



## ACCEPTANCE CRITERIA FOR DISODIUM OCTABORATE TETRAHYDRATE (DOT) WOOD PRESERVATIVE TREATMENT SYSTEMS

AC62

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### PREFACE

Evaluation reports issued by ICC Evaluation Service, Inc. (ICC-ES), are based upon performance features of the International family of codes and other widely adopted code families, including the Uniform Codes, the BOCA National Codes, and the SBCCI Standard Codes. Section 104.11 of the *International Building Code*® reads as follows:

The provisions of this code are not intended to prevent the installation of any materials or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

Similar provisions are contained in the Uniform Codes, the National Codes, and the Standard Codes.

This acceptance criteria has been issued to provide all interested parties with guidelines for demonstrating compliance with performance features of the applicable code(s) referenced in the acceptance criteria. The criteria was developed and adopted following public hearings conducted by the ICC-ES Evaluation Committee, and is effective on the date shown above. All reports issued or reissued on or after the effective date must comply with this criteria, while reports issued prior to this date may be in compliance with this criteria or with the previous edition. If the criteria is an updated version from the previous edition, a solid vertical line (|) in the margin within the criteria indicates a technical change, addition, or deletion from the previous edition. A deletion indicator (→) is provided in the margin where a paragraph has been deleted if the deletion involved a technical change. This criteria may be further revised as the need dictates.

ICC-ES may consider alternate criteria, provided the report applicant submits valid data demonstrating that the alternate criteria are at least equivalent to the criteria set forth in this document, and otherwise demonstrate compliance with the performance features of the codes. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria set forth in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria in this document and otherwise demonstrate compliance with the performance features of the codes, ICC-ES retains the right to refuse to issue or renew an evaluation report, if the product, material, or type or method of construction is such that either unusual care with its installation or use must be exercised for satisfactory performance, or if malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use of the product, material, or type or method of construction.

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# ACCEPTANCE CRITERIA FOR DISODIUM OCTABORATE TETRAHYDRATE (DOT) WOOD PRESERVATIVE TREATMENT SYSTEMS

## 1.0 INTRODUCTION

**1.1 Purpose:** The purpose of this criteria is to establish requirements for disodium octaborate tetrahydrate (DOT) wood preservative treatment systems, for both interior and exterior applications in accordance with the applicable EPA labeling, of lumber and plywood by pressure processes (proprietary), to be recognized in an ICC Evaluation Service, Inc. (ICC-ES), evaluation report under the 2006 *International Building Code*® (IBC), the 2006 *International Residential Code*® (IRC), the BOCA® *National Building Code/1999* (BNBC), the 1999 *Standard Building Code*® (SBC), and the 1997 *Uniform Building Code*™ (UBC). The bases of recognition are IBC Section 104.11, IRC Section R104.11, BNBC Section 106.4, SBC Section 103.7 and UBC Section 104.2.8. For applicable code sections, refer to AC326.

The reason for the development of this criteria is to evaluate a proprietary wood preservative for resistance to decay and termites, since Section 2304.1.1 of the IBC and Sections R319 and R320 of the IRC do not provide test methods and performance requirements for documenting resistance to decay and termites.

**1.2 Scope:** The ICC-ES Acceptance Criteria for Proprietary Wood Preservative Systems—Common Requirements for Treatment Process, Test Methods and Performance Requirements (AC326) shall be used for evaluating disodium octaborate tetrahydrate (DOT) wood preservative systems, except when noted otherwise in this criteria. Preservative-treated lumber and plywood that is in accordance with this acceptance criteria is subject to the following exposure limitations:

### 1.2.1 Preservative-treated Wood Exposure Limitations:

**1.2.1.1 DOT Preservative:** Lumber and plywood treated solely with DOT preservative to the minimum retention and penetration specified in Table 1 shall be limited to locations that are not in contact with the ground and are not subject to contact with liquid water (AWPA UC2).

**1.2.1.2 DOT and Proprietary Polymer Binder:** Lumber and plywood treated with DOT and proprietary polymer binder to the minimum retention and penetration as determined in accordance with Section 4.0 shall be specified in Table 2 and noted in the final evaluation report, shall be considered acceptable for interior and exterior use, but shall be limited to locations that are not in contact with the ground (AWPA UC3B).

