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Standard Specification for Interior Radiation Control Coating (IRCC) for Building Applications¹

This standard is issued under the fixed designation C1841; 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 specification covers the classification, composition, and physical properties of an Interior Radiation Control Coating (IRCC) for use in building applications to reduce radiant heat transfer. The IRCC is sprayed, roller applied, or brushed onto interior building surfaces.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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

- C168 Terminology Relating to Thermal Insulation
- C1186 Specification for Flat Fiber-Cement Sheets
- C1321 Practice for Installation and Use of Interior Radiation Control Coating Systems (IRCCS) in Building Construction
- C1371 Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emis-someters

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.

- C1396 Specification for Gypsum Board
- D16 Terminology for Paint, Related Coatings, Materials, and Applications
- D1653 Test Methods for Water Vapor Transmission of Organic Coating Films
- D3273 Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
- D3274 Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation
- D3925 Practice for Sampling Liquid Paints and Related Pigmented Coatings
- D4708 Practice for Preparation of Uniform Free Films of Organic Coatings
- E84 Test Method for Surface Burning Characteristics of Building Materials
- E96 Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
- 2.2 CSA Standard:³
 - CSA O121 Douglas Fir Plywood
- 2.3 NIST Standard:⁴
 - Voluntary Product Standard PS 1-07 Structural Plywood

3. Terminology

3.1 Refer to the Terminology C168 for definitions of general terms related to thermal insulation used in this specification.

3.2 Refer to the Terminology D16 for definitions of general terms for paint, related coatings, materials, and applications used in this specification.

3.3 Definitions of Terms Specific to This Standard:

3.3.1 *interior radiation control coating (IRCC), n*—a low-emittance liquid applied material, adjacent to an air space within a structure.

3.3.2 *premixed coating, n*—a liquid product that requires all ingredients be combined and blended during manufacture and require only stirring before application.

³ Available from Canadian Standards Association (CSA), 178 Rexdale Blvd., Toronto, ON M9W 1R3, Canada, <http://www.csagroup.org>.

⁴ Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, <http://www.nist.gov>.

3.3.3 *field mixed coating, n*—a liquid product that requires two or more components be combined in the field before application.

3.3.4 *film (as related to IRCC coatings), n*—a dried coat of an IRCC.

3.3.5 *binder, n*—the coating ingredient that holds the particles together.

4. Classification

4.1 *Type 1*—emittance less than or equal to 0.15.

4.2 *Type 2*—emittance greater than 0.15 and less than or equal to 0.25.

5. Ordering Information

5.1 Material order shall specify premixed coating or field mixed coating.

5.2 Material order shall specify Type 1 or Type 2.

6. Materials and Manufacture

6.1 *Composition*—The manufactured product shall be in liquid form, suitable for application to interior surfaces by spraying, roller applying, or brushing. The product shall use suitable binders, to which various pigments, dilutants, and other additives have been combined to give the desired properties.

6.2 *Product Testing*—The IRCC shall be applied and tested per the manufacturer’s recommended dry film coating thickness.

7. Physical Properties

7.1 *Emittance*—Shall be determined in accordance with 11.1 and meet the relevant performance requirements from Table 1.

7.2 *Water Vapor Permeance*—Shall be determined in accordance with 11.2 and meet the relevant performance requirements from Table 1.

7.3 *Surface Burning Characteristics*—The surface burning characteristics of the cured coating shall be determined in accordance with 11.3 and shall comply with the relevant performance requirements from Table 1.

TABLE 1 Physical Property Requirements for Interior Radiation Control Coating Films

Property	Value
Emittance	Type 1 less than or equal to 0.15. Type 2 greater than 0.15 and less than or equal to 0.25
Water Vapor Permeance	Shall be greater than 10 perms (5.72 × 10 ⁻⁷ gram/Pa·s·m ²)
Surface Burning Characteristics	The surface burning characteristics class rating of an IRCC system, as coated on a specific substrate, shall be reported and its class rating shall not degrade the class rating of the substrate. See Table 2 for surface burning characteristics class ratings.
Mold Resistance	Report the results for the coated and uncoated substrate using the rating scale in Test Method D3274.

TABLE 2 Surface Burning Characteristic Class Ratings

Class	Value
A	Flame spread index 25 or less Smoke developed index 450 or less
B	Flame spread index 26 to 75 Smoke developed index 450 or less
C	Flame spread index 76 to 200 Smoke developed index 450 or less

7.4 *Mold Resistance*—Shall be determined in accordance with 11.4. Report the mold resistance for the coated and uncoated substrate and meet the relevant performance requirements from Table 1.

8. Workmanship, Finish, and Appearance

8.1 An IRCC shall be manufactured, packaged and shipped in such a manner that, when received by the customer, they are suitable for installation or field mixing in accordance with Practice C1321.

9. Significance and Use – Applications

9.1 This specification recognizes that the effectiveness of an IRCC is dependent on proper installation. Practice C1321 addresses the use and installation of an IRCC.

9.2 Table 1 in this specification identifies the important film properties for IRCC products.

9.3 When specific material properties are required for a particular application the user shall consult the manufacturer.

9.4 A key component of the effectiveness of an IRCC is the maintenance of the surface emittance. Contamination of surfaces generally impacts the surface emittance and the effectiveness of the coating. Contamination can be soot, organic material, dirt, fly ash or similar material in the environment.

