INTERNATIONAL STANDARD

ISO 17708

First edition
2003-07-01

Footwear — Test methods for whole shoe — Upper sole adhesion

Chaussures — Méthodes d'essai applicables à la chaussure entière — Liaison tige semelle

Reference number
ISO 17708:2003(E)

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Foreword

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ISO 17708 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 216, *Footwear*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read "...this European Standard..." to mean "...this International Standard...".

Contents

Foreword

This document (EN ISO 17708:2003) has been prepared by Technical Committee CEN/TC 309, "Footwear", the secretariat of which is held by AENOR.

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of an identical text or by endorsement, at the latest by January 2004, and conflicting national standards shall be withdrawn at the latest by January 2004.

This document has been prepared on the basis of the European Standard EN 344:1992 (subclause 5.1).

Annex A is normative.

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.

1 Scope

This standard describes a test method for the determination of the resistance to separation of the upper from the outsole or to separate adjacent layers of the outsole or to cause tear failure of the upper or the sole is measured. It also defines conditions of ageing that can be used for production control.

It applies to all types of footwear (cementing, vulcanisation, injection moulding, etc.) where the evaluation of sole adhesion on the upper is needed and where the upper is continuously assembled (closed shoe).

NOTE 1 In all cases the objective should be to test the bond strength nearest to the edge of the assembly.

NOTE 2 The test need not be carried out when the bond has been made by grindery (using, for example, nails or screws) or stitching.

2 Normative references

This European Standard incorporates by dated or undated reference, 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 12222, *Footwear — Standard atmospheres for conditioning and testing of footwear and components for footwear.*

EN ISO 7500-1, *Metallic materials - Verification of static uniaxial testing machines - Part 1: Tension / compression testing machines (ISO 7500-1:1999).*

3 Term and definition

For the purposes of this European Standard, the following term and definition apply.

3.1
upper-sole adhesion
force required to separate the sole-upper interface.

4 Apparatus and material

The following apparatus and material shall be used:

4.1 Sharpness tool

For a clean cutting up of the test pieces.

4.2 Tensile testing machine

The tensile-testing machine shall comply with the requirements of EN ISO 7500-1 to an accuracy corresponding to class 2, with a constant rate of traverse of 100 mm/min ± 10 mm/min. It shall be able to measure a force range of 0 N to 600 N. The machine shall be fitted with either pincer or flat jaws (depending on the type of construction of the test sample), 25 mm to 30 mm wide, capable of firmly gripping the test pieces.

A low-inertia machine having autographic force recording facilities is essential.

4.3 Vernier callipers

For measuring of the width of the upper assembling margin or covering.

5 Sampling and conditioning

5.1 Footwear conditioning

Before dismantling and cutting out the test pieces, condition the footwear according to EN 12222 for 24 h and, if required, carry out an ageing process according to annex A.

5.2 Samples number

For each model, the minimum number of samples shall be two items of footwear.

5.3 Preparation of test pieces

5.3.1 Upper-sole adhesion: construction type a (see Figure 1)

Take a test piece from either the inner or the outer joint region.

Cut the test piece at X-X and Y-Y with sides at right angles to the edge of the sole using a press knife or bandsaw (see 4.1) to cut through the upper, innersole or outsole to produce a test piece about 25 mm wide. The length of the upper and sole shall be about 15 mm measured from the feather line (see Figure 2). Remove the insole.

5.3.2 Upper-sole adhesion: construction types b, c, d and e (see Figure 1)

Take a test piece from either the inner or outer joint region.

Cut the upper and sole at X-X and Y-Y to produce a test piece with a width of about 10 mm and a length of not less than 50 mm. Remove the insole.

Separate the upper from the sole for a length of about 10 mm by inserting a hot knife in the adhesive layer (see Figure 3).

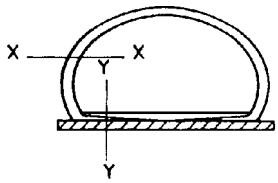
NOTE It is considered that a construction is c or d when the distance from the X-X to the upper face of the insole is at least 8 mm.

5.3.3 Sole-interlayer adhesion: construction types f and g (see Figure 1)

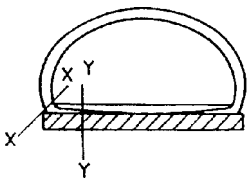
Take a test piece from either the inner or the outer joint region.