**1.2.1.3 DOT and Proprietary Organic Binder:** Lumber and plywood treated with DOT and proprietary organic binder to the minimum retention and penetration as determined in accordance with Section 4.0 shall be specified in Table 2 and noted in the final evaluation report; shall be considered acceptable for interior and exterior use; but shall be limited to locations that are not in contact with the ground (AWPA UC3B).

**DOT-insecticide:** Lumber and plywood treated with DOT-insecticide shall have retentions and penetrations specified in the approved quality control manual submitted

by the applicant for an evaluation report, and shall be limited to locations that are not in contact with the ground and are not subject to contact with liquid water (AWPA UC2).

**1.3 Codes and Reference Standards:** Where standards are referenced in this criteria, these standards shall be applied consistently with the code upon which compliance is based. Codes and standards are listed in Section 1.3 of AC326. Standards not listed in AC326 that are required for evaluation of DOT wood preservative systems are listed below:

### 1.3.1 American Wood-Preservers' Association (AWPA):

**1.3.1.1** 2006 American Wood-Preservers' Association (AWPA) Book of Standards®.

**1.3.1.2** AWPA Standard A2-06®, Standard Methods for Analysis of Waterborne Preservatives and Fire-Retardant Formulations.

**1.3.1.3** AWPA A21-00®, Standard Method for the Analysis of Wood and Wood Treating Solutions by Inductively Coupled Plasma Emission Spectrometry.

**1.3.1.4** AWPA Standard C31-02®, Commodity Standard for Lumber Use Out of Contact with the Ground and Continuously Protected from Liquid Water—Treatment by Pressure Processes.

**1.3.1.5** AWPA E15-03®, Evaluating the Efficiency of Diffusible or Volatile Internal Remedial Preservatives.

### 1.3.2 ASTM International Reference Standards:

**1.3.2.1** ASTM D 1758-02, Standard Test Method of Evaluating Wood Preservatives by Field Tests with Stakes.

### 1.3.3 ICC-ES Acceptance Criteria:

**1.3.3.1** Acceptance Criteria for Quality Control Manuals (AC10).

**1.3.3.2** Acceptance Criteria for Test Reports (AC85).

**1.3.3.3** Evaluation Guideline for Fire-retardant-treated Wood Roof Systems (EG107).

**1.3.3.4** Acceptance Criteria for Proprietary Wood Preservative Systems—Common Requirements for Treatment Process, Test Methods and Performance (AC326).

## 1.4 Definitions:

### 1.4.1 DOT Wood Preservative Systems:

**1.4.1.1 Disodium Octaborate Tetrahydrate (DOT):** Disodium octaborate tetrahydrate is a sodium borate having the approximate composition  $Na_2 B_8 O_{13} \cdot 4 H_2 O$ , and formula weight 412.52.

**1.4.1.2 DOT with Proprietary Polymer Binder:** DOT followed by a secondary pressure treatment process including a proprietary sodium fixation agent having the approximate composition  $Na Si O_2 + C_{12} H_{14}$ .

**1.4.1.3 DOT with Proprietary Organic Binder:** The composition of the organic binder shall be specified in the

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quality control documentation complying with AC10 that is submitted by the manufacturer.

**1.4.1.4 DOT-Insecticide:** DOT with a proprietary insecticide. The composition of the treatment formulation shall be specified in the quality control documentation complying with AC10 that is submitted by the manufacturer.

**1.4.2 Preservative-treated Wood:** Wood treated with the wood preservative listed in this criteria shall be referred to using a proprietary trade name listed in the ICC-ES evaluation report on the preservative system. The wood shall be manufactured in accordance with an approved quality control manual.

### 2.0 BASIC INFORMATION

Basic information required for DOT wood preservative systems shall be provided in accordance with Section 2.0 of AC326.

### 3.0 PRESERVATIVE TREATMENT PROCESS

**3.1 Preservative Treatment of Lumber and Plywood:** The preservative treatment with DOT wood preservative systems shall comply with preservative treatment by pressure processes, quality control standards published by the American Wood Preservers' Association, and AC326 except for the following:

#### 3.2 General Requirements:

**3.2.1** Steaming prior to conditioning or treatment is permitted for a total period not to exceed the maximum duration specified in Tables 1 and 2, as applicable. The steam temperature shall not exceed 245°F (118°C).

