

Footwear protecting against chemicals —

Part 1: Terminology and test methods

The European Standard EN 13832-1:2006 has the status of a British Standard

ICS 13.340.50

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 13832-1:2006.

The UK participation in its preparation was entrusted to Technical Committee PH/1, Safety, protective and occupational footwear.

A list of organizations represented on PH/1 can be obtained on request to its secretary.

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

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 29 September 2006

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ISBN 0 580 49263 X

Amendments issued since publication

Amd. No.	Date	Comments

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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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of an identical text or by endorsement, at the latest by February 2007, and conflicting national standards shall be withdrawn at the latest by February 2007.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

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