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## AMERICAN INSTITUTE OF TIMBER CONSTRUCTION

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7012 South Revere Parkway · Suite 140 · Centennial, Colorado 80112  
Telephone (303) 792-9559 · <http://www.aitc-glulam.org>

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### AITC 109 - 2007

#### STANDARD FOR PRESERVATIVE TREATMENT OF STRUCTURAL GLUED LAMINATED TIMBER

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## 1. INTRODUCTION

- 1.1 Wood structures properly designed and constructed have performed satisfactorily for centuries. Where the possibility of decay, insect attack, or marine borer attack exists, the wood used must be heartwood of a naturally durable species or pressure-treated with an approved preservative to insure durability. Information contained in this standard is based on what is believed to be the most accurate and reliable technical data currently available. It should be used with professional design consideration for any general or specific application regarding need for and suitability of the use of preservative-treated wood.
- 1.2 This standard covers preservative treatment of structural glued laminated timber made from species for which allowable stresses are published in AITC 117, *Standard Specifications for Structural Glued Laminated Timber of Softwood Species* or AITC 119, *Standard Specifications for Structural Glued Laminated Timber of Hardwood Species* and for which values for treatment penetrations and retentions are published in AWWA T1-06, *Use Category System, Processing and Treatment Standard* and in AWWA U1-06, *Use Category System: User Specification for Treated Wood*. This standard does not

address the use of naturally durable species or chemical treatments for purposes other than increased durability, such as fire-retardant treatments.

- 1.3 **Use Restrictions.** The Environmental Protection Agency (EPA) has established restrictions on the uses of creosote, pentachlorophenol, and inorganic arsenicals as given in Position Document (PD) No. 4 (see Reference 13.7). This document contains use and handling precautions on these three types of treatments for all types of wood products.
  - 1.3.1 *Non-Habitable Structure Use.* Any of the recommended treatments included in this document which meet both the required retentions for the intended end use and the appropriate EPA regulations can be used for structures that are not inhabited and do not carry or store food, feed or drinking water. Typical applications are pilings, bridges, piers, conveyor structures, culverts, etc.
  - 1.3.2 *Habitable Structure Use.* Restrictions on the use of preservative-treated glued laminated timber inside buildings and habitable structures are as follows:
    - 1.3.2.1 *Creosote.* Creosote is generally recommended for exterior use only and shall not be used in residential interiors nor in farm building interiors where there may be direct contact with humans or animals. Creosote shall only be used for industrial building components which are in ground contact and subject to decay or insect attack and where two coats of an appropriate sealer, as recommended in the EPA Consumer Information Sheet, have been applied to the treated wood. Creosote solutions shall not be used in structures intended for storing food or feed, or where treated wood may come into contact with drinking water.
    - 1.3.2.2 *Pentachlorophenol.* Pentachlorophenol (PCP) shall not be used in residential, industrial, or commercial structure interiors except for laminated members or building components which are in ground contact and subject to decay or insect attack and where two coats of an appropriate sealer, as recommended in the EPA Consumer Information Sheet, have been applied to the treated wood. It shall not be used for building interiors where there may be direct contact with humans or animals. It shall not be used for structures intended for storing food, feed or where the treated wood may come into contact with drinking water.
    - 1.3.2.3 *Inorganic Arsenicals.* Inorganic arsenicals may be used in residential, commercial, or industrial interiors provided that all dust is removed from the wood surface after installation. It must not be used in structures where food or feed is stored, or where treated wood may come into contact with drinking water.
    - 1.3.2.4 Further information on the use and handling of preservative-treated wood products can be found in Consumer Information Sheets (CIS) accompanying shipments or in EPA PD No. 4 (Ref 13.7).

## 2. GENERAL

- 2.1 **Control of Decay.** Wood decay is caused by fungi that use wood as a food source. Fungi develop and grow in wood when conditions favorable to decay exist. These fungi grow only when four basic biological needs are met: (1) air, (2) favorable temperatures (32-100 °F), (3) moisture, and (4) food (wood). Decay is prevented through the elimination of any one of these needs. The first two are present in most structures and cannot be eliminated. Keeping wood dry (below 20% moisture content) through proper design and detailing is an effective means to eliminate decay in most structures. In structures where it is impossible to keep the wood dry, the use of preservative treatments, which make the food source (wood) toxic to decay fungi, should be used.
- 2.2 **Control of Insects.** Attack from most insects can be prevented by keeping wood dry or using preservative-treated wood. Some species of insects, however, such as termites can attack dry wood

and must rely on special detailing, inspection, and the use of preservative-treated wood to prevent damage.

