



Designation: C1936 – 23

Standard Test Method for Corrosiveness of Mineral-Fiber or Cellulosic-Fiber Insulation by Comparison to Control¹

This standard is issued under the fixed designation C1936; 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.

1. Scope

1.1 This method provides a qualitative measure of the corrosiveness of mineral-fiber or cellulose fiber insulation by comparison to a control.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

A109/A109M Specification for Steel, Strip, Carbon (0.25 Maximum Percent), Cold-Rolled

B152/B152M Specification for Copper Sheet, Strip, Plate, and Rolled Bar

B209/B209M Specification for Aluminum and Aluminum-Alloy Sheet and Plate

C168 Terminology Relating to Thermal Insulation

G1 Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens

3. Terminology

3.1 **Definitions**—Terminology **C168** shall be considered as applicable to the terms used in these test methods.

¹ This test method is under the jurisdiction of ASTM Committee **C16** on Thermal Insulation and is the direct responsibility of Subcommittee **C16.31** on Chemical and Physical Properties.

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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.

4. Summary of Test Method

4.1 Individually assemble five each of specially cleaned steel, copper, and aluminum test plates between pieces of insulation. Insulation is held uniformly against each side of the test plate with wire screens and rubber bands.

4.2 Assemble an equal number of cleaned metal test plates between pieces of washed sterile cotton in an identical manner.

4.3 Vertically suspend the samples in a humidity test chamber at 95 ± 3 % relative humidity and temperature of $120 \pm 3^\circ\text{F}$ ($49 \pm 2^\circ\text{C}$) for time periods determined by the type of metal being tested. Steel is tested for 96 ± 2 h. Copper and aluminum are tested for 720 ± 5 h.

4.4 After the appropriate test period, compare the test plates exposed to the insulation to the control plates exposed to sterile cotton for severity of corrosion. The insulation is considered to have passed this test if the corrosion attributed to the insulation is not significantly worse than that of the washed sterile cotton controls.

5. Significance and Use

5.1 The fiber composition and the type of binder used in the manufacture of mineral fiber insulation can sometimes create a potential for corrosion on certain metals in the presence of water or water vapor.

5.2 The fiber composition and type of fire retardant used in the manufacture of cellulosic fiber insulation can sometimes create a potential for corrosion on certain metals in the presence of water or water vapor.

5.3 This method is used to determine the relative corrosion potential of mineral or cellulosic fiber insulation on specific metals under elevated temperature and high humidity conditions only.

6. Apparatus

6.1 **Woven Wire Screen**, $1\frac{1}{2} \pm \frac{1}{4}$ by $4\frac{1}{2} \pm \frac{1}{4}$ in. (38 ± 6.3 by 114 ± 6.3 mm), made of Type 304 stainless steel, 0.063 ± 0.005 -in. (1.60 ± 0.13 -mm) wire, $\frac{7}{16} \pm \frac{1}{16}$ -in. (11 ± 1.6 -mm) open square grid.

6.2 **Rubber Bands**, No. 12.

6.3 *Humidity Test Chamber*; clean, well maintained, and capable of controlling temperature at $120 \pm 3^\circ\text{F}$ ($49 \pm 2^\circ\text{C}$), and humidity at $95 \pm 3\%$ relative humidity.

7. Reagents and Materials

7.1 *Metal Test Plates*—Meeting the following composition requirements, the dimensions of all metal test plates shall be $1 \text{ by } 4 \pm \frac{1}{4} \text{ in.}$ ($25 \text{ by } 100 \pm 6.3 \text{ mm}$):

7.1.1 *Steel Plates* shall be $0.02 \pm 0.005 \text{ in.}$ ($0.5 \text{ mm} \pm 0.13 \text{ mm}$) thick, in accordance with Specification **A109/A109M**, bright No. 2 finish, cold-rolled low-carbon strip steel, quarter hard, temper No. 3.

7.1.2 *Aluminum Plates* shall be $0.025 \pm 0.005 \text{ in.}$ ($0.6 \pm 0.13 \text{ mm}$) thick, in accordance with Specification **B209/B209M**, Type 3003-0.

7.1.3 *Copper Plates* shall be $0.032 \pm 0.005 \text{ in.}$ ($0.8 \pm 0.13 \text{ mm}$) thick, in accordance with Specification **B152/B152M** Type ETP, No. 110 soft copper.

