

# PRESSURE-TREATED SOUTHERN PINE

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## FOREWORD

Southern Pine's superior treatability makes it the preferred species when pressure treatment with wood preservatives is required. That is why nearly 85% of all pressure-treated wood used in the U.S. is Southern Pine.

This publication provides information to assist with the proper specification and use of pressure-preservative treated Southern Pine products, simply referred to here as "pressure-treated Southern Pine". Information on other species, treatment processes and preservatives is not included. The Product Locator on SouthernPine.com includes suppliers of pressure-preservative-treated, preservative-treated and fire-retardant-treated Southern Pine.

The information in this brochure has been compiled as a service from the members of the Southern Forest Products Association. Sources include the *Book of Standards* (2013 edition) published by the American Wood Protection Association (AWPA), the *International Residential Code* (IRC) and *International Building Code* (IBC) published by the International Code Council (ICC), *Evaluation Reports* (ESR) published by the ICC Evaluation Service (ICC-ES), and the *Standard Grading Rules for Southern Pine Lumber* (2014 edition) published by the Southern Pine Inspection Bureau (SPIB).



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SFPA is a nonprofit trade association that has represented manufacturers of Southern Pine lumber since 1915.

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The Southern Forest Products Association (SFPA) does not grade, test, manufacture nor treat lumber products. The primary purpose of this publication is to provide a convenient reference for pressure-treated Southern Pine products based on information from other sources. Neither SFPA, nor its members, warrant that the data from such sources on which the recommended uses of Southern Pine contained herein are correct, and disclaim responsibility for injury or damage resulting from the use of such information.

The conditions under which lumber is used in construction may vary widely, as does the quality of workmanship and construction. Neither the Southern Forest Products Association, nor its members, have knowledge of the quality of materials, workmanship or construction methods used on any construction project, and, accordingly, do not warrant the technical data, design or performance of the lumber in completed structures.

The information in this publication is based upon design values for visually graded Southern Pine dimension lumber that became effective June 1, 2013.



## INTRODUCTION

Wood can be subject to attack by insects, micro-organisms and decay fungi, especially in high-moisture conditions. Preservatives help ensure long-term structural performance by protecting wood used in a wide range of service conditions. Pressure-treated Southern Pine wood products are an economical and renewable building material.

There is a variety of processes used to protect wood products, including pressure, non-pressure, thermal, nonbiocidal and fire-retardant treatments. There is also a variety of preservatives used for each treatment process. The best preservative for any particular project largely depends upon the product, species and end-use application.

Only information on the most common and versatile treated wood in the marketplace today – pressure-preservative treated Southern Pine, simply referred to as “pressure-treated Southern Pine” – is included in this publication.

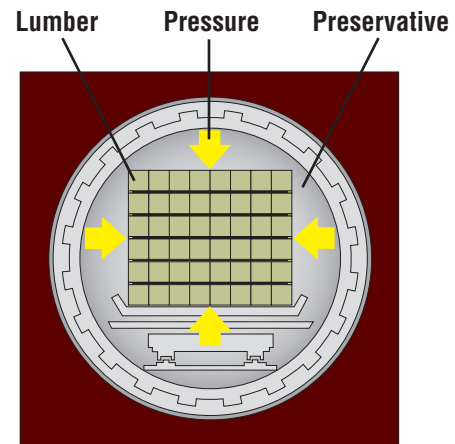
Pressure treatment with preservatives protects wood exposed to high-moisture conditions and potential deterioration. Treated wood must meet minimum requirements for preservative penetration and retention for use in a particular service condition. But not all wood treats the same. Most wood species do not easily accept preservatives and must first be “incised”, or perforated along the surface, reducing the wood’s strength and stiffness. Southern Pine’s unique cellular structure easily permits the deep penetration of preservatives, rendering the wood useless as a food source for fungi, termites and micro-organisms without the need for incising. Southern Pine’s superior treatability has made it the preferred species when pressure treatment with wood preservatives is required.

Figure 1 indicates five wood deterioration zones in the United States, ranging from low to severe. Untreated

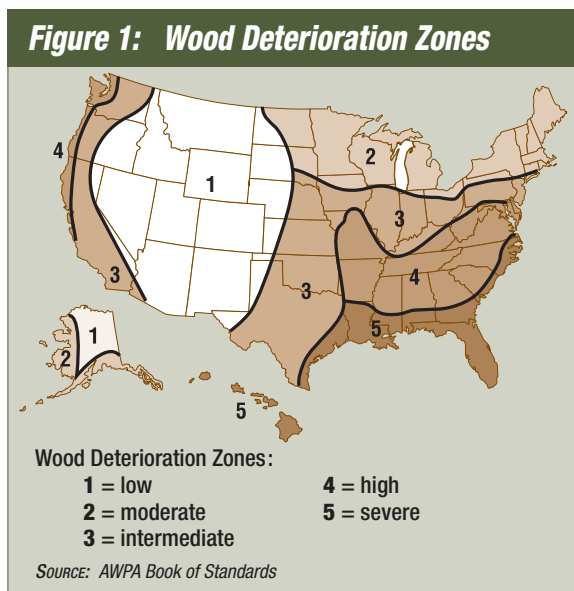
wood can deteriorate when four conditions required for decay and insect attack occur: high moisture, a favorable temperature, oxygen and a food source (wood fiber). If any one of these conditions is removed, deterioration cannot occur. Pressure treating Southern Pine products to eliminate wood fiber as a food source is an effective solution. Treatment with preservatives protects wood exposed to the elements, subjected to high humidity, and in contact with the ground, water or other moisture sources.

## PRESSURE-TREATING PROCESS

Pressure-treated Southern Pine is the product of a carefully monitored and controlled process. Within a pressurized cylinder, preservatives are forced deep into the wood cells. The treatment process bonds the preservative within the wood fiber.



Cross-section of pressure cylinder



## CODE ACCEPTANCE

The American Wood Protection Association (AWPA) is the standards-writing organization for the U.S. wood treating industry. AWPA's *Book of Standards* provides consensus-based guidance on methods, preservatives and other technologies that protect wood products. Wood preservatives are accepted for model building code compliance by reference to the AWPA *Book of Standards*, or by *Evaluation Reports* issued by the ICC-Evaluation Service. Acceptance of a preservative into the AWPA *Book of Standards*, or by ICC evaluation, ensures that properly treated wood products perform satisfactorily for their intended service condition.

Model building codes have specific requirements for wood protection by use of approved naturally-durable wood, or wood that is preservative treated in accordance with AWPA *Standard U1* for the species, product, preservative and end use. The codes recognize that not all preservative-treated wood is pressure treated. Non-pressure treatments typically involve borate-based preservatives that are sprayed on untreated lumber to provide a surface barrier coating. These non-pressure treatments are marketed as a defense against mold, fungal decay and/or termite attack, and are intended only for enclosed, interior framing; non-pressure treatments cannot be substituted for approved naturally durable or pressure preservative-treated wood in exterior applications.

The *International Residential Code*® (IRC), Sections R317 and R318, provides specific requirements for protection against decay and subterranean termites. Some common applications to check for building code requirements for wood protection include:

- Wood in contact with the ground or water
- Sills and sleepers on a concrete or masonry slab
- Wood used above ground where specified distances from exposed ground are not met  
Example: Wood joists closer than 18 inches or wood girders closer than 12 inches
- Structural members exposed to the weather without adequate protection

Whenever practical, boring, machining, trimming or surfacing should be done prior to treatment. Field-cut ends, notches and drilled holes of preservative-treated wood should be treated in accordance with AWPA *Standard M4*. See Field Treatments on page 18 for additional information.

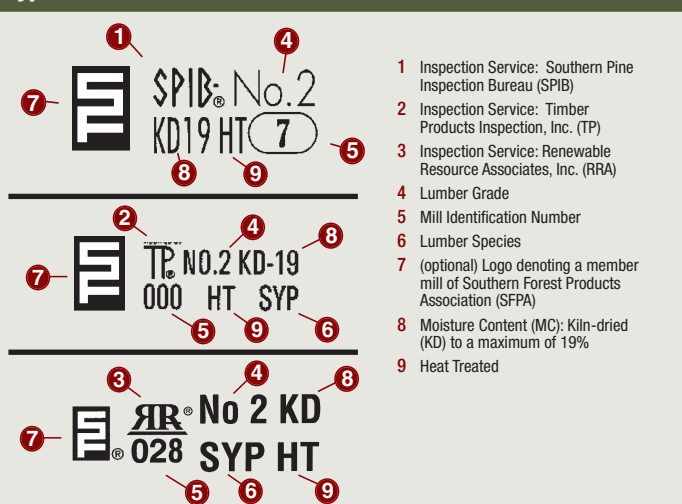
## IDENTIFICATION – GRADE & QUALITY MARKS

Southern Pine is recognized by building codes and regulatory agencies for use in construction and must be properly identified. Each piece of lumber must be grade marked by an agency accredited by the American Lumber Standard Committee (ALSC), and manufactured in accordance with *Product Standard PS 20* published by the U.S. Department of Commerce. Southern Pine lumber is graded in accordance with the Grading Rules published by the Southern Pine Inspection Bureau (SPIB). SPIB, Timber Products Inspection Inc. (TP) and other organizations\* are accredited to inspect and grade mark Southern Pine lumber in accordance with SPIB Grading Rules.

In addition, all treated Southern Pine must be identified with a treated quality mark – either plastic end tag or ink stamp – conforming to building code standards. Quality marks identify wood products treated with preservatives standardized by AWPA or evaluated by ICC-ES. Use of such marks provides assurance that:

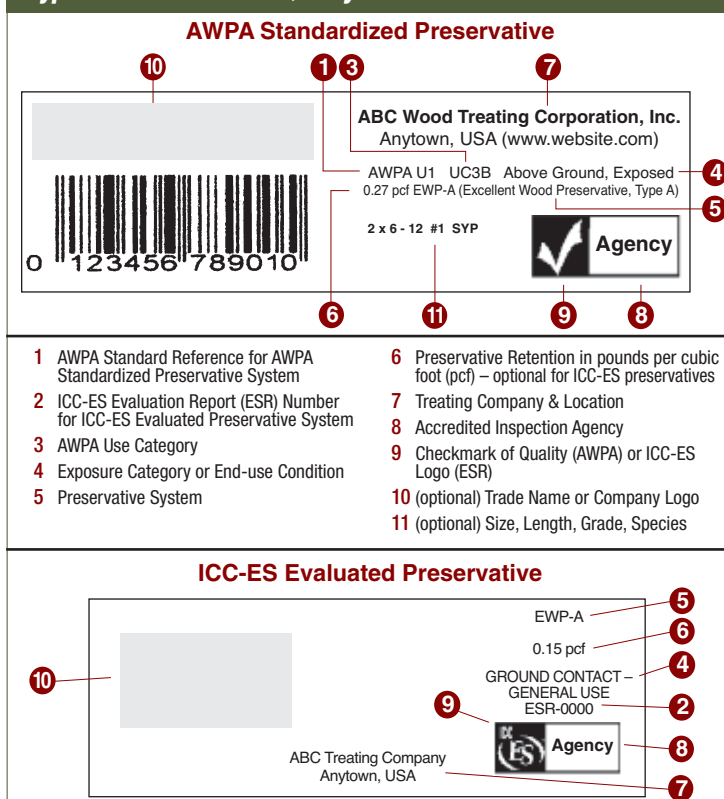
- the preservative is EPA-approved for the end-use application
- the wood product is treated in compliance with federal law
- the preservative retention and penetration meets the manufacturing specifications
- the pressure-treated wood product has been inspected by an accredited quality-audit program

### Typical Southern Pine Lumber Grade Marks – ink stamp



\* Other organizations accredited by ALSC to inspect and grade all or selected Southern Pine products according to SPIB Grading Rules include: California Lumber Inspection Service (CLIS), Northeastern Lumber Manufacturers Association (NELMA), West Coast Lumber Inspection Bureau (WCLIB) and Western Wood Products Association (WWPA).

### Typical Treated Lumber Quality Marks – plastic end tag or ink stamp



## WOOD PRESERVATIVE SYSTEMS

There are three broad classifications of preservatives used for the pressure treatment of wood products:

**Waterborne** preservatives serve a wide variety of uses including residential, commercial, marine, agricultural, recreational and industrial applications. They are most often specified because they are clean in appearance, odorless, paintable and registered with the EPA for both interior and exterior use without a sealer.

**Creosote** preservatives, including creosote/coal tar mixtures, protect railroad ties, marine pilings and utility poles.

