



Standard Practice for Conditioning Leather and Leather Products for Testing¹

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This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This practice covers the conditioning of all units and specimens of leather and leather products prior to testing and the conditions under which they should be tested. This practice does not apply to wet blue.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D1517 Terminology Relating to Leather

E337 Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)

2.2 IU Standards:

IUP/3 Conditioning²

3. Terminology

3.1 Definitions:

3.1.1 For definitions of leather terms used in this practice, refer to Terminology **D1517**.

3.1.2 *standard atmospheric conditions*—for leather and leather testing, one of two sets of conditions:

(1) a temperature of $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$) and a relative humidity of $50 \pm 4\%$

(2) a temperature of $20 \pm 2^\circ\text{C}$ ($68.0 \pm 3.6^\circ\text{F}$) and a relative humidity of $65 \pm 4\%$.

Condition set (1) is used as the standard for leather testing in North America and condition set (2) is used as the standard for leather testing in Europe and Japan.

¹ This practice is under the jurisdiction of ASTM Committee **D31** on Leather and is the direct responsibility of Subcommittee **D31.07** on Physical Properties. This practice was developed in cooperation with the American Leather Chemists Assn.

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² *Journal of the Society of Leather Trades' Chemists*, Vol XLII, No. 12, pp 386–387.

4. Summary of Test Method

4.1 The conditioning prescribed in this practice is designed to obtain reproducible test results on leather and leather products by the standardization of the relative humidity and temperature conditions to which the leather or leather product is subjected prior to and during testing.

5. Significance and Use

5.1 Temperature and relative humidity have an influence on many of the physical properties of leather. Depending on environmental conditions the moisture content in leather may vary significantly. Standardized conditioning in part allows for reliable comparisons to be made among different leather and leather products, and among different laboratories.

6. Apparatus

6.1 *Room*, in which the standard atmosphere is automatically maintained.

6.2 *Psychrometer*—Either a sling psychrometer, or a stationary type psychrometer having the air circulated over the thermometer bulbs.

NOTE 1—It is preferable to draw air over the thermometer bulb rather than blow air, from a fan source, over them. Heat from the fan may cause errors in the readings.

6.3 *Thermometers*—The thermometers should conform approximately to the following requirements: range 0 to 52°C (32 to 122°F); graduation 0.2°C (0.5°F). They should be matched to within 0.1°C (0.25°F) throughout the range used.

NOTE 2—Under ordinary conditions, an error of 1% in relative humidity corresponds to an error of approximately 0.1°C (0.2°F) in the wet-bulb depression.

6.4 *Chamber for maintaining 65% relative humidity*—A relative humidity of $65 \pm 2\%$ at $20 \pm 2^\circ\text{C}$ can be maintained in a closed space by the use of a saturated solution of certain salts in water (in which the solid phase is present in excess)³ or a sulfuric acid solution. The solution should be placed in a

³ *Handbook of Chemistry and Physics*, Chemical Rubber Publishing Co.; Lange, *Handbook of Chemistry*, Handbook Publishers; and Wilson, *Modern Practice in Leather Manufacture*, Reinhold Publishing Co.

large shallow dish inside the closed vessel. Continuous circulation of air inside the vessel is essential. Appropriate saturated salt solutions can be prepared from either pure ammonium nitrate or pure sodium nitrate.

NOTE 3—Creeping of the solid phase in these salt solutions can be made negligible by applying a thin layer of paraffin wax on the inside wall of the shallow dish.

NOTE 4—Vegetable-tanned leathers experience a slight change of color when stored over sodium nitrite, but there is no evidence of damage to the leather or any detrimental effect on the physical properties of the leather.⁴

A sulfuric acid solution that is 35.6 % by weight (sp. gr. 1.270 @ 20°C) is satisfactory. It is necessary to check the sp. gr. of this solution from time to time and to restore it to the value 1.270 by appropriate additions of water or concentrated sulfuric acid.

7. Calibration

7.1 *Thermometers*—The thermometers used for the determination of the wet- and dry-bulb temperature shall be calibrated against a certified standard thermometer and any corrections found necessary shall be applied to the readings.

NOTE 5—Test Method E337 may be used for reference.

7.2 *Relative Humidity*—Use either the sling or the stationary psychrometer to determine the relative humidity of the conditioned atmosphere. In both cases, air circulation rate around the thermometer bulbs should be not less than 10 ft (3 m)/s and the exposure not less than 60 s before readings are taken. When using the sling psychrometer, readings, especially of the wet bulb, shall be taken as quickly as possible after bringing it to rest.

7.2.1 Using the wet- and dry-bulb readings, determine the relative humidity from psychrometric tables.⁵

NOTE 6—The wet-bulb temperature, T_w , in degrees Celsius corresponding to a relative humidity of 50 % at a given air temperature, t , in degrees

Celsius (dry-bulb) and a given barometric pressure, B , in centimetres of mercury, may be calculated as follows:

$$T_w = 0.82t - 2.68 - 0.03(76.2 - B) \quad (1)$$

If t is degrees Fahrenheit and B is in inches of mercury then the equation will be as follows:

$$T_w = 0.82t + 0.72 - 0.15(30 - B) \quad (2)$$

NOTE 7—A hygrothermograph or similar instrument may be used to indicate the approximate temperature and relative humidity of the conditioning room. It should be checked for accuracy at frequent intervals, but it shall not be used as a substitute for the thermometer and psychrometer to determine the temperature and relative humidity of the atmosphere.

8. Procedure

8.1 Either the prepared test specimen or the unit from which it is to be cut shall be conditioned.

8.2 The conditioning room is to be used for both conditioning and testing. Suspend each test specimen or unit so that the standard atmosphere will have free access to all the surfaces.

8.3 *Time of Conditioning*—Store the specimens or units in the standard atmosphere until they reach mass equilibrium. This usually requires from 24 to 75 h, depending on the leather and its thickness. The specimens shall have reached equilibrium when hourly weightings show progressive mass changes not greater than 0.25 %.

8.4 *Measurements*—Measure all dimensions of test specimens after conditioning. If the units are conditioned, cut all specimens from the unit and measure them in the standard atmosphere.

9. Report

9.1 The report of results of testing shall be accompanied by a statement as to whether or not the specimens were conditioned and tested in the standard atmosphere.

10. Keywords

10.1 conditioning; humidity; leather; preparation for testing; temperature

⁴ *Journal of the Society of Leather Trades' Chemists*, Vol 48, No. 10, p 377.

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