- 2.3 **Control of Marine Organisms.** Wood in contact with salty or brackish water may be subject to attack from various marine organisms. Protection from damage by marine organisms can be provided by the use of the appropriate preservative-treated wood.

### 3. TREATMENT REQUIREMENTS

- 3.1 **Installations Where Preservative Treatment Is Required.** In general, wood in AWPAs Use Categories UC3, UC4, and UC5 require preservative treatment. A general description of AWPAs Use Categories is included in Table 1. Use categories are further divided into subcategories described in AWPAs U1. Examples of installations where wood structural members require preservative treatment include:
- 3.1.1 Building constructions in which portions of wood structural members extend beyond the walls and the protection of the roof, and where adequate weather protection cannot be provided to insure an in-service moisture content of less than 20% (UC 3).
- 3.1.2 Enclosed buildings housing "wet processes" or other high humidity environments where, despite ventilation, there is sufficient moisture remaining in the atmosphere to maintain the equilibrium moisture content in any of the wood elements at a level above 20%. Examples include spas, heated swimming pools, industrial processes which cause high humidity, etc (UC3).
- 3.1.3 Outdoor exposures where there is no protective cover for wood structural members from the weather, such as in bridges, piers and wharfs, towers, and electrical utility structures (UC3).
- 3.1.4 Wood elements in direct contact with the ground or with water, such as in retaining walls, bulkheads, and poles or piles where the wood extends out of the water rather than being permanently and totally submerged (UC4).
- 3.2.5 Timbers in contact with salt and brackish water (UC5).
- 3.2.6 Locations where wood will be subject to insect attack and cannot be protected by other means.

**Table 1.** Descriptions of AWPAs Use Categories (adapted from AWPAs U1-06)

Use Category	Service Conditions
UC1	Interior Construction, Above Ground, Dry
UC2	Interior Construction, Above Ground, Damp
UC3	Exterior Construction, Above Ground
UC4	Exterior Construction, Ground Contact or Fresh Water
UC5	Salt or Brackish Water

- 3.2 **Installations Where Treatment May Be Required (UC2).** Examples of installations where wood structural members can only be protected from decay with difficulty and where particular attention to details and connections is required are given in the following sub-paragraphs. The assurance of a reliable long term maintenance program is needed in these applications to maintain an in-service moisture content of less than 20%. In the absence of these construction details and maintenance, the members shall be treated.
- 3.2.1 Timbers used in certain types of buildings, such as indoor swimming pools and ice skating rinks, in which wood structural members are subject to sustained high humidity and/or moisture condensation shall be pressure-treated with an appropriate preservative unless the designer is certain that the timbers will be maintained at a moisture content of less than 20% for the life of the structure. Protection shall be provided by means of proper use of vapor and moisture retarders, insulation, and adequate

ventilation used collectively. The moisture protection system shall be installed and remain operable during the life of the structure.

- 3.2.2 Wood structural members that are adjacent to masonry or concrete shall be protected by the use of ventilated air spaces, vapor retarders, or other moisture barrier separations that prevent direct contact of the wood with masonry or concrete. Otherwise, the timbers shall be pressure-treated with an appropriate preservative.
- 3.3 **Installations Where Preservative Treatment is Not Required (UC1).** Treatment is not required where proper design and detailing keep the moisture content of the wood below 20%, where constant submersion in fresh water eliminates oxygen, or where the temperatures are continuously maintained below freezing or above 100 °F. Examples of such installations include:
  - 3.3.1 Enclosed buildings with good watertight roof membranes, proper roof maintenance, good joint details, adequate flashing and drainage, good ventilation, properly located insulation and vapor retarders, and a well-drained building site.
  - 3.3.2 Any usage where the wood is completely and totally submerged in fresh water. (Attack by marine organisms makes the use of untreated wood in salt water impractical.)
  - 3.3.3 Freezers or other special structures where the wood is continually maintained at temperatures below 32 °F or above 100 °F.