**Oilborne** preservatives are used primarily for utility crossarms and poles, piling, posts and glulam.

Wood preservatives are registered with the Environmental Protection Agency (EPA) for their safe use. There are numerous preservatives available in the marketplace today, many approved by AWPAs while others have ICC-ES Evaluation Reports (ESR). These preservatives can be expected to provide excellent protection for wood products when appropriate preservative retention levels are applied.<sup>1</sup>

Table 1 lists preservative systems used for the pressure treatment of Southern Pine products, and includes the trade names of the treated wood, preservative producers and code acceptance (AWPA and/or ESR number). The preservatives in Table 1 are grouped by classification (waterborne, creosote and oilborne), with the waterborne classification further divided into four categories for clarification:

- Copper Based, Dissolved
- Copper Based, Micronized
- Carbon Based
- Borates

### WATERBORNE PRESERVATIVES, COPPER BASED

Copper has been used for centuries to control fungi. Copper-based preservatives rely on the well-established effectiveness of copper to provide most of the protection to the wood; co-biocides complete the formulations by adding protection against copper-tolerant fungi. Copper-based preservatives can generally be used in both interior and exterior applications, even in the most-severe service conditions. There are two main methods to prepare copper-based preservatives for pressure treatment:

- **Dissolved copper-based** preservative solutions are very effective in penetrating the cells in the wood fiber during the pressure-treatment process, and provide long-term protection from fungal decay and termite attack. They were developed to protect wood products exposed to exterior conditions.

Copper Azole (CA) and Alkaline Copper Quat (ACQ) are commonly used to treat Southern Pine wood products in a wide variety of exterior residential, commercial and agricultural construction applications.

Chromated Copper Arsenate (CCA) is no longer used in consumer applications, but remains an EPA-approved preservative for use in non-consumer industrial, commercial, marine and agricultural applications.

Typical applications for CCA-treated Southern Pine include:

- Agricultural Timbers & Poles
- Foundation Piling
- Highway Construction
- Marine, Brackish & Salt water
- Permanent Wood Foundations
- Utility Poles
- **Micronized copper-based** preservatives are formulated with micron-sized particles of copper suspended in water. They were developed to reduce impact on aquatic and terrestrial environments, and are less corrosive to fasteners.

Micronized Copper Azole ( $\mu$ CA and MCA) is commonly used to treat Southern Pine wood products in both interior and exterior applications.

### WATERBORNE PRESERVATIVES, NON-COPPER BASED

Preservatives without copper provide a lower environmental impact, a natural appearance and are not corrosive. They were developed for use in less-severe service conditions.

**Carbon-based preservatives** (PTI and EL2) are approved for interior and exterior above-ground uses; this includes the bulk of exterior wood products used in residential construction – everything except ground-contact applications.

The most common **borate preservative** is inorganic boron (SBX). SBX is standardized by AWPAs for interior uses, such as sill plates, furring strips, joists, studs, roof trusses, blocking, rafters, beams and other framing applications. ESR-2667 provides acceptance for exterior construction, above ground, coated and rapid water runoff uses (e.g. fascia, siding, trim) when continuously protected from direct wetting with a minimum of one coat of primer and two coats of finish paint.

### CREOSOTE-BASED PRESERVATIVES

Creosote is a tar oil distillate and one of the oldest wood preservatives. Creosote is an effective preservative for severe exposure conditions in commercial, industrial and marine applications, including marine borers in salt water. It is also commonly used by the railroad industry to treat crossties and switchties. Creosote is not generally used in consumer applications due to its odor and oily surface appearance. Creosote-based preservatives include Creosote Preservative (CR), Creosote Solution (CR-S) and Creosote-Petroleum Solution (CR-PS).

### OILBORNE PRESERVATIVES

Oilborne preservatives include Pentachlorophenol (Penta), Copper Naphthenate and Oxine Copper. Penta is commonly used to treat utility poles; it is approved for above-ground and ground contact end uses, but is not generally used in consumer applications due to its odor and oily surface appearance. Copper naphthenate is used to treat field cuts and holes per AWPAs *Standard M4*; it is also used to treat glulam (after gluing) and utility poles. Oxine copper is low in toxicity and approved for above-ground end uses, including glulam beams (after gluing) and certain applications where food is harvested, transported or stored. Oxine copper can also be used to treat field cuts and holes per AWPAs *Standard M4*.

<sup>1</sup> *Comparison of Wood Preservatives in Stake Tests* – 2011 Progress Report, Forest Products Laboratory; Research Note FPL-RN-02; U.S. Department of Agriculture.



**Table 1: Preservatives for the Pressure Treatment of Southern Pine <sup>1</sup>**

Classification	Name of Preservative System	Code – Type	Trade Name of Treated wood	Preservative Producer	Website	Codes & Standards	Common Uses
Waterborne, Copper Based, Dissolved	Alkaline Copper Betaine	KDS	Impralit®-KDS	Ruetgers Organics	Ruetgers-Organics.com	AWPA U1, P55, ESR-2500	Not commonly used to treat Southern Pine.
		KDS-B	Impralit®-KDS-B			AWPA U1, P56, ESR-2500	
	Alkaline Copper Quat	ACQ-A ACQ-D	Naturewood® (ACQ)	Koppers Performance Chemicals	www.kopperspc.com	AWPA U1, P5, P28, P29, ESR-1980	Used in above ground, ground contact and fresh water applications.
			Preserve® ACQ	Viance	TreatedWood.com	AWPA U1 P5, P28, P29	
	Ammoniacal Copper Zinc Arsenate	ACZA	Chemonite®	Arch Wood Protection (Lonza)	Chemonite.com	AWPA U1, P5, P22	Not commonly used to treat Southern Pine.
	Chromated Copper Arsenate	CCA-C	Wolmanized® Heavy Duty™	Arch Wood Protection (Lonza)	WolmanizedWoodHD.com	AWPA U1, P5, P23	Used in heavy-duty industrial, highway, salt water marine and utility applications. CCA is not approved for residential use, except for Permanent Wood Foundations.
			SupaTimber®	Viance	TreatedWood.com		
			K-33®	Koppers Performance Chemicals	www.kopperspc.com		
	Copper Azole	CA-C	NatureWood® CA	Koppers Performance Chemicals	www.kopperspc.com	AWPA U1, P5, P48	Used in above ground, ground contact and fresh water applications.
			Preserve® CA	Viance	TreatedWood.com	AWPA U1, P5, P48	
Wolmanized® Outdoor®			Arch Wood Protection (Lonza)	WolmanizedWood.com	AWPA U1, P5, P48, ESR-1721		
Copper Naphthenate, Waterborne	CuN-W	QNap™-5w	Nisus	Nisuscop.com	AWPA U1, P5, P34	Used to field treat cuts and holes per AWPA M4.	
Waterborne, Copper Based, Micronized	Micronized Copper Azole	μCA-C	Wolmanized® Outdoor®	Arch Wood Protection (Lonza)	WolmanizedWood.com	ESR-1721	Used in above ground, ground contact and fresh water applications.
	Micronized Copper Azole	MCA	MicroPro® / LifeWood®	Koppers Performance Chemicals	www.kopperspc.com	ESR-2240	
Waterborne, Carbon Based	DCOI/Imidacloprid/Stabilizer, Waterborne	EL2	Ecolife™ II	Viance	TreatedWood.com	AWPA U1, P5, P47	Used in above-ground applications.
	Propiconazole Tebuconazole Imidacloprid	PTI	Wolmanized EraWood®	Arch Wood Protection (Lonza)	WolmanizedWood.com	AWPA U1, P5, P45, ESR-1477	
			NexWood™	Koppers Performance Chemicals	www.kopperspc.com	AWPA U1, P5, P45	
Waterborne, Borates	Inorganic Boron	SBX	SillBor®	Arch (Lonza)	SillBor.com	AWPA U1, P5, P25	Used in interior applications and other above-ground uses continuously protected from liquid water. Can also be used to pretreat poles, piles and railroad ties.
			Advance Guard®/Hi-bor®	Koppers Performance Chemicals	www.kopperspc.com	AWPA U1, P5, P25, ESR-2667	
			TimberSaver®	Viance	TreatedWood.com	AWPA U1, P5, P25	
			Cellutreat	Nisus	CelluTreat.com	AWPA U1, P5, P25	
Creosote	Creosote Preservative	CR		Coopers Creek Koppers KMG-Bernuth Lone Star Specialties Ruetgers Stella-Jones	CoopersCreekChemical.com Koppers.com KMGchemicals.com LoneStarSpecialties.net Ruetgers-Group.com Stella-Jones.net CreosoteCouncil.org	AWPA U1, P1/P13	Used to treat railroad ties, marine piles and utility poles.
	Creosote Solution	CR-S				AWPA U1, P2	
	Creosote-Petroleum Solution	CR-PS				AWPA U1, P3	
Oilborne	Copper Naphthenate	CuN	Cop-Guard®		FRTW.com	AWPA U1, P8, P36	Used to field treat cuts and holes per AWPA M4 and to treat glulam beams and utility poles.
	Oxine Copper (Copper 8 Quinolinolate)	Cu8	Cop-8®		FRTW.com	AWPA U1, P8, P37	Used to treat glulam beams for above ground applications and to field treat cuts and holes per AWPA M4.
	Pentachlorophenol	PCP-A PCP-C PCP-G		KMG-Bernuth	KMGchemicals.com	AWPA U1, P8, P35	Used to treat utility poles and glulam beams.

(1) Not all of the preservatives approved by the American Wood Protection Association (AWPA) or by Evaluation Reports (ESR) from the International Code Council's Evaluation Service (ICC-ES) are produced or commonly used to pressure treat Southern Pine lumber products. Approved preservatives not included in this table include: ACC, ACQ-B, ACQ-C, CDDC, CX-A and a number of oilborne preservatives. Refer to the AWPA Book of Standards and ICC-ES ESRs for complete information on all approved preservatives.

## SPECIFICATION GUIDELINES & EXAMPLES

The information presented here is summarized from the *AWPA Book of Standards* and *ICC-ES Evaluation Reports*. The specification guidelines, examples and tables included in this publication are only intended to be a guide. Specifiers and users should use their best judgment to determine the appropriate specification for a particular use.

AWPA *Standard U1* is the primary standard for specifiers, end users and building code officials. This standard is based on the Use Category System (UCS), a simplified approach to selecting the best treated wood products. The UCS includes five major Use Categories (UC) that clearly describe various exposure conditions. The five UCs range from the least-severe exposure that wood products can be subjected to in service (UC1 Interior/Dry), to the most severe exposure (UC5 Marine/Brackish and Salt water). There are also several subcategories, such as UC3A and UC3B for Above Ground, Exterior applications in Protected or Exposed conditions, respectively. There is a sixth and separate UC for fire retardant applications which are not covered in this publication.

The AWPA Use Category System and Use Categories described in *AWPA Standard U1* are trademarks of the American Wood Protection Association. The Service Conditions for treated products approved through ICC-ES *Evaluation Reports* are similar but identified differently.

Different end-use applications may require different amounts of preservative protection. There are many approved preservatives with different penetration and retention levels depending upon the species, product, end-use application and exposure hazard. Penetration refers to the depth a preservative must permeate into the wood fiber during the pressure-treating process. Retention level refers to the amount of preservative that remains in the wood after the process is complete and is expressed in pounds per cubic foot (pcf). Retention requirements can be different based on the wood preservative system used to pressure treat the wood product and its intended end use (Above Ground, Ground Contact, etc.).

Specifiers may choose to provide detailed specifications that include all pertinent information including the appropriate preservative treatment and retention level for the end use of the product. Or, a more simplified approach is to provide the most important information – **the end-use application and service condition (exposure hazard)** – which then allows suppliers to provide a preservative and corresponding retention level that complies with those requirements.

This section provides introductory information with a Simplified Specification Guide and Example for a basic approach, followed by more data and Specification Examples to assist with more detailed specifications. Special emphasis is placed on sawn lumber products which are most commonly specified by users of this publication.

## SIMPLIFIED SPECIFICATION GUIDELINES

Table 2 is a simplified guide for selecting pressure-treated Southern Pine products. This table provides specification information for the most common treated applications, but is not meant to be an all-inclusive reference.

- The **Service Conditions** column describes common exposure hazards.
- The **Applications** column lists products typically exposed to each service condition.
- The **Preservative Systems** column lists the most cost-effective and readily-available preservatives used for each service condition and end-use application.

