean flexural strength after 12 cycles | -2% | EN 12371 |
| **Water vapour permeability** | N.P.D | EN ISO 12573 or EN 12524 |
| **Thermal shock resistance** | N.P.D | EN 14066 |
| **Apparent density** | From 2640 to 2670 kg/m$^3$ | EN 1936 |

*Figure 5 Example of CE marking of modular tiles for internal floors*

| | | |
|---|---|---|
|  Year: 2005 | Reference standard: **EN 12057**<br>Product: **Modular tiles of natural stone for floors and stairs**<br>Denomination of the stone in accordance with EN 12440<br>-Traditional name: Serizzo Formazza<br>-Petrological name: gneiss<br>-Typical colour: light grey<br>-Place of origin: Formazza (VB), Italy<br>End uses: **Internal floor finishing** | |
| AnyCo Ltd, P.O. Box 21, B – 1050 | | |
| **Characteristics** | **Declared values** | **Test method** |
| **Reaction to fire** | Class $A1_{fl}$ | Without testing |
| **Flexural strength**<br>-Lower expected value<br>-Mean value<br>-Standard deviation | <br>12,3MPa<br>13,7MPa<br>0,7MPa | EN 12372 |
| **Slip resistance**<br>(polished surface finish) | SRV dry: 40<br>SRV wet: 14 | EN 14231 |
| **Apparent density** | From 2650 to 2660 kg/m$^3$ | EN 1936 |

**6.4 Stone masonry units**

The draft harmonized standard concerning these products is not yet at formal vote stage. Therefore the information given below shall be considered provisional. It can be foreseen, however, that the CE marking for masonry units will not come into force before the year 2007.

Masonry units are classified into two categories:

- units with a specified mean compressive strength with a probability of failure to reach it not exceeding 5% (Category I);
- units not intended to comply with the level of confidence of Category I units (Category II).

The system for the attestation of conformity will be System 4 for Category II masonry units and System 2 for Category I Masonry units. In this case the certification of the FPC system by an approved body will be limited to parameters related to compression strength and bond strength.

The characteristics to be controlled and declared for stone masonry units are given in Table 15.

*Table 15 Characteristic to be controlled and declared for natural stone masonry units*

| A - Essential characteristics (relevant for CE marking) | Test method |
|---|---|
| Dimension and dimensional tolerances | EN 772-20/EN 13373 |
| Compressive strength (*) | EN 772-1 |
| Shear bond strength (*) | Fixed values from EN 998-2 or test according EN 1052-3 |
| Reaction to fire | Class A1, without testing |
| Open porosity (**) | EN1936 |
| Water absorption by capillarity (**) | EN 772-11 |
| Frost resistance | EN 12371 |
| Apparent density | EN 1936 |
| (*) only for use in elements subjected to structural requirements<br>(**) only for external use | |
| B - Other characteristics (voluntary) | Test method |
| Petrographic name | EN 12407 |
| Surface appearance | Comparison with a reference sample |
| Flexural strength (***) | EN 12372 |
| (***) only for units that could be subjected to flexural stress during use | |

**6.5 Voluntary characteristics**

The attention of producers and final users of stone construction products is focused on the implementation of the CE marking.

But it must be reminded that for each end use the relevant harmonized standard, besides giving the prescriptions for the CE marking, has also a voluntary part in which other characteristics are considered.

These characteristics (mentioned as voluntary characteristics in the tables from 9 to 15) have no influence on the essential requirements of the works and are therefore not required for the CE marking. But they are important to the trade, that is to achieve a thoroughly satisfactory result of the works, and for this reason they were included in the standards.

In conclusion, if a stone producer wants to reach a better qualification of his stone, he should determine, control and declare also the voluntary characteristics. On the other hand, the user should ask for products conforming to the relevant product standard: in this case not only the essential characteristics but also the voluntary characteristics shall be declared by the producer.

## 7. THE SUCCESSIVE STEPS FOR THE AFFIXING OF THE CE MARKING

The technical harmonization in Europe for stone construction products in the framework of the Construction Products Directive is in progress.

For stone products for external paving the relevant harmonized standards were published in December 2001 and therefore the CE marking has come into force in October 2003. For the other stone construction products (excluding masonry) the relevant harmonized standards have been recently adopted and the CE marking will therefore come into force during the year 2006.

Therefore stone producers shall prepare for the fulfilment of the tasks related to the affixing of the marking. The successive steps are here briefly summarized, taking into account the fact that in general the system for the attestation of conformity will be System 4 (declaration of conformity by

the manufacturer on the basis of the results of initial type testing and factory production control both carried out by the manufacturer itself under its responsibility).

1 – Initial type testing. The list of the essential characteristics to be declared with CE marking and the relevant test methods are given in the harmonized standards. Therefore these tests shall be performed as soon as the harmonized standard concerning a given class of stone construction products is available. This will give time to perform all the other tasks before the coming into force of the obligation.

2 – Establishment of a factory production control system. The manufacturer shall define the procedures for the internal control of the production, consisting of regular inspection checks and tests on the raw material, the production process and the finished products. By repeating the determination of the essential characteristics on different samples of finished products their range of variability during production can be defined.

3 – Decision on the values of the essential characteristics to be declared. This decision is based on the results of the tests performed on finished products. If enough experimental data are available a statistical treatment of the test results can be performed and the lower expected value, mean value and standard deviation declared. Otherwise, to be on the safe side, it would be better to declare the minimum test value.

4 – Preparation of the declaration of conformity. When steps 1 to 3 have been completed the declaration of conformity can be prepared. This shall include the name of the manufacturer, the place of production, the description of the product, the declared values of the essential characteristics and the number and title of the harmonized standard to which the product conforms.

5 – Affixing of the CE marking. The declaration of conformity authorises the last step, that is the affixing of the CE marking. This shall consist of the letters "CE" and shall appear on the packaging and/or on the accompanying commercial documents.

The CE marking shall be accompanied by the following information:

- reference to the relevant harmonized standard;
- the last two digit of the year in which the marking was affixed;
- the product description and end uses;
- the list of the essential characteristics and the relevant declared values.

## 8. CONCLUSIONS

The CE marking of stone products for external paving has come into force in October 2003. For the other stone construction products (excluding masonry) the relevant harmonized standards have recently been adopted and we can anticipate the following dates for the implementation of CE marking:

- roofing slates: May 2006;
- products for cladding and flooring: September 2006.

It is foreseen that the obligation of the CE marking for stone masonry units will not start before the second semester of the year 2007.

Finally special attention is drawn to the fact that the harmonized standards, besides giving the prescriptions for the CE marking of the different stone construction products, give also the requirements for other characteristics considered important to the trade (voluntary characteristics).

For a thorough characterization of the products also voluntary characteristics should be determined and controlled.