#### 3.2.2 Minimum Vacuum:

**3.2.2.1** Minimum vacuum for lumber and plywood treated solely with DOT preservative must be 22 inches (559 mm) of mercury at sea level.

**3.2.2.2** Minimum vacuum for lumber and plywood treated with DOT preservative with proprietary polymer binder, DOT preservative with proprietary organic binder or DOT-insecticide shall be as stated in the manufacturer's proprietary treater's manual for the selected wood species.

**3.2.3** Incising is required as noted in Tables 1 and 2.

**3.2.4** Incising of lumber shall be in accordance with Section 3.2.4 of AC326.

**3.3 Treatment Requirements:** Treatment process shall be in accordance with Section 3.3 of AC326 and Tables 1 and 2, as applicable.

#### 3.4 Results of Treatment:

**3.4.1** Retention shall be determined by assay analysis of the treated wood.

**3.4.1.1** Number of borings per charge shall be 20.

**3.4.1.2** Sampling zone for assay, measured from the surface, shall comply with Tables 1 and 2.

**3.4.2** Minimum retention of, and penetration for, preservative treatment of lumber shall comply with Tables 1 and 2.

**3.4.3** Penetration shall be determined by boring 20 pieces that are well distributed throughout each charge. The charge will be accepted if 90 percent of the borings comply with penetration requirements.

**3.4.4** Redrying after treatment is required for Table 1 DOT-only treated wood and DOT-insecticide. Redrying after treatment is optional for Table 2 DOT with proprietary polymer binder or for Table 2 DOT with proprietary organic binder treated wood. The maximum permissible kiln temperature shall not exceed 165°F (74°C) for spruce-pine-fir and ponderosa pine. The maximum permissible kiln temperature for all other species noted in Table 1 shall not exceed 160°F (71°C).

**3.5 Boron Determination Requirements:** Determination of boron in treated wood shall be in accordance with AWPA Standard A2, Sections 15 and 16.

### 4.0 TEST METHODS AND PERFORMANCE REQUIREMENTS

The performance characteristics of the wood-preservatives listed in this acceptance criteria shall be documented by testing. Testing shall be in accordance with AWPA and ASTM standards and the test procedure indicated in Annex A. The wood-preservative products listed in this acceptance criteria shall demonstrate resistance to rot, mold, mildew, and fungal decay; and resistance to subterranean termites, including Formosan termites. DOT with a proprietary polymer binder or DOT with a proprietary organic binder shall also demonstrate appropriate use in aboveground unprotected applications (AWPA UC3B).

The following documentation (Sections 4.1 to 4.5) is needed to substantiate the performance characteristics of the wood-preservative products listed in this acceptance criteria:

**4.1 Laboratory Tests:** Testing shall be in accordance with Section 4.1 of AC326.

**Alternate to Termite Testing:** As an alternate to testing, an independent engineering analysis using prior product testing may be submitted which demonstrates termite resistance at minimum retention values specified for the product. The analysis shall be signed, sealed and dated by the responsible engineer.

**4.2 Preservative Permanence:** Testing in Sections 4.2.1, 4.2.2 and 4.2.3 shall be performed for ground contact use; testing in Section 4.2.4 shall be performed for aboveground unprotected use. The testing documenting this performance must include analysis by the approved testing laboratories which conclude that the product may be used exposed to the weather (AWPA UC3B).

**Conditions of Acceptance:** Testing shall demonstrate level of use recommended for the product, either aboveground unprotected (AWPA UC3B) or protected from contact with liquid water (AWPA UC2). See Section 1.2 of this criteria.

**4.2.1** Testing shall be in accordance with Section 4.4.1 of AC326.

**4.2.2** Depletion from soil bed testing in accordance with AWPA E 14.

**4.2.3** Testing shall be in accordance with Section 4.4.2 of AC326.

**4.2.4** Testing in accordance with Annex A is used when evaluating product for installation in aboveground, unprotected applications (AWPA UC3B).

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**4.3 Effects on Wood Properties:** Testing shall be in accordance with Section 4.5 of AC326.

**4.4 Corrosion:** Testing shall be in accordance with Section 4.6 of AC326.

**4.5 Treatment Testing:** Testing shall be in accordance with Section 4.7 of AC326.

**5.0 QUALITY CONTROL**

Quality control shall be in accordance with Section 5.0 of AC326.