Remove the upper by cutting along the feather line at X-X. Remove the insole if present. Cut a strip parallel to and including the sole edge at Y-Y to produce a test piece about 15 mm wide and at least 50 mm long.

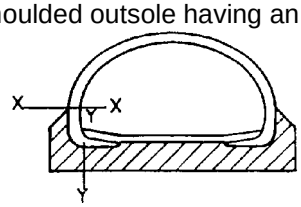
Separate the sole layers for a length of about 10 mm by inserting a hot knife into the adhesive layer (see Figure 3).



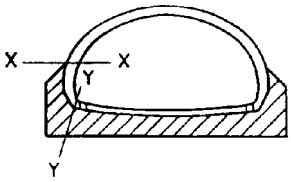
Type a: Conventional lasting
Cemented or moulded outsole having an extended edge



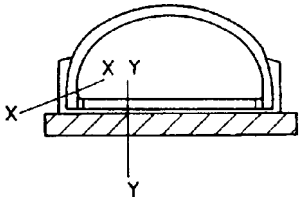
Type b: Conventional lasting
Close trimmed outsole



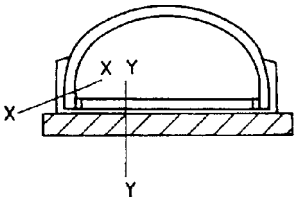
Type c: Conventional lasting
Direct injected or vulcanized outsole or cemented dished outsole



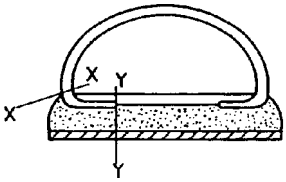
Type d: Strobel stitched
Cemented dished outsole or direct injected or vulcanized outsole



Type e: Conventional lasting or strobel stitched with rubber mudguard and cemented outsole



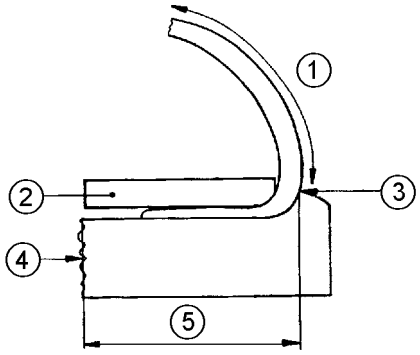
Type f: Machine sewn or welted where the outsole is bonded to the throughsole



Type g: Multilayered sole
It may be moulded-on sole, a moulded unit or a built unit

Figure 1 — Types of construction showing positions for preparation of the test piece for bond strength

Dimensions in millimeters



Key

1 Approx. 15
2 Insole (removed)
3 Feather line
4 Outsole
5 Approx. 15

Figure 2 — Cross section of the test piece of construction type

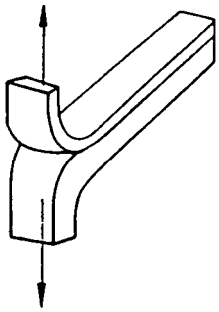


Figure 3 — Prepared test piece

6 Test method

6.1 Principle

Measurement of the force required to separate the upper from the outsole, using a tensile machine with a continuously recording load.

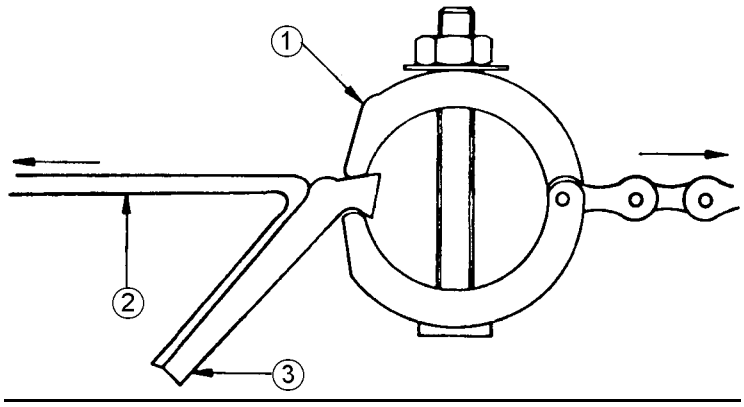
6.2 Procedure

6.2.1 Before carrying out the test, measure the width of the test piece, to the nearest mm, at five points using vernier callipers and calculate the average value, *A*, to the nearest mm.

