



SLOVENSKI STANDARD
SIST EN 1339:2003
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Betonske plošče za tlakovanje - Zahteve in preskusne metode

Concrete paving flags - Requirements and test methods

Platten aus Beton - Anforderungen und Prüfverfahren

Dalles en béton - Prescriptions et méthodes d'essai

Ta slovenski standard je istoveten z: EN 1339:2003

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|-----------|---------------------------|--------------------------------|
| 91.100.30 | Beton in betonski izdelki | Concrete and concrete products |
| 93.080.20 | Materiali za gradnjo cest | Road construction materials |

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ICS 93.080.20

English version

Concrete paving flags - Requirements and test methods

Dalles de trottoir en béton - Prescriptions et méthodes
d'essai

Platten aus Beton - Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 16 October 2002.

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

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Foreword

This document (EN 1339:2003) 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of an identical text or by endorsement, at the latest by November 2003, and conflicting national standards shall be withdrawn at the latest by February 2005.

This document has been prepared under Mandates M/119 and M/121 given to CEN by the European Commission and the Free Trade Association and supports the essential requirements of EU Directives.

For the relationship with the Construction Products Directive, see informative Annex ZA, which is an integral part of this document.

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

No existing European Standard is superseded.

The annexes B, C, D, E, F, G, H, I, and J are normative, the annexes A, K and ZA are informative.

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EN 1339:2003 (E)**1 Scope**

This European Standard specifies materials, properties, requirements and test methods for cement bound unreinforced concrete paving flags and complementary fittings.

It is applicable to precast concrete paving flags and complementary fittings that are for use in trafficked paved areas and roof coverings.

In case of regular use of studded tyres additional requirements are sometimes needed.

This standard does not deal with the tactility or visibility of flags nor with permeable flags.

This standard provides for the product marking and the evaluation of conformity of the product to this European Standard.

2 Normative references

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

EN 10083-2, *Quenched and tempered steels — Part 2: Technical delivery conditions for unalloyed quality steels.*

EN 13369, *Common rules for precast concrete products.*

EN ISO 4288, *Geometric product specification (GPS) - Surface texture - Profile method: Rules and procedures for the assessment of surface texture (ISO 4288:1996).*

EN ISO 6506-1, *Metallic materials - Brinell hardness test - Part 1: Test method.*

EN ISO 6506-2, *Metallic materials - Brinell hardness test - Part 2: Verification and calibration of testing machines.*

EN ISO 6506-3, *Metallic materials - Brinell hardness test - Part 3: Calibration of reference blocks.*

ISO 48, *Rubber, vulcanised or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD).*

ISO 4662, *Rubber — Determination of rebound resilience of vulcanizates.*

ISO 7619, *Rubber — Determination of indentation hardness by means of pocket hardness meters.*

ISO 7873, *Control charts for arithmetic average with warning limits.*

ISO 7966, *Acceptance control charts.*

ISO 8486-1, *Bond abrasives — Determination and designation of grainsize distribution — Macrogrits F4 to F220.*

3 Terms and definitions

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

3.1

arris

part of a flag where two faces meet. It can be bevelled, rounded, chamfered, radiussed or splayed

3.2

concrete paving flag

precast concrete unit used as a surfacing material that satisfies the following conditions:

- its overall length does not exceed 1 m;
- its overall length divided by its thickness is greater than four

NOTE These two conditions are not applicable to complementary fittings.

3.3

complementary fitting

unit, sometimes a part of a flag, which is used to infill and enable an area to be completely surfaced

3.4

permeable paving flag

flag intended, by its structure, to allow the passage of water through the flag

3.5

overall length

longer side of the rectangle with the smallest area able to enclose the flag excluding any spacer nibs

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3.6

overall width

shorter side of the rectangle with the smallest area able to enclose the flag excluding any spacer nibs

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3.7

thickness

distance between the upper face and the bed face of the flag

3.8

spacer nibs

small protruding profiles on a side face of a flag

3.9

upper face

surface intended to be seen when in use

3.10

bed face

surface generally parallel to the upper face and in contact with the bedding after laying

3.11

facing layer

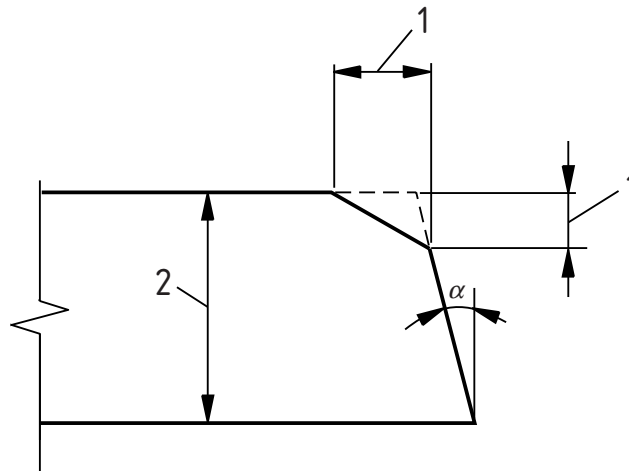
layer of concrete on the upper face of a flag of different material and/or properties to the main body or backing layer of a flag

NOTE To be distinguished from wipe, being a fine cement mortar or slurry applied to the surface of the flag.

