



Standard Test Method for Freeze/Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water Resistive Barrier Coatings¹

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1. Scope

1.1 This test method covers procedures for determining the effect of freezing and thawing of exterior insulation and finish systems (EIFS), an EIFS with water-resistive barrier coatings, and water-resistive barrier coatings by itself.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information purposes 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 to determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

E 631 Terminology of Building Constructions

E 2110 Terminology for Exterior Insulation and Finish Systems (EIFS)

3. Terminology

3.1 For definitions and terms relating to this standard, see Terminologies **E 631** and **E 2110**.

4. Summary of Test Method

4.1 Specimens are subjected to cycles of freezing and thawing. Surface changes, viewed at 5 $\times$ magnification, are examined for signs of deleterious effects, such as cracking, crazing, checking, blistering, peeling, delamination, or erosion.

5. Significance and Use

5.1 Resistance to freezing and thawing is a factor when determining the durability of EIFS, an EIFS with water-resistive barrier coatings, and water-resistive barrier coatings by itself.

6. Apparatus

6.1 *Compressor, Freezing Chamber, and Circulator*—Of such design and capacity that the temperature of the air in the freezing chamber shall not exceed -9°C (16°F) one hour after introducing the maximum charge of units. The initial temperature will not exceed 32°C (90°F).

6.2 *Trays and Containers*—Will be shallow, metal, and have an inside depth of 38.1 ± 12.7 mm ($1\frac{1}{2} \pm \frac{1}{2}$ in.) and be of suitable strength and size so that the tray with a charge of frozen units can be removed from the freezing chamber by one person.

6.3 *Thawing Tank*—Should permit complete submersion of the specimens in their trays. Adequate means shall be provided so that the water in the tank may be kept at a temperature of $24 \pm 5.5^{\circ}\text{C}$ ($75 \pm 10^{\circ}\text{F}$).

6.4 *Drying Room*—Maintained at a temperature of $24 \pm 8^{\circ}\text{C}$ ($75 \pm 15^{\circ}\text{F}$), with a relative humidity between 30 and 70 percent. The drying room should be free from drafts.

7. Test Specimens

7.1 Water-Resistive Barrier Coatings

7.1.1 Prepare a minimum of five test specimens measuring a minimum of 150 mm^2 (6 in.^2) for each substrate that will be evaluated.

7.1.2 For sheathing substrates, two sheathing sections shall be assembled with a 3.2-mm ($\frac{1}{8}$ -in.) joint. The joint shall be treated as it would in its end-use configuration.

7.1.3 Apply the water-resistive barrier coating over the substrate surface in accordance with the manufacturer's instructions. The specimen shall be representative of those used in actual construction. Allow the water-resistive barrier coating to dry a minimum of 24 hours.

7.1.4 The back and sides of the test specimens shall be sealed with an impervious material that need not be the coating.

7.2 EIFS Testing

7.2.1 Prepare a minimum of five test specimens measuring a minimum of 150 mm^2 (6 in.^2) and consisting of the following materials:

7.2.1.1 Substrate,

7.2.1.2 Water-resistive barrier coating (if applicable),

7.2.1.3 Insulation board,

7.2.1.4 Reinforcing mesh, and

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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.

7.2.1.5 Finish.

7.2.2 If a water-resistive barrier coating is included as part of the EIFS System, apply the water-resistive barrier coating over the substrate surface in accordance with the manufacturer's instructions. The specimen shall be representative of those used in actual construction.

7.2.3 Secure the insulation board to the substrate or water-resistive barrier coating (where applicable). Apply the base coat and reinforcing mesh to the surface of the insulation board including the edges. Allow the base coat to cure a minimum of 24 hours.

7.2.4 The back and sides of the test specimens shall be sealed with an impervious material that need not be the water-resistive barrier coating.

8. Conditioning

8.1 Allow the test specimens to cure a minimum of 28 days at room temperature of $22 \pm 3^{\circ}\text{C}$ ($72 \pm 5^{\circ}\text{F}$) and $50 \pm 5\%$ relative humidity.

9. Procedure

NOTE 1—There are two test methods, A and B, that have different cycle times and durations. The manufacturer should specify which test(s) to run.

9.1 Method A (60 Cycles)

9.1.1 Visually observe the test specimens for cracks or damage. Discard any damaged samples and replace them with samples prepared and cured in accordance with Sections 7 and 8.

