



Designation: D7787/D7787M – 13 (Reapproved 2022)

Standard Practice for Selecting Wood Substrates for Weathering Evaluations of Architectural Coatings¹

This standard is issued under the fixed designation D7787/D7787M; 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 practice offers guidelines for selecting wood or wood composite substrates for the evaluation of specific weathering performance characteristics of architectural coatings such as exterior paints, primers, and deck finishes.

1.2 Procedures include selecting wood species and choosing individual wood test panels through visual examination of the wood characteristics.

1.3 This practice is intended to cover the most commonly employed wood substrates used in weathering studies of architectural coatings. It is not intended to serve as a comprehensive guide for all wood species that may be employed for the purpose of evaluating weathering performance characteristics of architectural coatings.

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 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.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *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.*

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 D01.42 on Architectural Coatings.

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2. Referenced Documents

2.1 *ASTM Standards:*²

D4214 Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films

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

3. Terminology

3.1 *Definitions:*

3.1.1 *weathering performance characteristic, n*—an attribute displayed by a coating after a period of exposure to natural sunlight, UV light, moisture, varying temperatures or other environmental elements.

3.1.1.1 *Discussion*—Weathering performance characteristics may include film integrity attributes such as checking, cracking, peeling, flaking, erosion, chalking; appearance attributes such as gloss or color retention; or resistance to dirt pickup, mildew, or algal defacement.

3.1.2 *wood condition factor, n*—an attribute of a wood panel that indicates its state prior to being used in a coatings performance evaluation.

3.1.2.1 *Discussion*—Wood condition factors may include duration of time since the panel was milled, chemical pretreatments, or exposure to environmental elements prior to being coated.

3.1.3 *wood panel, n*—a thin, flat substrate material composed of any species of wood or wood composite.

4. Summary of Practice

4.1 The experimenter first determines the critical weathering performance characteristics of the architectural coating being tested and determines the species and lumber grade of a wood or wood composite that is similar to the in-service application of the wood that is to be studied.

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.

4.2 Wood species are selected based on the weathering performance characteristics of interest and the species that will likely be used for the studied application.

4.3 Individual test panels are selected based on visual observation of the following features: (a) growth patterns (rate of growth, % latewood, grain, etc.), (b) grain orientation, (c) characteristic feature (knots, checks, glue lines, etc.), and (d) color characteristics frequently associated with heartwood or sapwood of the wood and the type of wood extractives of the in service wood. Selection should be done using quantitative or qualitative criteria to ensure the best substrate representation for the test series. When evaluating multiple coating samples on the same board, in selecting the board, care must be taken to assure that the areas designated for each paint sample contain similar characteristic features mentioned above to insure proper comparison of coating durability.

5. Significance and Use

5.1 Natural weathering tests can take several years and accelerated weathering evaluations often run for cycles requiring several weeks or months before obtaining useful data. Correlating wood panels selection with desired weathering performance characteristics assists a coatings experimenter in maximizing information in the desired time frame.

5.2 Because of the long time spans required for exposure testing, it is critical to plan a reliable experiment while controlling as many variables as possible. For this reason, selection of experimental panels made from representative wood species or composites, grades of lumber and surface types that are expected to be painted is very important.

5.3 This practice may be used for any types of exterior architectural coating intended for use on wood or wood composite substrate such as exterior house paints, primers, wood stains, or waterproofer.

6. Procedure

6.1 *Determine Critical Weathering Performance Characteristics:*

6.1.1 The determination of critical weathering performance characteristics is at the discretion of the experimenter depending on the performance indicators of interest for the coating system being evaluated.

6.1.2 Weathering characteristics typically of interest may include:

6.1.2.1 Film deterioration factors such as cracking, peeling, flaking, chalking, or blistering.

6.1.2.2 Ability of coating to adhere to wood or wood composite surface over extended periods as the substrate expands and contracts due to moisture, or thermal influences, or both.

6.1.2.3 Visual appearance factors such as color or gloss retention.

6.1.2.4 Extractive bleeding or other paint discoloration associated with the wood substrate.

6.1.2.5 Resistance to fungal or algal defacement.

6.1.2.6 Resistance to dirt pick-up.

6.2 Select wood characteristics for the experiment that will provide the most relevant results for the exposure experiment in the desired timeframe. Wood features and wood condition factors (as defined in 3.1.2) together with coating formulation and application method, including dry film thickness or coverage spread rate will determine the speed and extent of exhibited weathering performance characteristics.

6.2.1 Pre-weathering of wood substrates affects the weathering performance of coatings. Significant changes in the weathering results of coatings may be observed from periods of pre-weathering as short as one week. For this reason, adequate pre-weathering of panels is required if paint is to be applied sometime after wood installation on the structure.

6.2.2 Different types of wood chemical or thermal treatments, composite glue lines or type of binder used may impact a coatings performance or longevity.

6.3 *Select Wood Species (younger than 60 years old):*

6.3.1 *Southern Yellow Pine (Pinus spp.)*—This wood type is among the most commonly employed wood substrates for weathering tests due to its availability and low dimensional stability. It includes species such as shortleaf, slash, loblolly, and longleaf. Pine is often selected where film deterioration characteristics such as cracking, checking, and flaking are required. Pine boards tend to flex and expand more than other wood species in varying environmental conditions. Specific features of pine species are resin pockets and bleeding resin. For this reason, pine lumber used in a majority of architectural applications such as siding or trim boards must be kiln dried at a high temperature to set the resin.

6.3.2 *Cedar*—The term “Cedar” is a general term that can be applied for True Cedar (*Cedrus spp.*) but is also used for Western Redcedar (*Thuja plicata*) and Eastern Redcedar (*Juniperus virginiana*). Cedars generally will give a more dimensionally sound surface than Pine species. Film durability failures will normally take longer over cedar than pine. Cedar panels can be used to assess gloss and color retention, and it can be used to observe tannin stain-blocking resistance.

6.3.3 *Redwood (Sequoia sempervirens)*—Generally selected for its heavy tannin content to observe stainblocking effectiveness of architectural primers or topcoats.

6.3.4 *Pressure Treated Pine*—Includes various chemically treated wood. Pressure treated lumber is generally used for studying weathering effects of deck finishes, wood stains and waterproofing coatings. Pressure-treated pine is often selected to study erosion or film deterioration of waterproofing coatings, and long-term water repellent characteristics.

6.3.5 *Engineered Wood Trim (EWT) and Siding*—Includes manufactured wood products composed of wood segments, flakes, particles, or fiber-based composites, or combinations thereof. Use of EWT and siding now command a significant share of the wood cladding market. Thus, it is critical to evaluate these products in any general architectural finish performance evaluation.

6.4 *Selection of Wood Test Panels for Natural Weathering:*

NOTE 1—The techniques described for selection of wood test panels may be applied to any wood species and are not limited to the species listed previously.

NOTE 2—Supplementary information related to wood structure and