Designation: D1611 – 12

Standard Test Method for Corrosion Produced by Leather in Contact with Metal[1]

This standard is issued under the fixed designation D1611; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

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

1. Scope

1.1 This test method covers the qualitative and quantitative determination of corrosion produced by leather in contact with metal. This test method does not apply to wet blue.

1.2 The values stated in inch-pound units are to be regarded as the standard.

1.3 *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:*[2]

D91 Test Method for Precipitation Number of Lubricating Oils

2.2 *Military Standard:*[3]

MIL-H-6083 (latest revision) Hydraulic Fluid, Petroleum Base, for Preservation and Operation

3. Terminology

3.1 *Definitions:*

3.1.1 *corrosion*—a modification of the metal surface in contact with a leather specimen, evidenced by visible pitting and erosion of the metal surface or by a change in mass of the metal tested in comparison with a blank determination. Any permanent discoloration in film form on the specimen (metal) that does not readily buff off with a nonabrasive cloth shall be called incipient corrosion, while any visible pitting of the metal surface or formation of a layer of reaction products on the metal surface shall be considered as corrosion. In the latter case and for quantitative purposes, the corrosion level should be assessed by determination of the mass changes which occur in the metal panel.

3.1.2 *staining*—a discoloration of the metal surface after contact with a leather specimen, which discoloration is caused by minor amounts of leather—metal interreaction products formed on the metal surface. Such stains should readily buff off the metal surface without permanent marring of its surface appearance.

4. Summary of Test Method

4.1 A conditioned piece of leather and two plates of the same metal are dipped in a noncorrosive oil and drained to the drip point. They are stacked together under a load of 25 ± 5 lbf (111 ± 22 N) and placed in a desiccator containing a relative humidity of 90 to 95 % at 73.5 ± 2°F (23 ± 1°C) for a period of 14 days. For quantitative purposes, the metal plates are weighed before and after the test.

5. Significance and Use

5.1 The procedure is primarily intended to evaluate chrome leather intended for use in hydraulic systems under circumstances where metal corrosion is a serious factor. A high relative humidity is used for the purpose of accelerating the results.

6. Apparatus

6.1 *Desiccator,* containing a saturated solution of ammonium dihydrogen phosphate.

6.2 *Four Plates of the Metal to Be Tested*[4]—The surface roughness should be 8 to 20 µin (203 to 508 nm) rms finish. They should be approximately 2 by 4 in. (51 by 102 mm) and of uniform thickness.

6.3 *Mass,* 25 ± 5 lb (11.3 ± 2.3 kg).

[1] This test method is under the jurisdiction of ASTM Committee D31 on Leather and is the direct responsibility of D31.01 on Vegetable Leather. This test method was developed in cooperation with the American Leather Chemists Assn. (Standard Method E52-1961).

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

[4] The sole source of supply of the steel test panels-Q Panel QD35, 3 by 5 in., surface roughness 203–305 nm, known to the committee at this time is The Q Panel Company, 15610 Industrial Parkway, Cleveland, OH 44135. If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee[1], which you may attend.

6.4 *Nonabrasive Cloth*—The cloth should not scratch or mar the surface of the metal plates when the plates are rubbed with the cloth, or cause any change in the mass of the metal plates.

6.5 *Forceps.*

6.6 *Analytical Balance.*

6.7 *Piece of Glass,* of approximately the length and width of the metal panels.

7. Reagents

7.1 *Noncorrosive Oil,* conforming to Military Specification MIL-H-6083 is recommended.

7.2 *Precipitation Naphtha,* conforming to specifications given in Test Method D91.

8. Test Specimen

8.1 The specimen shall be a piece of leather 25 by 80 mm and split to a uniform thickness.

9. Procedure—Qualitative

9.1 Condition the leather specimen by placing it in a desiccator at 90 to 95 % relative humidity and 73.5 ± 2°F (23 ± 1°C) for a period of 72 h.

9.2 Buff the metal plates with a nonabrasive cloth and wash them with precipitation naphtha.

9.3 Immerse the humidified specimen and the metal plates in a noncorrosive oil and drain them to the drip point. Place the specimen between the two metal plates, hold them together under a mass of 25 ± 5 lb (11.3 ± 2.3 kg), and place them in the desiccator. Insert a glass plate between the top metal plate and the mass to avoid contact between dissimilar metals. Also prepare two control plates in the same manner. Place them in the desiccator so that they do not touch each other or the specimen. Then close the desiccator and hold the specimen and plates at 90 to 95 % relative humidity at 73.5 ± 2°F (23 ± 1°C) for a period of 14 days.

9.4 At the end of 14 days, inspect the surfaces of the plates that were in contact with the leather specimen and compare them with the control plates. To facilitate inspection and evaluation, the plates may be washed with precipitation naphtha and buffed with the nonabrasive cloth.

10. Procedure—Quantitative

10.1 For quantitative evaluation, the procedure shall be the same as for qualitative testing, except that the metal plates shall be handled with forceps and weighed to the nearest 1 mg after buffing and washing with precipitation naphtha and before dipping in the noncorrosive oil. At the conclusion of the test, weigh the plates again after washing in naphtha and buffing with the nonabrasive cloth.

10.2 Handle the two metal control plates having the same dimensions as the test plates in exactly the same manner as the test plates with the exception that they shall not be brought into contact with the specimen.

10.3 At the conclusion of the test, apply any change in mass of the control plates as a correction to the change in mass of the test plates. The result is the change in mass of the test plates from being in contact with the leather specimen.

11. Report

11.1 For qualitative purposes, report the leather as being either noncorrosive, causing staining, causing incipient corrosion, or causing corrosion.

11.2 For quantitative purposes, if visible pitting is evident record the total number of pit marks. If erosion is evident, report the percent area of erosion. In the absence of visible pitting or erosion, express the corrosion level as a gain or loss in milligrams per square centimetre. This is obtained by dividing the change in mass of the test plates from being in contact with the specimen (10.3) by the area of the leather specimen in contact with the plates. If there is no change in the mass of the plates from being in contact with the specimen report the leather as being noncorrosive.

12. Precision and Bias

12.1 The precision of the quantitative results depends on the precision of the measurement of the mass changes of the metal panels, the method of determining the area of erosion, and correctly counting pit marks.

13. Keywords

13.1 corrosion; leather; metal corrosion by leather