### Simplified Specification Example – Residential Decks:

Simplified specifications can be written using the information provided in Table 2. When considering a residential deck for example, Table 2 shows that the decking, joists, beams, cross bracing, railing components and stair stepping are typically an Above Ground, Exterior end-use (Use Category 3B), while the supporting posts and stair stringers are typically a Ground Contact/ Fresh water, General Use (Use Category 4A) application. Thus, a simple specification for Southern Pine residential decks that permits the use of all appropriate preservatives (and their corresponding retention levels) could be written as:

*All Southern Pine for the decking, joists, beams, cross bracing, railing components and stair stepping shall be treated with preservatives to the requirements for an Above Ground, Exposed service condition (UC3B) in accordance with AWPA Standard U1 or ICC-ES Evaluation Reports.*

*All Southern Pine for the deck posts and stair stringers shall be treated with preservatives to the requirements for a Ground Contact/ Fresh water, General Use service condition (UC4A) in accordance with AWPA Standard U1 or ICC-ES Evaluation Reports.*

Standard Sizes of Southern Pine			
Nominal Size (width x thickness, inches)	Actual Size (width x thickness, inches)	Nominal Size (width x thickness, inches)	Actual Size (width x thickness, inches)
<b>Boards</b>		<b>Timbers</b>	
1 x 4	3/4 x 3-1/2	6 x 8	5-1/2 x 5-1/2
1 x 6	3/4 x 5-1/2	8 x 8	7-1/2 x 7-1/2
1 x 8	3/4 x 7-1/4	12 x 12	11-1/2 x 11-1/2
1 x 10	3/4 x 9-1/4	<b>Radius Edge Decking</b>	
1 x 12	3/4 x 11-1/4	1-1/4 x 4	1 x 3-1/2
<b>Dimension</b>		1-1/4 x 6	1 x 5-1/2
2 x 4	1-1/2 x 3-1/2	The American Softwood Lumber Standard PS 20 published by the U.S. Department of Commerce lists net lumber dimensions (actual sizes). Refer to the <i>Southern Pine Use Guide</i> and the <i>SPIB Standard Grading Rules for Southern Pine Lumber</i> .	
2 x 6	1-1/2 x 5-1/2		
2 x 8	1-1/2 x 7-1/4		
2 x 10	1-1/2 x 9-1/4		
2 x 12	1-1/2 x 11-1/4		
4 x 4	3-1/2 x 3-1/2		
4 x 6	3-1/2 x 5-1/2		
4 x 8	3-1/2 x 7-1/4		

**Table 2: Simplified Specification Guide<sup>1</sup>**

Service Conditions <sup>2</sup>	Typical End-Use Applications <sup>2</sup>	Commonly-Used Preservative Systems <sup>1,3</sup>
<b>Above Ground, Interior: Dry</b> UC1	<b>Sawn interior framing, flooring, furniture, millwork &amp; trim; roof trusses</b>	Borates, Carbon based, Copper azoles & quats
<b>Above Ground, Interior: Damp</b> UC2	<b>Sawn interior framing, flooring, furring strips, millwork &amp; trim, sill plates; roof trusses; subflooring</b>	Borates, Carbon based, Copper azoles & quats
<b>Above Ground, Exterior: Protected</b> with coating & rapid water runoff UC3A	<b>Sawn painted/coated fascia, fence pickets, gazebo material, millwork &amp; trim, siding</b>	Carbon based, Borates, Copper azoles & quats
<b>Above Ground, Exterior: Exposed</b> UC3B - Intermittent wetting but with sufficient air circulation so wood can readily dry - Excludes Above Ground applications with Ground Contact-type hazards	<b>Sawn decking, deck joists &amp; beams</b> (not subject to frequent wetting – see TIP on page 8), <b>deck cross bracing, railing components &amp; stair stepping; unpainted fascia, fencing, gazebo material, millwork &amp; trim, siding; floor trusses; fresh water pier, dock, walkway and boardwalk decking, joists &amp; beams</b> (not subject to frequent wetting – see TIP on page 8); <b>lattice; outdoor furniture; porch flooring</b>	Copper azoles & quats, Carbon based
	<b>Glulam beams</b> for boardwalks, decks, gazebos, raised floor construction etc.	Copper Naphthenate, Oxine Copper
	<b>Shakes &amp; shingles</b>	CCA, Copper azoles & quats
	<b>Utility crossarms</b> (general use)	Penta, CCA
<b>Ground Contact/ Fresh water: General Use</b> UC4A Non-critical components - In contact with ground - Above Ground but difficult to maintain, repair/replace and are critical to performance & safety - Above Ground but may be subject to Ground Contact-like conditions - Continuous or prolonged wetting	<b>Sawn deck, fence, agricultural/farm &amp; general-use posts; deck joists &amp; beams</b> (ground contact) & <b>stair stringers; agricultural stakes; fresh water floating dock platforms; fresh water pier, dock, walkway &amp; boardwalk decking, joists &amp; beams</b> (subject to frequent wetting); <b>fresh water pier cross bracing; fresh water pier, dock, walkway &amp; boardwalk supports; gazebo &amp; veranda supports; landscape timbers; outdoor furniture; pergolas; playground equipment; retaining walls</b> (not critical); <b>skirtboard; highway structural</b> (general)	Copper azoles & quats
	<b>Sawn bulkhead sheeting</b> (fresh water); <b>round, ½ and ¼ round highway</b> (guide, sign and sight) & <b>fence (farm) posts; stockyard fence rail</b>	CCA, Copper azoles & quats
	<b>Glulam deck posts</b>	Copper Naphthenate, Copper azoles & quats
	<b>Railroad crossties &amp; switchties</b> (general), <b>mine &amp; bridge ties; brine storage</b>	Creosote, Copper Naphthenate
	<b>Utility poles</b> (low decay)	CCA, Creosote, Oilborne
<b>Ground Contact/ Fresh water: Heavy Duty</b> UC4B - Critical components or difficult replacement - High decay potential - Includes salt water splash - Continuous or prolonged wetting	<b>Sawn agricultural posts; building supports; marine out-of-water salt water splash</b> (above ground); <b>Permanent Wood Foundations; structural support sawn poles &amp; piles</b>	Copper azoles & quats, CCA
	<b>Crib walls; greenhouse; retaining walls</b> (critical)	Copper azoles & quats
	<b>Glulam</b> for bridges, sound barrier walls	Copper Naphthenate, CCA, Copper azoles & quats
	<b>Highway bridge, guardrails &amp; spacer blocks, structural</b> (important)	CCA, Copper azoles & quats
	<b>Railroad crossties &amp; switchties</b>	Creosote
	<b>Utility poles</b> (moderate decay)	CCA, Creosote, Oilborne
<b>Ground Contact/ Fresh water: Extreme Duty</b> UC4C - Critical structural components - Severe environments - Extreme decay potential - Includes salt water splash - Continuous or prolonged wetting	<b>Foundation piles; highway bridge, cribbing, piles &amp; structural</b> (critical); <b>marine out-of-water salt water splash</b> (ground contact); <b>sawn building posts</b> (important structural); <b>sawn poles &amp; piles</b> (critical structural support)	CCA, Creosote
	<b>Railroad crossties &amp; switchties</b> (structural)	Creosote
	<b>Utility poles</b> (severe decay)	CCA, Creosote, Oilborne
<b>Marine/ Brackish &amp; Salt water</b> UC5A Northern Waters UC5B Central Waters UC5C Southern Waters	<b>Marine piling, bulkheads, seawalls, pier cross bracing; aqua/mariculture; highway; boats</b>	CCA, Creosote

(1) This table provides specification information for only the most common treated end-use applications and is not meant to be an all-inclusive reference. There are numerous approved preservatives, but not all of them are suitable or commonly used for a specific end use. To provide the most practical information possible, only the preservatives that specifiers, users and producers have established as present market leaders for pressure-treated Southern Pine are included in this table. Refer to the American Wood Protection Association (AWPA) Book of Standards and International Code Council-Evaluation Service (ICC-ES) Evaluation Reports (ESRs) for complete information on all approved preservatives.

(2) Service conditions and end-use applications are based on AWPA Standard U1 (Tables 2-1 and 3-1) and ICC-ES ESRs.

(3) Borates include SBX and DOT; Carbon based includes PTI and EL2; Copper azoles & quats includes dissolved and micronized preservative systems; Oilborne includes Penta and CuN. See Table 1 for a more complete list of preservatives and producers.



## TIP: Use Ground Contact for Long-Term Performance

The two most common service conditions for pressure-treated Southern Pine lumber are Above Ground, Exposed (UC3B) and Ground Contact, General Use (UC4A); the term "Ground Contact" also includes contact with fresh water. Specifying the proper end-use application is very important for long-term performance because higher retention levels are typically required for Ground Contact (UC4A) as compared to Above Ground (UC3B). In addition, different preservatives may be used for Above Ground (e.g. carbon-based preservatives) as compared to Ground Contact (e.g. copper azoles & quats).

The most common misapplications occur when lumber treated for Above Ground Use Only is used where the actual service condition simulates a Ground/ Fresh water Contact end use. For longer-term performance, specify and verify Ground Contact (UC4A) for applications such as:

- Deck joists and beams in close proximity to the ground
- Deck decking, joists and beams subject to frequent wetting from moisture sources such as hot tubs or air-conditioning units
- Joists and beams which are difficult to maintain and are critical to the performance and safety of the entire system
- Fresh water pier cross bracing
- Fresh water dock platforms and fresh water pier joists and beams subject to water immersion or frequent wetting from wind, waves, water-level changes or other factors
- Stair stringers in ground contact or in close proximity to the ground
- Walkway and boardwalk decking, joists and beams in close proximity to the ground or subject to water immersion or frequent wetting



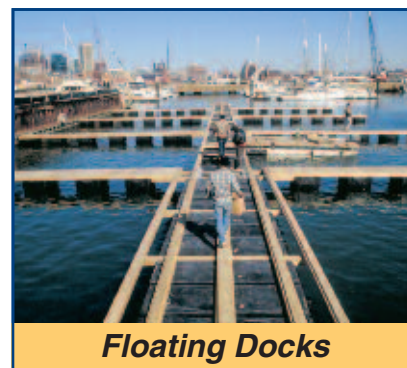
**Deck Joists & Beams**



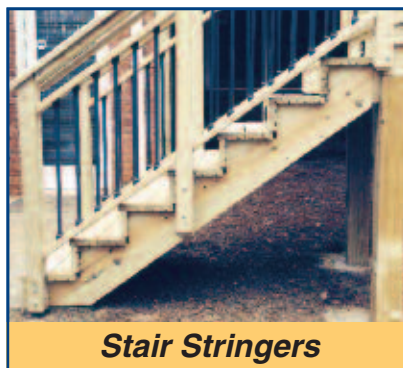
**Frequent Wetting**



**Cross Bracing**



**Floating Docks**



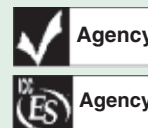
**Stair Stringers**



**Ground-level Walkways**

### ON THE JOB SITE

Treated wood products should be used for their intended service condition. Make sure wood products on the job site have been treated for the particular project or application by reading the plastic end tags or ink stamps on each piece. (See the typical grade marks and quality marks on page 3.) Specifically look for the **Checkmark of Quality** for AWPAs standardized preservatives OR the **ICC-ES logo** for preservatives evaluated with ESRs, AND the **Third-party Inspection Agency** (e.g. SPIB, TP); treated wood without these identifications does not meet building code requirements. Also look for the proper **End-Use Application**, such as:



#### ABOVE GROUND

Above Ground Use Only  
Continuously Protected from Liquid Water  
Decking Use Only  
General Use Framing Lumber  
Vertical Use Fence Boards  
UC1 (Interior, Dry)  
UC2 (Interior, Damp)  
UC3A (Above Ground, Protected)  
UC3B (Above Ground, Exposed)

#### FOUNDATION

Basement Studs  
Permanent Wood Foundation (PWF; FDN)  
Stud Use Only

#### GROUND CONTACT/ FRESHWATER

Ground Contact  
Ground Contact (Fresh water)  
UC4A (Ground Contact, General Use)  
UC4B (Ground Contact, Heavy Duty)  
UC4C (Ground Contact, Extreme Duty)

#### MARINE, BRACKISH/ SALTWATER

Marine  
Seawall (This Side Seaward)  
UC5A (Marine Use, Northern Waters)  
UC5B (Marine Use, Central Waters)  
UC5C (Marine Use, Southern Waters)

## DETAILED SPECIFICATION GUIDELINES

Detailed specification information for pressure-treated Southern Pine wood products can be obtained from the *AWPA Book of Standards*, *ICC-ES Evaluation Reports* and from preservative producers and wood treaters.

The index below lists additional specification tables included in this publication. These tables include the most readily available preservatives used to pressure-treat Southern Pine and are organized by wood product and end-use application. Minimum retention requirements are from *AWPA Standard U1* and/or *ICC-ES Evaluation Reports*.

**Table 3-1:** SAWN PRODUCTS Used in Outdoor Construction Projects  
*Residential/Business, Exterior*

**Table 3-2:** SAWN PRODUCTS Used in the Construction of Buildings  
*Residential/Business, Interior/Exterior*

**Table 3-3:** SAWN PRODUCTS Used in Agricultural, Highway & Industrial Construction  
*Nonresidential/Nonbuildings, Exterior*

**Table 4:** ROUND POSTS, POLES & TIMBER PILING, plus GLUED-LAMINATED UTILITY POLES

**Table 5:** ENGINEERED WOOD PRODUCTS

**Table 6:** MARINE, Brackish & Salt water

**Specification Examples:** Various levels of complexity are common for specifications.

- 1) For example, a simplified specification permitting the use of all appropriate species and preservative combinations for sill plates in residential construction could be written as:

*All lumber for sill plates shall be treated with waterborne preservatives to the requirements for Above Ground, Interior, Damp (Use Category 2) in accordance with AWPA Standard U1 or ICC-ES Evaluation Reports. Dry after treatment to a maximum moisture content of 19%.*

- 2) If a particular species and preservative is desired, the specification can be slightly more detailed, such as:  
*All lumber for sill plates shall be Southern Pine treated with inorganic boron (SBX) to the requirements for Use Category 2 (UC2) in accordance with AWPA Standard U1. Dry after treatment to a maximum moisture content of 19%.*

- 3) More complete specifications include pertinent Standard number(s), such as:

- *AWPA Standard U1 – Use Category System: User Specification for Treated Wood* - the primary reference when specifying a wood product treated with a preservative system approved by AWPA. Standard U1 explains and defines the various Use Categories, lists different products and recommended Use Categories based on their end-uses and exposures, lists AWPA-standardized preservatives for each wood species, and includes Commodity Specifications for specific product types such as sawn products, utility poles, piling, plywood and glulam. The Commodity Specifications contain retention requirements for the preservative systems, plus any special requirements that may apply.

