

# SLOVENSKI STANDARD

## SIST EN 13832-1:2006

01-december-2006

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### Obutev za varovanje pred kemikalijami - 1. del: Izrazje in preskusne metode

Footwear protecting against chemicals - Part 1: Terminology and test methods

Schuhe zum Schutz gegen Chemikalien - Teil 1: Terminologie und Prüfung

Chaussures protégeant contre les produits chimiques - Partie 1: Terminologie et méthodes d'essai

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#### ICS:

13.340.50

Zaščitna obutev

Protective footwear

**SIST EN 13832-1:2006**

**en**

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English Version

## Footwear protecting against chemicals - Part 1: Terminology and test methods

Chaussures protégeant contre les produits chimiques -  
Partie 1: Terminologie et méthodes d'essai

Schuhe zum Schutz gegen Chemikalien - Teil 1:  
Terminologie und Prüfung

This European Standard was approved by CEN on 1 August 2006.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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## Foreword

This document (EN 13832-1:2006) has been prepared by Technical Committee CEN/TC 161 "Foot and leg protectors", 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of an identical text or by endorsement, at the latest by February 2007, and conflicting national standards shall be withdrawn at the latest by February 2007.

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.

EN 13832, *Footwear protecting against chemicals*, is published in three parts

- Part 1: *Terminology and test methods*
- Part 2: *Requirements for footwear resistant to chemicals under laboratory conditions*
- Part 3: *Requirements for footwear highly resistant to chemicals under laboratory conditions*

It has been assumed in the drafting of this standard that the execution of its provisions is entrusted to appropriately qualified and experienced people for whose guidance it has been prepared and that appropriate precautions will be taken to avoid injury to health and contamination of the environment.

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

## 1 Scope

This European Standard specifies test methods for the determination of degradation, permeation and penetration resistance of footwear by chemicals and defines the terms to be used.

This standard allows a comparison to be made of the resistance of footwear against selected chemicals under laboratory conditions.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 868, *Plastics and ebonite - Determination of indentation hardness by means of a durometer (Shore hardness)* (ISO 868:2003)

EN ISO 20344: 2004, *Personal protective equipment - Test methods for footwear* (ISO 20344:2004)

ISO 23529, *Rubber - General procedures for preparing and conditioning test pieces for physical test methods*

## 3 Terms and definitions

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

### 3.1

#### footwear material

material or combination of materials used in footwear for the purpose of isolating the feet and legs from direct contact with chemicals

### 3.2

#### degradation

deleterious change in one or more properties of a footwear material due to contact with a chemical

NOTE These changes may include, e.g. flaking, swelling, disintegration, embrittlement, discoloration, dimensions, appearance, hardening and softening.

### 3.3

#### penetration

movement of a chemical through porous materials, seams, pinholes, or other imperfections in a footwear material at a non-molecular level

### 3.4

#### permeation

process by which a chemical moves through a footwear material at a molecular level

NOTE Permeation involves the following:

- absorption of molecules of the chemical into the contacted (outside) surface of a material;
- diffusion of the absorbed molecules into the material;
- desorption of the molecules from the opposite (inside) surface of the material.

### 3.5

#### test chemical

chemical or mixture of chemicals that is used to determine the breakthrough time under the laboratory test conditions. The chemical will be one that can cause adverse effects to the human body by contact with the skin.

**3.6****breakthrough time**

elapsed time between the initial application of a test chemical to the outside surface of a footwear material and its subsequent presence on the other side of the material, measured in accordance with this standard

**3.7****chemical resistant footwear**

any material or combination of materials used in footwear for the purpose of isolating the feet or feet and legs from a contact with a sprayed chemical

NOTE This footwear (classification I or II, see Clause 4 of EN 13832-2: 2006)

- conforms to EN 13832-2
- has been tested with at least two chemicals under laboratory conditions

**3.8****footwear highly resistant to chemical**

any material or combination of materials used in footwear for the purpose of isolating the feet or feet and legs from direct contact with a chemical.

