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(2) *Procedures for insulation intended for pouring applications.* If the insulation is intended for pouring applications, conduct the following procedures:

(i) Weigh the empty insulation specimen container and record its weight.

(ii) Using a shovel (Apparatus #12) remove insulation from the simulated attic space and place it into the specimen container until the container just begins to overflow.

(iii) Follow steps (vi) through (xii) as specified under *Procedures for insulation intended for pneumatic applications.*

(iv) Repeat this procedure (steps (i) through (iii)) using another specimen of the insulation until four settled densities are obtained for a given material. Then average these figures to arrive at a final settled density.

(e) *Insulation intended for pouring and pneumatic applications.* If the insulation is intended for both pouring and pneumatic applications, or if it is uncertain whether the insulation will be poured or installed pneumatically, the insulation shall be tested for settled density using the test specimen preparation and test procedures at §1209.4 (c) and (d) for each of the applications. The larger of the two settled density values shall be used in performing the corrosiveness test at §1209.5 and the smoldering combustion test at §1209.7.

(f) *Calculations.* Calculate the settled density of each specimen using the following formula:

Settled Density in $kg/m^3 = W/V_s$, where

W=combined weight of the container and insulation in grams, minus the weight of the container in grams.

V_s=volume of insulation in liters after shaking.

§ 1209.5 Test procedures for corrosiveness.

This section prescribes the procedures for determining the corrosiveness of cellulose insulation. Cellulose insulation shall be tested for corrosiveness using the measured settled density, obtained by following the test procedure at §1209.4, to calculate the amount of distilled or deionized water to add to the test specimens. Determination of corrosiveness shall be in accordance with the following test procedure:

(a) *Apparatus and materials*—(1) *Humidity chamber.* A forced-air humidity chamber capable of maintaining 48.9±1.7 °C (120±3 °F) and 97 ±1.5 percent relative humidity.

(2) *Crystallizing dishes.* Six glass crystallizing dishes, 90 mm (3.54 in) diameter by 50 mm (1.9 in) height.

(3) *Test coupons.* (i) Two aluminum coupons. 3003 bare aluminum, zero temper.

(ii) Two copper coupons. ASTM B 152, type ETP, Cabra No. 110 soft copper.

(iii) Two steel coupons. Low carbon, commercial quality, cold rolled, less than 30 carbon content, shim steel.

Each coupon shall be 50.8 by 50.8 mm (2 by 2 in) by 0.076 mm (0.003 in) thick metal free of tears, punctures, or crimps.

(4) Test specimens: Six test specimens of insulation shall be used for one test. Each specimen shall weigh 20g (0.7 oz).

(b) *Procedure*—(1) *General procedures for cleaning all metal coupons.* The metal coupons shall be cleaned by the following method:

(i) At no time during the fabrication, cleaning or testing shall the metal coupons be touched by ungloved hands.

(ii) Gloves shall be clean and in good condition.

(iii) All chemicals used shall be of American Chemical Society reagent grade or better, free from oily residues and other contaminants.

(iv) Water shall be distilled or deionized water.

(v) Handle cleaned coupons only with clean forceps.

(vi) In order to avoid exposing laboratory personnel to toxic fumes, the commission recommends that all cleaning procedures be performed in a fume hood.

(vii) Clean the coupons by vapor degreasing with 1,1,1-trichloroethane for ten minutes. Following vapor degreasing, subject the coupons to caustic and/or detergent washing as appropriate. Following caustic or detergent washing, rinse the coupons in flowing water to remove residues. Inspect each coupon for a water-break free surface. (A water-break is a break, separation, beading or retraction of the water film as the coupon is held vertically after wetting. As the coupons are cleaned, the water film should become gradually thinner at the top

and heavier at the bottom.) Hot air dry the coupons at 105 °C (221 °F).

(2) Specimens of cellulose insulation submitted for testing shall be blown, combed, or otherwise mixed to reasonably assure homogeneity in the cellulose insulation test specimens.

(3) Before presaturating each 20g (0.7 oz) test specimen, subdivide it into two 10g (0.35 oz) portions. The quantity of distilled or deionized water to be used for each 10g (0.35 oz) portion shall be determined using the following formula:

ml distilled water = 46 / (settled density, Kg/m^3) × 75

or

ml distilled water = 2.9 / (settled density, lb/ft^3) × 75

(4) Presaturate each 10g (0.35 oz) portion with the determined amount of water. Place one presaturated 10g (0.35 oz) portion into a crystallizing dish, tamp level using the bottom of a clean suitably sized glass beaker. Place a metal coupon onto the presaturated insulation portion and center it in a horizontal plane. Place the other presaturated 10g (0.35 oz) portion into the crystallizing dish on the metal coupon and tamp the composite specimen (metal coupon plus saturated insulation in the crystallizing dish) to assure an even distribution of this material and to assure good contact of the insulation with the metal. Exercise care in preparing the composite specimens to eliminate air pockets from forming next to the metal coupons.

(5) Do not cover the crystallizing dish. (Care should be taken to avoid evaporation from the composite specimen while it is being prepared until it is placed in the humidity chamber.) If dripping occurs in the chamber, position a drip guard in the chamber to divert condensation to the chamber floor. Repeat the above for the other metal coupons. Place all six composite specimens into the humidity chamber. The chamber shall be preconditioned to 48.9 ±1.7 °C (120 ±3 °F) and 97 ±1.5 percent relative humidity. The specimens shall remain in the chamber for 336 ±4 hours. (Keep the chamber door open a minimum of time while placing composite specimens in and removing them from the chamber.)