#### 4. DESIGN CONSIDERATIONS

- 4.1 **Material Properties.** The allowable design values for preservative-treated wood, as included in the "National Design Specification for Wood Construction" (NDS), apply. When the moisture content of the wood in service is less than 16%, untreated timbers and dry-use design values may be used. When the moisture content of the wood in service is 16% or greater, wet-use design values shall be used. When the moisture content of the wood in service is 20% or greater, glued laminated timbers shall be pressure-treated with an appropriate preservative, and wet-use design values shall be used.
- 4.2 **Treatment Prior to or After Gluing.** Glued laminated timber may be manufactured with lumber treated prior to gluing, or it may be treated after gluing. While many species are successfully treated prior to gluing, laminators may choose not to laminate pre-treated lumber due to difficulty in meeting bonding requirements or other considerations. Treatment prior to gluing is generally available only for Southern Pine. The specification of treatment prior to gluing for other species should only be done after consultation with a qualified laminator. Treatment after gluing with waterborne preservatives is generally not recommended for the reasons stated in 6.1.3.2.
- 4.3 **Treating Facility Limitations.** The size of available pressure-treating cylinders must be considered when specifying pressure preservative treatments. Due to these cylinder limitations, it may not be possible to treat certain large or curved members after gluing. If treatment is required for these members, treatment prior to gluing should be specified. It is important to contact the supplier prior to initiating the design of large members which require treatment, since special handling and treating problems may exist.
- 4.4 **Exudation of Preservative.** While there is the possibility of exudation of creosote and pentachlorophenol solutions from treated members when the specified retentions are used, the specification of retentions in excess of those shown in Tables 3 and 4 is more likely to result in exudation. Such exudation may continue for a long period of time.
- 4.5 **Exudation of Natural Wood Resin.** Most species of softwood commonly used in glued laminated timbers contain resins in some portions of the wood. Resins may be present in the form of pitch, pitch streaks, or pitch pockets. Generally, resin is set during drying and remains fixed during the service life

of the product. Occasionally, some resins exude from localized areas or from pitch streaks which were not set during the drying process.

## 5. SPECIES

- 5.1 The following species are included for preservative-treated structural glued laminated timber in AWWA U1-06: Coastal Douglas Fir, Hem-Fir, Western Hemlock, Southern Pine, Red Oak, Red Maple, and Yellow Poplar.

## 6. TYPES OF PRESERVATIVE TREATMENTS

- 6.1 Various characteristics of preservative treatments affect their use with glued laminated timber. Some treatments are suitable for use in treating after gluing, and some are suitable for use in treating before gluing. Preservative treatments to be used shall be as agreed upon between the buyer and seller, but the treatment process shall be in accordance with applicable AWWA Standards. Preservative treatments are described in the following subsections. A summary of uses of these treatments is given in Table 2. The specifier must select the preservative treatment best suited for a particular job. Availability of treatment types may vary with geographic area and supplier.
- 6.1.1 *Creosote and Creosote Solutions.* Creosote is a coal tar product containing a multitude of chemical compounds toxic to decay fungi, insects and most marine organisms. Creosote treated material is suitable for the most severe exposure conditions. It has a dark, oily surface appearance which generally cannot be stained or painted. It possesses an odor. Creosote solutions should not be used in contact with materials subject to staining such as plaster, wallboard, etc., or in direct contact with roofing felt. As a practical consideration, the treatment is used only after gluing.
- 6.1.2 *Oil-Borne Treatments.* Oil-Borne preservative treatments are toxic to decay fungi and insects and utilize various hydrocarbon solvents as carriers. Pentachlorophenol (PCP) is the most common oil-borne preservative; however, other preservatives such as copper naphthenate (CuN) or oxine copper (Cu8) are also used. The solvents have various effects on finished products and are classified into the following types in AWWA Standard P9, *Standards For Solvents and Formulations For Organic Preservative Systems*.
- 6.1.2.1 *PCP Type A - Petroleum Distillates, or a Blend of Petroleum Distillates and Co-Solvents.* This treatment may become blotchy when exposed to the weather, although this condition diminishes with time. Type A treatment should not be used with wood in contact with material subject to staining, such as wallboard or plaster and does not result in a readily paintable surface. It should not be used in direct contact with roofing felt, but should be separated from the roofing membrane by a barrier of rosin-sized sheathing paper or similar material which is resistant to the treating solution. As a practical consideration, treatment with this type of solvent is used only after gluing.
- 6.1.2.2 *PCP Type C - Light Hydrocarbon Solvent with Auxiliary Solvent.* This treatment can leave a natural wood-appearing surface if the treater is advised of appearance requirements and is capable of meeting them. The surface of treated wood can generally be stained or painted after the light solvent volatiles have evaporated. Type C treatment should not be used with wood in contact with material subject to staining, such as wallboard or plaster. It should not be used in direct contact with roofing felt, but should be separated from the roofing membrane by a barrier of rosin-sized sheathing paper or similar material which is resistant to the treating solution.