- *AWPA Standard T1 – Use Category System: Processing and Treatment Standard* – governs the preservative retention and penetration requirements, processing limitations, quality control and inspection requirements for treated wood

- *AWPA Standard M1 – Standard for the Purchase of Treated Wood Products* – guidance for purchasers of treated wood products

- *AWPA Standard M4 – Standard for the Care of Preservative-Treated Wood Products* – requirements for care of preservative-treated poles, piles, lumber and ties in plants, storage yards and on job sites, plus requirements for field fabrication and management of used treated wood products

- *AWPA Preservative Standards, such as P25 - Standard for Inorganic Boron (SBX), and/or ICC-ES Evaluation Report Numbers*

More complete specifications also include the following:

	<b>Example</b>
Commodity	<i>Deck Support Posts</i>
Service Condition	<i>Ground/ Fresh water Contact, General Use (UC4A)</i>
Wood Product Type	<i>Sawn Products</i>
Species	<i>Southern Pine</i>
Preservative	<i>Copper Azole (CA-C)</i>
Retention	<i>0.15 pcf</i>
Special Requirements*	<i>No special requirements. Drying after treatment is not required.</i>
Identification	<i>Suppliers shall provide treated material which includes a quality mark that identifies the following on each piece:</i>
	<i>- Inspection agency</i>
	<i>- Treated standard</i>
	<i>- Treating facility</i>
	<i>- Preservative and retention</i>
	<i>- Suitable end use</i>

\* Pre- or post-treatment preparation, including conditioning and drying such as Kiln-Dried After Treatment (KDAT)

There are many preservative/retention options that could be supplied for the Deck Support Post example above. Some common choices for UC4A based on Tables 1, 2, 3-1 and 5 are shown below. Note that some service conditions may require a Heavy Duty (UC4B) retention for posts (e.g. 0.60 pcf ACQ).

<b>Solid-Sawn Deck Support Posts</b>		
<b>Common Preservatives</b> (from Tables 1 & 2)	<b>Trade Names</b> (from Table 1)	<b>Retention (pcf)</b> (from Table 3-1)
<b>Waterborne, Copper Based, Dissolved</b>		
Copper Azole (CA-C)	NatureWood® CA	0.15
	Preserve® CA	0.15
	Wolmanized® Outdoor®	0.15
Alkaline Copper Quat (ACQ)	NatureWood® (ACQ)	0.40
	Preserve® ACQ	0.40
<b>Waterborne, Copper Based, Micronized</b>		
Micronized Copper Azole (µCA-C, MCA)	Wolmanized® Outdoor®	0.14
	MicroPro® / LifeWood®	0.15
<b>Glulam Deck Support Posts</b>		
<b>Common Preservatives</b> (from Tables 1 & 2)	<b>Trade Names</b> (from Table 1)	<b>Retention (pcf)</b> (from Table 5)
<b>Oilborne</b>		
Copper Naphthenate (CuN)	Cop-Guard®	0.060

# COMMON PRESERVATIVES & RETENTIONS BY PRODUCT AND END USE

Tables 3-1 through 6 are organized by wood product and end-use application.

**Table 3-1: SAWN PRODUCTS Used in Outdoor Construction Projects<sup>1</sup>**  
Residential/Business, Exterior

End Uses <sup>4</sup>	Service Condition – Use Category or ESR <sup>4,5</sup>	Southern Pine Waterborne Preservatives <sup>2</sup> & Minimum Retentions <sup>3</sup> (pcf) by End Use <sup>4</sup>					
		PTI <sup>6</sup>	EL2	μCA-C <sup>7</sup>	MCA <sup>7</sup>	CA-C	ACQ-A,D <sup>8</sup>
<b>Decks, Residential</b>							
Decking	3B	0.018	0.019	0.050	0.060	0.060	0.15
Decking, <i>subject to wetting</i> – see TIP on page 8	4A			0.14	0.15	0.15	0.40
Decking & Specialties	ESR <sup>5,5.1</sup>	0.013+	0.019	0.050	0.060	0.060	0.15
Joists, Beams, <i>above ground</i>	3B	0.018	0.019	0.050	0.060	0.060	0.15
Joists, Beams, <i>close ground proximity</i> – see TIP, page 8	4A			0.14	0.15	0.15	0.40
Joists, Beams, <i>ground contact</i>	4A			0.14	0.15	0.15	0.40
Posts, <i>ground contact</i>	4A			0.14	0.15	0.15	0.40
Railing Components, <i>above ground</i>	3B	0.018	0.019	0.050	0.060	0.060	0.15
Stair Stepping, <i>above ground</i>	3B	0.018	0.019	0.050	0.060	0.060	0.15
Stair Stringers, <i>ground contact</i> – see TIP, page 8	4A			0.14	0.15	0.15	0.40
<b>Fences</b>							
Pickets, Rail, Slats, Trim, <i>coated</i>	3A	0.013	0.019	0.050	0.060	0.060	0.15
Pickets, Rail, Slats, Trim, <i>uncoated</i>	3B	0.018	0.019	0.050	0.060	0.060	0.15
Fence Boards & Pickets	ESR <sup>5,5.2</sup>	0.013	0.019	0.050	0.060	0.060	0.15
Fencing	ESR <sup>5,5.1</sup>	0.013	0.019	0.050	0.060	0.060	0.15
Posts, <i>ground contact</i>	4A			0.14	0.15	0.15	0.40
<b>Fresh water</b> , see Piers & Docks, Walkways & Boardwalks							
<b>Furniture</b> , outdoor							
Above ground	3B	0.018	0.019	0.050	0.060	0.060	0.15
Ground contact	4A			0.14	0.15	0.15	0.40
<b>Gazebos</b>							
Above ground, <i>painted/coated</i>	3A	0.013	0.019	0.050	0.060	0.060	0.15
Above ground, <i>unpainted</i>	3B	0.018	0.019	0.050	0.060	0.060	0.15
Ground contact	4A			0.14	0.15	0.15	0.40
<b>Landscape Timbers, S4S</b> , ground contact	4A			0.14	0.15	0.15	0.40
<b>Lattice</b> , above ground, exterior	3B	0.018	0.019	0.050	0.060	0.060	0.15
<b>Lumber, Boards, Timbers</b> , general use, exterior							
Above ground, <i>painted/coated</i>	3A	0.013	0.019	0.050	0.060	0.060	0.15
Above ground, <i>unpainted</i>	3B	0.018	0.019	0.050	0.060	0.060	0.15
Above ground, <i>general use</i>	ESR <sup>5</sup>	0.013+	0.019	0.050	0.060	0.060	0.20
Ground contact or fresh water, <i>not critical</i>	4A			0.14	0.15	0.15	0.40
Compost, Plant and Mushroom Boxes, Bender Board, Edging, Flumes, Retaining Walls, <i>not critical</i>							
Ground contact, <i>general use</i>	ESR <sup>5</sup>			0.14	0.15	0.15	0.40
<b>Pergolas</b>	4A			0.14	0.15	0.15	0.40
<b>Piers &amp; Docks</b> , fresh water							
Decking, Joists, Beams	3B	0.018	0.019	0.050	0.060	0.060	0.15
Decking, Joists, Beams, <i>frequent wetting</i> – see TIP, p.8	4A			0.14	0.15	0.15	0.40
Floating dock platforms – see TIP, page 8	4A			0.14	0.15	0.15	0.40
Pier cross bracing – see TIP, page 8	4A			0.14	0.15	0.15	0.40
Supports	4A			0.14	0.15	0.15	0.40
<b>Playground Equipment</b> , ground contact	4A			0.14	0.15	0.15	0.40
<b>Posts, Sawn</b> , ground contact or fresh water							
Deck, Fence, General and Playground Equip. Posts	4A			0.14	0.15	0.15	0.40
Pier, Dock, Walkway and Boardwalk Posts	4A			0.14	0.15	0.15	0.40
<b>Walkways &amp; Boardwalks</b> , fresh water							
Decking, Joists, Beams	3B	0.018	0.019	0.050	0.060	0.060	0.15
Decking, Joists, Beams, <i>frequent wetting</i> – see TIP, p.8	4A			0.14	0.15	0.15	0.40
Posts	4A			0.14	0.15	0.15	0.40

**Footnotes for Tables 3-1, 3-2, 3-3, 4, 5 and 6:**

- (1) Tables 3-1 thru 6 include only the most readily-available preservatives used to pressure treat Southern Pine wood products by end use. See Table 1 for a more complete list of preservative systems, their names and additional information.
- (2) Not all preservatives are approved or used for all end uses or service conditions. To provide the most practical information possible, these tables provide minimum retention levels for only the most common preservatives for each specific end use. Refer to the American Wood Protection Association (AWPA) Book of Standards and International Code Council-Evaluation Service (ICC-ES) Evaluation Reports (ESRs) for complete information on all approved preservatives.
- (3) Minimum retention requirements are from AWPA Standard U1 (Commodity Specifications A through G) and ICC-ES ESRs, and are given in pounds per cubic foot (pcf).
- (4) End Uses are based on AWPA Standard U1 (Tables 2-1 and 3-1) and ICC-ES ESRs. See AWPA Standard U1 for a more complete list of commodities, uses, exposures, use categories, commodity

specifications and special requirements.

- (5) Use Categories (UC) are trademarks of AWPA. The service conditions for treated products evaluated through ICC-ES ESRs are similar but identified differently. Some retention levels required by ICC-ES ESRs are different than required by AWPA Standard U1.
- (5.1) Above ground decking and other specialties (railing, spindles, trim, fencing, fascia, lattice)
- (5.2) Above ground vertical use fence boards and pickets
- (5.3) Critical structural members and wood foundation systems
- (5.4) Above ground continuously protected from liquid water
- (6) For UC3B, PTI is required to have a minimum retention of 0.013 pcf plus a 0.24 pcf water repellent, or 0.018 pcf without a water repellent.
- (7) Code acceptance for micronized copper azole is through ICC-ES ESRs; other preservatives are standardized by AWPA.
- (8) ACQ-A is not approved for retentions exceeding 0.40 pcf. ESR-1980 requires a minimum retention of 0.20 pcf for ACQ in above ground, general use applications.

- (9) 0.17/0.28 (B<sub>2</sub>O<sub>3</sub> basis) equals 0.25/0.40 (DOT basis). SBX is required to have a minimum retention of 0.28 (B<sub>2</sub>O<sub>3</sub>) or 0.40 (DOT) pcf in areas subject to Formosan subterranean termite activity. Listed retentions for the other preservatives are suitable for exposure to Formosan termites.
- (10) SBX is standardized by AWPA for interior use only; ESR-2667 provides acceptance for exterior construction, above ground, coated & rapid water runoff when continuously protected from direct wetting with a minimum of one coat of primer and two coats of finish paint.
- (11) CCA is EPA-approved for use in non-consumer agricultural, foundation, highway, marine and utility pole applications. CCA is not approved for residential use, except for Permanent Wood Foundations.
- (12) Crossties and Switchties can be pre-treated with SBX (DOT) and then secondarily treated with CR, CR-S, CR-PS or CuN.
- (13) Outer zone/inner zone.
- (14) Can also be treated with CR-PS.
- (15) CR only.



