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An American National Standard

Standard Test Method for Copper Strip Corrosion by Liquefied Petroleum (LP) Gases[1]

This standard is issued under the fixed designation D 1838; 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.

ε[1] NOTE—Warning notes were placed in the text editorially in May 2001.

1. Scope

1.1 This test method detects the presence of components in liquefied petroleum gases which may be corrosive to copper.

NOTE 1—For an equivalent copper strip test applicable to less volatile petroleum products, see Test Method D 130.

1.2 The values stated in acceptable metric units are to be regarded as the standard. The values in parentheses are for information only.

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.* For specific hazard statements, see 6.1, 8.3.1, and Annex A1.

2. Referenced Documents

2.1 *ASTM Standards:*

D 130 Test Method for Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test[2]

E 1 Specification for ASTM Thermometers[3]

3. Summary of Test Method

3.1 A polished copper strip is immersed in approximately 100 mL of the sample and exposed at a temperature of 37.8°C (100°F) for 1 h in a cylinder of suitable working pressure. At the end of this period, the copper strip is removed and rated as one of the four classifications of the ASTM Copper Corrosion Standards.

4. Significance and Use

4.1 Copper corrosion limits provide assurance that difficulties will not be experienced in deterioration of the copper and copper-alloy fittings and connections that are commonly used in many types of utilization, storage, and transportation equipment.

5. Apparatus

5.1 *Corrosion Test Cylinder*, constructed of stainless steel with an O-ring removable top closure according to the dimensions given in Fig. 1. Provide a flexible aluminum connecting hose with swivel connections with adapter to a 6.4 mm (¼-in.) pipe. The whole assembly shall be capable of withstanding a hydrostatic test pressure of 6895 kPa (1000 psig). No leak shall be discernible when tested at 3450 kPa (500 psig) with gas.

5.2 *Water Bath*, capable of being maintained at 37.8 ± 0.5°C (100 ± 1°F). Incorporate suitable supports to hold the test cylinder in an upright position. Make the bath deep enough so that the entire cylinder and valves will be covered during the test.

5.3 *Thermometer*—An ASTM Density Thermometer having a range from – 20 to 105°C (–5 to + 215°F), graduated in 0.2°C (0.5°F) subdivisions, and conforming to the requirements for Thermometer 12C (12F), as prescribed in Specification E 1.

5.4 *Strip Polishing Vise*, to hold the copper strip firmly without marring the edges. For convenient vises see Test Method D 130.

6. Materials

6.1 *Wash Solvent*—Use acetone or knock test grade 2.2.4 trimethylpentane. (**Warning—** Extremely flammable. See Annex A1.)

6.2 *Copper Strip*, 12.5 mm (½ in.) wide, 1.5 to 3.0 mm (1/16 to ⅛ in.) thick, cut 75 mm (3 in.) long from smooth-surfaced, hard-temper, cold-finished copper of 99.9 + percent purity; electrical bus bar stock is generally suitable. Drill a 3.2 mm (⅛ in.) hole approximately 3.2 mm (⅛ in.) from one end in the center of the strip. The strips can be used repeatedly but should be discarded if the surfaces become deformed.

[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.H on Liquefied Petroleum Gas.

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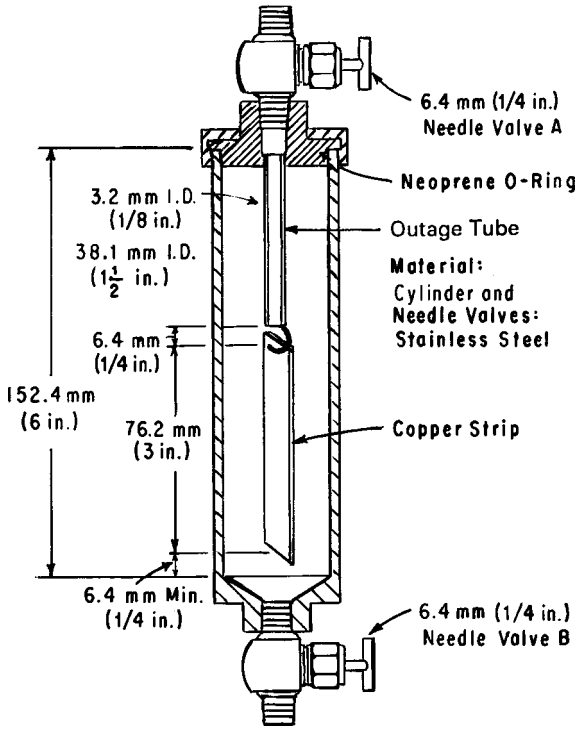
[2] *Annual Book of ASTM Standards*, Vol 05.01.