NOTE This footwear (classification II, see Clause 4 of EN 13832-3: 2006)

- conforms to EN 13832-3
- has been tested with at least three chemicals under laboratory conditions

**3.9****collecting medium**

medium in which the test chemical is freely soluble to saturation mass or volume fraction greater than 0,5 %

**3.10****delay time**

time between actual arrival of the test chemical on the collecting side of the specimen and the analytical instrumentation registering a response to it

**3.11****permeation rate**

mass of test chemical permeating the footwear per unit area per unit time ( $\mu\text{g}\cdot\text{cm}^{-2}\cdot\text{min}^{-1}$ )

**3.12****closed loop**

breakthrough detection system in which the collecting medium is recirculated through the sampling compartment of the cell test

NOTE Closed loop systems are not used with gaseous collecting media.

**3.13****open loop**

breakthrough detection system in which the collecting medium passes through the sampling compartment of the cell test without recirculation

NOTE Open loop systems may be used with either liquid or gaseous collecting media.

**3.14****shrinkage**

reduction in one or more linear dimensions of a test piece of greater than 0,5 % as a result of degradation

**3.15****growth**

increase in one or more linear dimensions of a test piece of greater than 12 % as a result of degradation

## 4 Test methods

### 4.1 Sampling and conditioning

The minimum number of samples, i.e. separate items of footwear, to be tested in order to verify compliance with the requirements specified in Clause 6 and EN ISO 20344, together with the minimum number of test pieces to be taken from each sample, are given in Table 1.

Wherever possible, test pieces shall be taken from the whole footwear item unless otherwise stated.

**NOTE** If it is not possible to obtain a large enough test piece from the footwear, then a sample of the material from which the component has been manufactured may be used instead and this should be noted in the test report.

Where samples are required from each of three sizes, these shall comprise the largest, smallest and a middle size of the footwear under test.

All test pieces shall be conditioned in a standard atmosphere of  $(23 \pm 2) ^\circ\text{C}$  and  $(50 \pm 5) \%$  relative humidity for a minimum of 48 h before testing, unless otherwise stated in the test method.

The maximum time which shall elapse between removal from the conditioning atmosphere and the start of testing shall be not greater than 10 min, unless otherwise stated in the test method.

**Table 1 — Minimum number of samples and test specimens or test pieces**

Tests	Number of samples	Number of test pieces from each sample	Test only on the final footwear
Table 1 of EN ISO 20344:2004 is applicable			
Degradation test EN 13832-1: 2006, 4.2	1 pair	2 discs	yes
Permeation test EN 13832-1: 2006, 4.3	1 pair	2 discs	yes

### 4.2 Degradation test

#### 4.2.1 Principle

The basic physical properties of the footwear component (upper and sole) are checked before and after contact with chemicals.

#### 4.2.2 Apparatus

##### 4.2.2.1 Degradation cell

The apparatus shall be suitable for holding the test piece. A suitable apparatus is illustrated in Figure 1 and comprises a base-plate (5) and an open-ended cylindrical chamber (4) that is held tightly against the test piece (6) by the wing nuts (1) mounted on the bolts (2).

**NOTE** A hole of diameter approximately 50 mm may be made in the base-plate for the examination of the surface not in contact with the liquid.

