SLOVENSKI STANDARD
SIST EN 1344:2013

01-december-2013

Nadomešča:
SIST EN 1344:2002

Opečni tlakovci - Zahteve in preskusne metode

Clay pavers - Requirements and test methods

Pflasterziegel - Anforderungen und Prüfverfahren

Pavés en terre cuite - Spécifications et méthodes d'essais

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

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English Version

Clay pavers - Requirements and test methods

Pavés en terre cuite - Spécifications et méthodes d'essai

Pflasterziegel - Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 18 July 2013.

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Foreword

This document (EN 1344:2013) 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of an identical text or by endorsement, at the latest by April 2014, and conflicting national standards shall be withdrawn at the latest by April 2014.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 1344:2002.

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 main changes with respect to the previous edition are listed below:

— test method for slip and skid resistance: now has a reference to CEN/TS 16165;

— change in load apply with the method for the determination of transverse breaking strength;

— Annex ZA: revised content.

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1 Scope

This European Standard specifies the requirements of pavers and accessories manufactured from clay for use in the flexible form of construction (see 3.10) and in the rigid form of construction (see 3.11).

This European Standard applies to rectangular and other shaped units intended as construction products in pavements mainly for exterior use, including roofs as roof paving units, but which may also be used internally. The flexible form of construction is subjected to pedestrian and vehicular traffic, while the rigid form of construction is usually subjected to pedestrian traffic.

This European Standard specifies the characteristics and classes of performance and corresponding test methods. It provides for product marking and for the evaluation of conformity of the product to this European Standard.

This European Standard covers only clay pavers and accessories with or without coatings and with or without post firing chemical treatment which do not contain any material with asbestos fibres nor contain formaldehyde.

It excludes products intended for refractory and chemical engineering applications and clay floor tiles. It also excludes clay masonry units.

This European standard does not cover clay pavers having tactile surfaces.

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.

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EN 1745, *Masonry and masonry products — Methods for determining thermal properties*

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

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EN 13501-5, *Fire classification of construction products and building elements — Part 5: Classification using data from external fire exposure to roofs tests*

CEN/TS 16165:2012, *Determination of slip resistance of pedestrian surfaces — Methods of evaluation*

ISO 630 (all parts), *Structural steels*

ISO 3310-1, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

ISO 8486-1, *Bonded abrasives — Determination and designation of grain size distribution — Part 1: Macrogrits F4 to F220*

3 Terms and definitions

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

3.1
clay paver
unit satisfying certain shape and dimensional requirements (see 4.1) used for the surface course of pavements and manufactured predominantly from clay or other argillaceous material, with or without any additions, by shaping, drying and firing at a sufficiently high temperature to form a durable ceramic product

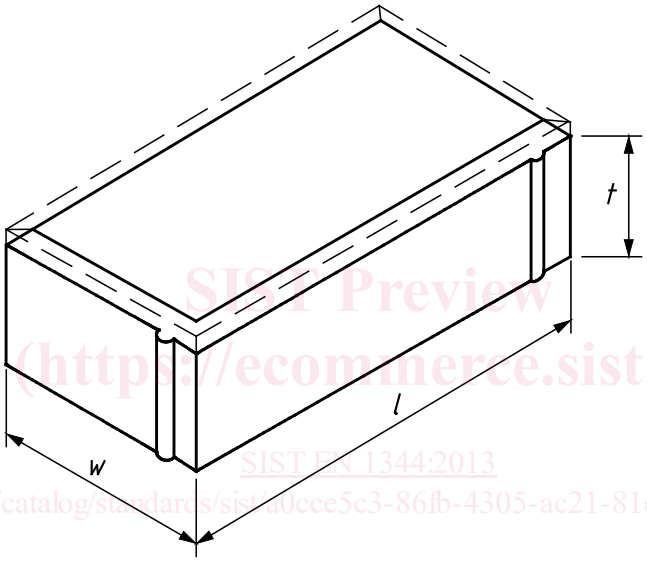
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3.2
accessory
specially shaped unit intended to fulfil a particular function in the finished pavement

Note 1 to entry: Fittings for use in flexible paving allow completion of the pavement at the perimeter and around obstructions by bonding with pavers laid in a prescribed pattern (e.g. squares, bishops mitre units). Fittings for use with rigid paving being bedded, jointed and pointed in mortar may be used to fulfil functions in both rigid laid paving, such as the provision of surface water drainage, e.g. channel units, or to fulfil particular functions in flexible paving schemes and/or to provide edge restraint for flexible pavements.