**TABLE 2-- Uses and Characteristics of Preservative Treatments for Glued Laminated Timbers<sup>1,2</sup>**

Treatment Type	Visual/ Physical Appearance	When Architectural Appearance is Important	Paintability	Treatment before Gluing	Treatment after Gluing	Ground Contact or Embedded in Concrete	Exposed to Wetting or in Contact with Masonry	Contact with Fresh Water <sup>3</sup>	Contact with Salt Water	Limitations
Creosote, Creosote Solutions and Creosote Petroleum	Dark, oily	NR	Cannot be painted or stained	NR	A	A	A	A	A	Odor may be objectionable. Should not be in direct contact with roofing felt. Should not be used in contact with materials subject to staining, such as plaster, wallboard, etc.
Oil Borne PCP	Type A	NR	Not readily paintable	NR	A	A	A	A	NR	Should not be used in direct contact with roofing felt. Should not be used in contact with materials subject to staining, such as plaster, wallboard, etc. EPA requires two coats of urethane, shellac, latex epoxy enamel, or varnish for interior use.
	Type C	A	Can be painted or stained after surface preparation as recommended by treater	A	A	A	A	A	NR	Softwood species used in laminating may exude resin after treatment, although condition diminishes with time. EPA requires two coats of urethane, shellac, latex epoxy enamel, or varnish for interior use.
Copper Naphthenate (CuN)	Dark brown to green	A	Can be finished with oil-based stain or paint after drying.	NR	A	A	A	A	NR	Stain-blocking primer is recommended before painting.
Oxine Copper (Cu8)	Can have natural appearance if treater is advised of finished appearance requirements	A	Can be finished with oil-based stain or paint after drying.	NR	A	NR	A	A	NR	Stain-blocking primer is recommended before painting
Water-Borne Treatments (ACQ-C, ACC, ACZA, CCA)	Light green, gray-green, or brown in color depending upon chemicals used	L	Can be painted or stained when surface is dry and prepared in accordance with coating manufacturer's recommendations	A	L	A	A	A	A	Wetting and redrying process associated with treatment may result in dimensional changes, warping, checking, or splitting of the members when treated after gluing. When used in high moisture conditions, all metallic connections shall be of corrosive-resistant metal per the treater's recommendations.

Footnotes to Table 2

A -- Generally acceptable.

L -- Acceptable only within limitations.

NR -- Not recommended

1. Some preservative treatments may cause irritation when in direct human contact. See Reference 12.7 for handling precautions.
2. Availability of treatments for use with specific species and in specific geographical regions should be verified before specifying.
3. For potable water, other restrictions may apply. See Reference 13.8 for use site precautions.

