
GUIDANCE DOCUMENT G: SURFACE APPLIED WOOD PRESERVATIVE FINISH PERFORMANCE TESTING GUIDELINES

Jurisdiction: Technical Committee P-6

Adoption: Previously Appendix G to the AWP Technical Committee Regulations, this document was converted to a Guidance Document by the AWP Executive Committee in January 2013.

This Guidance Document is not an AWP Standard. These are nonmandatory guidelines presented to aid the user in understanding the basic testing requirements for wood protection systems and to assist the AWP Technical Committees in the development of AWP Standards. The testing of products in accordance with this Guidance Document does not constitute conformance to any AWP Standard. No product can be considered to conform to an AWP Standard until it has been subjected to complete technical review and voting by AWP's Technical Committees, and procedural review and final action by the AWP Executive Committee pursuant to the AWP Technical Committee Regulations.

Introduction. This performance testing guideline is a companion to AWP Guidance Document D: Protocol for Standardization of New Wood Preservative Finishes. The guideline's goal is to outline specific tests that can be used to evaluate performance properties of surface applied wood preservative finishes and coatings. These properties include the condition of the product prior to application, as well as the performance of the treatment. The standard tests described below can be used as a basis in product testing. The tests can be used to evaluate the effectiveness of any clear, toner, or stain that is marketed as a wood preservative finish. The tests are to be used where applicable.

1.0 Definitions. For the purpose of this guideline, the following coating definitions apply:

Clear – Any product, water borne or solvent borne, that does not obscure or alter the aesthetic qualities (color, texture, etc.) of the substrate upon application and drying.

Semi-Transparent Stain – Any product, water borne or solvent borne, that alters a substrate's color but does not hide or obscure the grain pattern or surface texture that may be present.

Solid-Stain – Any product, water borne or solvent borne, that changes a substrate's color and hides the grain pattern, but does not obscure the surface texture.

Toned Finish – Any product, water borne or solvent borne, that alters a substrate's color but whose final color is greatly influenced by the substrate itself. The coating does not hide or obscure the grain pattern or surface texture of the substrate.

All of the tests mentioned are currently in use by industry and describe the desired product performance.

2.0 Testing

2.1 Product Condition: The stability of the product should be confirmed. Different aspects of stability include changes in the formula's physical and chemical properties after storage. Typical storage conditions used for evaluation are room temperature, 49°C (120° F), and 4°C (40° F). The properties investigated depend on the product's carrier base (i.e. solvent or water), and can include specific gravity, viscosity, settling, particle size, and pH. The stability of any biocide present in the product should be determined. The appropriate analytical procedures should be used to determine the active concentration before and after stability storage. Concentrated products, in addition to the above-mentioned properties, should be tested for dilution stability.

For those finishes registered under FIFRA, the biocide/biocides used in the product shall comply with all applicable federal and state EPA regulations. The concentration used shall comply with the recommended usage for either above ground or ground contact, depending on the product's end use.

The following tests can be used to determine a finish's physical properties:

Federal Test Method Standard No. 141, Method 4203, Dilution stability determination

ASTM D1849– Test Method for Package Stability of Paint

ASTM D2243 – Test Method for Freeze-Thaw Resistance of Waterborne Coatings

ASTM D1475 – Test Method for Density of Paint, Varnish, Lacquer, and Related Products

ASTM D1200 – Test Method for Viscosity by Ford Viscosity Cup

ASTM D2196 – Test Method for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield) Viscometer

ASTM D1640 – Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature

ASTM D56 – Test Method for Flash Point by Tag Closed Cup Tester

ASTM E70 – Test Method for pH of Aqueous Solutions with the Glass Electrode

ASTM D2369 – Test Method for Volatile Content of Coatings

ASTM D5095 – Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes, and Silane-Siloxane Blends Used in Masonry Water-Repellent Treatments

ASTM D3960 – Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings

2.2 Package Container Stability: Tests should be conducted to determine if there is any container/product interaction. Characteristics investigated should include the above referenced Standards. In addition, any degradation of the container should be examined and its cause investigated.

2.3 Product Performance: The performance characteristics of the product are determined by its desired end use. For example, water repellent preservatives should be tested for initial water repellency, long term water repellency, preservative penetration and retention, and preservative performance. If mildewcidal claims are made, additional testing should be conducted to determine the coating's efficacy. Following are categories of Standards that can be used to quantify a coating's performance.

2.3.1 Water Repellency:

Federal Specification TT-W-572b – Anti Swelling Effectiveness of Water Repellent Treatments for Wood

ASTM D4446 – Standard Test Method for Anti-Swelling Effectiveness of Water -Repellent Formulations and Differential Swelling of Untreated Wood When Exposed to Liquid Water Environments

ASTM D5401 – Standard Test Method for Evaluating Clear Water Repellent Coatings on Wood

AWPA NI-96 – All Millwork Products-Preservative Treatment by Nonpressure Process

WDMA TM-2 – Swellometer Test (Water Repellent test part of IS4 protocol)

ISO/DIN 4496 – Wood Test Method-Determination of the Radial and Tangential Shrinkage

2.3.2 Weathering: The ability of a coating to perform when exposed to the environment can be measured using a variety of methods. These methods include both accelerated and natural weathering. Accelerated testing should be conducted over a length of time that ensures adequate correlation to natural weathering.