10. Sampling

10.1 Sampling shall be performed in accordance with Practice D3925.

11. Test Methods

11.1 *Emittance*—The surface emittance of the product shall be tested in accordance with Test Method C1371.

11.2 *Water Vapor Permeance*—Utilize either 11.2.1 or 11.2.2.

11.2.1 *Release Substrate*—Prepare free films in accordance with Practice D4708. The permeance of the free film IRCC product shall be tested in accordance with either: Test Method E96 Test Method A (Dry Cup/Desiccant) or Test Method D1653 Test Method A (Dry Cup/Desiccant).

11.2.2 *Film Support*—Prepare films utilizing a high permeance film support substrate if no free film of the IRCC product can be created. The permeance of the film support IRCC product shall be tested in accordance with Test Method D1653 Test Method A (Dry Cup/Desiccant). Recommended support materials can be found in Test Method D1653 Section 7.5. Tests shall be run on the film support with and without the IRCC product to determine the net effect of the IRCC product.

11.3 *Surface Burning Characteristics*—Determine in accordance with Test Method **E84**. The IRCC shall be applied and tested per the manufacturer’s recommended dry film coating thickness.

11.3.1 If the IRCC is intended to be applied over a wood substrate, the test specimens shall consist of the IRCC mounted on the “A” face of nominal $1\frac{5}{32}$ in. untreated plywood with a face veneer of Douglas fir. The plywood shall comply with NIST Voluntary Product Standard PS 1-07. The plywood shall carry the grade stamp of either APA-The Engineered Wood Association or TECO, indicating that the plywood has been graded PS 1-07 A-C and is for exterior exposure. Alternatively, the plywood shall be permitted to be stamped as conforming to CSA O121.

11.3.2 If the IRCC is intended to be applied over gypsum board, the test specimens shall consist of the IRCC mounted on a $\frac{5}{8}$ in. (15.9 mm) thick Type X gypsum board, complying with Specification **C1396**. The gypsum board shall not be required to be mounted on studs.

11.3.3 If the IRCC is intended to be applied directly to a noncombustible wall or ceiling surface, the test specimens shall consist of the IRCC mounted on a $\frac{1}{4}$ in. (6.3 mm) thick fiber-cement board, complying with Specification **C1186** (Grade II) and the requirements contained in the Annex on Fiber-Cement Board Requirements of Test Method **E84**.

11.3.4 If the IRCC is intended to be applied over a substrate other than wood, gypsum board, or a noncombustible substrate, the test specimens shall consist of the IRCC mounted on the substrate to be used in field practice.

11.4 *Mold Resistance*—Test in accordance with Test Method **D3273** and determine the surface disfigurement in accordance with Test Method **D3274**.

11.5 *Reporting Requirements:*

11.5.1 Description of the material being tested, include:

- 11.5.1.1 Composition or generic identification, and
- 11.5.1.2 Coating type (premixed or field mixed).

11.5.2 Report test results as determined in **11.1** for Emission and include:

- 11.5.2.1 Substrate tested, and
- 11.5.2.2 Dry film coating thickness.

11.5.3 Report test results as determined in **11.2** for Water Vapor Permeance, including the relevant performance requirements from **Table 1** and include:

- 11.5.3.1 Substrate tested, and
- 11.5.3.2 Dry film coating thickness.

11.5.4 Report test results as determined in **11.3** for the Surface Burning Characteristics and include (1) Substrate tested, and (2) Dry film coating thickness.

11.5.4.1 Report Details including the relevant performance requirement achieved from **Table 1**.

11.5.4.2 Report Class Rating, as determined per **Table 2**, of the IRCC system as coated on the identified substrate.

11.5.4.3 Report Class Rating, as determined per **Table 2**, of the identified substrate used for testing.

11.5.4.4 State the flame spread index and the smoke developed index for the substrate prior to testing and include the source of the published values.

11.5.5 Report test results as determined in **11.4** for Mold Resistance including the relevant performance requirement achieved from **Table 1** and include:

- 11.5.5.1 Substrate tested, and
- 11.5.5.2 Dry film coating thickness.

12. Inspection and Rejection

12.1 Inspection of the material shall be agreed upon between the purchaser and the supplier as part of the purchase contract.

12.2 Failure to conform to the requirements of this specification shall constitute cause for rejection. Rejection shall be promptly reported in writing to the producer or supplier.

12.3 The producer or supplier shall have the option to re-inspect rejected shipments and resubmit the entire lot for inspection and re-sampling after the removal and replacement of nonconforming portions.

13. Certification

13.1 As specified in the purchase order or contract, a certification shall be furnished to the purchaser indicating that the material was manufactured, sampled, tested, and inspected in accordance with this specification and has been found to meet the requirements. As specified in the purchase order or contract, a report of the test results shall be furnished on request.

14. Packaging

14.1 All IRCC products shall be packaged in a manner that protects the product from physical damage.

15. Package Marking

15.1 The markings shall be clear and legible. Unless otherwise specified, each container shall be marked with the manufacturer’s name, product and designation, emission and manufacturing date code.

16. Storage

16.1 The material shall be stored in accordance with the recommendations of the manufacturer unless otherwise agreed upon between the purchaser and manufacturer.

17. Keywords

17.1 high reflectance; interior radiation control coating; low emittance; radiation control; spray applied; thermal radiation