- 6.1.3 *Water-Borne Treatments.* Water-borne preservative treatments conforming to AWWA Standard P5, *Standard For Waterborne Preservatives*, utilize water soluble preservative chemicals which become fixed in the wood during the treating process. They are toxic to decay fungi, insects and most marine organisms.
- 6.1.3.1 Water-borne treatments are typically used to treat laminations prior to gluing. They tend to leave the wood a light green, grey-green, or brown color, depending on the chemical formulation used. When the treated wood surface is dry, the member can be stained or painted in accordance with the coating manufacturer's recommendations. When used in high moisture applications where the in-service moisture content of the wood will be greater than 16%, any metal hardware in contact with the wood should be corrosion resistant in accordance with the chemical treatment manufacturer's recommendations.
- 6.1.3.2 Treating of glued laminated timber members with water-borne preservatives after gluing is not generally recommended. If glued laminated timbers are treated after gluing, dimensional changes caused by saturation of the wood with the water-borne preservatives and their carrier followed by subsequent re-drying may result in raised grain and excessive warping, checking, or splitting. The use of water-borne treated glued laminated timber members without adequate re-drying of the timbers prior to installation can also result in excessive deflections as well as checking, splitting and warping as previously mentioned as the members "season" in-service.
- 6.1.3.3 Treatability of species may vary with different water-borne treatments. It is important to verify with the treater that the preservative specified is compatible with the species used.
- 6.1.3.4 When timber members are fabricated with water-borne treated wood and used in chemical or industrial environments, care must be taken to insure compatibility of the treated material with the environment to prevent chemical degradation of the members and their connections.

## **7. RETENTION, PENETRATION, CERTIFICATION AND MARKING REQUIREMENTS**

- 7.1 Retention and penetration recommendations for the various preservatives and species covered by this standard are given in Tables 3 – 7. The retention and penetration requirements shown are those included in AWWA U1-06 and T1-06, . Members "Treated to Refusal" shall not be considered as meeting the requirements of this standard.
- 7.2 If laminations are treated prior to gluing, a certificate shall be furnished to the laminator by the treater or qualified third party inspection agency, identifying the type of treatment used and indicating that the treating process has been performed in accordance with, and conforms to, the requirements of AWWA U1 and T1. For members treated after gluing, a similar certificate shall be provided to the laminator and/or the end user. The treater shall maintain records of assays for retention and penetration which are made to verify conformance to AWWA U1 and T1, and these shall be available to the laminator and/or the end user. Each bundle or load shall be identified by the treater and this identification should be by agreement between the laminator and the treater.
- 7.3 When glued laminated timber is retreated for any reason, consideration must be made for the possible effects of treatment on the strength and/or appearance of the members. A re-treatment may result in some exudation of the preservative chemical resulting in a possibly unacceptable appearance of the members. Such re-treatment shall be documented in the treating records and shown on the applicable treating certificate supplied by the treater.
- 6.4 The X-ray spectroscopy method as described in AWWA Standard A9 may be used in the assay of pentachlorophenol in glued laminated timber members, including those used in highway construction.

## **8. INCISING**

- 8.1 Incising is the operation used by treaters to puncture the surfaces of wood as an aid in securing deeper and more uniform penetration of preservative. Incising is required for structural glued laminated timber of all listed species, except Southern Pine.
- 8.2 Laminations to be treated prior to gluing shall not be incised on the mating faces to be glued.

## **9. INDIVIDUAL LAMINATIONS TO BE TREATED PRIOR TO GLUING**

- 9.1 Treating individual laminations with creosote, creosote solution, creosote petroleum or pentachlorophenol in heavy petroleum oil prior to gluing will interfere with bonding and is not recommended.
- 9.2 PCP-Type C and CCA are the preservatives most commonly used for treating individual laminations prior to gluing. Other treatments should be specified only after consultation with a qualified laminator.
- 9.3 Although the use of other species is permitted by AWWA standards, Southern Pine is the only laminated timber species group that commonly utilizes laminations treated prior to gluing. This treatment should be specified for other species only after consultation with a qualified laminator.
- 9.3 Lumber, prior to treatment, shall be of the minimum thickness and width that will allow planer cleanup of the surfaces after drying and before gluing, to maintain the maximum level of protection and to minimize the production of preservative treated shavings.
- 9.4 Lumber shall be dried after treatment to a moisture content not to exceed the maximum moisture content permitted for production of glued laminated timber in accordance with the current version of American National Standard ANSI/AITC A190.1, *Structural Glued Laminated Timber*.
- 9.5 Lumber treated prior to gluing shall have mating faces resurfaced after treatment and just prior to gluing. The resurfacing of laminations treated prior to gluing should remove as little wood as practical while making the surface clean, planed, and uniform in thickness suitable for gluing. The maximum time between resurfacing and gluing of pre-treated lumber shall be established at the time of plant qualification.

