

Colour Fastness of Leather to Ironing

1 Purpose and Scope

- 1.1 By fastness to ironing is meant the behaviour of the colour of leather on exposure to a hot iron, as for instance in crease removal in shoe manufacture or ironing in garment manufacture.
- 1.2 Ironing leather may affect not only the colour of the leather but also its surface. The highest permissible temperature is that temperature at which the finish does not smear and the colour of the leather remains substantially unchanged (Grey Scale 4-5).
- 1.3 The fastness to ironing depends on the resistance of the colour of leather to heat, as well as to the mechanical demands of ironing on the leather surface. Finishes, particularly those based on thermoplastic binders, are liable to be damaged by ironing. The fastness to ironing depends also on the presence in the finish of auxiliary agents, which can facilitate the movement of the iron over the leather surface.
- 1.4 The behaviour of the leather in the test at different temperatures allows not only the determination of the highest permissible ironing temperatures but also may indicate the behaviour of the colour of the leather on exposure to other forms of heat.

2 Principle

- 2.1 The surface of the leather to be tested is exposed to five to and fro motions with a metal finger (10 x 10 mm) coplanar with the surface under specified pressure and speed at a temperature selected in the range 80-240 °C.
- 2.2 Tests are usually carried out at the specified pressure of 98 kPa. Other pressures can be used on request (Section 7.1).
- 2.3 The test is carried out on normally conditioned leather.
- 2.4 The leather is tested stretched.
- 2.5 The highest temperature is determined to the nearest 20 °C at which the leather can be ironed without smearing the finish or changing the colour (Grey Scale 4-5).
For leather without finish, the highest temperature is determined at which no change in colour occurs.
- 2.6 The test is discontinued where a leather irons successfully at 240 °C or where it cannot be ironed successfully at 80 °C.

3 Apparatus and Materials

- 3.1 Basic apparatus (as IUF 450)
 - 3.1.1 A carriage with:
 - (a) a horizontal metal planar platform,
 - (b) a holder for fastening the leather leaving 80 mm freely exposed,
 - (c) a device which allows the leather to be extended by at least 20% in the direction of ironing.
 - 3.1.2 Means of driving the carriage to and fro with:
 - (a) a distance of travel of 35 mm,
 - (b) speed of 40 ± 2 cycles (to and fro) per min.
 - 3.1.3 Means for preselecting a given number of cycles.

- 3.1.4 A holder for the ironing finger (Section 3.3) with:
 - (a) a means for placing finger coplanar with the stretched test specimen.
 - (b) a means for moving the finger at right angles to the direction of ironing, so that several tracks can be made on the test specimen.
- 3.2 Ironing element
 - 3.2.1 A finger, weight 500 g, removable, yet able to be fixed, made with an ironing element of V4B steel plane and with a smoothness of 10^{-7} ($= \mu\text{.m}$) polished surface area 10 mm x 10 mm with rounded edges (1.0 mm radius) with:
 - (a) a means of electrically heating the element to the desired temperature in the range 70-250 °C.
 - (b) additional weights of 500 g, 1500 g, 4500 g.
 - 3.2.2 Means of setting the temperature so that the mean temperature is within 5 °C of the set temperature.
 - 3.2.3 The fluctuation of the set temperature must not be greater than ± 4 °C (eg, a range of 8 °C).
- 3.3 Ancillary apparatus and materials
 - 3.3.1 Instruments for checking the temperature of the ironing element.
 - 3.3.2 Solvents to clean the ironing element, eg, methyl ethyl ketone, ethyl acetate, tetra chloro-ethylene, toluene.
 - 3.3.3 Abrasive paper, 400 grit.
- 4 Specimen
 - 4.1 The specimen should be 120 x 70 mm which is sufficient for tests at the four temperatures.
 - 4.2 Conditioning. Should be as specified in IUP 3 (65% rh, 20 °C).
- 5 Procedure
 - 5.1 Weight of finger
 - 5.1.1 The normal test is with a total weight of 1000 g which requires the addition of 500 g to the finger.
 - 5.1.2 Depending on the outcome of the test, at 1000 g, additional tests may be carried out either at lower pressure (without the 500 g weight) or at higher pressures with heavier weights.
 - 5.2 General procedure
 - 5.2.1 In order to minimise the total number of tests required the initial temperature of tests should be 160 °C.
 - 5.2.2 If the latter withstood 160 °C, the second step is to test it at the temperature of 240 °C. If the latter stands this temperature the tests can be discontinued.
If it does not, proceed as in the scheme below.
 - 5.2.3 If the leather cannot be ironed successfully at 160 °C, the second step is to test it at 80 °C. If the leather does not withstand this temperature successfully, the testing can be discontinued. If it does, proceed as in the scheme below.
(1), (2), (3) and (4) are successive test temperatures which will enable the whole range from 80 °C to 240 °C to be covered with the minimum number of individual tests. The decision to raise or lower the temperature at each stage is dependent on whether the leather is or is not satisfactory at that temperature.

