



Standard Specification for Exterior Solar Radiation Control Coatings on Buildings¹

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1. Scope

1.1 The purpose of this specification is to provide general requirements for products used to reduce thermal loads on buildings by reflecting solar radiation from roofs and walls. Radiation control coating (RCC) is a liquid applied coating having a solar reflectance of 0.8 and an ambient temperature infrared emittance of at least 0.8.

1.2 This specification covers the physical and mechanical properties of liquid-applied radiation control coatings (RCCs) designed for exterior application on buildings or other structures, where ambient air temperatures range from -34 to 54°C [-30 to 130°F]. The specification also includes the testing procedures by which the acceptability of the material may be determined.

1.3 The products that comply with this specification may be used for other applications and have other properties not covered by this specification. In such cases, it is advisable to check other specifications that address the applications of interest.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.5 *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

C168 Terminology Relating to Thermal Insulation

¹ This specification is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.21 on Reflective Insulation.

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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.

- C419 Practice for Making and Curing Test Specimens of Mastics Thermal Insulation Coatings
- C461 Test Methods for Mastics and Coatings Used With Thermal Insulation
- C1371 Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emis-someters
- D471 Test Method for Rubber Property—Effect of Liquids
- D903 Test Method for Peel or Stripping Strength of Adhe-sive Bonds
- D2370 Test Method for Tensile Properties of Organic Coat-ings
- D2697 Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings
- D3274 Test Method for Evaluating Degree of Surface Dis-figurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation
- E84 Test Method for Surface Burning Characteristics of Building Materials
- E96/E96M Test Methods for Water Vapor Transmission of Materials
- E349 Terminology Relating to Space Simulation
- E903 Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres (Withdrawn 2005)³
- E1175 Test Method for Determining Solar or Photopic Reflectance, Transmittance, and Absorptance of Materials Using a Large Diameter Integrating Sphere
- G155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

3. Terminology

3.1 *Definitions*—Terminology C168 and E349 shall apply to this specification.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *radiation control coating (RCC), n*—a radiation control coating is a material that is designed to have a high solar reflectance (above 0.8) and a high infrared emittance (above 0.8) for long wavelength radiation.

3.2.2 *solar reflectance, n*—solar reflectance is the fraction of incident solar radiation that is reflected.

³ The last approved version of this historical standard is referenced on www.astm.org.

4. Significance and Use

4.1 It is recognized that the solar reflectance of RCCs will be reduced by soiling, which is caused by the accumulation of dirt, dust and other contaminants on the surface. The soiling, on the roof, will differ from location to location and from environment to environment. It is possible that soiling rates are affected by the slope of the surface, the roughness of the surface, the characteristics of the dust in the air, the dust content of the air and the degree of growth of mildew and other organisms on the surface. Low slopes, rough surfaces, dusty air and persistent moisture and conditions of high humidity are all conducive to soiling. At this time there are insufficient observations available to predict the amount of soiling for a given locale or the effect of the soiling on solar reflectance. Nor have any test procedures been developed to determine the ease with which the RCCs can be cleaned and the degree to which the solar reflectance can be restored. It is suggested that users examine the potential for soiling at the application site and determine if the cleaning methods suggested by the manufacturer are likely to be adequate to maintain solar reflectance at an acceptable level, for the type of soiling expected

5. Materials and Manufacture

5.1 *Composition*—The manufactured product shall be in liquid form, suitable for application to exterior surfaces by brushing, rolling, or spraying. The product shall be a elastomeric or resinous material, to which various pigments, dilutants, and other additives have been added to give the desired properties.

6. Physical and Mechanical Properties

6.1 *Total Solids*—The total solids of the liquid product shall not be less than 25 %, by weight, and shall be determined in accordance with 8.1.

6.2 *Solids Volume*—The total solids in the liquid product shall not be less than 25 %, by volume, as determined in accordance with 8.2.

6.3 *Solar Reflectance*—The solar reflectance of the cured coating shall be determined in accordance with 8.3. The solar reflectance of the cured coating shall be no less than 0.8.

6.4 *Infrared Emittance*—Infrared emittance, at ambient temperature, shall be determined in accordance with 8.4. The ambient temperature infrared emittance of the cured coating shall be no less than 0.8.