6.2.2 Then measure the bond strength according to one of the following ways:

6.2.2.1 Upper-sole adhesion: Construction type a. Clamp the test piece into the jaws of the tensile machine, using a pincer jaw to grip the short edge of the sole (see Figure 4), and record the force/deformation graph at a separation speed of 100 mm/min ± 20 mm/min. After testing, observe the appearance of the separated areas and classify it according to subclause 7.2.

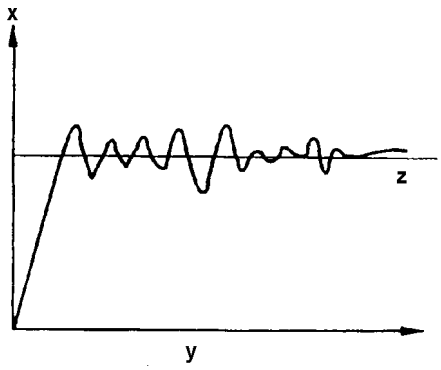
6.2.2.2 Upper-sole adhesion: Construction types b, c, d and e and sole-interlayer adhesion: construction types f and g. Clamp the separated ends of the test piece in the flat jaws and record the load/deformation graph (see Figure 5) at a jaw separation speed of 100 mm/min ± 20 mm/min. After testing, observe the appearance of the separated areas and classify it according to subclause 7.2.



Key

1 Pincer jaw for sole edge
2 Upper
3 Sole

Figure 4 — Pincer jaw showing the position of the test piece



Key

x Peeling force, N
y Deformation
z Average

Figure 5 — Example of force/deformation graph

7 Expression of results

7.1 Determination of the upper-sole adhesion

Calculate the upper-sole adhesion, *R*, in newtons per millimetre, using the formula:

$$R = \frac{F}{A}$$

where

F is the average force, in newtons, estimated from the force/deformation graph recorded according to 6.2.2.1 or 6.2.2.2;

A is the average width determined according to 6.2.1.

Round the results off to the nearest tenth of a millimetre.

NOTE For footwear where the assembling margins vary, proceed differently. Note the strength after the unsticking of 10 mm and note the corresponding assembling margin. Then, calculate the local upper-sole adhesion, R_i.

Calculate the average value of R_i.

7.2 Evaluation of appearance after the test

The appearance of the separated areas (see 6.2.2.1 and 6.2.2.2) shall be classified according to the following codes.

