



Standard Test Methods for Penetration of Preservatives in Wood and for Differentiating Between Heartwood and Sapwood¹

This standard is issued under the fixed designation D 3507; 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 These test methods cover procedures for determining penetration of preservatives in wood in cases where demarcation between the treated and untreated wood is not readily visible. Included are test methods for differentiating the heartwood and the sapwood of wood samples for specific species, and a test method for differentiating the heartwoods between the red oaks and the white oaks.

1.2 The procedures appear in the following order:

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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 determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D 1193 Specification for Reagent Water

2.2 *Other Standards:*

AWPA Standard A 3-84, Methods for Determining Penetration of Preservatives and Fire Retardants³

AWPA Standard M 2-83, for Inspection of Treated Timber Products³

AWPA Standard P 9-84, Standards for Solvents and Formulations for Organic Preservative Systems³

3. Summary of Test Methods

3.1 A specific chemical solution or powder for each preservative is applied to a wood specimen or cross section of wood to bring out a color that is distinctive for the particular preservative.

3.2 A chemical solution, specific for a species of wood, is applied to a wood specimen or cross section of wood to bring out colors distinctive to sapwood and heartwood.

4. Significance and Use

4.1 Preservatives of the metallic series and oil soluble preservatives are not readily apparent in a cross section of wood either due to similar color to the species of wood or lack of color of the preservative itself. Chemical staining of a treated specimen of wood reveals the presence of the preservative.

4.2 The sapwood and heartwood of Douglas-Fir and the pine species can be differentiated by a chemical stain.

¹ These test methods are under the jurisdiction of ASTM Committee D07 on Wood and are the direct responsibility of Subcommittee D07.06 on Treatments for Wood Products.

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These test methods are substantially the same as AWPA Standards A 3 and M 2.

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.

³ Available from American-Wood-Preservatives Assn., P.O. Box 286, Woodstock, MD 21163-0286.

5. Reagents

5.1 *Purity of Reagent*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.⁴ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

5.2 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean reagent water conforming to Specification D 1193, Type I or II.

PENETRATION OF ARSENIC-CONTAINING PRESERVATIVES

6. Apparatus

- 6.1 *Balance*.
- 6.2 *Atomizers (Optional)*—3.
- 6.3 *Medicine Dropper*.

7. Reagents

- 7.1 *Ammonium Molybdate* $((\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4 \text{H}_2\text{O})$.
- 7.2 *o-Anisidine*.
- 7.3 *Hydrochloric Acid* (sp gr 1.19)—Concentrated hydrochloric acid (HCl).
- 7.4 *Hydrochloric Acid* (1.7 %)—Mix 8.5 g of concentrated HCl (sp gr 1.19) with 491.5 g of water.
- 7.5 *Hydrochloric Acid* (1+1)—Mix 1 volume of concentrated HCl (sp gr 1.19) with 1 volume of water.
- 7.6 *Solution 1*—Dissolve 3.5 g of ammonium molybdate in 90 mL of water, then add 9 mL of concentrated HCl.
- 7.7 *Solution 2*—Dissolve 1 g of *o*-anisidine in 99 g of 1.7 % HCl.
- 7.8 *Solution 3*—Dissolve 30 g of stannous chloride in 100 mL of HCl (1+1).
- 7.9 *Stannous Chloride* $(\text{SnCl}_2 \cdot 2 \text{H}_2\text{O})$.

8. Procedure

8.1 Apply Solution 1 first, followed by Solution 2 and Solution 3 in that order. Apply the solutions by dropping the solution on the wood with a medicine dropper, by pouring the solutions over the wood, or by spraying the solutions on the wood using a fine mist sprayer. Allow 2 min between application of each solution. Spraying is the preferred procedure.

8.2 After Solution 3 is applied, the areas of the wood specimen that contain arsenic will immediately turn blue. This blue color may tend to fade but may be restored by another application of Solution 3.

PENETRATION OF COPPER-CONTAINING PRESERVATIVES

9. Apparatus

- 9.1 *Atomizer*.
- 9.2 *Graduate*, 100-mL.
- 9.3 *Balance*.
- 9.4 *Medicine Dropper*.

10. Reagents

- 10.1 *Chrome Azurol S*.
- 10.2 *Chrome Azurol S—Sodium Acetate Solution*—Dissolve 0.5 g of chrome azurol S and 5.0 g of sodium acetate in 80 mL of water and dilute to 500 mL.
- 10.3 *Sodium Acetate*.

11. Procedure

11.1 Spray the solution over split increment cores or freshly cut surfaces of the treated sample. A deep blue color reveals the presence of copper.

PENETRATION OF FLUORIDE-CONTAINING PRESERVATIVES

12. Scope

12.1 The mixed stock solutions will not work satisfactorily after standing 1 h. Therefore, minimum quantities of the mixed stock solutions should be made up to avoid wastage.

12.2 The surface of the wood should be well dried before testing. Results are not reliable on wet surfaces.

13. Apparatus

- 13.1 *Atomizer*.
- 13.2 *Balance*.
- 13.3 *Medicine Dropper*.

14. Reagents

- 14.1 *Hydrochloric Acid* (sp gr 1.19)—Concentrated hydrochloric acid (HCl).
- 14.2 *Sodium Alizarin Sulfonate*.
- 14.3 *Solution 1*—Mix 0.5 g of sodium alizarin sulfonate in 100.0 g of water.
- 14.4 *Solution 2*—Mix 0.5 g of zirconyl chloride in 30.0 g of HCl and 70.0 g of water.
- 14.5 *Solution, Mixed*—Mix equal quantities of Solution 1 and Solution 2 by adding Solution 1 to 2 (red to white); otherwise, a proper reaction will not take place.
- 14.6 *Zirconyl Chloride*.⁵

15. Procedure

15.1 Spray or drop the mixed solution on the surface of the split increment core or cross section of wood to be tested. The atomizer should be held about 75 mm (3 in.) from the surface under test and the spraying continued until the surface can be seen to be wetted. No running of the condensed spray must

⁴ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.

⁵ Fisher Z-80 or an equivalent have been found suitable and is available from Fisher Scientific Co., Pittsburgh, PA.