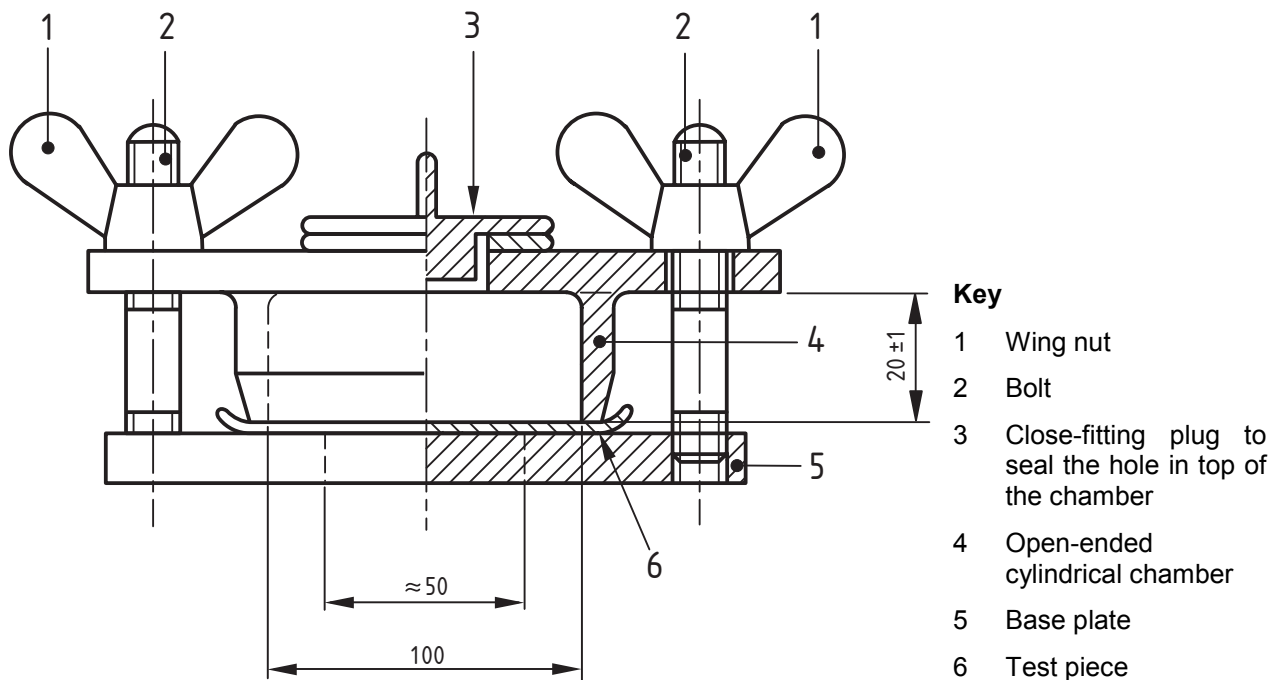
During the test, the opening in the top of the chamber shall be closed by a close-fitting plug (3).

##### 4.2.2.2 Miscellaneous

- wash flask, for example a Becher glass
- absorbent paper or lint free textile fabric



Dimensions in millimetres



**Figure 1 — Example of vessel for degradation resistance of footwear components**

#### 4.2.3 Preparation of samples

SIST EN 13832-1:2006

If it is impossible to take the sample from the footwear, it may be taken from raw material representative of the shoe.

The test piece for the upper shall consist of a disc of diameter  $(120 \pm 10)$  mm, taken from the footwear (see Figure 2) or from the material intended for use in constructing the footwear. The lining shall be removed.

NOTE During removal of the lining as small an amount as possible of polymeric material should be removed.

For the sole, a disc of diameter  $(120 \pm 10)$  mm shall be taken from the fore part of the sole. Discs with a thickness of  $(2,5 \pm 0,1)$  mm shall be prepared according to the following steps:

- a) Remove the sole tread by splitting.
- b) Obtain the thickness of  $(2,5 \pm 0,1)$  mm by removing the interior material.

Except for the necessary handling during preparation, the surface in contact with the chemical shall be tested without any mechanical treatment. If there is seam in the sample upper, it shall be tested.