9.1.2 Submerge the test specimens (finished side down) in the water of the thawing tank. Water temperature shall be $24 \pm 5.5^{\circ}\text{C}$ ($75 \pm 10^{\circ}\text{F}$).

9.1.3 Place a restraining bar across the test specimens to ensure the samples remain at a depth of 5 mm (0.20 in.).

9.1.4 Remove the test specimens from the thawing tank and stand them in the freezing trays. A space of at least 12.7 mm ($\frac{1}{2}$ in.) shall separate the test specimens as placed in the trays. Place the trays and their contents in the freezing chamber for 20 ± 1 hours.

9.1.5 Remove the trays from the freezing chamber after 20 ± 1 hours and submerge the test specimens in the water-thawing tank as shown in 9.1.2 and 9.1.3 for $4 \pm \frac{1}{2}$ hours.

9.1.6 Freeze the test specimens using the procedure described in 9.1.4 for one cycle each day of the normal work week. Following the $4 \pm \frac{1}{2}$ hour-thawing after the last freeze-thaw cycle, remove the test specimens from the trays and store them for 44 ± 1 hours in the drying room. Do not stack or pile units. Provide a space of at least 25.4 mm (1 in.) between all test specimens. Following this period of air drying, inspect the specimens, submerge them in the thawing tank for $4 \pm \frac{1}{2}$ hours, and again subject them to a normal week of freezing and thawing cycles in accordance with 9.1.2 and 9.1.5.

NOTE 2—If a laboratory has personnel available for testing 7 days a week, the requirement for storing the test specimens for 44 ± 1 hours in the drying room following the $4 \pm \frac{1}{2}$ hour-thawing after the last freezing cycle of the week may be waived. The test specimens may then be subjected to this method of freezing and thawing for 60 consecutive days.

9.1.7 Continue to subject the test specimens to Method A (60 cycles) of freezing and thawing.

9.1.8 After completion of Method A, examine the test specimens for deleterious effects. If deleterious effects occur prior to the completion of Method A, stop the test and record the number of cycles completed.

9.2 Method B (10 Cycles)

9.2.1 Visually observe the test specimens for cracks or damage. Discard any damaged samples and replace them with samples prepared and cured in accordance with Sections 7 and 8.

9.2.2 Air dry the test specimens at a temperature of 49°C (120°F) for a minimum of 8 hours.

9.2.3 Submerge the test specimens (finished side down) in the thawing tank. Water temperature shall be $24 \pm 5.5^{\circ}\text{C}$ ($75 \pm 10^{\circ}\text{F}$).

9.2.4 Place a restraining bar across the test specimens to ensure the samples remain a depth of 5 mm (0.20 in.).

9.2.5 Remove the test specimens from the thawing tank and stand them in the freezing trays. A space of at least 12.7 mm ($\frac{1}{2}$ in.) shall separate the test specimens as placed in the trays. Place the trays and their contents in the freezing chamber for 16 h. Temperature of the freezer shall be maintained at -28.9°C (-20°F).

9.2.6 Continue to subject the test specimens to Method B. If deleterious effects occur prior the completion of Method B, stop the test and record the number of cycles completed.

9.2.7 After completion of Method B, view the test specimens for surface changes, under $5\times$ magnification, for deleterious effects such as cracking, checking, crazing, erosion, and so forth.

10. Calculation or Interpretation of Results

10.1 Deleterious effects are defined as surface changes, as viewed by a minimum $5\times$ magnification, such as checking, cracking, crazing, erosion, or other characteristics that may effect performance as a wall cladding. May also include delamination, or indications of delamination between components.

11. Report

11.1 Date of test and date of report.

11.2 Identification of the test specimen by manufacturer's brand or trade name and its components.

11.3 Details of the test assembly, including a description of components, mixing and application, and thickness of components.

11.4 The number of freeze-thaw cycles to which the test specimens were subjected.

11.5 The presence or absence of deleterious effects.

11.6 The nature of deleterious effects.

11.7 A statement that the tests were conducted in accordance with this test method, or a complete description of any deviations from this test method.

11.8 Photographs of a control sample versus the tested samples.

12. Precision and Bias

12.1 No statement is being made about either the precision or bias of this test method for measuring freeze-thaw resistance because the result merely states whether there are deleterious effects.

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