3.3
work dimension
dimension of a paver specified for its manufacture to which the actual dimension should conform within specified tolerances (see Figures 1 and 2)

Note 1 to entry: For rectangular pavers, the dimensions of length, width and thickness are indicated in Figures 1 and 2. Some pavers may be used in two or more orientations.



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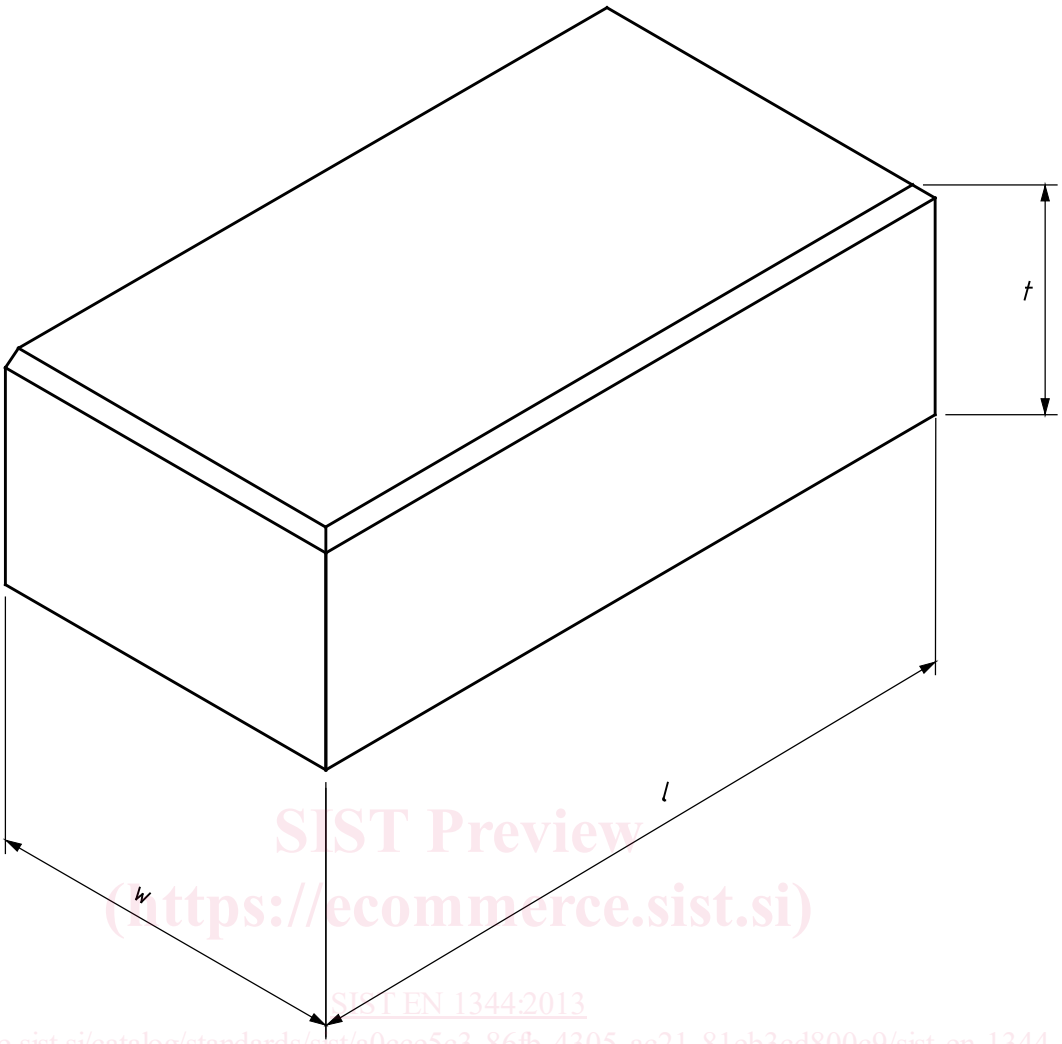
Key
l length
w width
t thickness

Figure 1 — Paver dimensions for pavers intended for flexible laying

Note 2 to entry: Position of spacer nibs and chamfers can vary with different pavers.

Note 3 to entry: Nibs in drawing rounded.