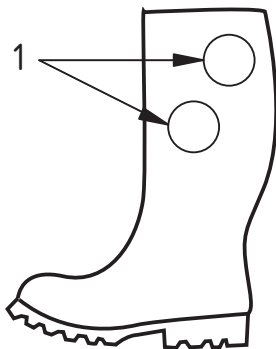


Figure 2a) - Knee length rubber boot

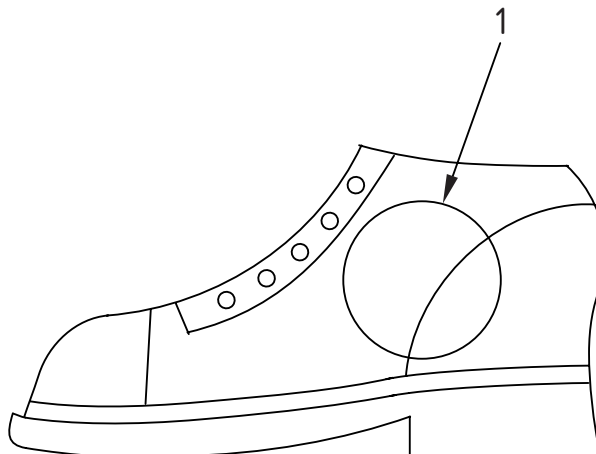


Figure 2b) - Shoe or low boot

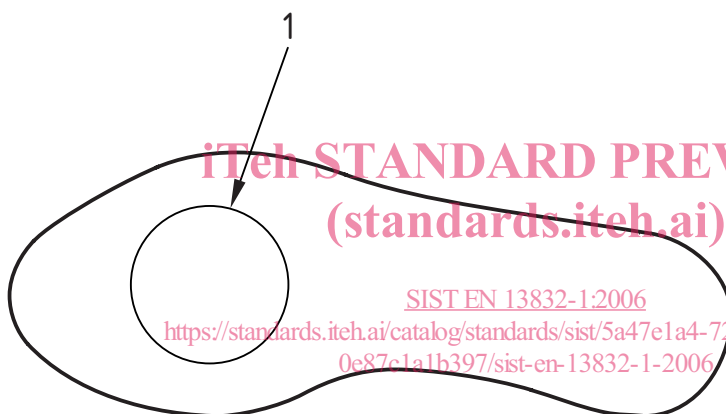


Figure 2 c) - Sole or insole

**Key**

1 Area for taking samples

Figure 2 — Area for sampling of footwear

#### 4.2.4 Procedure

##### 4.2.4.1 Preliminary measurements

For footwear in rubber material, measure the elongation at break according to EN ISO 20344:2004, 6.4 before degradation.

Before chemical degradation the tests given in Table 2 shall be performed.

Table 2 — Tests for basic properties of the sole and the upper before degradation

Sole		Upper	
1 <sup>st</sup> test	2 <sup>nd</sup> test	1 <sup>st</sup> test	2 <sup>nd</sup> test
Tear resistance EN ISO 20344: 2004, 8.2	Hardness EN ISO 868	Tear resistance EN ISO 20344: 2004, 6.3	Elongation at break EN ISO 20344: 2004, 6.4 (not applicable for leather upper)

In addition, perform these measurements on all the test pieces.

- For the upper: weigh the test piece to the nearest milligram (mass  $M_{u1}$ ).
- For the sole: weigh the test piece to the nearest milligram (mass  $M_{s1}$ ) and measure the hardness in accordance with EN ISO 868.

#### 4.2.4.2 Degradation

Place the test piece in the apparatus as indicated in Figure 1. The outer part shall be in contact with the chemical.

Fill the chamber of the apparatus with the liquid chemical chosen for the test to a depth of approximately 15 mm and insert the plug (3). Maintain the apparatus for  $(23 \pm 1)$  h either at a temperature of  $(23 \pm 2)$  °C or at another temperature. In the latter case, report the temperature in the test report..

Remove the liquid and release the test piece. Any surplus liquid should be removed from the surface of the test piece.

#### 4.2.4.3 Measurements after degradation

Wash the test piece with a large amount of water using a wash flask and dry the test piece by wiping with absorbent paper or a textile fabric that does not deposit lint.

At the temperature of  $(23 \pm 2)$  °C, in a maximum time of 30 min:

- for the upper: weigh the test piece to the nearest milligram (mass  $M_{u2}$ );
- for the sole: weigh the test piece to the nearest milligram (mass  $M_{s2}$ ) and measure the hardness in accordance with EN ISO 868.

Retain the degraded discs for use in the subsequent tests, as given in 4.2.5. Start the tests given in 4.2.5 immediately and complete the entire sequence of tests within the two hours of completing this degradation test.

Samples that are too strongly affected by the degradation test do not need to be tested in accordance with 4.2.5.

For example, when the samples:

- have holes;
- are swollen and distorted;
- become brittle.

#### 4.2.5 Assessment of the basic physical properties of the footwear after degradation

##### 4.2.5.1 Preparation of samples

As quickly as possible after completing the measurements in 4.2.4.3, cut the test pieces for the physical tests as defined in Figure 3 from the discs that have been tested in accordance with 4.2.4.