INTERNATIONAL STANDARD

ISO 17698

Second edition
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Footwear — Test methods for uppers — Delamination resistance

Chaussures — Méthodes d'essai des tiges — Résistance au délaminage

Reference number
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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

ISO 17698 was prepared by the European Committee Standardization (CEN) Technical Committee CEN/TC 309, *Footwear*, in collaboration with ISO Technical Committee TC 216, *Footwear*, in accordance with the agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 17698:2003), which has been technically revised.

This International Standard is based on the IULTCS/IUF 470 Method.

Footwear — Test methods for uppers — Delamination resistance

1 Scope

This International Standard specifies a test method for determining the delamination resistance of uppers made from coated material, in order to assess the suitability for the end use.

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.

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 7500-1[1)], *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

ISO 17709[2)], *Footwear — Sampling location, preparation and duration of conditioning of samples and test pieces*

ISO 18454[3)], *Footwear — Standard atmospheres for conditioning and testing of footwear and components for footwear*

ISO 20870[4)], *Footwear — Ageing conditioning*

3 Terms and definitions

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

3.1
delamination resistance
strength of adhesion between a coating and its base material

4 Apparatus and material

The following apparatus and material shall be used.

4.1 Tensile testing machine, with a jaw separation rate of (100 ± 10) mm/min, a force range appropriate to the specimen under test (normally a range of 0 N to 200 N is suitable for test specimens of polyurethane coated fabric) and the capability of measuring the force to an accuracy greater than 2 % as specified by ISO 7500-1, class 2.

4.2 Autographic recorder, or similar means of continuously recording the force.

1) To be published.

2) ISO 17709 is equivalent to EN 13400.

3) ISO 18454 is equivalent to EN 12222.

4) ISO 20870 is equivalent to EN 12749.

4.3 Rapid acting platen press, capable of applying a pressure of (550 ± 50) kPa on an area of 50 mm × 70 mm.

4.4 Rubber pad, of thickness at least 10 mm and hardness (40 ± 10) IRHD.

4.5 Radiant heater, capable of heating a dry adhesive film on resin rubber to 80 °C to 90 °C within 15 s, normally mounting the adhesive film from 100 mm to 150 mm from a heater element of power approximately 3 kW and area of approximately 0,06 m^2 is satisfactory. Commercial equipment used for reactivating soles and uppers in footwear production is suitable.

4.6 Means of checking that the temperature of the adhesive film is within the range 80 °C to 90 °C. Heat sensitive crayons are suitable, preferably with a melting temperature of 83 °C. Also suitable are infra-red temperature measuring guns.

4.7 Resin rubber, thickness (3,5 ± 0,2) mm and hardness (95 ± 2) IRHD with a surface peel tear strength greater than that of the test specimen.

NOTE Hardness (95 ± 2) IRHD is equal to Shore A.

4.8 Solvent-borne polyurethane adhesive, which will bond well to resin rubber and the coated surface of the test specimen.

4.9 Adhesion primer, such as a halogenating solution used in footwear manufacture, for rubber can be helpful in producing satisfactory bonds.

4.10 Cutting device, such as a press knife or scissors capable of cutting rectangular test specimens of dimensions (50 ± 1) mm × (70 ± 1) mm. In addition, if carrying out the test on hydrolysed test specimens, a second cutting device is required to cut square test specimens (70 ± 1) mm × (70 ± 1) mm.

4.11 Cutting device, such as a sharp knife or rotary disc cutter for cutting test specimens from bonded test assemblies. This device shall neither unduly compress nor force apart the layers of the test assembly at the edges during cutting, and therefore a press knife is unsuitable.

4.12 Distilled or deionized water, if testing the wet adhesion strength, complying with grade 3 of ISO 3696.

4.13 Timer, capable of recording times up to 30 s to the nearest 0,5 s.

5 Sampling

5.1 For the dry tests, mark six rectangular boxes (70 ± 1) mm × (50 ± 1) mm: two with their longer edges parallel to the along direction of sheet material (machine or backbone direction) or X-axis (as defined in ISO 17709) of the upper, and four with their longer edges perpendicular to this, on the reverse of the sheet material or uppers.

5.2 For the wet tests, mark either a further two rectangular boxes (70 ± 1) mm × (50 ± 1) mm, putting the 50 mm edge in the direction with the lowest dry peel strength (if already known), or a further six boxes as described in 5.1 on the reverse of the material or uppers.