**6.0 EVALUATION REPORT RECOGNITION**

Conditions of use shall be in accordance with Section 6.0 of AC326. ■

**TABLE 1—DOT PRESERVATIVE TREATMENT PROCESS VALUES**

REQUIREMENTS	SOUTHERN PINE	EASTERN WHITE PINE	COASTAL DOUGLAS FIR	HEM-FIR	SPRUCE-PINE-FIR	PONDEROSA PINE
1.0 General requirements						
1.1 Maximum duration of steaming prior to conditioning treatment	17 hours	4.5 hours	4 hours	4 hours	6 hours	6 hours
1.2 Minimum vacuum	22	22	22	22	22	22
1.3 Incising	Not required	Not required	Required	Not required	Required	Not required
2.0 Treatment DOT						
2.1 Range of pressure during DOT treatment process (psig)	75-200	50-150	50-150	50-150	75-175	75-200
2.2 Maximum temperature of DOT preservative during entire pressure period (°F)	200	200	200	200	240	240
3.0 Results of treatment						
3.1 Retention shall be determined by assay analysis of the treated wood.						
3.1.1 Number of borings per charge	20	20	20	20	20	20
3.1.2 Sampling zone for assay measured from surface (inches)						
Sizes up to 2 inches thick	0.0-0.6	Complete cross-sect.	0.0-0.6	0.0-0.6	0.0-0.6	0.0-0.6
Sizes over 2 inches thick	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
3.2 Minimum retention for DOT preservative treatment of lumber, pcf B <sub>2</sub> O <sub>3</sub>	0.17 <sup>1</sup> or 0.28 <sup>2</sup>	0.17 <sup>1</sup> or 0.28 <sup>2</sup>	0.17 <sup>1</sup> or 0.28 <sup>2</sup>	0.17 <sup>1</sup> or 0.28 <sup>2</sup>	0.17 <sup>1</sup> or 0.28 <sup>2</sup>	0.17 <sup>1</sup> or 0.28 <sup>2</sup>
3.3 Minimum penetration	2.5 inches or 85% of sapwood, whichever is less	0.5 inch or 90% of sapwood, whichever is greater	0.4 inch or 90% of sapwood, whichever is greater	0.4 inch or 90% of sapwood, whichever is greater	0.4 inch or 90% of sapwood, whichever is greater	2.5 inches or 85% of sapwood, whichever is less

<sup>1</sup>Products treated at this retention level are not suitable for exposure to Formosan termites.

<sup>2</sup>Minimum retention level for exposure to Formosan termites.

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**TABLE 2—DOT WITH PROPRIETARY POLYMER BINDER PRESERVATIVE TREATMENT PROCESS VALUES**

<b>REQUIREMENTS</b>		<b>SOUTHERN PINE</b>
1.0	General requirements	
1.1	Maximum duration of steaming prior to conditioning treatment	17 hours
1.2	Minimum vacuum	Refer to treater's manual
1.3	Incising	Not required
2.0	Treatment DOT	
2.0.1	Range of pressure during DOT treatment process (psig)	30-200
2.0.2	Maximum temperature of DOT preservative during entire pressure period (°F)	200
2.1	Binding proprietary polymer	
2.1.1	Range of pressure during DOT treatment process (psig)	30-200
2.1.2	Maximum temperature of DOT preservative during entire pressure period (°F)	200
2.2	Organic Binder	
2.2.1	Range of pressure during DOT treatment process (psig)	30-200
2.2.2	Maximum temperature of DOT preservative during entire pressure period (F°)	200
3.0	Results of treatment	
3.1	Retention shall be determined by assay analysis of the treated wood.	
3.1.1	Number of borings per charge	20
3.1.2	Sampling zone for assay measured from surface (inches)	
	Sizes up to 2 inches thick	0.0-0.6
	Sizes over 2 inches thick	0.0-1.0
3.2	Minimum retention for DOT preservative treatment of lumber, pcf B <sub>2</sub> O <sub>3</sub>	See Note A
3.3	Minimum penetration	See Note A

Note A: Minimum retention and minimum penetration shall be determined in accordance with Section 4.0 of this acceptance criteria and noted in the final evaluation report.