**Table 3-2: SAWN PRODUCTS Used in the Construction of Buildings<sup>1</sup>**  
**Residential/Business, Interior/Exterior**

End Uses <sup>4</sup>	Service Condition – Use Category or ESR <sup>4,5</sup>	Southern Pine Waterborne Preservatives <sup>2</sup> & Minimum Retentions <sup>3</sup> (pcf) by End Use <sup>4</sup>							
		SBX <sup>9,10</sup>	PTI <sup>6</sup>	EL2	μCA-C <sup>7</sup>	MCA <sup>7</sup>	CA-C	ACQ-A,D <sup>8</sup>	CCA <sup>11</sup>
<b>Cant Strips</b> , above ground	3B		0.018	0.019	0.050	0.060	0.060	0.15	
<b>Fascia Boards</b> , above ground, exterior									
Painted, coated	3A	0.17/0.28	0.013	0.019	0.050	0.060	0.060	0.15	
Unpainted	3B		0.018	0.019	0.050	0.060	0.060	0.15	
<b>Fire Escapes</b> , exterior exposed	4A				0.14	0.15	0.15	0.40	
<b>Flooring</b> , above ground									
Interior	1, 2	0.17/0.28	0.013	0.019	0.050	0.060	0.060	0.15	
Exterior	3B		0.018	0.019	0.050	0.060	0.060	0.15	
<b>Framing</b> , interior, above ground									
<b>Joists, Rafters, Purlins, Studs, Headers, Beams</b>	1, 2	0.17/0.28	0.013	0.019	0.050	0.060	0.060	0.15	
<b>Sill Plates</b>	2	0.17/0.28	0.013	0.019	0.050	0.060	0.060	0.15	
<b>Furniture</b> , indoor	1	0.17/0.28	0.013	0.019	0.050	0.060	0.060	0.15	
<b>Furring Strips</b> , above ground									
Indoor	2	0.17/0.28	0.013	0.019	0.050	0.060	0.060	0.15	
Outdoor	3B		0.013	0.019	0.050	0.060	0.060	0.15	
<b>Interior</b> , above ground	ESR <sup>5,5,4</sup>	0.17/0.28	0.018	0.019	0.050	0.060	0.060	0.20	
<b>Lumber, Boards, Timbers</b> , General Use									
Above ground, interior, dry	1	0.17/0.28	0.013	0.019	0.050	0.060	0.060	0.15	
Above ground, interior, damp	2	0.17/0.28	0.013	0.019	0.050	0.060	0.060	0.15	
Above ground, general use	ESR <sup>5</sup>		0.013+	0.019	0.050	0.060	0.060	0.20	
Above ground, exterior, painted/coated	3A	0.17/0.28	0.013	0.019	0.050	0.060	0.060	0.15	
Above ground, exterior, unpainted	3B		0.018	0.019	0.050	0.060	0.060	0.15	
Ground contact or fresh water	4A				0.14	0.15	0.15	0.40	
Ground contact, general use	ESR <sup>5</sup>				0.14	0.15	0.15	0.40	
Ground contact or fresh water, critical	4B				0.23	0.23	0.31	0.60	0.60
Ground contact, critical/ heavy duty/ foundation	ESR <sup>5,5,3</sup>				0.23	0.23	0.25	0.60	0.60
Ground contact or fresh water, severe	4C						0.31	0.60	0.60
Ground contact, extreme duty	ESR <sup>5</sup>						0.60	0.60	0.60
<b>Millwork, Trim</b> , above ground									
Interior	1, 2	0.17/0.28	0.013	0.019	0.050	0.060	0.060	0.15	
Exterior, painted	3A	0.17/0.28	0.013	0.019	0.050	0.060	0.060	0.15	
Exterior, unpainted	3B		0.018	0.019	0.050	0.060	0.060	0.15	
<b>Permanent Wood Foundation</b>	4B				0.23	0.23	0.31	0.60	0.60
<b>Piles, Sawn</b> , ground contact or fresh water									
<b>Structural Support</b>	4B				0.23	0.23	0.31	0.60	0.60
<b>Structural Support, critical</b>	4C						0.31	0.60	0.60
<b>Poles, Sawn</b> , ground contact or fresh water									
<b>Structural Building Support, moderate decay</b>	4B				0.23	0.23	0.31	0.60	0.60
<b>Posts, Sawn</b> , ground contact or fresh water									
<b>Important Building Structural</b>	4C						0.31	0.60	0.60
<b>Porch Flooring</b> , above ground, exterior	3B		0.018	0.019	0.050	0.060	0.060	0.15	
<b>Roof Decking</b> , above ground, exterior	3B		0.018	0.019	0.050	0.060	0.060	0.15	
<b>Shakes and Shingles</b> , above ground, exterior	3B						0.060	0.15	0.25
<b>Siding</b> , above ground, exterior									
Painted, coated	3A	0.17/0.28	0.013	0.019	0.050	0.060	0.060	0.15	
Unpainted	3B		0.018	0.019	0.050	0.060	0.060	0.15	
<b>Skirtboard</b> , Post-Frame Construction	4A				0.14	0.15	0.15	0.40	
<b>Structural Supports</b> , ground contact or fresh water									
<b>Veranda Supports</b>	4A				0.14	0.15	0.15	0.40	
<b>Residential/Business Supports</b>	4B				0.23	0.23	0.31	0.60	0.60
<b>Residential/Business Supports</b>	4C						0.31	0.60	0.60
<b>Critical Supports</b>	4C						0.31	0.60	0.60
<b>Trusses</b>									
<b>Roof Trusses, interior</b>	1, 2	0.17/0.28	0.013	0.019	0.050	0.060	0.060	0.15	
<b>Floor Trusses, above ground</b>	3B		0.018	0.019	0.050	0.060	0.060	0.15	

(1) This table includes only the most readily-available preservatives used to pressure treat Southern Pine solid-sawn products by end use. See Table 1 for a more complete list of preservative systems, their names and additional information.

(2) Not all preservatives are approved or used for all end uses or service conditions. To provide the most practical information possible, this table provides minimum retention levels for only the most common preservatives for each specific end use. Refer to the American Wood Protection Association (AWPA) Book of Standards and International Code Council-Evaluation Service (ICC-ES) Evaluation Reports (ESRs) for complete information on all approved preservatives.

(3) Minimum retention requirements are from AWPA Standard U1 (Commodity Specifications A (Sawn Products), B (Posts) and D (Poles)) and ICC-ES ESRs, and are given in pounds per cubic foot (pcf).

(4) End Uses are based on AWPA Standard U1 (Tables 2-1 and 3-1) and ICC-ES ESRs. See AWPA Standard U1 for a more complete list of commodities, uses, exposures, use categories, commodity specifications and special requirements.

See additional footnotes on page 10.

**Table 3-3: SAWN PRODUCTS Used in Agricultural, Highway and Industrial Construction<sup>1</sup>  
Nonresidential/Nonbuildings, Exterior**

End Uses <sup>4</sup>	Service Condition – Use Category or ESR <sup>4,5</sup>	Southern Pine Preservatives <sup>2</sup> & Minimum Retentions <sup>3</sup> (pcf) by End Use <sup>4</sup>										
		Waterborne							Oilborne	Creosote		
		PTI <sup>6</sup>	EL2	µCA-C <sup>7</sup>	MCA <sup>7</sup>	CA-C	ACQ-A,D <sup>8</sup>	CCA <sup>11</sup>	PCP-A,C	CR, CR-S	CR-PS	
<b>Agriculture/Farms</b>												
Agriculture/Mariculture, ground contact	4A			0.14	0.15	0.15	0.40	0.40				
Fence Posts, sawn four sides, ground contact	4A			0.14	0.15	0.15	0.40	0.40				
Food Contact, above ground, exterior	3B	0.018	0.019									
Food Harvest & Storage, above ground, exterior	3B	0.018	0.019									
Grape/Agricultural Stakes, sawn, ground contact	4A			0.14	0.15	0.15	0.40					
Greenhouse, ground contact or fresh water	4B			0.23	0.23	0.31	0.60					
Poles, Sawn, agricultural/farm	4A			0.14	0.15	0.15	0.40	0.40				
Posts, Sawn, agricultural use, moderate decay	4B			0.23	0.23	0.31	0.60	0.60				
Stockyard Fence Rail, above ground, exterior	4A			0.14	0.15	0.15	0.40					
<b>Aquaculture</b> , fresh water	4C					0.31	0.60					
<b>Bridges</b> , Lumber, Timber & Decking, UC4C retentions	4C					0.31		0.60			12	12
<b>Cooling Towers</b> , fresh water contact	4A			0.14	0.15	0.15		0.40				
<b>Crib Walls</b> , ground contact or fresh water	4B			0.23	0.23	0.31	0.60					
<b>Cribbing &amp; Culverts</b>	4C					0.31		0.60			12	12
<b>Crossarms</b> , Sawn, above ground, exterior												
General Use	3B					0.060		0.25	0.40			
Critical or hard to replace	4A					0.15		0.40	0.50			
<b>Crossties &amp; Switchties<sup>12</sup></b>	4A										8.0	8.0
<b>Highway Construction</b> , exterior												
Ground contact or fresh water	4B			0.23	0.23	0.31	0.60	0.60				
Brackish or salt water, single treatment	5A							1.5			20	
Brackish or salt water, single treatment	5B, 5C							2.5			25	
Brackish or salt water, dual treatment, esp. UC5C	5C, 5B, 5A							1.5 (1st)			20 (2nd)	
Brine Storage, ground contact or fresh water	4A										10	10
Cribbing, ground contact or fresh water	4C					0.31	0.60	0.60			12	12
Handrails, Guardrails, above ground, exterior	3B			0.050	0.060	0.060	0.15					
Posts, Sawn, ground contact or fresh water												
Sign Posts, Fence Posts, Handrails, general	4A			0.14	0.15	0.15	0.40	0.40				
Guardrails, Spacer Blocks, critical, moderate decay	4B			0.23	0.23	0.31	0.60	0.60				
<b>Lumber, Timber, Boards</b> , General Use, exterior												
Above ground, unpainted/uncoated	3B	0.018	0.019	0.050	0.060	0.060	0.15	0.25				
Above ground, general use	ESR <sup>5</sup>	0.013+	0.019	0.050	0.060	0.060	0.15	0.25				
Ground contact or fresh water	4A			0.14	0.15	0.15	0.40	0.40				
Boats, Bulkhead Sheeting, fresh water												
Expansion Boards												
Ground contact, general use	ESR <sup>5</sup>			0.14	0.15	0.15	0.40	0.40				
Ground contact or fresh water, critical	4B			0.23	0.23	0.31	0.60	0.60			10	10
Ground contact, critical/heavy duty/foundation	ESR <sup>5,5.3</sup>			0.23	0.23	0.25	0.60	0.60				
Ground contact, salt water splash	4C					0.31	0.60	0.60			12	12
Ground contact, extreme duty	ESR <sup>5</sup>						0.60	0.60				
<b>Lumber, Timbers and Decking</b> , UC4C retentions for												
Bridges, Structural Members, Cribbing & Culverts	4C					0.31		0.60			12	12
<b>Marine</b> , Out-of-Water, Salt water Splash												
Above Ground	4B			0.23	0.23	0.31	0.60	0.60			10	10
Ground contact	4C					0.31	0.60	0.60			12	12
<b>Marine</b> , Brackish or Salt water												
<b>Aquaculture/Mariculture, Seawalls</b>												
Boats, Bulkhead Sheeting, marine												
Brackish or salt water, single treatment	5A							1.5			20	
Brackish or salt water, single treatment	5B, 5C							2.5			25	
Brackish or salt water, dual treatment, esp. UC5C	5C, 5B, 5A							1.5 (1st)			20 (2nd)	
<b>Posts, Sawn</b> , ground contact or fresh water, general	4A			0.14	0.15	0.15	0.40	0.40				
<b>Retaining Walls</b> , ground contact or fresh water, critical	4B			0.23	0.23	0.31	0.60					
<b>Ties, Mine &amp; Bridge</b>												
Ground contact or fresh water	4A			0.14	0.15	0.15	0.40				10	10
Brackish or salt water, single treatment	5A							1.5			20	
Brackish or salt water, single treatment	5B, 5C							2.5			25	
Brackish or salt water, dual treatment, esp. UC5C	5C, 5B, 5A							1.5 (1st)			20 (2nd)	

(1) This table includes only the most readily-available preservatives used to pressure treat Southern Pine solid-sawn products by end use. See Table 1 for a more complete list of preservative systems, their names and additional information.  
(2) Not all preservatives are approved or used for all end uses or service conditions. To provide the most practical information possible, this table provides minimum retention levels for only the most common preservatives for each specific end use. Refer to the American Wood Protection Association (AWPA) Book of Standards and International Code Council-Evaluation Service (ICC-ES) Evaluation Reports (ESRs) for complete information on all approved preservatives.  
(3) Minimum retention requirements are from AWPA Standard U1 (Commodity Specifications A (Sawn Products), B (Posts), C (Crossties and Switchties) D (Poles) and G (Marine)) and ICC-ES ESRs, and are given in pounds per cubic foot (pcf).  
(4) End Uses are based on AWPA Standard U1 (Tables 2-1 and 3-1) and ICC-ES ESRs. See AWPA Standard U1 for a more complete list of commodities, uses, exposures, use categories, commodity specifications and special requirements.  
See additional footnotes on page 10.