[3] *Annual Book of ASTM Standards*, Vol 14.03.



Metric Equivalents

in.	mm	in.	mm
⅛	3.2	3	76
¼	6.4		
1½	38.1	6	152

FIG. 1 Copper Strip Corrosion Test Cylinder

6.3 *Polishing Materials*—Silicon carbide grit paper of various degrees of fineness including 65-µm (240-grit) paper or cloth; also a supply of 105-µm (150-mesh) silicon carbide grain and pharmaceutical grade absorbent cotton (cotton wool).

6.4 *Copper Corrosion Standard Plaques* are available.[4] Their care and inspection for stability are described in detail in Test Method D 130.

7. Preparation of Strips

7.1 *Surface Preparation*—Remove all surface blemishes from all six sides of the strip with silicon carbide grit paper of such degrees of fineness as are needed to accomplish the desired results efficiently. Finish with 65-µm (240-grit) silicon carbide paper or cloth, removing all marks that were made by other grades of paper used previously. Immerse the strip in wash solvent from which it can be withdrawn immediately for final polishing or in which it can be stored for future use.

7.1.1 As a practical manual polishing procedure, place a sheet of the paper on a flat surface, moisten it with wash solvent and rub the strip against the paper with a rotary motion, protecting the strip from contact with the fingers with an ashless filter paper. Alternatively, the strip can be prepared by use of motor-driven machines using appropriate grades of dry paper on cloth.

7.2 *Final Polishing*—Remove a strip from the wash solvent. Holding it in the fingers protected with ashless filter paper, polish first the ends and then the sides with the 105-µm (150-mesh) silicon carbide grains picked up from a clean glass plate with a pad of absorbent cotton moistened with a drop of wash solvent. Wipe vigorously with fresh pads of absorbent cotton and subsequently handle only with stainless steel forceps; do not touch with the fingers. Clamp in a vise and polish the main surfaces with silicon carbide grains on absorbent cotton. Rub in the direction of the long axis of the strip, carrying the stroke beyond the end of the strip before reversing the direction. Clean all metal dust from the strip by rubbing vigorously with clean pads of absorbent cotton until a fresh pad remains unsoiled. When the strip is clean immediately attach to the dip tube and immerse it in the prepared test bomb.

7.2.1 It is important to polish the whole surface of the strip uniformly to obtain a uniformly stained strip. If the edges show wear (surface elliptical) they will likely show more corrosion than the center. The use of a vise will facilitate uniform polishing.

8. Procedure

8.1 With valve *B* (Fig. 1), open, place approximately 1 mL of distilled water into a clean test cylinder and swirl to moisten the walls; allow the remainder to drain from the cylinder, insert the freshly polished copper strip suspended from the hook on the dip tube making sure that the bottom of the strip is at least 6.4 mm (¼ in.) from the bottom of the cylinder when assembled. After assembly of the apparatus, close both valve *A* (Fig. 1), on closure assembly with outage tube, and valve *B*.

8.2 Holding the test cylinder upright so as not to wet the copper strip with water, attach the sample source to the test cylinder valve A (Fig. 1) by means of a short length of flexible aluminum tubing that has been purged with the sample. Admit some sample to the cylinder by opening the valve at the sample source and then valve A.

8.3 Close valve A without disconnecting the test cylinder from the sample source. Invert the test cylinder and open valve B to purge the air from the test cylinder. Return the test cylinder to the upright position and drain any residual liquid through the open valve B. Close valve B with the test cylinder now in its upright position, open valve A and fill the test cylinder with the sample. When the test cylinder is full, close valve A, the valve at the sample source, and disconnect the aluminum tubing.

8.3.1 **Warning**—Safe means for the disposal of vapors and liquids during this and subsequent procedures must be provided.

8.4 As soon as the aluminum tubing is disconnected, and with the cylinder in its upright position, open valve A slightly so that all liquid above the end of the outage tube will be removed from the test cylinder. When vapor first emerges from valve A, close valve A.

8.5 Immediately after filling, and venting as described in 8.4, immerse the test cylinder in the water bath maintained at 37.8 ± 0.5°C (100 ± 1°F). Allow the cylinder to remain in the bath for 1 h ± 5 min.

8.6 At the end of the test period remove the cylinder from the bath and, holding the cylinder in a vertical position, open

[4] The ASTM Copper Strip Corrosion Standards approved by Committee D-2 are available from ASTM Headquarters. Request Adjunct No. ADJD0130