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.

Designation: D1006/D1006M – 26

Standard Practice for Conducting Exterior Exposure Tests of Hand and Factory Applied Paints on Wood and Wood Composite Materials[1]

This standard is issued under the fixed designation D1006/D1006M; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This practice covers procedures to be followed for direct exposure of house and trim paints on new, previously unpainted wood and wood composite materials to the environment. When originators of a weathering test have the actual exposure conducted by a separate agency, the specific conditions for the exposure of test and control specimens should be clearly defined and mutually agreed upon between all parties.

1.2 This standard covers specimen preparation including the application of the test paint to the wood substrate.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.4 *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.*

1.5 *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]

D523 Test Method for Specular Gloss
D660 Test Method for Evaluating Degree of Checking of Exterior Paints
D661 Test Method for Evaluating Degree of Cracking of Exterior Paints
D714 Test Method for Evaluating Degree of Blistering of Paints
D772 Test Method for Evaluating Degree of Flaking (Scaling) of Exterior Paints
D2244 Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
D4214 Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
D5237 Guide for Evaluating Fabric Softeners
D6132 Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Using an Ultrasonic Coating Thickness Gage
D7787 Practice for Selecting Wood Substrates for Weathering Evaluations of Architectural Coatings
E122 Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process
E1677 Specification for Air Barrier (AB) Material or Assemblies for Low-Rise Framed Building Walls
G7 Practice for Natural Weathering of Materials
G113 Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials

[1] This practice is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.27 on Accelerated Testing.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard

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G147 Practice for Conditioning and Handling of Materials for Natural and Artificial Weathering Tests

3. Terminology

3.1 *Definitions*—The definitions given in Terminology G113 are applicable to this practice.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *rainscreen, n*—a system of construction where the siding stands off from the moisture-resistant surface of a building wall, creating an air gap to allow drainage and ventilation.

4. Significance and Use

4.1 The procedure described in this practice is intended to aid in evaluating the performance of house and trim paints to new, previously unpainted wood.

4.2 The relative durability of paints in outdoor exposures can be very different depending on the location of the exposure because of differences in solar radiation, time of wetness, temperature, pollutants, and other factors. Therefore, it cannot be assumed that results from one exposure in a single location will be useful for determining relative durability in a different location. Exposures in several locations with different climates which represent a broad range of anticipated service conditions are recommended.

4.2.1 Because of year-to-year climatological variations, results from a single exposure test cannot be used to predict the absolute rate at which a material degrades. Several years of repeat exposures are needed to get an "average" test result for a given location.

4.2.2 Solar radiation varies considerably as function of time of year. This can cause large differences in the apparent rate of degradation in many paints. Comparing results for materials exposed for short periods (less than one year) is not recommended unless materials are exposed at the same time in the same location.

4.2.3 It is recommended that at least three replicates of each material be tested. A statistical estimate of the number of replicates needed based on parameters known about the material can be found in Practice E122.

4.3 The Significance and Use section in Practice G7 addresses many variables to be considered in exterior exposure tests.

5. Location of Test Sites and Exposure Orientation

5.1 *Test Sites*—The climatic conditions of the test sites should be representative of those of the area in which the paints are to be used. The type and rate of failure of a paint film will vary when exposed to different combinations of climatic and atmospheric conditions. For reliable results, exposure sites should be selected that are representative geographically, climatically, and in atmospheric contaminations with those of the locality in which the paint will be used. To obtain conclusions that are valid for paints with national distribution requires exposure at several sites, selected to cover a wide range in climatic conditions. Suggested sites include South Florida, the Great Lakes region, the hot desert southwest, the northeast, and extreme southern Louisiana.

5.2 *Exposure Orientation*—Unless otherwise specified, specimens for testing house paint should be exposed on vertical test fixtures facing either north or south, or both. In comparisons where dirt collection and mildew resistance are not pertinent, north vertical exposures may be omitted. Test fixtures shall be placed in a location so that there is no shadow on any specimen when the sun's angle of elevation is greater than 20°. Specimens can be exposed at other " exposure angles" in order to focus on the degradation mode desired. Typical exposure angles are as follows:

5.2.1 *Vertical North (Northern Hemisphere)*—Exposure rack is positioned so that the exposed surfaces of specimens are vertical (90°) facing north, away from the equator. This orientation encourages the growth of biological organisms since the amount of direct sunlight reaching the specimens is reduced or completely eliminated depending on latitude.

NOTE 1—Significant amounts of sunlight will fall directly onto North facing specimens at lower latitudes in the summer months.

5.2.2 *Vertical South (Northern Hemisphere)*—Exposure rack is positioned so that the exposed surfaces of the specimens are vertical (90°) facing south, toward the equator. This orientation allows direct sunlight to reach the specimens and results in degradation commonly associated with ultraviolet exposure.