7.2.1 Separation of the adhesive film from one of the materials (defective adhesion, see Figure 6): Code A

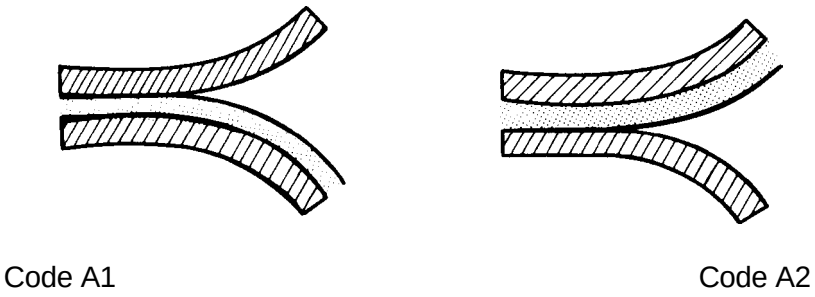


Figure 6 — Defective adhesion

7.2.2 Separation in the adhesive film without unsticking (defective cohesion, see Figure 7): Code C

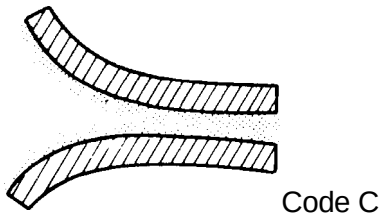


Figure 7 — Defective cohesion

7.2.3 Wrong joining of the two adhesive films (defective coalescence, see Figure 8): Code N

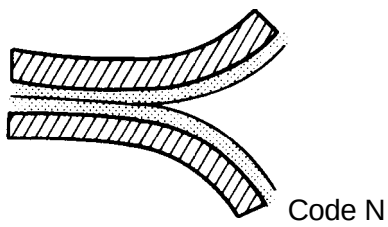
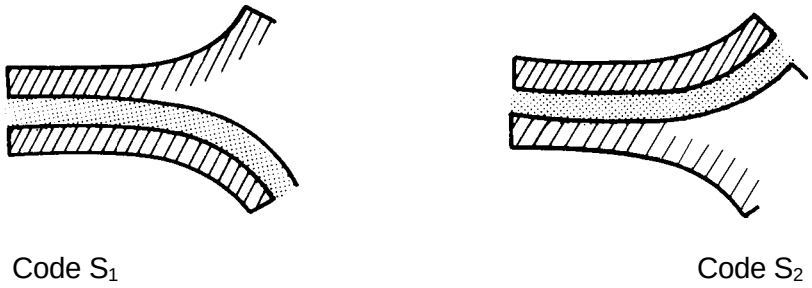


Figure 8 — Defective coalescence

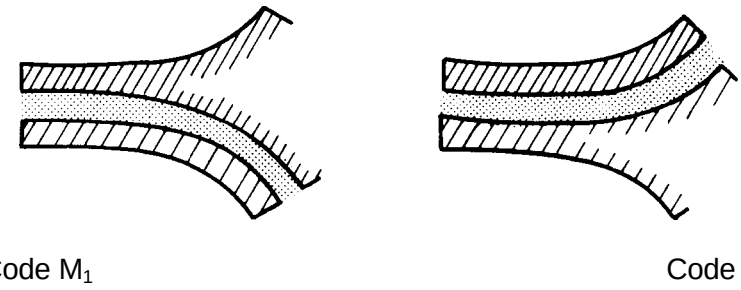
7.2.4 Delamination of material (see Figure 9): Code S



Code S_1 Code S_2

Figure 9 — Material delamination

7.2.5 Partial or complete breaking of material (see Figure 10): Code M



Code M_1 Code M_2

Figure 10 — Partial or complete breaking of the material

8 Test report

The test report shall include the following information:

a) reference to this standard, EN ISO 17708;

b) characteristics of the sample used (material, footwear type, assembling process);

c) values of pulling off for each individual determination (minimum, maximum, average);

d) assembling margin width for each sample;

e) upper-sole adhesion, in newtons per millimetre, for each sample;

f) material appearance code;

g) use of the ageing procedure (when applicable), as well as all the conditions or details which can have an influence on results, even if they are not recorded in this standard;

h) any deviation from this test method;

i) date of testing.

Annex A
(normative)

Ageing process conditions for the upper-sole adhesion test

A.1 Scope

This annex defines the ageing process conditions for the test of upper-sole adhesion.

A.2 Principle

The accelerated thermal ageing is used to determinate the measured adhesion evolution according to clause 6, to estimate the assembling quality after ageing.

A.3 Samples

Clause 5 describes the preparation of samples submitted to ageing. First, these samples serve to the initial adhesion determination.

A.4 Apparatus

The following apparatus shall be used:

A.4.1 Oven with forced air circulation, which can be maintained at a temperature of 50 °C ± 2 °C or 70 °C ± 2 °C.

A.4.2 Test pieces, hanging on system avoiding contact with walls.

A.5 Accelerated ageing conditions

A.5.1 Standard ageing conditions

The test pieces are placed in an oven with forced circulation (see A.4.1) at a temperature of 50 °C ± 2 °C for 7 days, without the test pieces coming into contact with the oven walls.

After this period and before the adhesion test, the test pieces are conditioned for 24 h according to EN 12222.

A.5.2 Production control

For production control, it is possible to use other conditions, to have quicker results. These conditions are as follows:

The test pieces are placed in an oven with forced circulation (see A.4.1)) at a temperature of 70 °C ± 2 °C, for 72 h.

After this period and before the adhesion test, the test pieces are conditioned for 24 h according to EN 12222.

NOTE The ageing conditions specified in A.5.1 and A.5.2 may not give equivalent results.

Bibliography

[1] EN 344:1992, *Requirements and test methods for safety, protective and occupational footwear for professional use.*

[2] EN 1391:1998, *Adhesives for leather and footwear materials - A method for evaluating the bondability of materials - Minimum requirements and material classification.*

[3] EN 1392:1998, *Adhesives for leather and footwear materials - Solvent-based and dispersion adhesives - Test methods for measuring the bond strength under specified conditions.*

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