**Table 4: Round Posts, Poles & Timber Piling, plus Glued-Laminated Utility Poles<sup>1</sup>**

End Uses <sup>4</sup>	Service Condition – Use Category or ESR <sup>4,5</sup>	Southern Pine Preservatives <sup>2</sup> & Minimum Retentions <sup>3</sup> (pcf) by End Use <sup>4</sup>							
		Waterborne					Oilborne		Creosote
		µCA-C	MCA	CA-C	ACQ-A,D <sup>6</sup>	CCA	PCP-A,C	CuN	CR, CR-S
<b>Round, Half-Round and Quarter-Round Posts (lengths &lt; 16 feet), ground contact or fresh water</b>									
<i>Agricultural (Farm), Round Structural Members</i>	4B	0.23	0.23	0.31	0.60	0.60			
<i>Building Construction, Round Posts</i>	4B	0.23	0.23	0.31		0.60			
<i>Fence, Round, 1/2 &amp; 1/4 Round</i>	4A	0.14	0.15	0.15	0.40	0.40			
<i>General</i>	4A	0.14	0.15	0.15	0.40	0.40			
<i>Highway Construction</i>									
<i>Brine Storage, moderate decay</i>	4B								10 <sup>15</sup>
<i>Guardrail Posts, Spacer Blocks, moderate decay</i>	4B	0.23	0.23	0.25	0.50	0.50			
<i>Fence, Guide, Sign &amp; Sight Posts</i>	4A	0.14	0.15	0.15	0.40	0.40			
<i>Playground Equipment</i>	4A	0.14	0.15	0.15	0.40				
<b>Round and Glued-Laminated (Glulam) Poles (lengths ≥ 16 feet), ground contact or fresh water</b>									
<i>Agricultural Use, Round Poles</i>									
Low decay	4A	0.14	0.15	0.31		0.60	0.30	0.060	6.0
Moderate decay	4B	0.23	0.23	0.31		0.60	0.38	0.080	7.5
<i>Building Construction, Structural Round Poles</i>	4B	0.23	0.23	0.31		0.60	0.45		9.0
<i>Highway Construction, Round Poles, moderate decay</i>	4B	0.23	0.23	0.31		0.60	0.38	0.080	7.5
<i>Lighting Poles, Round</i>									
Moderate decay	4B	0.23	0.23	0.31		0.60	0.38	0.080	7.5
High decay	4C			0.31		0.60	0.45	0.13	9.0
<i>Utility Poles, Round</i>									
Low decay	4A	0.14	0.15	0.31		0.60	0.30	0.060	6.0
Moderate decay	4B	0.23	0.23	0.31		0.60	0.38	0.080	7.5
High decay	4C			0.31		0.60	0.45	0.13	9.0
<i>Utility Poles, Laminated - Distribution, Transmission</i>									
General, low decay	4A	0.14	0.15				0.45/0.23 <sup>13</sup>	0.095/0.048 <sup>13</sup>	9.0/4.5 <sup>13,15</sup>
Important, moderate or high decay	4B	0.23	0.23				0.45/0.23 <sup>13</sup>	0.095/0.048 <sup>13</sup>	9.0/4.5 <sup>13,15</sup>
Critical, high or severe decay	4C						0.60/0.30 <sup>13</sup>	0.15/0.075 <sup>13</sup>	12/6.0 <sup>13,15</sup>
<b>Round Timber Piling</b>									
<i>Building Construction, Foundation Piles</i>									
Completely embedded in soil, ground contact	4C			0.41		0.80			12
<i>Highway Construction, Round Timber Piling</i>									
Ground contact or fresh water	4C			0.41		0.80			12
Brackish or salt water, single treatment	5A					1.5/0.9 <sup>13</sup>			16
Brackish or salt water, single treatment	5B, 5C					2.5/1.5 <sup>13</sup>			20
<i>Marine, Round Timber Piling, brackish or salt water</i>									
Northern waters	5A					1.5/0.9 <sup>13</sup>			16
Central and Southern waters	5B, 5C					2.5/1.5 <sup>13</sup>			20
<i>Marine, Round Timber Piling, dual treatment</i>	5C, 5B					1.0 (1st)			20 (2nd)

(1) This table includes only the most readily-available preservatives used to pressure treat Southern Pine round posts, round timber piling and glulam utility poles by end use. See Table 1 for a more complete list of preservative systems, their names and additional information.  
 (2) Not all preservatives are approved or used for all end uses or service conditions. To provide the most practical information possible, this table provides minimum retention levels for only the most common preservatives for each specific end use. Refer to the American Wood Protection Association (AWPA) Book of Standards for complete information on all approved preservatives.  
 (3) Minimum retention requirements are from AWPA Standard U1 (Commodity Specifications B (Posts), D (Poles), E (Round Timber Piling) and G (Marine)) and ICC-ES ESRs, and are given in pounds per cubic foot (pcf). Commodity Specification B includes playground equipment (both sawn & round), round building posts & poles and modified exposures for farm use, plus states that creosote is the preferred treatment for brine storage.  
 (4) End Uses are based on AWPA Standard U1 (Tables 2-1 and 3-1) and ICC-ES ESRs. See AWPA Standard U1 for a more complete list of commodities, uses, exposures, use categories, commodity specifications and special requirements.



Round timber piling and glulam floor beams



Round timber piling



Round timber piling – marine application



**Table 5: Engineered Wood Products<sup>1</sup>**

End Uses <sup>4</sup> by Product	Service Condition - Use Category or ESR <sup>4</sup>	Southern Pine Preservatives <sup>2</sup> & Minimum Retentions <sup>3</sup> (pcf) by End Use <sup>4</sup>										
		Waterborne						Oilborne			Creosote	
		PTI <sup>6</sup>	EL2	μCA-C7	MCA7	CA-C	ACQ-A,D <sup>8</sup>	CCA <sup>11</sup>	PCP-A,C	Cu8	CuN	CR, CR-S
<b>Plywood</b>												
Above ground, exterior Roof decking, Flooring, Subflooring General, including Agricultural/Farms	3B 3B	0.018 0.018	0.019 0.019	0.050 0.050	0.060 0.060	0.060 0.060	0.15 0.15	0.25				
Ground contact or fresh water General, including Highway Construction	4A			0.14	0.15	0.15	0.40	0.40	0.50			10 <sup>14</sup>
Salt water splash, Marine	4B			0.23	0.23	0.31	0.60	0.60				12 <sup>14</sup>
Brackish or salt water Marine, Highway Construction, Boat Building	5A, 5B, 5C							2.5				25
Permanent Wood Foundation, ground contact & above	4B			0.23	0.23	0.31	0.60	0.60				
Subflooring, interior, damp	2	0.013	0.019	0.050	0.060	0.060	0.15					
<b>Glulam, treated after gluing</b>												
Above ground, interior	1-2											
Above ground, exterior, structural	3B								0.30	0.020	0.040	8.0 <sup>14</sup>
Ground contact or fresh water, low decay General structural, including Highway non-critical	4A								0.60		0.060	10 <sup>14</sup>
Ground contact or fresh water, high decay Highway, important structural	4B								0.60		0.075	12
Ground contact or fresh water, severe decay Highway, critical structural	4C								0.60		0.075	12
Utility Poles, Laminated - Distribution, Transmission General	4A								0.45/0.23 <sup>13</sup>		0.095/0.048 <sup>13</sup>	9.0/4.5 <sup>13</sup>
Important, high decay	4B								0.45/0.23 <sup>13</sup>		0.095/0.048 <sup>13</sup>	9.0/4.5 <sup>13</sup>
Critical, severe decay	4C								0.60/0.30 <sup>13</sup>		0.15/0.075 <sup>13</sup>	12/6.0 <sup>13</sup>
<b>Glulam, laminations treated before gluing</b>												
Above ground, interior	1-2	0.013		0.050	0.060	0.060	0.15					
Above ground, exterior, structural	3B	0.018		0.050	0.060	0.060	0.15					
Ground contact or fresh water, low decay General structural, including Highway non-critical	4A			0.14	0.15	0.15	0.40	0.40				
<b>Parallel Strand Lumber</b>												
Above ground, exterior, structural	3B					0.060		0.25	0.40		0.040	8.0 <sup>14</sup>
Highway, structural, ground contact or fresh water General	4A						0.15	0.40	0.50		0.060	10 <sup>14</sup>
Important or high decay	4B						0.31	0.60	0.60		0.075	10
Critical or severe decay	4C						0.31	0.60	0.60		0.075	12
<b>Laminated Veneer Lumber</b>												
Above ground, exterior, structural	3B											8.0
Highway, structural, ground contact or fresh water General	4A											10
Important or high decay	4B											12
Critical or severe decay	4C											12

(1) This table includes only the most readily-available preservatives used to pressure treat Southern Pine engineered wood products including plywood, glulam, PSL and LVL by end use. See Table 1 for a more complete list of preservative systems, their names and additional information.

(2) Not all preservatives are approved or used for all end uses or service conditions. To provide the most practical information possible, this table provides minimum retention levels for only the most common preservatives for each specific end use. Refer to the American Wood Protection Association (AWPA) Book of Standards and International Code Council-Evaluation Service (ICC-ES) Evaluation Reports (ESRs) for complete information on all approved preservatives.

(3) Minimum retention requirements are from AWPA Standard U1 (Commodity Specification F (Wood Composites)) and ICC-ES ESRs, and are given in pounds per cubic foot (pcf).

(4) End Uses are based on AWPA Standard U1 (Tables 2-1 and 3-1). See AWPA Standard U1 for a more complete list of commodities, uses, exposures, use categories, commodity specifications and special requirements.

See additional footnotes on page 10.

## PRESSURE-TREATED ENGINEERED WOOD PRODUCTS

Many engineered wood products, referred to as wood composites by AWPA, can be pressure treated to resist decay and insects. This includes plywood structural wood sheathing, glued-laminated (glulam) timber, parallel strand lumber and laminated veneer lumber. Glulam can be treated before or after gluing. Visit [apawood.org](http://apawood.org) for additional information.



Pressure-treated glulam beam



Pressure-treated plywood

**Table 6: Marine (Brackish & Salt water) Applications<sup>1</sup>**

End Uses <sup>4</sup>	Service Condition – Use Category <sup>4</sup>		
<b>Marine Out-of-Water, Salt water Splash</b> Above Ground Ground Contact	4B 4C		
<b>Marine, Brackish or Salt water</b> Long Island, NY, North; San Francisco, North Long Island to GA So. Border, San Francisco, South South of GA, Gulf Coast, Hawaii & Puerto Rico	5A 5B 5C		
<b>Southern Pine Preservatives<sup>2</sup> &amp; Minimum Retentions<sup>3</sup> (pcf) by End Use<sup>4</sup></b>			
End Uses <sup>4</sup> by Product	Service Condition – Use Category <sup>4</sup>	Waterborne	Creosote
		CCA	CR, CR-S
<b>Marine Lumber, Timbers &amp; Boards, Sawn</b> Single treatment Single treatment Dual treatment - 1st CCA, 2nd Creosote	5A 5B, 5C 5C, 5B	1.5 2.5 1.5 (1st)	20 25 20 (2nd)
<b>Highway Construction, Aquaculture/Mariculture, Boats, Bulkhead Sheeting, Seawalls, Pier Cross Bracing, Piles, Mine Ties, Bridge Ties</b>			
<b>Marine Piles, Round</b> Single treatment Single treatment Dual treatment - 1st CCA, 2nd Creosote	5A 5B, 5C 5C, 5B	1.5/0.9 <sup>13</sup> 2.5/1.5 <sup>13</sup> 1.0 (1st)	16 20 20 (2nd)
<b>Marine Plywood</b> Single treatment	5A, 5B, 5C	2.5	25

(1) This table includes only the most readily-available preservatives used to pressure treat Southern Pine wood products in marine construction. See Table 1 for a more complete list of preservative systems, their names and additional information.

(2) Not all preservatives are approved or used for all end uses or service conditions. To provide the most practical information possible, this table provides minimum retention levels for only the most common preservatives used for Southern Pine. Refer to the American Wood Protection Association (AWPA) Book of Standards for complete information on all approved preservatives.

(3) Minimum retention requirements are from AWPA Standard U1 (Commodity Specification G (Marine)), and are given in pounds per cubic foot (pcf).

(4) End Uses are based on AWPA Standard U1 (Tables 2-1 and 3-1). See AWPA Standard U1 for a more complete list of commodities, uses, exposures, use categories, commodity specifications and special requirements.

**TIP: Use Marine and Seawall Grades**

The SPIB *Standard Grading Rules for Southern Pine Lumber* include two grade categories specifically for marine applications. Both require pressure treatment by an approved treating process and preservative for marine usage.



**Marine** requires that all four longitudinal faces must be free of pith and/or heartwood. It can be specified in sizes 1" to 20" thick and 2" to 20" wide in any grade of Dimension Lumber or Timbers.

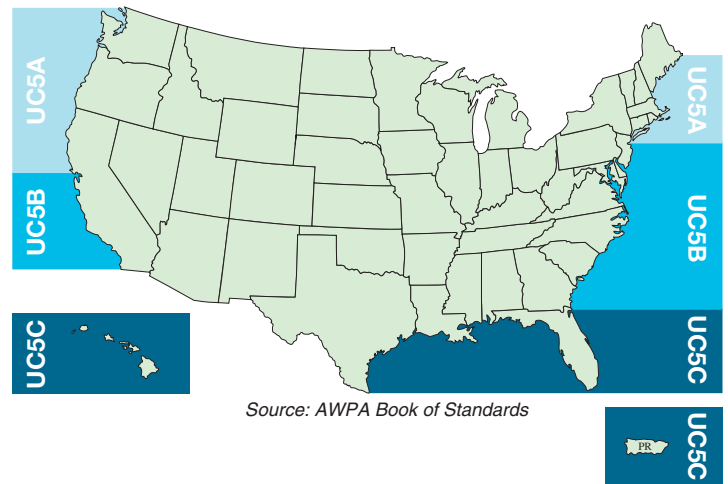
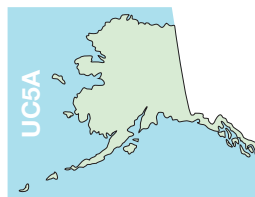
**Seawall** requires that one wide face and both adjacent narrow faces must be free of pith and/or heartwood. It can be specified in sizes 2" to 4" thick and 6" to 14" wide in any grade of Dimension Lumber. Seawall is intended for bulkhead sheeting applications and must have the sapwood face stamped THIS SIDE SEAWARD.

For additional information on specifications and design concepts for marine applications, refer to SFPA's publication *Marine Construction Guide*.



**MARINE USE CATEGORIES FOR U.S. COASTAL WATERS**

Coastal zones and corresponding Use Categories for salt water marine exposure are shown here. Use Category requirements for particular zones are based on the presence of specific marine organisms. The degree of hazard posed by these organisms in a specific coastal zone will determine the appropriate preservative loading. This map is only a general guide and should be supplemented with local information where there is doubt concerning the nature of marine borer activity and selection of an appropriate preservative.