5.3 Make further marks on the material to divide each of the rectangles marked in 5.1 and 5.2 into two equal halves (35 ± 0,5) mm × (50 ± 1) mm. Mark the along direction or X-axis in each of the smaller rectangles. Use an arrow and ensure that the arrow heads point in the same direction. For uppers, the arrow head shall point towards the toe.

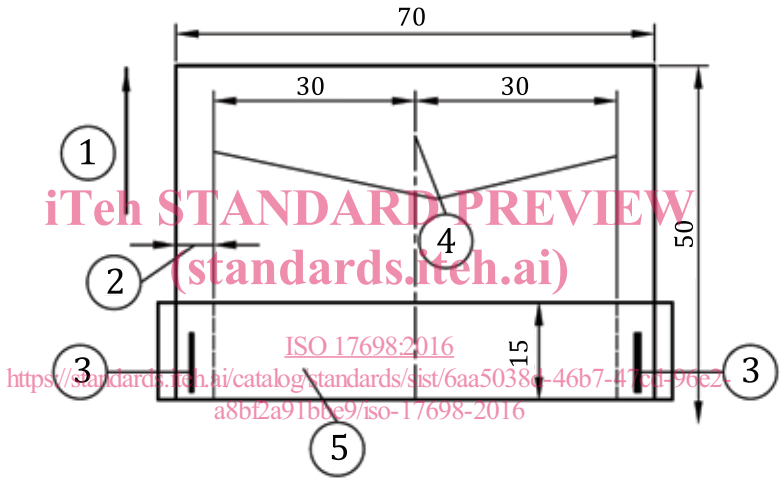
5.4 For tests after humidity aging, mark a further two (70 ± 1) mm square boxes with their edges parallel to the along direction or X-axis. Mark the along direction or X-axis using an arrow as described in 5.3.

NOTE Since ink marks can be removed by the wetting or hydrolysis treatments, it is advisable to also use a code of cut off corners.

5.5 Cut from the sheet material or uppers the rectangular boxes marked in 5.1 and 5.2 and the squares marked in 5.4. Each piece of material is later cut to give two test specimens (30 ± 0,5) mm × (50 ± 1) mm, see Figure 1. After bonding to resin rubber, each piece of material is later cut to give two peel test specimens. With some shoe styles, it will not be possible to cut the correct size pieces of material. In such cases, it will be necessary to reduce the size of the pieces to a minimum of (40 ± 1) mm × (50 ± 1) mm. In all such cases, the pieces will give one test specimen only and shall not be further sub-divided as shown in 5.3.

5.6 Cut a rectangular piece of resin rubber (see 4.7) measuring (50 ± 1) mm × (70 ± 1) mm for each piece of material cut as described in 5.5. If the setting of the radiant heater unit (see 4.5) needs to be checked, cut one or two additional pieces of rubber.

Dimensions in millimetres



Key

1 direction of peel
2 approximately 5 mm
3 staple
4 cut lines
5 paper strip

NOTE Specimens can be taken from materials likely to be used for uppers or from made-up uppers or finished footwear.

Figure 1 — Test specimen assembly

6 Test method

6.1 Principle

The coated surface of a test specimen is bonded to a piece of resin rubber using a strong adhesive. The force required to peel the test specimen from the resin rubber leaving the coating attached to the rubber is measured using a tensile testing machine. The test can also be carried out on wet and hydrolysed test specimens.

6.2 Procedure

6.2.1 Place a strip of paper (75 ± 5) mm × (15 ± 3) mm to the coated side of each piece of material cut as described in 5.5 so that it is against one of the longer edges. Attach the paper strips with a staple (or similar) at each end so that the staples are positioned as shown in Figure 1. With the four test specimens cut for the dry test where the arrow points toward a longer edge, two shall have the paper strip attached along the edge to which the arrow is pointing and two shall have the paper strip along the opposite edge.

6.2.2 If an adhesion primer (see 4.9) is available, apply this in accordance with the supplier's instructions to the whole area of the reverse side of each piece of resin rubber cut as described in 5.6.

6.2.3 Allow the resin rubber pieces to dry full in accordance with the supplier's recommendations.

6.2.4 Apply the polyurethane adhesive (see 4.8) in accordance with the supplier's instructions to the whole area of the reverse of each piece of resin rubber.