6.5 *Elongation*—The elongation of the cured coating shall be determined in accordance with 8.5.

6.5.1 The elongation of the cured coating shall be greater than 200 % and 100 % at testing temperatures of 25 and -18°C [77 and 0°F] respectively.

6.5.2 The elongation of the coating after UV exposure shall not be less than 80 % of the values obtained at 25 and -18°C [77 and 0°F] on the cured coating.

6.6 *Adhesion*—The adhesion of the coating shall be determined in accordance with 8.6. The adhesion of the cured coating shall be reported for each of the substrates tested.

6.7 *Water Vapor Permeance*—The water vapor permeance of the cured coating shall be determined in accordance with 8.7. The water vapor permeance values shall be reported for the thickness tested but in no case shall be greater than 20 perms.

6.8 *Flame Retardancy*—The flame retardancy of the cured coating shall be determined in accordance with 8.8 and shall be tested on a substrate typical of final installation. Flame spread and smoke development shall be no greater than that required by local code requirement.

6.9 *Fungi Resistance*—The fungi resistance of the cured coating shall be determined and found acceptable in accordance with 8.9.

6.10 *Water Absorption*—Water absorption of the cured coating shall be determined in accordance with 8.10.

6.11 *Cured Sample Thickness*—The cured sample thickness shall be determined in accordance with 8.11.

6.12 *Outdoor Durability*—The outdoor durability shall be determined in accordance with 8.12.

7. Sample Preparation

7.1 *Sampling*—Samples for testing shall be taken from the original containers immediately after stirring the material to a uniform condition.

7.2 *Cured Sample Preparation*—For tests to be performed on specimen of cured (dry) product, the thickness of the specimen will be no less than the manufacturer's recommended cured coating thickness. The cured coating specimen shall be prepared on a substrate suitable for the intended test. Example of these substrates are metal, stucco or black asphalt.

7.3 Cured values shall be determined in accordance with 8.11.

8. Test Methods

8.1 *Total Solids (by Weight)*—Determine the total solids of the wet product in accordance with Test Methods C461, Section 8.

8.2 *Solids Volume*—Determine the solids volume of the wet product in accordance with Test Method D2697.

8.3 *Solar Reflectance*—The solar reflectance shall be determined on samples in the cured condition placed on low solar reflectance substrates in accordance with either Test Method E903 or E1175. This may be done with a solar reflectometer.

8.4 *Total Hemispherical Emittance*—Total hemispherical emittance, at ambient temperature, shall be determined on cured samples placed on low emittance substrates in accordance with Test Method C1371.

8.5 *Elongation*—Elongation tests shall be performed on cured samples before and after 3000-h exposure to ultraviolet (UV) radiation in accordance with Test Method D2370 and Practice G155 (without water).

8.6 *Adhesion*—Adhesion tests shall be performed on cured samples in accordance with Test Method D903.

8.7 *Water Vapor Permeance*—Determine the water vapor permeance on cured samples in accordance with Test Methods **E96/E96M**, desiccant method.

8.8 *Flammability*—Determine the flammability of cured samples in accordance with Test Method **E84**.

8.9 *Fungi Resistance*—Determine the fungi resistance of the cured material in accordance with Test Method **D3274**.

8.10 *Water Absorption*—Determine the water absorption of the cured product in accordance with Test Method **D471**.

8.11 *Cured Samples Thickness*—Determine cured sample thickness in accordance with Practice **C419**.

8.12 *Outdoor Durability*—Determine the outdoor durability in accordance with Practice **G155**.

9. Inspection and Rejection

9.1 Inspection and rejection of material shall be agreed upon between the purchaser and the seller as part of the purchase contract.

10. Packaging and Package Marking

10.1 *Packaging*—Unless otherwise agreed or specified, materials shall be packaged in the manufacturers standard commercial containers.

10.2 *Marking*—The marking shall be clear and legible. Unless otherwise specified, each container shall be marked with the date of manufacture, material name, ASTM designation, manufacturer's name or trademark, and coverage of material in container.

11. Keywords

11.1 emittance; radiation control coating; solar reflectance; solids volume; total solids

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