Source: AWPA Book of Standards



## LONG-TERM PERFORMANCE

Wood products are preservative treated to provide the required longevity for their intended use. This section addresses a variety of topics pertinent to the proper use and long-term performance of pressure-treated wood products. This includes consideration of the following:

- using the right fasteners and connectors for corrosion protection
- re-drying after treatment with waterborne preservatives for dimensional stability
- structural design, including use of the latest design values and appropriate adjustment factors
- on-site job storage for moisture protection
- treatment for field-cut ends, notches and drilled holes
- proper installation, finishing and maintenance

### FASTENERS & CONNECTORS

Metal used in construction must be properly protected from corrosion. The potential for corrosion of fasteners (e.g. nails, screws, bolts, nuts and washers) and connectors (e.g. joist hangers, straps, hinges, post anchors and truss plates) in contact with pressure-treated wood varies by preservative system and end-use exposure. For example, wood treated with non-copper based waterborne preservatives, such as SBX, PTI and EL2, is less corrosive overall than wood treated with copper-based preservatives. Also, wood treated with micronized copper preservatives, such as MCA and  $\mu$ CA, is less corrosive overall than wood treated with dissolved copper preservatives, such as ACQ, CA and CCA. In addition, interior, dry environments are less conducive to corrosion than exterior, wet environments. Particularly severe environments include swimming pools, below-grade foundations, salt water exposure, trapped water and other environments that allow for constant, repetitive or long periods of wet conditions.

It is important to follow specific recommendations from preservative and hardware manufacturers, but the following is some general guidance:

- Model building code requirements are provided in Section 2304.9.5 of the *International Building Code*® and Section R317.3 of the *International Residential Code*®.
- In general, the codes require fasteners to be of hot-dipped, zinc-coated galvanized steel in accordance with *ASTM A153*, type 304 or 316 stainless steel, silicon bronze or copper.
- An exception allows the use of plain carbon-steel fasteners for wood treated with borates and used in an interior, dry environment.
- Connectors should conform with *ASTM A653*.
- Fasteners and connectors used together must be of the same metallic composition to avoid galvanic corrosion; for example, use hot-dip galvanized nails with hot-dip galvanized joist hangers and stainless-steel nails with stainless-steel joist hangers.



- Aluminum fasteners and aluminum building products (e.g. window and door trim, flashing, siding, roofing and gutters) should not be placed in direct contact with wood products treated with dissolved copper preservatives. Direct contact with aluminum may be allowed for wood products treated with borates, carbon-based and micronized copper preservatives when used for interior and exterior, above-ground applications that do not trap moisture or allow the wood to be exposed to standing water or to water immersion.
- Stainless-steel fasteners are required for Permanent Wood Foundations below grade and other severe environments.
- Electroplated galvanized fasteners and connectors are typically not accepted for use in exterior applications, regardless of the preservative system.
- Other coatings or metal products may be available so follow the hardware manufacturers' recommendations for compatibility with wood treated with the various preservative systems and end-use exposures.
- Construction adhesives are not a replacement for metal fasteners, but can be added for extra holding power. Be sure the product label states the adhesive is "for use with treated lumber" and follow the adhesive manufacturer's instructions.

### DRIED AFTER TREATMENT

As the name implies, waterborne preservatives use water to carry preservatives deep into the wood's fiber. Treating standards require wood products to be dry prior to treatment, with the moisture content percent requirement varying by product and size. For example, the moisture content for dimension lumber must be 19% or less prior to treatment, and can exceed 50% when removed from the treating cylinder.

Most pressure-treated Southern Pine is delivered without being redried, but drying after treatment – either KDAT (kiln dried after treatment) or ADAT (air dried after treatment) – can be specified to return the wood to its dry condition.

Drying after treatment may be required for structural strength or dimensional stability. For example, *AWPA Standard U1* requires pressure-treated lumber and plywood for Permanent Wood Foundations to be dried after treatment.

Building codes may also require drying after treatment where wood treated with waterborne preservatives is used in enclosed locations where drying in service cannot readily be achieved. Examples include interior products and framing such as cant strips, flooring, joists, millwork & trim, roof & floor trusses, sill plates and studs.

In addition, drying after treatment is recommended when dimensional stability and tightness of fit are important to the end-use application. Examples include, decking, playground equipment, porch flooring and siding where superior long-term performance is desired.





## DESIGN VALUES FOR PRESSURE-TREATED APPLICATIONS

Reference design values for Southern Pine lumber are tabulated in the *Design Values for Wood Construction Supplement of the National Design Specification® (NDS)®* published by the American Wood Council. Reference design values for untreated lumber also apply to lumber pressure treated by an approved process and preservative. As a result, new design values that became effective June 1, 2013 also apply to visually graded Southern Pine dimension lumber that is pressure-treated.

Reference design values are based on normal load duration under the moisture service conditions specified; they must be multiplied by applicable adjustment factors to determine adjusted design values. Adjustment factors for untreated lumber also apply to pressure-treated lumber with one exception – in Allowable Stress Design applications allowing an increase with the Load Duration Factor,  $C_D$ , that factor cannot exceed 1.6 for structural members pressure treated with waterborne preservatives.



As an example, common adjustment factors to consider when sizing pressure-treated joists for an exterior application include:

**Wet Service Factor,  $C_M$**  – A reduction required for lumber used under conditions where the moisture content of the wood in service will exceed 19% for an extended period of time, such as for uncovered outdoor decks regularly exposed directly to rain or other sources of moisture. Members that are protected from the weather by roofs or other means but are occasionally subjected to windblown moisture, such as for covered porches, are generally considered dry applications.

**Repetitive Member Factor,  $C_R$**  – An increase allowed when at least three joists are in contact or spaced not more than 24" on center and are joined by a load distributing element such as decking.

**Incising Factor,  $C_I$**  – A reduction required for difficult-to-treat species that must be incised to meet AWPA treating standards. This reduction does not apply to Southern Pine because of its ease of treatability.

Refer to SFPA publications *Southern Pine Use Guide* and *Maximum Spans for Southern Pine Joists & Rafters* for more information.

## STORAGE

All wood products, including pressure-treated products, will continue to lose or gain moisture until they adjust to the conditions of their end-use environment. As a result, proper storage before and during construction is important. Treated lumber should be stacked and stored in the same manner as untreated wood. Follow these simple rules to help ensure proper storage and product performance at the job site:

**Inspect lumber** upon delivery for proper grade-marking and moisture content, plus other conditions that may require attention, such as mold.

**Unload lumber** in a dry place – not in wet or muddy areas.

**Elevate lumber** on stringers to prevent absorption of ground moisture and to allow air circulation. Do not store lumber in direct contact with the ground.

**Cover lumber** stored in an open area with a material that provides protection from the elements. Polyethylene or similar non-porous covers act as a vapor barrier, so it is important to allow ventilation around the material to prevent condensation on the underside of the covering.

**Enclose framing lumber** under roof as soon as possible.

**Store exterior products** (e.g. decking, porch flooring, siding) in a covered outdoor area to allow acclimation prior to installation. Layering the material on stringers to permit air circulation will help promote drying.

**Store interior products** (e.g. flooring, millwork) in the enclosed, conditioned area where installation will occur.

**Use lumber** in the order in which it is received. Inventory rotation is important.



Proper job site storage

Additional protection is provided when lumber is paper-wrapped or has been treated with a weather-protective coating. However, availability is limited and weather-protective coatings are effective for only three to six months. Damage to the paper during transportation can reduce its effectiveness, and protection is lost when paper wrappings are removed. For more details, refer to SFPA publications *Southern Pine Use Guide* and *Managing Moisture and Mold*.

## FIELD TREATMENTS

Whenever practical, complete all required fabrication prior to treatment. Otherwise, any cuts and holes that penetrate the treated zone must be field treated in accordance with AWP Standard M4, *Standard for the Care of Preservative-Treated Wood Products*.



Southern Pine lumber and timbers less than 6" thick and used in above-ground applications, generally do not require field treatment to provide a good service life, but it is still considered good practice for satisfactory long-term performance. Material with narrow sapwood faces or heavy heartwood cross-sections should be field treated when cut or drilled. Bored holes for fasteners and connectors can be field treated with coal-tar roofing cement conforming to *ASTM D5643*.



AWPA M4 includes the following additional requirements:

- Apply field-treatment preservatives in accordance with the product label.
- Clean excessive preservative from the product's surface prior to use.
- Treat timber piles used to support structures, or used as foundation piling, with a liberal application of copper naphthenate with a minimum 2.0% copper metal.
- Cap marine piling exposed to the weather with a permanently fixed coating or caps attached to the piles.

The appropriate preservative for field treatment depends on the preservative system originally used to treat the product as shown below.

### Recommended Preservative for Field Treatment

Original Preservative	End-Use Application	Field Treatment Preservative	Requirement
Waterborne preservatives, copper naphthenate, pentachlorophenol, creosote or creosote solution	All, as appropriate for the original preservative system	Copper Naphthenate	Minimum 2.0% copper metal is recommended; minimum 1.0% can be used if the higher concentration is not readily available
Waterborne preservatives	Above ground and continuously protected from water only	Inorganic Boron	Minimum 1.5% (B <sub>2</sub> O <sub>3</sub> basis)
Waterborne preservatives, copper naphthenate, pentachlorophenol, creosote or creosote solution	Above ground only	Oxine Copper	Minimum 0.675% oxine copper (0.12% copper metal)

## FINISHING

As with other building materials, the satisfactory long-term performance of pressure-treated Southern Pine is dependent upon proper design, installation, finishing and maintenance.

Finishing recommendations vary by preservative type and end-use application, so be sure to follow the paint or stain manufacturer's instructions for specific projects. In general, waterborne preservatives are clean in appearance and can be painted or stained. Creosote and oilborne pentachlorophenol, on the other hand, have an oily surface appearance and are not paintable on a practical basis. Southern Pine treated with waterborne preservatives accepts a finish similar to untreated Southern Pine. Most importantly, the treated wood should be dry before applying the finish.

Pressure-treated wood is most often used in outdoor environments that would be challenging to any building material. As an example, outdoor decks present a particularly severe exposure for both the wood and its finish. Pressure-treated decking is exposed to both sun and rain, greatly accelerating the natural weathering process. The wood shrinks and swells as repeated cycles of drying and wetting

occur, subjecting its finish to excessive stress. Furthermore, the finish on the top surface of the decking is subjected to abrasive wear, particularly in high-traffic areas.



The key to satisfactory long-term performance of pressure-treated decking is to minimize its dimensional changes. This can be accomplished by including a water repellent in the treatment process, drying after treatment and re-applying a water-repellent finish when needed. For additional information on finishing and maintaining decks, refer to the SFPA publication *Southern Pine Decks and Porches* and visit [SouthernPineDecks.com](http://SouthernPineDecks.com).



# SPAN TABLES

Tables 7 through 9 are abbreviated span tables for pressure-treated Southern Pine visual grades No.1 and No.2, intended for use under wet-service conditions (floor/deck joists) where moisture content (MC) exceeds 19%. For other grades, loading conditions and on-center spacings, refer to SFPA's publication, *Maximum Spans for Southern Pine Joists & Rafters*; download a PDF from SouthernPine.com. Spans are given in feet and inches and are the maximum allowable horizontal span of the member from inside to inside of bearings.

Spans were determined on the same basis as the code-recognized *Span Tables for Joists & Rafters* and *Wood Structural*

*Design Data*, published by the American Wood Council; concentrated loads and uplift loads caused by wind were not considered. Applied loads are in pounds per square foot (psf). Deflection is limited to the span in inches divided by 360, and is based on live load only. The load duration factor,  $C_D$ , is 1.0.

Standard engineering design formulas for simple span beams with uniformly distributed gravity loads were used. The calculated spans assume fully supported members, properly sheathed and nailed on the top edge of the joist. Maximum spans were calculated using design values that became effective June 1, 2013.

