



Standard Practice for Determining the Effects of Temperature Cycling on Fenestration Products¹

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1. Scope

1.1 This practice covers the testing of any fenestration products that are installed with the exterior surface exposed to weathering conditions. It is intended to measure the response of the fenestration product to temperature cycles with the temperature changes being induced by controlling the air temperature on the exterior (weather side) or by exposing the product to infrared radiation, or both. When tested using this practice, fenestration products are exposed to standard cycles of elevated and depressed ambient air and surface temperatures. Test methods are specified for evaluating changes in performance that may occur as a result of temperature cycling. With this practice, seasonal and diurnal temperature conditions are simulated in a controlled laboratory apparatus.

1.2 In this practice, two test methods, Test Method A and Test Method B, are described for exposing the exterior surface of fenestration products to the elevated portion of a standardized temperature cycle. The purpose for providing two test methods of exposure is to address two distinct needs of the fenestration industry.

1.2.1 Test Method A uses infrared radiation to increase the surface temperature of the fenestration product and uses a black panel temperature sensor placed in front of the specimen's exterior surface to sense the temperature. The surface temperature of the black panel temperature sensor is raised to a preset level above the exterior ambient air temperature. This provides a more realistic test for temperature exposure based on atmospheric solar radiation and its effect on the temperature increase of exterior building materials. This method should be used when the number of cycles can be large and the outcome is critical for field correlation. Test Method A is intended for comparative product evaluations.

1.2.2 Test Method B uses elevated temperature produced by convective hot air to achieve the exterior air temperature set-point. It provides a more severe test because it elevates the

exterior air temperature to levels that are not obtainable under in-service conditions. This provides a more rapid degradation cycle for accelerating the effects of the temperature exposure cycling on some materials and fastening methods used in fenestration products. This method is intended to be used when the number of temperature cycles must be minimized or the outcome is not critical for field correlation. Test Method B is intended for research and development purposes and not for comparative product evaluations.

1.3 In this practice, three temperature exposure levels are suggested for each method: Level 1 is a low temperature exposure, Level 2 is a moderate temperature exposure, and Level 3 is a high temperature exposure. The purpose of providing three levels of temperature exposure is to accommodate different grades of fenestration products based on their designs and their potential geographic installation locations. Other temperature levels may be selected by the specifier.

1.3.1 Performance characteristic measurements are used to evaluate the effects on the fenestration product caused by temperature cycling. They are measured by the following tests:

1.3.1.1 Air leakage rates shall be measured in accordance with Test Method E283.

1.3.1.2 Water penetration resistance shall be measured in accordance with Test Method E331 or Test Method E547.

1.3.1.3 Structural strength shall be measured in accordance with Test Method E330. This test shall only be performed when specified and only after temperature cycling is completed.

1.3.2 The test specifier may also choose additional tests to characterize fenestration product performance. (See Note 3 for suggested additional tests.)

1.3.3 For the purposes of product comparison, these tests are performed at or near standard laboratory conditions, but for research and development purposes, they may also be performed during an elevated or depressed portion of the temperature cycle in order to measure the effects of the temperature extreme on the performance parameter being evaluated. For the purposes of comparative evaluation, the parameters defined in 11.2 shall be used.

1.4 Values reported in SI units are to be regarded as the standard. The units reported in parentheses are for information only.

¹ This practice is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.51 on Performance of Windows, Doors, Skylights and Curtain Walls.

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