5.2.3 *Other Exposure Orientations*—If desired, exposures may also be conducted at other angles or facing directions to provide faster results. See Practice G7 for more information on other exposure options.

NOTE 2—A 45 degree exposure facing the equator may speed up the deterioration compared to a vertical exposure, but the change in angle may also change the type of failure mode.

5.3 In the case where it is desirable to expose coated panels in a sheltered area, such as under eaves, a suitable test rack with a sheltered or eave arrangement can be used.

6. Construction of Test Fixtures (Exposed Racks)

6.1 Test fixtures should be durable and rigid enough to withstand the effects of weather. All materials used for test fixtures shall be either treated wood or noncorrodible metal without surface treatment. Aluminum Alloys 6061T6 or 6063T6 have been found suitable for use in most locations.

6.2 *Test Fixture Design*—Test racks of several different designs are currently used for the exposure testing of paints on wood. Test racks for the exposure of paints and trims that more closely simulate end-use applications, including under eave and rainscreen exposures, are presented fully in Appendix X1. Test racks that are commonly used for the exposure of wood siding boards, primarily for the evaluation of mildew growth, dirt accumulation, and color change are shown in Fig. 1. These racks can be configured to hold specimens or specimen holders of any convenient width and length. An offset design (notched cutouts) in the mounting hardware shall be used in order to reduce contamination from rain runoff from specimens mounted above other specimens. Offsets shall be of the proper size to accommodate the width of the siding board. Typically, 152 mm [6 in.] or 230 mm [9 in.] sized offsets are used. Other sizes are available. An example of an offset mounting hardware is shown in Fig. 2.

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FIG. 1 Typical Exposure Rack

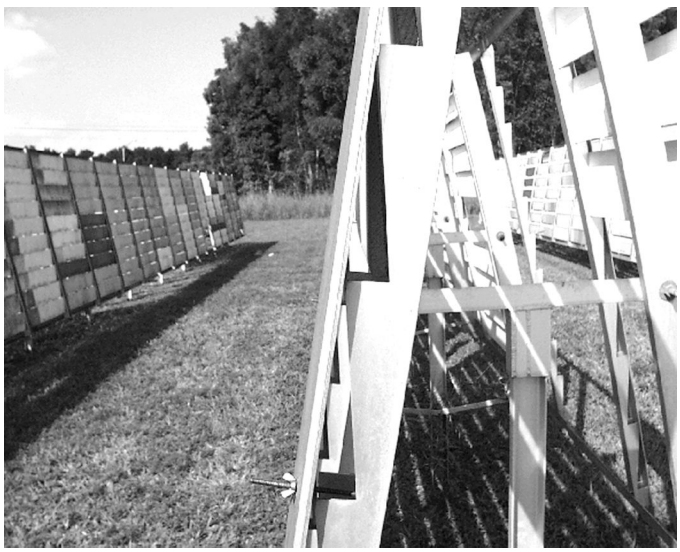


FIG. 2 Offset Mounting Hardware

6.3 To create a sheltered eave type exposure, place a 90 degree cap along the top of the exposure rack which projects 25 mm [1 in.] beyond the face of the mounted panels.

7. Construction of Test Specimens

7.1 Choose a wood substrate in accordance with Practice D7787. Prior to use, test lumber and panels shall be stored under such conditions that the moisture content of the wood will be maintained within the normal range for exterior woodwork in the region in which the tests are conducted. Exposures on wood substrates should be performed on three panels to allow for variations in wood. In selecting wood test boards, care should be taken to consider features of cladding that may be present in usage environments such as variations and orientation of grain patterns, age, and presence of knots.

7.2 For house paints, unless the pattern of siding requires some other choice, test panels should be made of one or the other of two patterns of siding, namely 127 mm [0.5 in.] or 190 mm [0.75 in.] bevel siding or 25 mm [1 in.] by 152 mm [6 in.] drop siding. A test panel may be subdivided into two or more test areas. A subdivided panel is one complete panel in which multiple paint specimens are applied to sections of the panel. If the panels in the house paint test are not subdivided, one 914 mm [3 ft] length of 152 mm siding will be acceptable. If the panels are subdivided, each test area shall be a minimum of 152 mm in length.

7.3 For trim paints, the test panel may have 25 mm [1 in.] by 102 mm [4 in.] pieces of lumber at each end.

7.4 For exposures of paints on test fixtures described in 6.2 and Fig. 1, a test panel should be a 914 mm [36 in.] length of 152 mm [6 in.] siding substrate unless otherwise agreed upon. Each area shall be a minimum of 152 mm in length. Each test area can be painted with a different paint thus providing a side-by-side comparison for performance.

NOTE 3—It is important to remember that up to 75 mm [3 in.] of each end of the test panel will be masked by the exposure rack.

7.5 When it will not interfere with the property to be tested, all panels should be coated on the back to protect against warping.

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