## **10. ADHESIVES AND PROCESSES**

- 10.1 Glued laminated timbers to be treated by pressure processes or pre-treated laminations to be made into laminated timber shall be glued with wet-use adhesives conforming to ANSI/AITC A190.1.
- 10.2 In general, longer curing times or higher temperatures are required for gluing pre-treated laminations than for gluing untreated laminations to obtain glue bonds of comparable quality. Treatment may affect adhesive spread requirements and assembly times.
- 10.3 In any process, different combinations of lumber species, pre-treatment preservative, and adhesive type may not produce the same quality of glue bond as obtained with untreated lumber, even though fabricated using the same procedures and conditions. It is, therefore, important that the use of any particular combination of species, pre-treatment preservative, and adhesive be supported by adequate gluing data for the individual laminator's procedures. Each plant shall qualify the maximum retention of treatments it intends to use for each species to be glued.

**Table 3. Retention Requirements (pcf) for Laminated Timber – Members Treated After Gluing (adapted from AWWA U1-06, Commodity Specification F)**

USE CATEGORY Species	Preservative				
	Creosote	PCP	Cu8	CuN	ACZA
<b>UC2, UC3</b>					
Southern Pine	8.0	0.30	0.02	0.040	NR
Coastal Douglas fir	8.0	0.30	NR	0.040	0.30
Western Hemlock, Hem-Fir	8.0	0.30	0.02	0.040	NR
Red Oak	7.0	NR	NR	NR	NR
Red Maple, Yellow Poplar	8.0	NR	NR	NR	NR
<b>UC4A</b>					
Southern Pine	10.0	0.60	NR	0.060	NR
Coastal Douglas fir	10.0	0.60	NR	0.060	0.60
Western Hemlock, Hem-Fir	10.0	0.60	NR	0.060	NR
Red Oak	8.5	NR	NR	NR	NR
Red Maple, Yellow Poplar	10.0	NR	NR	NR	NR
<b>UC4B, UC4C: Glued Laminated Poles. See Table 5</b>					

NR = Not Recommended

**Table 4. Retention Requirements (pcf) for Laminated Timber – Laminations Treated Before Gluing (adapted from AWWA U1-06, Commodity Specification F)**

USE CATEGORY Species	Preservative						
	PCP	Cu8	CuN	ACQ-C	ACC	ACZA	CCA
<b>UC2, UC3</b>							
Southern Pine	0.30	0.020	0.040	0.25	0.25	0.25	0.25
Coastal Douglas fir	0.30	0.020	0.040	0.25	0.25	0.25	0.25
Western Hemlock	0.30	0.020	0.040	0.25	0.25	0.25	0.25
Hem-Fir	0.30	0.020	0.040	0.25	0.25	0.25	0.25
<b>UC4A</b>							
Southern Pine	0.6	NR	0.06	0.40	0.50	0.40	0.40
Coastal Douglas fir	0.6	NR	0.06	0.40	0.50	0.40	0.40
Western Hemlock	0.6	NR	0.06	0.40	0.50	0.40	0.40
Hem-Fir	0.6	NR	0.06	0.40	0.50	0.40	0.40
<b>UC4B, UC4C: Glued Laminated Poles. See Table 5</b>							

NR = Not Recommended

**Table 5. Retention Requirements (pcf) for Laminated Timber – Glued Laminated Poles (adapted from AWWA U1-06, Commodity Specification D)**

USE CATEGORY Species	Preservative		
	Creosote	PCP-A, PCP-C	CuN
<b>UC4A, UC4B</b>			
Southern Pine	7.5	0.38	0.08
Coastal Douglas fir – Outer zone	9.0	0.45	0.095
Inner zone	4.5	0.23	0.048
<b>UC4C</b>			
Southern Pine	9.0	0.45	0.13
Coastal Douglas fir – Outer zone	12.0	0.60	0.15
Inner zone	6.0	0.30	0.075

**Table 6.** Retention Requirements (pcf) for Laminated Timber – Marine Applications (adapted from AWP A U1-06, Commodity Specification G for solid-sawn materials in marine applications)