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Key

l length

w width

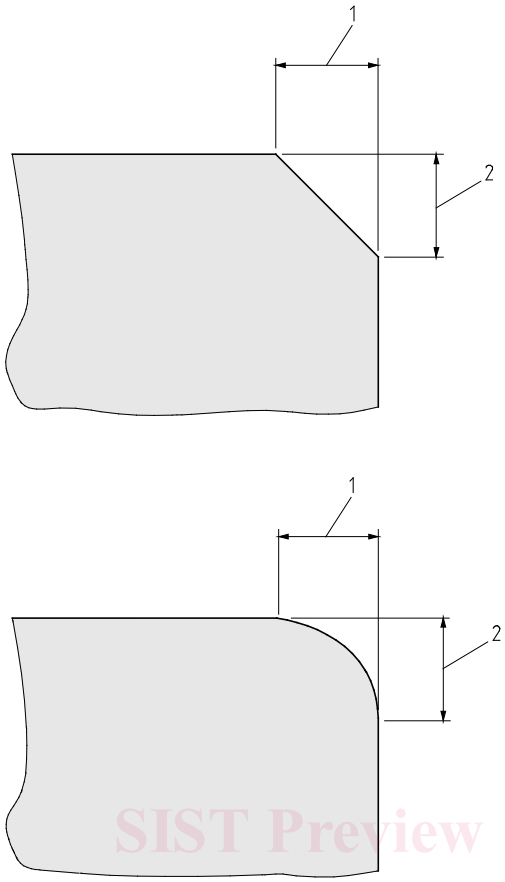
t thickness

Figure 2 — Paver dimensions for pavers intended for rigid and for flexible paving

3.4
spacer nib
small protruding profile on side face of paver (see Figure 1)

Note 1 to entry: As the spacer nib is intended to project into the joint, its presence is ignored when stating plan work dimensions e.g. for the length and width of rectangular pavers.

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Key

1 chamfer width

2 chamfer depth

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Figure 3 — Chamfer width and depth

3.5
chamfer
bevelled or rounded arris on paver (see Figure 3)

3.6
wearing face
surface intended to be seen when in use

3.7
overall length
longer side of the rectangle to enclose the wearing face of the paver excluding any spacer nibs

3.8
overall width
shorter side of the rectangle to enclose the wearing face of the paver excluding any spacer nibs

3.9
overall thickness
distance between the upper wearing face of the paver and the opposite face of the paver

3.10
flexible form of construction
pavers laid with narrow sand-filled joints on a sand bed

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3.11
rigid form of construction
pavers laid with cementitious mortar joints on a similar mortar bed

4 Requirements

4.1 Dimensional characteristics

4.1.1 Shape and dimensions

4.1.1.1 Shape

Clay pavers shall be rectangular or any other shape that allows them to be laid in a repeating pattern. They may be provided with a chamfer on the arrises around one or more of the paver surfaces that are intended to form the wearing face. If a chamfer has a work dimension greater than 7 mm in width or depth (see Figure 3), this shall be stated by the manufacturer.

NOTE The restriction on the size of the chamfer prevents the formation of an excessively wide recessed joint.

Clay pavers for flexible paving may also be provided with spacer nibs on two or more of the paver surfaces.

Clay pavers for rigid paving shall either be rectangular or shaped so that they may be laid in a combination with each other separated only by a nominal 10 mm mortar joint.

Pavers for rigid paving should not incorporate spacer nibs.

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4.1.1.2 Work dimensions

The work dimensions of length, width and thickness of rectangular pavers shall be stated in millimetres in that order. It shall also be declared in which orientation(s) the pavers may be used (i.e. which is/are the wearing face(s)). The geometry of non-rectangular pavers shall be given if necessary by reference to a scale drawing or sketch upon which the work size dimensions are marked.

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The work thickness of pavers for flexible paving shall be not less than 40 mm and the work dimensions shall be such that the ratio of overall length to thickness is not greater than 6.

The work thickness for pavers for rigid paving shall be not less than 30 mm.

4.1.1.3 Dimensional tolerances

4.1.1.3.1 General

The subsequent parameters on dimensional tolerances are relevant for clay pavers but not for accessories.

4.1.1.3.2 Mean value

When sampled in accordance with Annex A and measured in accordance with Annex B, the mean value for a given dimension of a sample of 10 pavers shall not differ from the declared work dimension by more than $0{,}4\sqrt{d}$ rounded to the nearest mm, where *d* is the work dimension (in mm).