(6) Upon completion of the test disassemble the composite specimens. Thoroughly wash the metal coupons under running water and lightly brush them using a soft nylon bristle brush or equivalent to remove loose corrosion products. Remove the remaining corrosion products from the metal coupons by cleaning them in accordance with the following practices:[1]

(i) Technique #1—Electrolytic Cleaning. This technique can be used for post-cleaning the tested copper, steel and aluminum coupons.

Description: Electrolyze the coupons as follows: Make a solution containing 28 ml of sulfuric acid (specific gravity 1.84), 2 ml of organic inhibitor, e.g. aobut 0.5 g/liter of such inhibitors as diorthotolyl thiourea, quinoline ethiodide, or betanaphthol quinoline may be used, and 970 ml of water. The solution shall be at 75 °C (167 °F). The anode shall be carbon or lead, and the cathode shall be one metal coupon. The electrolyzing shall run for 3 minutes at a current density of 20 A/dm^2. *Caution:* If lead anodes are used, lead may deposit on the coupon. If the coupon is resistant to nitric acid, the lead may be removed by a flash dip in 1 + 1 nitric acid (plus water). To avoid injury in this and subsequent techniques when mixing acid and water, gradually pour the acid into the water with continuous stirring, provide cooling if necessary.

(ii) Technique #2—Copper. This technique or Technique #1 can be used for post-cleaning the tested copper coupons only.

Description: Make a solution containing 500 ml of hydrochloric acid (specific gravity 1.19), 100 ml of sulfuric acid (specific gravity 1.84), and 400 ml of water. To avoid injury, prepare the solution by slowly adding the sulfuric acid to the water with continuous stirring. Cool, then add the hydrochloric

[1] These practices are the recommended practices in ''ASTM G1—Standard Recommended Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens,'' published by American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.

acid slowly with continuous stirring. The solution shall be at room temperature. Dip the coupons in the solution for 1 to 3 minutes.

(iii) Technique #3—Steel. This technique or technique #1 can be used for post-cleaning the tested steel coupons only.

Description: Use one of the following two solutions:

Solution #1. Add 100 ml of sulfuric acid (specific gravity 1.84), 1.5 ml organic inhibitor, and water to make a l liter solution. The solution shall be 50 °C (120 °F). Dip the coupons in this solution.

Solution #2 (also referred to as Clarke's solution). Add 20 g of antimony trioxide and 50 g of stannous chloride to 1 liter of hydrochloric acid (specific gravity 1.19). The solution shall be stirred and be used at room temperature. Dip the coupons in this solution stirring the solution at a rate such that deformation of the coupons does not occur. This dipping shall last for up to 25 minutes.

(iv) Technique #4—Aluminum. This technique or technique #1 can be used for post-cleaning the tested aluminum coupons only.

Description: Make a 1 liter solution by adding 20g of chromic acid, and 50 ml of phosphoric acid (specific gravity 1.69), to water. The solution shall be 80 °C (176 °F). Dip the coupons in this solution for 5–10 minutes. If a film remains, dip the coupons in nitric acid (specific gravity 1.42) for 1 minute. Repeat the chromic acid dip. Nitric acid alone may be used if there are no deposits.

(7) After cleaning, examine the metal coupons over a 40–W appliance light bulb for perforation.

(c) *Noncorrosiveness*. Noncorrosiveness shall be determined by the absence of any perforations (excluding notches which extend into the coupon 3 mm or less from any edge) on each of the six test coupons when the coupons are observed over a 40–W appliance light bulb.

§ 1209.6 Test procedures for critical radiant flux.

This section provides the test procedure for determining the critical radiant flux of exposed attic floor insulation using a radiant heat energy source.

(a) *Apparatus and description of test procedure*. Test chamber (Figures 3 and 4 paragraph (b) of this section). An air-gas fueled radiant heat energy panel or equivalent panel inclined at 30° above and directed at a horizontally-mounted attic floor insulation specimen. The radiant panel generates a radiant energy flux distribution ranging along the approximately 100-cm length of the test specimen from a nominal maximum of 1.0 W/cm.^{2} to a minimum of 0.1 W/cm^2. The test is initiated by open flame ignition from a pilot burner. The distance burned to flame-out is converted to W/cm^2 from the flux profile graph (Figure 8) and reported as critical radiant flux, W/cm^2. Section 1209.8 provides a procedure for calibrating the radiation pyrometer used to standardize the thermal output of the panel.

(b) *Construction and instrumentation of the radiant panel test chamber*. The radiant panel test chamber shall be constructed and instrumented as follows:

(1) The radiant panel test chamber employed for this test shall be located in a draft protected area maintained at 21±3 °C (69.8±9 °F) and relative humidity of 50±20%. The radiant panel test chamber, (Figures 3 and 4) shall consist of an enclosure 140 cm (55 in) long by 50 cm (19½ in) deep by 71 cm (28 in) above the test specimen. The sides, ends, and top shall be of 1.3 cm nominal (½ in) calcium silicate board, such as Marinite I, 0.74 g/cm^3 (46 lb/ft^3) nominal density, with a thermal conductivity at 177 °C (350 °F) of 1.11 cal (g)/hr cm^2 °C/cm [0.89 Btu/(hr) (ft^2) (°F/in)]. One side shall be provided with an approximately 10 cm × 110 cm (4 × 44 inches) draft tight fire resistant glass window so that the entire length of the test specimen may be observed from ourside the fire test chamber. On the same side and below the observation window is a door which, when open, allows the specimen platform to be moved out for mounting or removal of test specimens. A draft tight, fire resistant observation window may be installed at the low flux end of the chamber.

(2) The bottom of the test chamber shall consist of a sliding steel platform which has provisions for rigidly securing the test specimen holder in a fixed and level position. The free, or air access, area around the platform shall be