**ANNEX A  
TEST METHOD FOR EVALUATING PRESERVATIVE PERMANENCE WHEN  
EXPOSED TO LEACHING FROM RAINWATER, ULTRAVIOLET LIGHT EXPOSURE,  
WETTING AND DRYING CYCLE, AND FREEZE-THAW CYCLING**

**A1.0 INTRODUCTION**

The performance of proprietary wood preservative systems depends on the permanence of the active ingredients under a wide range of environmental exposure conditions. Typical exposures include leaching from rainwater, ultraviolet light exposure, shrinkage and checking from repeated wetting and drying cycles, and freeze/thaw cycling. There are no standard test procedures that evaluate all of these conditions.

The closest simulation of this exposure is to combine weatherometer exposures, weathering tests typically used for fire-retardant-treated wood, and a procedure developed by the University of Illinois to age railway ties. The weatherometer is designed to accelerate the testing of preservatives and typically includes periodic water spray and intense UV exposure. Fire-retardant-treated wood evaluation involves repeated cycling between water spray and kiln drying. The accelerated exposure test used by the University of Illinois to simulate long-term weathering exposure of preservative-treated railway ties involves exposure to water, freezing, and high-temperature drying.

The following test procedure for borates combines existing accelerated procedures but allows exposure conditions more representative of natural rain, light, and variable temperature exposure in accordance with industry-accepted accelerated test methodology.

**A2.0 PROCEDURE**

**A2.1** Treated wood samples of standard size lumber decking material shall be expose to combined ultraviolet (UV) exposure in accordance with EG107 and infrared lamp exposure for 48 hours (thermostatically controlled to maintain the chamber temperature at 50 to 60°C). This assures significant drying. Total exposure is two days (48 hours). Six sets of decking samples required in accordance with EG107 shall be used for exposure in this procedure.

**A2.2** Expose wood samples to water spray for 72 hours. Use an intermittent spray over the period, with 3 hours of spray followed by 3 hours of rest for 12 cycles. During each three-hour spray, the water spray shall be applied in accordance with EG107 on the test specimens. Determine the amount of borate retention following each three-hour cycle or immediately following each 72-hour rain procedure. The borate retention samples shall include the surface exposed to water spray.

**A2.3** Expose the wood samples to freezing conditions at -15°C for 48 hours. Total exposure time is two days (48 hours).

**A2.4** Repeat the procedure for a minimum of six times, or until the amount of retained borates becomes relatively constant, whichever occurs first. Monitor the borate retention in accordance with Section A2.2.

**A2.5** Samples which have been weathered in accordance with the above procedure, shall be subjected to soil block decay testing in accordance with AWWA E10, to evaluate the efficacy of the remaining preservative against brown rot fungi.

**A2.6** Control wood samples treated with DOT only shall be included in procedure A2.1 through A2.5 to establish relative performance reference.

**A2.7** Perform an evaluation of the preservative gradient after leaching to ensure that resistance to leaching is significant even at the vulnerable surfaces.

**A2.8** The testing performed in accordance with Sections A2.1 through A2.7 shall be correlated with field studies of existing sites with proprietary wood preservative treated lumber and plywood. The field study report shall be prepared by an approved testing laboratory, or inspection agency, or by a registered design professional. The field study shall identify the site and include specific information on deck location, installation date, the age of the deck, exposure to weather, and weather conditions during aging. Core samples of the treated wood shall be taken. The treated wood shall be documented by identifying the treater, species of wood and details of retention and penetration.

**Alternate:** As an alternate to the above correlation procedure, twelve cycles of testing outlined in A2.1 through A2.7 may be performed for the ICC-ES evaluation report (ESR) issuance provided that outdoor weathering tests are in progress per Section 1.2 of EG107. Core sample data from such outdoor tests shall be submitted at the time of the first and second renewals of the ESR.

**A3.0 CONDITIONS OF ACCEPTANCE**

**A3.1** At the conclusion of the testing in accordance with Sections A2.1 through A2.4, the amount of retained borates shall not be less than the amount of minimum retention as detailed in Table 1.

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**A3.2** Testing in accordance with Section A2.5 shall demonstrate that the weathered samples with the minimum retention specified in Table 1 shall resist brown rot fungi in accordance with AWPA E10.

**A3.3** The field study report of existing sites required under Section A2.8 above shall include a conclusions statement that the proprietary wood treatment with the minimum retention and penetration specified based on the testing in Section A2.1 through A2.5 are considered acceptable for use in exterior use, not in contact with the ground.