5.3 Procedure

- 5.3.1 All leathers are stretched to such an extent that they lie flat and in ironing do not noticeably move (generally 10%).
- 5.3.2 The finger with the appropriate weight is moved to the left so that the ironing surface is 5 mm from the edge of the left hand side of the test specimen.
- 5.3.3 The regulator temperature is set at 160 °C and heating commenced.
- 5.3.4 The counter is set at 5 cycles.
- 5.3.5 One minute after reaching the set temperature, the finger is clamped but held by hand so that the heated surface does not come into contact with the leather.
- 5.3.6 Lower the finger slowly. Start the motor immediately the heated surface comes into contact with the leather and remove the ironing surface from the leather immediately the motor cuts out. Lift up the finger.
- 5.3.7 Move the finger 15 mm to the right and, if the test was satisfactory, set the regulator to 240 °C or, if not, to 80 °C and repeat the test on a new track as described in 5.3.6.
- 5.3.8 Follow the scheme outlined in 5.2.3 until the highest temperature is determined at which the leather can be ironed satisfactorily.

5.4 Alternative procedures

The test can be carried out on request either without added weight or with a greater additional weight.

5.5 Assessment

- 5.5.1 After each test, the decision is made whether the test is to be repeated at a higher or lower temperature according to 5.2.3. If only colour changes occur, the specimen is allowed to cool to room temperature before assessment.
- 5.5.2 If the finish film remains intact, the final assessment of the highest ironing temperature is carried out on the sample reconditioned for 24 h in the standard atmosphere.

5.6 Care of the ironing surface

5.6.1 Cleaning of the ironing surface after each test:

- (a) The ironing surface can be contaminated by materials exuding from the finish or the smearing finish. Therefore immediate cleaning is desirable after each test as the material can be "burnt on" and is then removable only with great difficulty. It is recommended that the ironing surface is rubbed with a clean cotton flannel cloth.
- (b) If this does not clean the surface, then suitable solvents (Section 3.3.2) must be used. It is essential in this case to allow the heating element to cool down to room temperature (due to the possibility of fire when using flammable solvents and toxic decomposition products from chlorinated solvents).

- (c) Under no circumstances is any cleaning material to be used which damages the ironing surface.

5.6.2 Polishing

When required it is recommended that the ironing surface is treated with the abrasive paper (Section 3.3.3). A piece 120 x 25 mm is lightly stretched. The finger with the 1500 g weight is fixed and the counter set for 30 cycles and set in motion and allowed to switch off automatically. The surface is then wiped with a piece of cotton flannel.

6 Report

This should comprise:

- 6.1 Description of the type of leather.
- 6.2 Reference to this test method.
- 6.3 Details of any deviation from the method.
- 6.4 Total load on the finger.
- 6.5 The maximum ironing temperature in °C.

7 Notes

- 7.1 Other recommended loadings.
 - 7.1.1 Shoe upper leather 4 kg.
 - 7.1.2 Clothing leather 0.5 kg.
- 7.2 Heat resistance properties of shoe upper leather finishes (*Gerbereiwiss Praxis*, 22, 17, 1970).
- 7.3 Suitable apparatus can be obtained from:
W Keuny, Heiligholzstrasse 8, CH 4142 Muenchenstein, Switzerland.