USE CATEGORY Species	Preservative			Assay Zone	Penetration
	Creosote	ACZA	CCA		
<b>UC5A, UC5B, UC5C</b>					
Southern Pine, Mixed Southern Pine	25	2.5	2.5	0 – 0.6 in.	2.5 in. or 85%
Ponderosa Pine	25	2.5	2.5	0 – 0.6 in.	2.5 in. or 85%
Coastal Douglas-fir	25	2.5	2.5 <sup>(1)</sup>	0 – 0.6 in.	0.4 in. and 90%
Hem-Fir, Hem-Fir North	25	2.5	NR	0 – 0.6 in.	0.5 in. and 90%

<sup>(1)</sup> Coastal Douglas-fir from a few geographical areas has been found suitable for treatment with CCA, but it is generally recognized that it is extremely difficult to treat Douglas-fir to these retentions and penetrations with CCA, even with incising.

**Table 7.** Retention Requirements (pcf) for Dual Treatment of Laminated Timber – Marine Applications (adapted from AWP A U1-06, Commodity Specification G for solid-sawn materials in marine applications)

USE CATEGORY Species	First Treatment	Second Treatment	Assay Zone	Penetration
	ACZA/CCA	Creosote		
<b>UC5A, UC5B, UC5C</b>				
Southern Pine, Mixed Southern Pine	1.50	20.0	0 – 0.6 in.	1.0 in. (1 <sup>st</sup> treatment) 2.5 in. or 85% (2 <sup>nd</sup> treatment)
Coastal Douglas-fir, Hem-Fir, Hem-Fir North	1.50 <sup>(1)</sup>	20.0	0 – 0.6 in.	0.5 in. and 90% (1 <sup>st</sup> treatment) 0.5 in. and 90% (2 <sup>nd</sup> treatment)

<sup>(1)</sup> Coastal Douglas-fir from a few geographical areas has been found suitable for treatment with CCA, but it is generally recognized that it is extremely difficult to treat Douglas-fir to these retentions and penetrations with CCA, even with incising.

## 11. FABRICATION AND MACHINING

- 11.1 Where possible, all fabrication and machining which cuts through the treating envelope shall be performed prior to treatment.
- 11.2 When fabrication and machining are done after treatment, additional preservative treatment shall be applied in accordance with AWP A Standard M4, *Standard for the Care of Preservative-Treated Wood Products*.

## 12. CARE AFTER TREATMENT AND FIELD TREATMENT

- 12.1 Treated wood shall be protected from mechanical injury when handling.
- 12.2 Cutting of treated material must be avoided whenever possible.
- 12.3. When handling damage occurs, or cuts, daps, or other machining is performed after treatment, the cut or damaged surfaces shall be field treated as specified in AWP A Standard M4.
- 12.4. The application of oil or water-borne preservatives to treated or untreated members in the field is not as effective and can not replace pressure preservative treatment; therefore, it is important to do as much machining prior to treatment as possible.

**13. REFERENCES**

- 13.1 Timber Construction Manual, Fifth Edition, AITC, Centennial, Colorado.
- 13.2 AWPA Book of Standards 2006, American Wood Preservers' Association, Granbury, Texas.
- 13.3 The NRCA Roofing and Waterproofing Manual, The National Roofing Contractors Association, Rosemont, Illinois.
- 13.4 Marine Wood Maintenance Manual: A Guide For Proper Use of Douglas-Fir in Marine Exposures, Research Bulletin 48, Forest Research Laboratory, Oregon State University, Corvallis, Oregon.
- 13.5 National Design Specification for Wood Construction, American Forest & Paper Association, Washington, DC.
- 13.6 American National Standard for Wood Products - Structural Glued Laminated Timber, ANSI/AITC A190.1-2007, American National Standards Institute, New York, New York.
- 13.7 Wood Preservative Pesticides: Creosote, Pentachlorophenol, and Inorganic Arsenicals, EPA Position Document No. 4, PB 84-241538, National Technical Information Service, U.S. Dept. of Commerce, Springfield, Virginia.
- 13.8 Standard Specifications for Structural Glued Laminated Timber of Softwood Species, AITC 117-2004 AITC, Centennial, Colorado.
- 13.9 In-Service Inspection, Maintenance and Repair of Glued Laminated Timber Subject to Decay Conditions, Technical Note No. 13, AITC, Centennial, Colorado.