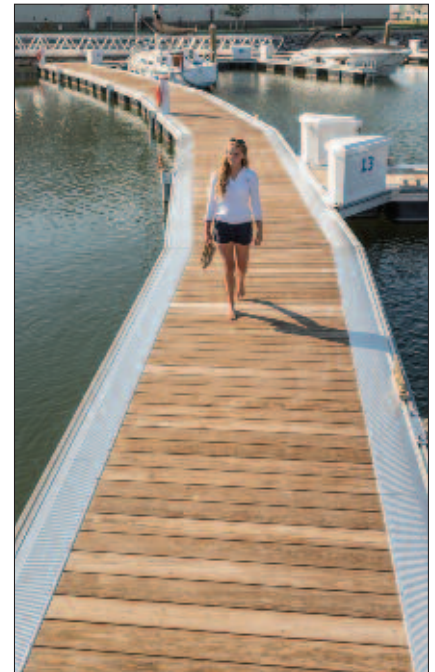
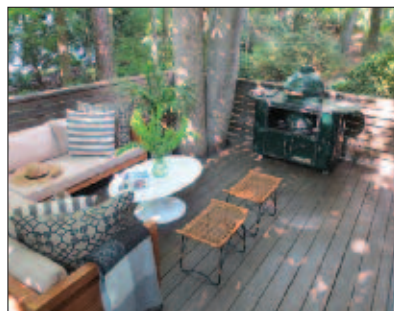
7 TREATED FLOOR/DECK JOISTS 40 PSF LIVE LOAD, 10 PSF DEAD LOAD, 360 DEFLECTION			
Size inches (actual)	Spacing inches on center	Visually Graded	
		No.1 No.1 Prime	No.2 No.2 Prime
2 x 6 (1.5x5.5)	12.0	10-4	9-11
	16.0	9-5	9-0
	24.0	8-2	7-7
2 x 8 (1.5x7.25)	12.0	13-8	13-1
	16.0	12-5	11-10
	24.0	10-4	9-8
2 x 10 (1.5x9.25)	12.0	17-5	16-2
	16.0	15-10	14-0
	24.0	13-1	11-5
2 x 12 (1.5x11.25)	12.0	21-2	19-1
	16.0	19-1	16-6
	24.0	15-7	13-6

8 TREATED FLOOR/DECK JOISTS 60 PSF LIVE LOAD, 10 PSF DEAD LOAD, 360 DEFLECTION			
Size inches (actual)	Spacing inches on center	Visually Graded	
		No.1 No.1 Prime	No.2 No.2 Prime
2 x 6 (1.5x5.5)	12.0	9-1	8-8
	16.0	8-3	7-10
	24.0	6-11	6-5
2 x 8 (1.5x7.25)	12.0	11-11	11-5
	16.0	10-9	10-0
	24.0	8-9	8-2
2 x 10 (1.5x9.25)	12.0	15-2	13-8
	16.0	13-7	11-10
	24.0	11-1	9-8
2 x 12 (1.5x11.25)	12.0	18-6	16-1
	16.0	16-1	14-0
	24.0	13-2	11-5

9 TREATED FLOOR/DECK JOISTS 100 PSF LIVE LOAD, 10 PSF DEAD LOAD, 360 DEFLECTION			
Size inches (actual)	Spacing inches on center	Visually Graded	
		No.1 No.1 Prime	No.2 No.2 Prime
2 x 6 (1.5x5.5)	12.0	7-8	7-3
	16.0	6-9	6-3
	24.0	5-6	5-2
2 x 8 (1.5x7.25)	12.0	9-10	9-2
	16.0	8-7	8-0
	24.0	7-0	6-6
2 x 10 (1.5x9.25)	12.0	12-6	10-11
	16.0	10-10	9-5
	24.0	8-10	7-9
2 x 12 (1.5x11.25)	12.0	14-10	12-10
	16.0	12-10	11-2
	24.0	10-4	9-1

Spans were determined on the same basis as the code-recognized *Span Tables for Joists & Rafters* and *Wood Structural Design Data*, published by the American Wood Council; concentrated loads and uplift loads caused by wind were not considered. Applied loads are in pounds per square foot (psf). Deflection is limited to the span in inches divided by 360, and is based on live load only. The load duration factor,  $C_D$ , is 1.0.

Listed spans are for wet-service conditions, pressure-treated Southern Pine floor/deck joists, MC > 19%. Check sources of supply for available grades and sizes. SFPA does not grade or test lumber. Neither SFPA, nor its members, warrant that the design values on which the span tables are based are correct, and disclaim responsibility for injury or damage resulting from the use of these tables.





## APPLICATIONS



### Decks & Porches

Today's home designs incorporate the deck and porch as natural extensions of the family's living area. With its built-in resistance to decay and termites, pressure-treated Southern Pine porch flooring, when properly installed, provides decades of satisfying service. Porches without complete roof protection are generally constructed in the same manner as outdoor decks, using a surface of either 2x6 nominal size or 5/4x6 Radius Edge Decking.

Visit [SouthernPineDecks.com](http://SouthernPineDecks.com) or refer to SFPA's publication *Southern Pine Decks and Porches*.

### Marine Structures

Pressure-treated Southern Pine materials are widely available in large sizes and heavy treatments, both preferred attributes for marine structures. Industry standards require different retention levels for treated material intended for freshwater, saltwater, or saltwater splash exposures. The choice of a preservative depends on how and where wood will be used in a marine environment.

For materials on specifications and design concepts, refer to SFPA's *Marine Construction Guide*.



### Raised Wood Floor Foundations

American homes have been built on raised wood floor systems since Colonial times. A raised wood floor system elevates the living space off the ground, isolating it from moisture and pests. Elevating a structure reduces flood insurance premiums and can even prevent flood damage. Installation, maintenance and modification of plumbing and utilities are simplified. Any foundation can settle over time, but a raised wood floor system makes easy work out of leveling and repairs.

Visit [RaisedFloorLiving.com](http://RaisedFloorLiving.com) or refer to the publication, *Raised Wood Floor Foundations – Design & Construction Guide*.

### Termite-Resistant Framing

Smart property owners are choosing entire framing packages of pressure-treated lumber. The “whole house” termite-resistant framing solution adds a second line of defense when used in conjunction with traditional termite controls such as ground-line treatments and termite barriers. Termite-resistant framing is a low-cost “insurance policy” to help protect what is often a homeowner's single largest investment. Building codes may require drying after treatment where wood treated with waterborne preservatives is used in enclosed locations where drying in service cannot readily be achieved.



### Timber Bridges

Interest in timber bridges has increased in recent years given America's challenges with its aging infrastructure. Timber bridges range from long-span glulam bridges on primary and secondary roads, to short-span solid-sawn bridges on rural roads. Sections can be prefabricated offsite, reducing construction schedules and labor costs – critical attributes for rural road systems with their large number of bridges that are either structurally deficient or functionally obsolete.

Visit the National Center for Wood Transportation Structures (NCWTS) at [WoodCenter.org](http://WoodCenter.org) for more information. Also visit [SouthernPine.com](http://SouthernPine.com) for standardized bridge plans.

### Permanent Wood Foundations

A PWF consists of loadbearing walls framed with pressure-treated lumber and sheathed with pressure-treated structural panels. The walls are designed to withstand backfill and vertical loading. They are supported laterally at the top by the floor system, at the bottom by a cast-in-place slab or pressure-treated wood basement floor, and at the base by backfill and foundation footings of crushed stone, gravel, coarse sand or poured concrete. Here's an innovative, engineered building system for crawlspace, split-level, or full-basement foundations, proven by years of success in thousands of homes and other structures throughout the U.S.

Refer to SFPA's publication *Permanent Wood Foundations: Design & Construction Guide*.



### Post-Frame Construction

Simple design principles and flexibility make post-frame construction popular among architects, engineers, and building designers. Post-frame buildings are economical, easy to construct, and code-compliant. They also offer excellent performance under high-wind and seismic loading conditions, making it ideal for demanding applications such as dairy barns, riding arenas, animal housing, and other rural buildings. The latest design concepts have extended post-frame construction to commercial buildings – auto dealerships and repair shops, retail stores, office buildings, and churches.

Educational and technical resources are available at [NFBA.org](http://NFBA.org).

## SAFE & ENVIRONMENTALLY FRIENDLY

Pressure-treated building materials add years to the service life of many structures, reducing the need for repairs and replacement. A structure's longer service translates into reduced demands made of our valuable forest resources.

When properly treated, handled and installed, pressure-treated Southern Pine is safe and environmentally friendly. Using some basic handling precautions and personal protection measures – all common building practices, whether using untreated wood or other materials – pressure-treated lumber is safe to use.



## Safe Practices

Suppliers of pressure-treated wood provide Material Safety Data Sheets (MSDS) and/or Consumer Information Sheets listing specific safe practices for particular preservatives. In general, consider the following common-sense practices when using, working with and disposing of pressure-treated wood:

- Only use treated wood where protection against insect attack or fungal decay is necessary or important.
- Only use wood products treated with waterborne preservatives that are visibly clean and free of surface residue.
- Only use wood products treated with oilborne or creosote preservatives that are reasonably free of surface deposits.
- Do not use treated wood where the preservative may become a component of food, animal feed or beehives.
- Do not use pressure-treated wood where it may come in contact with drinking water, except for uses involving incidental contact such as docks and bridges.
- Wear gloves when working with wood to avoid splinters.
- Wear a dust mask when machining wood to reduce the inhalation of wood dust.
- Wear eye protection to reduce the potential for eye injury from wood particles and flying debris during machining.
- Clean up all sawdust and debris.
- Wash hands thoroughly with mild soap and water after working with treated wood.
- Wash work clothes separately from other household clothing before reuse.
- Dispose of treated wood in landfills or commercial/ industrial incinerators or boilers in accordance with federal, state and local regulations.
- Do not burn treated wood in open fires or in stoves, fireplaces or residential boilers.



Safety first. When sawing or machining treated wood, wearing eye protection, a dust mask, and gloves is recommended, a practice applicable when using other sawn or machined building materials.



Photo courtesy HANDY Magazine



## TREATED WOOD = LOWER ENVIRONMENTAL IMPACT

Life Cycle Assessment (LCA) is an essential part of green building because it offers an objective and consistent way to measure the environmental impacts of building materials and assemblies. LCA confirms the environmental and other advantages of wood construction. Study after study in Europe, North America and elsewhere has shown that wood outperforms other products when considered over its complete life cycle.

But how does wood treated with preservatives compare to other building products used for the same application? Members of the Treated Wood Council wanted to know, and have published a series of life cycle comparisons (ISO 14044 compliant) on a range of treated products, from decking to marine piling. The analyses are conducted using life cycle methodologies following ISO 14044 standards, then published in peer-reviewed scientific journals.

Regardless of the application, analysis clearly shows that preservative-treated wood has a lower environmental impact when compared to steel, concrete, or plastic composites. To learn more, download these LCA summary reports at [SouthernPine.com](http://SouthernPine.com), listed under Publications:



*LCA: ACQ-Treated Lumber Decking with Comparisons to Wood Plastic Composite Decking*

*LCA: Borate-Treated Structural Framing with Comparisons to Galvanized Steel Framing*



*LCA: Treated Wood Marine Piling with Comparisons to Concrete, Steel and Plastic Piling*

*LCA: Treated Utility Poles with Comparisons to Steel and Concrete Utility Poles*



*LCA: Treated Highway Guardrail Posts with Comparisons to Galvanized Steel*

*LCA: Creosote-Treated Railroad Crossties with Comparisons to Concrete and Plastic Crossties*



### Wood products help reduce CO<sub>2</sub> emissions.

Wood is the responsible choice for building professionals. Why? Because wood products require less energy to manufacture – meaning fewer greenhouse gasses, like CO<sub>2</sub>. And trees use CO<sub>2</sub> to grow, changing greenhouse gases into the building blocks we know as wood. That's why wood products are increasingly being recognized as tools to combat climate change.

#### How Does Wood Reduce Carbon?



As trees grow, they remove and store carbon from the atmosphere.

Managed forests increase carbon storage by harvesting slower growing trees, and replacing them with younger trees.



Wood products, such as lumber and furniture, store carbon during their life cycle. They are 50 percent carbon by weight.



Recycling wood products allows them to continue to store carbon indefinitely.



## ADDITIONAL RESOURCES

The Southern Forest Products Association offers a wide variety of helpful publications for design-build professionals. The titles listed below are available online in PDF. Visit [SouthernPine.com](http://SouthernPine.com) to download and to see a listing of all publications.

**Southern Pine Use Guide**  
grade descriptions, design values, applications, specification guidelines

**Southern Pine Decks and Porches**  
product selection, construction guidelines, maintenance

**Marine Construction Guide**  
specifications, guidelines and design concepts for bulkheads, piers, docks, walkways and light vehicular bridges

**Southern Pine Maximum Spans for Joists and Rafters**  
span tables, design criteria

**Southern Pine Headers & Beams**  
size selection and allowable load tables for Southern Pine lumber and glued-laminated timber

**Raised Wood Floor Foundations**  
foundation types, construction details, floor framing spans, cost-saving strategies

The following two titles can also be downloaded from the Publications page of [SouthernPine.com](http://SouthernPine.com):

**Treated Wood in Aquatic Environments**  
a specification and environmental guide to selecting, installing and managing wood preservation systems in aquatic and wetland environments

**Best Management Practices**  
for the use of wood in aquatic and wetland environments



**Online  
PRODUCT LOCATOR**

Sourcing Southern Pine products?

Visit the online Product Locator at  
**SouthernPine.com**

to find SFPA member producers.

### SOURCES OF TREATED WOOD PRODUCT INFORMATION

American Wood Council [awc.org](http://awc.org)  
American Wood Protection Association [awpa.com](http://awpa.com)  
APA [apawood.org](http://apawood.org)  
Creosote Council [creosotecouncil.org](http://creosotecouncil.org)  
ICC Evaluation Service [icc-es.org](http://icc-es.org)  
North American Wood Pole Council [woodpoles.org](http://woodpoles.org)

Railway Tie Association [rta.org](http://rta.org)  
Southern Forest Products Association [southernpine.com](http://southernpine.com)  
Southern Pressure Treated Association [spta.org](http://spta.org)  
Western Wood Preservers Institute [wwpinstitute.org](http://wwpinstitute.org)  
Wood Preservation Canada [woodpreservation.ca](http://woodpreservation.ca)  
Wood Preservative Science Council [woodpreservativescience.com](http://woodpreservativescience.com)



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