6.2.5 Similarly, apply adhesive to the coated surface of each piece of material under test so that it just overlaps the paper strip.

6.2.6 Allow the adhesive to dry for at least 1 h.

6.2.7 If the time required to heat the adhesive film to a temperature of between 80 °C and 90 °C using the radiant heater is not known, then measure this time using the extra pieces of rubber cut as described in 5.6 and the means of checking the temperature of the adhesive film (see 4.6). If this time is found to be longer than 15 s, then either increase the temperature of the heating element or reduce the distance between the element and the resin rubber until the time is below 15 s. Record the time taken to heat the adhesive film to the desired temperature as T_a to the nearest 1 s.

6.2.8 The preparation of bonded assemblies is as follows.

6.2.8.1 Place a piece of adhesive coated resin rubber in the radiant heater with the adhesive surface facing the heater element so that it is subjected to heat for T_a (in seconds).

6.2.8.2 Carefully and quickly place the adhesive coated surface of a piece of upper material (see 5.5) in contact with the adhesive coating on the piece of resin rubber so that the edges of both surfaces are aligned. This will subsequently be referred to as a test assembly.

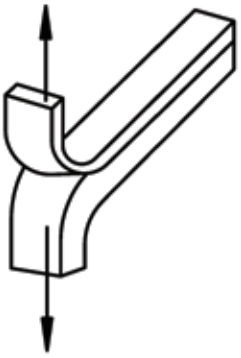
6.2.8.3 Immediately place the test assembly into the platen press (see 4.3) so that the resin rubber is lowermost and resting on the rubber pad (see 4.4). Apply a pressure of (550 ± 50) kPa to the assembly for (15 ± 1) s.

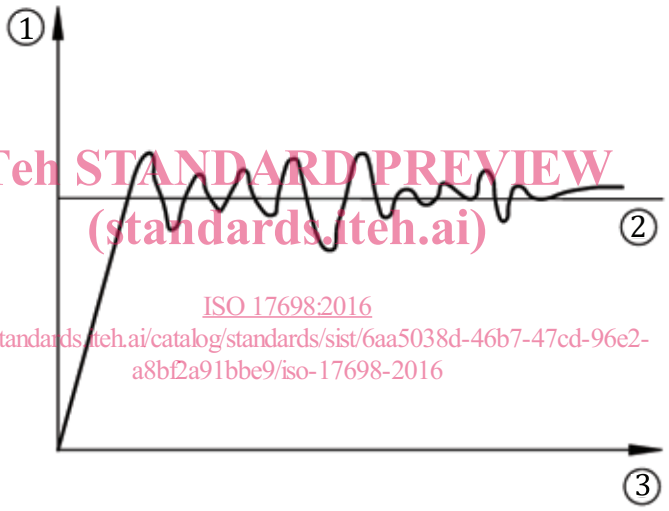
It is important that the time between removing the resin rubber from the heater unit described in 6.2.8.1 to placing the assembly in the press and applying pressure as described in 6.2.8.3 shall be no more than 7 s.

6.2.9 Store the bonded assemblies in a conditioned standard atmosphere as specified in ISO 18454 for at least 24 h.

6.2.10 Use the cutting device (see 4.10 and 4.11) to make three cuts in each test assembly parallel to the 50 mm edges so that the centre portions form two test specimens of width (30,0 ± 0,5) mm and length (50 ± 1) mm and the two outer portions are waste strips of width approximately 5 mm, see Figure 1.

6.2.11 Open the unbonded portion of each test specimen, taking care not to weaken the bond line, and centrally clamp it between the jaws of the tensile tester (see 4.1) so that the unbonded tab of resin rubber is in one jaw and the unbonded tab of upper material is in the other jaw (see Figure 2).





Key

1 delaminating force, in N
2 average
3 deformation

Figure 2 — Example of diagram force/deformation

6.2.12 Operate the tensile tester so that the jaws separate at a speed of (100 ± 10) mm/min and note the type of separation that occurs, such as the following:

a) failure of adhesion of the coating to the base material;

b) surface failure of the base material;

c) deep failure of the base material;

d) failure of adhesion of a top coating to a cellular coagulated coating;

e) failure within the cellular or coagulated coating;

f) separation between a cellular or coagulated layer and the base material.