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Footwear — Test methods for uppers — Delamination resistance

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

[Revision of first edition (ISO 17698:2003)]

ICS 61.060

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the European Committee for Standardization (CEN), and processed under the **CEN-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

Foreword

This Standard is based on the IULTCS/IUF 470 Method)

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 17698 was prepared by Technical Committee ISO/TC 216, *Footwear*, Subcommittee SC , and by Technical Committee CEN/TC 309, *Footwear* in collaboration.

This second/third/... edition cancels and replaces the first/second/... edition (EN 13514:2001, ISO 17698:2003), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

Footwear — Test methods for uppers — Delamination resistance

1 Scope

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

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.

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

ISO 7500-1, *Metallic materials — Verification of static unaxial testing machines — Part 1: Tension/compression testing machines*

ISO 17709[1)], *Footwear – Sampling location, preparation and duration of conditioning of samples and test pieces*

ISO 18454[2)], *Footwear — Standard atmospheres for conditioning and testing of footwear and components for footwear*

ISO 20870[3)], *Footwear — Ageing conditioning*

3 Term and definition

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:

1) EN 13400 is equivalent to ISO 17709.

2) EN 12222 is equivalent to ISO 18454.

3) EN 12749 is equivalent to ISO 20870.

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 Class 2 in ISO 7500-1.

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

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.

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

4.9 An 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 If testing the wet adhesion strength**, distilled or deionised water** 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.

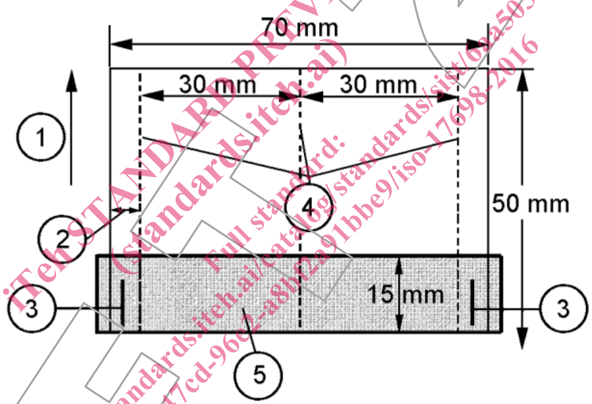
5.3 Make further marks on the material to divide each of the rectangles marked in 5.1 and 5.2 into two equal halves (35 ± 0,5) mm × (50 ± 1) mm. Mark the along direction or *X*-axis in each of the smaller rectangles. Use an arrow and ensure that the arrow heads point in the same direction. For uppers,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

5.4 For hydrolysis tests, 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 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 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 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.



Key

1 Direction of peel

2 Approximately 5 mm

3 Staple

4 Cut lines

5 Paper strip

Figure 1 — Test specimen assembly

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

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 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 suppliers instructions to the whole area of the reverse side of each piece of resin rubber cut in 5.6.

6.2.3 Allow the resin rubber pieces to dry full in accordance with the suppliers recommendations.

6.2.4 Apply the polyurethane adhesive (see 4.8) in accordance with the suppliers 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 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 Preparation of bonded assemblies:

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 (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.

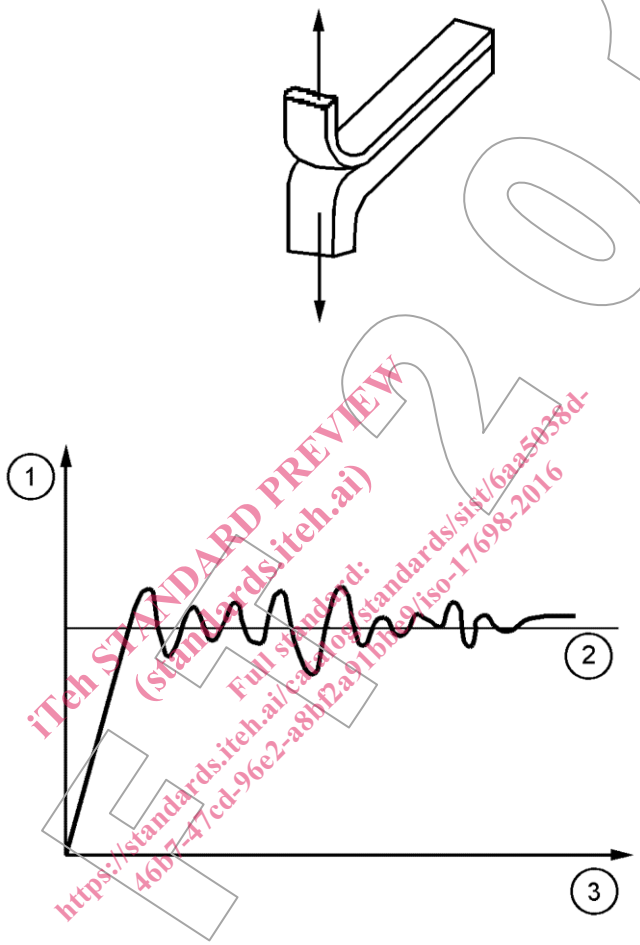
6.2.8.3 Immediately place the test assembly into the platen press (see 4.3) so that the resin rubber is lowermost and resting on the rubber pad (see 4.4). Apply a pressure of (550 ± 50) kPa to the assembly for (15 ± 1) s.

It is important that the time between removing the resin rubber from the heater unit in 6.2.8.1 to placing the assembly in the press and applying pressure 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 4.11) 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:

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

b) surface failure of the base fabric;