2.3.2.1 Accelerated: Accelerated testing should be conducted on the intended end use substrates. Different species and grain angles should be used to conduct the exposures. Product should be applied in a manner consistent with the expected application method and coverage rates. The following test methods can be used as guidelines for performing accelerated weathering tests:

ASTM G53 – Practice for Operating Light- and Water-Exposure Apparatus (fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials

ASTM D358 – Standard Specification for Wood to be Used as Panels in Weathering Tests of Coatings

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

ASTM G90 – Standard Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight

ASTM D4587 – Standard Practice for Conducting Tests on Paint and Related Coatings and Materials Using a Fluorescent UV-Condensation Light- and Water-Exposure Apparatus

ASTM G26 – Standard Practice for Operating Light-Exposure Apparatus (Xenon-Arc Type) with and without Water for Exposure of Nonmetallic Materials

ASTM D4141 – Practice for Conducting Accelerated Outdoor Exposure Tests of Coatings

2.3.2.2 Natural: Natural weathering should be conducted on the intended end use substrates. Different species and grain angles should be used to conduct the exposures. Product should be applied in a manner consistent with the expected application method and coverage rates. The coated substrates, and uncoated controls, should be mounted in a test rack that simulates the different exposure conditions the coatings may experience. These include northern and southern exposure, and different exposure angles (i.e. 90°, 45°, 5° from horizontal). The properties evaluated during weathering are dependent on the intended efficacy of the coating. Exposure should proceed to the coating's failure, and give adequate results to substantiate label claims. The following methods offer guidelines in performing exterior testing:

ASTM D358 – Standard Specification for Wood to be Used as Panels in Weathering Tests of Coatings

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

ASTM D1006 – Practice for Conducting Exterior Exposure Tests of Paints on Wood

ASTM D2921 – Test Method for Qualitative Tests for the Presence of Water Repellents and Preservatives in Wood Products

2.3.2.3 A minimum of triplicate exposure specimens should be used to conduct the accelerated and natural exposure testing. The wood species used to conduct the tests should be the target end use species. For instance, pressure treated wood (southern yellow pine or hem-fir), white cedar, and possibly redwood, if the product is to be sold in California, should be used to evaluate coatings intended for deck use. To ensure comparative and reproducible data, care should also be taken to maintain a consistent grain angle (i.e. flat sawn, rift sawn, or quarter sawn) within testing groups.

2.3.3 Surface Appearance: The ability of a coating or finish to retard the change in surface appearance when exposed to the environment is dependent on the ingredients used in the applied coating. The test methods used to examine the change in surface appearance can be used to evaluate clear products, as well as stains and toned finishes. The different aspects of surface appearance change can be quantified using the following tests:

ASTM D2921 – Standard Test Method for Qualitative Tests for the presence of Water Repellents and Preservatives in Wood Products

ASTM D2244 – Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates

ASTM D3456 – Standard Practice for Determining by Exterior Exposure Tests the Susceptibility of Paint Films to Microbiological Attack

ASTM D3274 – Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation

2.4 Preservative Performance: If the coating is regulated under FIFRA and is marketed as a wood preservative, either above ground, below ground, or both, the following test methods can be used to determine its performance characteristics.

AWPA E7 – Standard Method of Evaluating Wood Preservatives by Field Tests with Stakes

AWPA E9 – Standard Field Test for the Evaluation of Wood Preservatives to be used in Non-Soil Contact

AWPA N1 – All Millwork Products - Preservative Treatment by Non-Pressure Process

AWPA E10-91 – Standard Method of Testing Wood Preservatives by Laboratory Soil-Block Culture

AWPA E16 – Field Test for Evaluation of Wood Preservatives to be Used Exposed Out of Ground Contact: Horizontal Lap-Joint Method

WDMA TMI – Soil Block Test - Standard Method for Testing the Preservative Property of Wood Preservatives by Using Wood Specimens Uniformly Impregnated

2.5 Adhesion: If the product is to be used as a pretreatment, its effect on the adhesion of a topcoat should be determined. Following are tests that can be used to determine adhesion:

ASTM D3359 – Test Methods for Measuring Adhesion by Tape Test

ASTM D968 – Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive

ASTM D2197 – Test Method for Adhesion of Organic Coatings by Scrape Adhesion

3.0 Performance Report: The performance of the wood preservative finish or coating will be presented in a format describing the stability of the product as well as its performance. This report can be used to substantiate label claims.

4.0 References:

ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428

AWPA, P.O. Box 361784, Birmingham, AL 35236-1784

WDMA, 2025 M Street NW, Suite 800, Washington, DC 20036

ISO/DIN - Obtained in the USA from: ANSI, 11 W. 42nd Street, New York, NY 10036