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3.12
draw

intended angle of the side face from the vertical plane over the full height of a flag as shown in Figure 1



Key

1 Chamfer

2 Thickness

 α Draw

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Figure 1 — Example of chamfer and draw

3.13

chamfer

bevelled arris, as shown in Figure 1

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3.14

work dimension

any dimension of a flag specified for its manufacture to which the actual dimension should conform within specified permissible deviations

3.15

secondary processing

manufacturing process to texture the whole flag or any surface, carried out after basic manufacture before or after hardening

3.16

actual dimension

dimension of a flag as measured

3.17

chased side face

side face of a concrete paving flag, having a recessed profile

3.18

skid resistance

ability to resist relative movement between a vehicle tyre and the trafficked concrete paving flag surface

3.19

slip resistance

ability to resist relative movement between a pedestrian foot and the trafficked concrete paving flag surface

3.20**format**

work dimension of a flag specified in order of overall length, overall width and thickness

3.21**wipe**

fine cement mortar or slurry applied to the surface of the units

4 Requirements for materials**4.1 General**

Only materials with suitability established in terms of their properties and performance shall be used in the manufacture of concrete paving flags. The suitability requirements of the materials used shall be given in the manufacturer's production control documentation.

Where, by conformity with relevant specifications, the properties and performance of materials have been demonstrated, further testing need not be performed.

A reference scheme for materials inspection is given in annex A.

4.2 Asbestos

Asbestos, or materials containing asbestos, shall not be used.

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5 Requirements for products

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5.1 General

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The performance requirements of concrete paving flags are defined by classes which have associated marking designations.

Flags may be produced with a single concrete throughout or with different facing and backing layers.

When flags are produced with a facing layer this shall have a minimum thickness of 4 mm over that area claimed by the manufacturer to be faced, when measured in accordance with annex C. Isolated particles of aggregate protruding into the facing layer shall be ignored. The facing layer shall be an integral part of the flag.

An arris described as square may be bevelled or rounded. The horizontal or vertical dimensions shall not exceed 2 mm.

A bevelled arris exceeding 2 mm shall be described as chamfered. Its dimensions shall be declared by the manufacturer.

Flags may be produced with functional and/or decorative profiles, which shall not be included in the work dimensions of a flag.

The surface of flags may be textured, secondary processed or treated chemically; these finishes or treatments shall be described and declared by the manufacturer.

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5.2 Shape and dimensions

5.2.1 General

All references to dimensions in this subclause are to work dimensions.

The conformity criteria corresponding to each requirement taken separately are given in 6.3.8.1. The dimensions and deviations shall be measured according to annex C.

5.2.2 Work dimensions

The work dimensions shall be stated by the manufacturer.

5.2.3 Spacer nibs, draw or chased profiled side faces

Flags may be produced with spacer nibs, a draw or chased profiled side faces. When these are provided, the manufacturer shall declare their work dimensions.

NOTE The size of the space allocated to the flag should include an allowance for joints and deviations.

5.2.4 Permissible deviations

The permissible deviations on the manufacturer's declared work dimensions are given in Tables 1, 2 and 3.

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Table 1 — Permissible deviations

| Class | Marking | Flag work dimensions mm | Length mm | Width mm | Thickness mm |
|--|---------|----------------------------|--------------|-------------|-----------------|
| 1 | N | all | ± 5 | ± 5 | ± 3 |
| 2 | P | ≤ 600 | ± 2 | ± 2 | ± 3 |
| | | > 600 | ± 3 | ± 3 | ± 3 |
| 3 | R | all | ± 2 | ± 2 | ± 2 |
| The difference between any two measurements of the length, width and thickness of a single flag shall be ≤ 3 mm. | | | | | |

For non-rectangular flags the deviations of the other dimensions shall be declared by the manufacturer.

When the length of the diagonals exceeds 300 mm, the maximum permissible differences between the measurement of the two diagonals of a rectangular flag are given in Table 2.

Table 2 — Maximum differences between the measurement of the diagonals

| Class | Marking | Diagonal mm | Maximum difference mm |
|-------|---------|----------------|--------------------------|
| 1 | J | ≤ 850 | 5 |
| | | > 850 | 8 |
| 2 | K | ≤ 850 | 3 |
| | | > 850 | 6 |
| 3 | L | ≤ 850 | 2 |
| | | > 850 | 4 |

When the maximum dimension of a flag exceeds 300 mm, the deviations for flatness and bow given in Table 3 shall apply to an upper face intended to be plane.