Manufacturers able to supply pavers having a smaller deviation of the mean value from the declared work dimension than is given by the above expression may declare a smaller deviation in mm for each dimension.

4.1.1.3.3 Range

The difference between the largest and the smallest measurement of any given measured dimension to be found within a sample of 10 pavers, taken from a consignment in accordance with Annex A and measured in accordance with Annex B, shall be stated by reference to one of the two classes given in Table 1.

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Table 1 — Range

Class	Range mm
R0	No requirement
R1	≤ 0,6 $\sqrt{d}$
Manufacturers able to supply pavers having a smaller range than indicated by class R1 may declare a smaller range in mm for each dimension in class Rm.	

4.2 Physical characteristics

4.2.1 General

Clay pavers and/or accessories may or may not be chemically treated after their firing. Such post-firing treatment may have an impact on their non-treated performances of the freeze/ thaw resistance (see 4.2.2), of the transverse breaking load (see 4.2.3), of the abrasion resistance (see 4.2.4), the unpolished slip and skid resistance (see 4.2.5) and of acid resistance (see 4.3.3).

If a manufacturer wishes to apply a post firing chemical treatment, the clay pavers and accessories shall be tested both with and without the post firing chemical treatment.

The testing shall be in accordance with the requirements of the relevant clause of this European Standard and the characteristics shall be declared in accordance with the requirements of the relevant clause.

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4.2.2 Freeze/thaw resistance

It shall be stated whether the pavers and accessories are intended to meet the criteria for freeze/thaw resistance included in the method given in Annex C.

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When sampled in accordance with Annex A and tested by the chosen method the pavers shall meet the relevant criteria given in the test method. Classification of the pavers shall be indicated by the appropriate declaration shown in Table 2.

Table 2 — Freeze/thaw resistance

Class	Performance
FP0	No requirement
FP100	Freeze/thaw resistant

The freeze/thaw characteristics of FP100 clay pavers are not affected by commonly used de-icing salts.

4.2.3 Transverse breaking load

The transverse breaking load of the pavers for each of the orientations in which the pavers may be used shall be stated by reference to Table 3. When sampled in accordance with Annex A and tested in accordance with Annex D, with their wearing faces uppermost, the mean value and the minimum individual value of the transverse breaking load of a sample of ten pavers shall be not less than the appropriate value given in Table 3 and be classified accordingly.

Some pavers have more than one orientation. Manufacturers who are able to supply pavers with more than one orientation should state the orientation upon which the test was performed.

Accessories cannot be tested in accordance with Annex D because of different shape and dimensions and it may be assumed they have at least the same performance as the accompanying pavers.

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Table 3 — Transverse breaking load[a d]

Class	Transverse breaking load N/mm	
	Mean value	Minimum individual value
T0[b]	No requirement	No requirement
T1	≥ 30	≥ 15
T2	≥ 30	≥ 24
T3	≥ 80	≥ 50
T4	≥ 80[c]	≥ 64[c]

[a] This requirement for transverse breaking load does not apply to accessories or to pavers whose overall length is less than 80 mm.

[b] Class T0 is only suitable for pavers intended for use for rigid laying where the pavers are laid with cementitious mortar joints on a similar mortar bed itself placed on a rigid base.

[c] Mean value and minimum individual value higher than those corresponding to class T4 may be declared.

[d] Mean and minimum bending tensile strength value calculated from the formula given in D.4.2. may be declared in addition to the class declared.

4.2.4 Abrasion resistance

The abrasion resistance value of the pavers and accessories shall be declared by reference to one of the classes given in Table 4.

When sampled in accordance with Annex A, and tested in accordance with Annex E, the mean abraded volume for a sample of five pavers obtained from two measurements on each paver shall be not greater than the appropriate value given in Table 4.

Table 4 — Abrasion resistance

Class	Mean abraded volume mm^3
A1	≤ 2 100
A2	≤ 1 100
A3	≤ 450

4.2.5 Slip and skid resistance

4.2.5.1 Conditions

Clay pavers and accessories have satisfactory slip and skid resistance provided that their whole upper surface has not been ground and/or polished, or manufactured, such that a very smooth surface is produced.

4.2.5.2 Test method

If in an exceptional case the unpolished slip/skid resistance value (USRV) is required, the USRV of the pavers and accessories shall be stated by reference to one of the classes given in Table 5. If the pavers may be used in more than one orientation, the values for the intended wearing faces shall be declared.