8. Sampling, Test Specimens, and Test Units

8.1 *Test Specimens*—Two pieces of the material to be tested shall comprise one specimen. Each piece shall measure $1\frac{1}{2} \pm \frac{1}{4} \text{ by } 4\frac{1}{2} \pm \frac{1}{4} \text{ in.}$ ($38 \pm 6.3 \text{ by } 114 \pm 6.3 \text{ mm}$) by $\frac{1}{2} \pm \frac{1}{8} \text{ in.}$ ($13 \pm 3.2 \text{ mm}$) thick, when compressed against the metal test plates. As a guideline, cut board type insulations to a thickness of $\frac{1}{2} \pm \frac{1}{16} \text{ in.}$ ($12.7 \pm 1.6 \text{ mm}$); cut blanket type insulations to a thickness of $1 \pm \frac{1}{16} \text{ in.}$ ($25.4 \pm 1.6 \text{ mm}$). For each type of metal tested, make five specimens out of test insulation and five control specimens out of washed sterile cotton.

9. Specimen Preparation

9.1 Clean the metal test plates until the surface is free of water breaks. Take care to avoid excessive handling of the surfaces of the metal plates. Do not touch them at all once completing the final cleaning step. The use of plastic surgical gloves or their equivalent are recommended to facilitate the handling of the plates. Specific cleansing instructions for each type of metal is as described in Practice **G1**.

10. Procedure

10.1 Make five test specimens, each one consisting of one piece of metal placed between two pieces of insulation. Next, compress this assembly between two pieces of woven wire screen and secure near each end with a No. 12 rubber band or other means to ensure that the compressed thickness of this assembly measures $1 \pm \frac{1}{8} \text{ in.}$ ($25 \pm 3 \text{ mm}$).

10.2 Assemble 5 control specimens, each consisting of one piece of metal placed between two $1\frac{1}{2} \text{ by } 4\frac{1}{2} \text{ by } \frac{1}{2} \text{ in.}$ ($38 \text{ by } 114 \text{ by } 13 \text{ mm}$) pieces of sterile cotton. The sterile cotton shall have previously been solvent extracted in reagent grade acetone³ for 48 h, and then vacuum dried at low heat. Identify the outer surface of the cotton as rolled. After cleaning, place the

outer cotton surface against the metal coupons in the same manner as the insulation specimen. Then compress and secure these specimens in exactly the same manner as the insulation test specimens using wire screens and No. 12 rubber bands or other suitable means to maintain sample thickness.

10.3 Vertically suspend the five test specimens and the five control specimens in an atmosphere free of contaminants, having a relative humidity of $95 \pm 3\%$, and a temperature of $120 \pm 3^\circ\text{F}$ ($49 \pm 2^\circ\text{C}$) for the specified test period ($96 \pm 2 \text{ h}$ for steel, and $720 \pm 5 \text{ h}$ for copper and aluminum). Keep the humidity chamber for the entire test period. If the chamber must be opened, take care to ensure that the relative humidity does not rise sufficiently high to cause condensation within the chamber. At the conclusion of the test period, remove the specimens from the chamber, disassemble and mark them to distinguish individual plates from each other.

10.4 Closely examine the surfaces of each of the test and control plate for the following characteristics:

10.4.1 *Steel*—The presence and relative severity of red rust and pitting.

10.4.2 *Aluminum*—The presence and relative severity of pitting, scaling, or other evidence of attack. The generation of oxide is a protective mechanism of aluminum and shall be disregarded. Remove the oxide by scrubbing with a nonabrasive implement of rubber under running water or immersing into a 70 % solution of nitric acid.

10.4.3 *Copper*—Presence and relative severity of scaling, pitting, deposits or encrustation, severe discolorations, or general uniform attack. Surface blush and slight discolorations shall be ignored and removed by scrubbing with a nonabrasive implement of rubber under running water or immersing into a 10 % solution of sulfuric acid.

NOTE 1—Additional guidance for evaluating the plates can be found in Practice **G1**.

11. Interpretation of Results

11.1 Because of the subjectivity inherent in the judging of these plates, nonparametric statistical methods are employed to identify those materials that are conclusively more corrosive than sterile cotton.

11.2 The ten metal plates (five test, five control), shall be examined by at least four judges with experience in corrosion evaluation. Each judge shall independently rank all ten plates in order from least severe corrosion to most severe corrosion. The judges shall receive no indication as to which plates are control and which are test specimens. The judges' rankings shall be based on their own best estimate of the severity of the corrosion visible on each plate.

11.3 Upon completion of the judges' ratings, the arithmetic sum of all of the rankings for each plate shall be calculated. These sums shall then be ranked from 1 (lowest total) to 10 (highest total), with any ties being assigned the arithmetic mean of the rankings involved (for example, two plates tied for third = $(3 + 4)/2 = 3.5$; three plates tied for fourth = $(4 + 5 + 6)/3 = 5$). The new rankings thus established shall then be totaled for the control plates and the test specimens.

³ ACS Reagent Chemicals, Specifications and Procedures for Reagents and Standard-Grade Reference Materials, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.