When the upper face is not intended to be plane, the manufacturer shall supply the information on deviations.

Table 3 — Deviations of flatness and bow

| Length of gauge mm | Maximum convex mm | Maximum concave mm |
|-----------------------|----------------------|-----------------------|
| 300 | 1,5 | 1,0 |
| 400 | 2,0 | 1,5 |
| 500 | 2,5 | 1,5 |
| 800 | 4,0 | 2,5 |

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5.3 Physical and mechanical properties

5.3.1 General

The flags shall conform to the following requirements at the time they are declared suitable for use by the manufacturer.

When complementary fittings cannot be tested according to this standard, they are considered to be in the same class as the standard flags, provided they have at least the same concrete quality as flags complying with this standard.

5.3.2 Weathering resistance

5.3.2.1 Test method

The weathering resistance is determined by tests according to annex D for freeze-thaw resistance or annex E for water absorption and to the conformity criteria of 6.3.8.2.

5.3.2.2 Performance and classes

The flags shall conform to the requirements in Table 4.1 or Table 4.2.

Recommendations as to the class(es) of weathering resistance required to ensure durability for that country, for the uses for which the product is put on the market, may be made at a national level.

Table 4.1 — Water absorption

| Class | Marking | Water absorption % by mass |
|-------|---------|-------------------------------|
| 1 | A | no performance measured |
| 2 | B | ≤ 6 as a mean |

Where specific conditions exist such as frequent contact of surfaces with de-icing salts under frost conditions, the requirements defined in Table 4.2 may have to be fulfilled.

Table 4.2 — Resistance to freeze-thaw with de-icing salts

| Class | Marking | Mass loss after freeze/thaw test kg/m ² |
|-------|---------|---|
| 3 | D | ≤ 1,0 as a mean with no individual value > 1,5 |

5.3.3 Bending strength

5.3.3.1 Test method

The characteristic bending strength shall be determined by testing according to annex F and to the conformity criteria given in 6.3.8.3.

5.3.3.2 Performance and classes

The characteristic bending strength shall not be less than the value corresponding to the class in Table 5.

None of the individual results shall be less than the corresponding minimum bending strength in Table 5.

Table 5 — Bending strength classes

| Class | Marking | Characteristic bending strength MPa | Minimum bending strength MPa |
|-------|---------|--|---------------------------------|
| 1 | S | 3,5 | 2,8 |
| 2 | T | 4,0 | 3,2 |
| 3 | U | 5,0 | 4,0 |

Guidance on application may be provided at a national level.

5.3.3.3 Complementary fittings

Complementary fittings are not to be tested but considered to be in the same class as the standard flags, provided they have at least the same concrete strength.

5.3.3.4 Durability of strength

Under normal exposure conditions of use precast concrete flags will continue to provide satisfactory strength, provided they conform to 5.3.3.2 and are subject to normal maintenance.

5.3.4 Abrasion resistance

5.3.4.1 Test method

Abrasion resistance is determined by the Wide Wheel Abrasion test (see annex G), or as an alternative by the Böhme test (see annex H). The Wide Wheel Abrasion test is the reference test.

5.3.4.2 Performance and classes

Requirements for abrasion resistance are given in Table 6.

No individual result shall be greater than the required value.

Table 6 — Abrasion resistance classes

| Class | Marking | Requirement | |
|-------|---------|--|--|
| | | Measured in accordance with the test method described in annex G | Alternatively measured in accordance with the test method described in annex H |
| 1 | F | No performance measured | No performance measured |
| 2 | G | $\leq 26 \text{ mm}$ | $\leq 26\,000 \text{ mm}^3/5\,000 \text{ mm}^2$ |
| 3 | H | $\leq 23 \text{ mm}$ | $\leq 20\,000 \text{ mm}^3/5\,000 \text{ mm}^2$ |
| 4 | I | $\leq 20 \text{ mm}$ | $\leq 18\,000 \text{ mm}^3/5\,000 \text{ mm}^2$ |

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5.3.5 Slip/skid resistance

5.3.5.1 Conditions

Concrete paving flags have satisfactory slip/skid resistance provided that their whole upper surface has not been ground and/or polished to produce a very smooth surface.

5.3.5.2 Test method

If in an exceptional case a value for slip/skid resistance is required, the test method as described in annex I shall be used and the minimum slip/skid resistance value shall be declared.

If the surface of a flag contains ridges, grooves or other surface features which prevent testing by the pendulum friction equipment, the product is deemed to satisfy the requirements of this standard without testing. Where the flag is too small to provide a test area, the manufacturer shall test a larger flag having the same surface finish as the flag in question.

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

5.3.5.3 Durability of slip/skid resistance

Under normal conditions of use precast concrete flags provide satisfactory slip/skid resistance during the working life of the product, provided they are subjected to normal maintenance and unless a major proportion of aggregates which polish excessively have been exposed on the upper face.