NOTE The unpolished slip and skid resistance value relates to pavers as manufactured and helps to ensure adequate slip and skid on installation.

When sampled in accordance with Annex A, and tested in accordance with CEN/TS 16165:2012, Annex C, using slider 57 and a test surface contaminated with water under laboratory circumstances the mean USRV of

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the sub-sample of five pavers shall be not less than the value for the appropriate declared class given in Table 5 and be classified accordingly.

Table 5 — Unpolished slip/skid resistance value (USRV)

Class	Mean USRV (PTV units)
U0	No requirement
U1	≥ 35
U2	≥ 45
U3	≥ 55
Manufacturers may declare higher values.	

4.2.5.3 Durability of slip and skid resistance

Clay pavers and accessories have satisfactory slip and skid resistance during the working life of the product provided they are subject to normal maintenance and have not been subject to grinding and/or polishing to produce a very smooth surface.

In the absence of a European test method, the durability of slip and skid resistance shall be determined and declared as described in National provisions valid in the place of use of the product.

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4.3 Other characteristics

4.3.1 Fire performance

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4.3.1.1 Reaction to fire

The class of reaction to fire performance of clay pavers and their accessories is regarded as the class for the constituent material (i.e. clay). When subject to regulatory requirement, Class $A1_{FL}$ [1)] shall be declared according to EN 13501-1 without the need for testing (CWT), providing that clay pavers and their accessories do not contain more than 1 % in mass or volume (whichever is the lowest) of homogeneously distributed organic material.

NOTE Clay, as a homogeneously distributed material for these pavers, is considered as material of known and stable performance with respect to the reaction to fire performance as it does not consist of any organic material. As such, it does not contribute to the fire and it can be considered as the Class $A1_{FL}$ material.

4.3.1.2 External fire performance

Where subject to regulatory requirements, the external fire performance of clay pavers and their accessories shall be declared as Class B_{ROOF} [2)], according to EN 13501-5, without the need for testing [3)] for the following reasons:

1) See Decision of the Commission 96/603/EC of 1996-10-04 (see OJEU L267 of 1996-10-19), as amended twice by 2000/605/EC of 2000-09-26 (see OJEU L258 of 2000-10-12) and by 2003/424/EC of 2003-06-06 (see OJEU L144 of 2003-06-12).

2) See Decision of the Commission 2001/671/EC of 2001-08-21 (see OJEU L235 of 2001-09-04) as amended by 2005/823/EC of 2005-11-22 (see OJEU L307 of 2005-11-25).

3) See Decision of the Commission 2000/553/EC of 2000-09-06 (see OJEU L235 of 2000-09-19).

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a) their constituent material (clay) is considered according to EN 13501-1 as Class A1[1)] for the reaction to fire performance without the need for testing (CWT) (see also 4.3.1.1), and

b) pavers do not have any external coating applied on their upper surface.

4.3.2 Thermal conductivity

When clay pavers are used internally and subject to regulatory requirement, the $\lambda_{10,dry}$ shall be declared as taken from EN 1745.

4.3.3 Acid resistance

The surfaces of the clay pavers and/or accessories may or may not be chemically treated after their firing. Such post-firing treatment may have an impact on their non-treated performance of the acid resistance.

If a manufacturer wishes to apply a post firing chemical treatment, the clay pavers and accessories shall be tested both with and without the post firing chemical treatment.

Where subject to requirements to acid attack as the result of accidental spillage of acid in trafficked areas, and when sampled in accordance with Annex A and tested in accordance with Annex F the chemical resistance shall be stated by reference to the class of Table 6.

Table 6 — Chemical resistance

Class	Mass loss %
C	≤ 7

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Manufacturers may be able to supply pavers having a smaller mass loss in which case an appropriate declaration in % in class C_m may be made.

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NOTE 1 The acid resistance test in this standard is not applicable to the testing of pavers for use in chemical engineering applications (see Clause 1), such as construction of floors, container vessels and reaction vessels which are continually subjected to chemically aggressive conditions.

Typical examples of applications where requirements for acid resistance may be specified are:

— in roadways and open air factory yard areas, of industrial premises such as chemical works and the food industry where aggressive substances are sometimes in contact with the paving;

— in farm yards where silage and aggressive liquors could be present.

NOTE 2 In the majority of applications, the inherent acid resistance is satisfactory and therefore does not need to be specified.

4.3.4 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 web site on EUROPA accessed through: http://ec.europa.eu/enterprise/construction/cpd-ds/.