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# Selecting Preservative Treated Wood

## (WITH SPECIAL EMPHASIS ON LANDSCAPE TIMBERS)



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## I. Introduction

Wood is treated to prevent its destruction by wood-decaying organisms. Treating wood with the appropriate preservative increases its service life, and also helps to conserve our nation's timber resources. Although treated wood has long been used for products such as crossties and pilings, many new applications have been developed.

Preservative treated timbers are becoming increasingly popular for use in landscape construction. Their ready adaptability, ease of machining, and aesthetic qualities make them highly suited for use in landscape structures such as decks, fences, steps, and retaining walls. These structures blend naturally with the landscape and help to increase property values.

With so many different preservatives, methods of treatment, and wood species available, the buyer of treated wood is left with the difficult choice of which type of timber is best suited for use. The wrong choice could possibly require needless corrective measures or expensive replacement costs. This bulletin will provide the purchaser of treated wood with the information necessary to select treated wood with a special emphasis on landscape timbers.

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## II. Why Treat Wood?

Deterioration of wood in use is commonly caused by decay fungi, certain insects (including termites and carpenter ants), other organisms (marine borers), and weathering. Of these, decay fungi cause the greatest damage to wood in service.

Decay fungi, or wood rotters, are lower forms of plant life related to mushrooms, rusts, molds, and mildews. Wood rotters grow throughout the wood in threadlike strands digesting cellulose and other components for food. In the early stages, this causes a large loss of strength and eventually results in soft, crumbly, punky wood. In the advanced stages, fruiting bodies or conks may grow out of the wood releasing hundreds of thousands of tiny spores (similar to seeds) to the atmosphere. Because of the tremendous number of spores present in the soil and air, no wood is safe from decay if the proper growing conditions are present.

Four conditions must be favorable for the spores to germinate and grow. These are:

- Heat (20°-35°C or 68°-95°F optimum)
- Moisture Content (20% + moisture content in wood)
- Oxygen
- Food (cellulose and wood sugars)

By eliminating any of these conditions a decay fungus cannot readily grow and the wood is protected from decay.

Fungi need temperatures in the range of 68°-95°F for optimum growth. If the temperature rises above this range, fungal growth is greatly slowed. If the temperature drops far enough below, the rotters will become dormant until conditions are favorable again.

Fungi need sufficient moisture to decay wood. There is no such thing as "dry rot." Wood that is wetted and dried repeatedly may eventually decay because most rotters will become dormant until moisture conditions are favorable again. Wood at a moisture content of less than 20% will not decay.

Ground contact is especially likely to promote decay. Moisture from the soil and adequate oxygen provide extremely favorable decay conditions. Wood that is completely submerged in fresh water or buried far below the ground line will not rot due to a lack of sufficient oxygen.

The objective of a wood preservative is to contaminate or change the form of the fourth condition necessary for fungal growth, the food source. By impregnating the wood with a toxic substance, the fungi are unable to utilize the wood for food. It is probably the most effective decay prevention method used today for exterior exposure situations.

The wood in a tree consists of two general regions: the heartwood

**Figure 1. Cross section of a log showing the location of the heartwood and sapwood.**


**Sapwood**

Light-colored, porous, young wood just beneath the bark. Conducts food and minerals between leaves and roots. Decays quickly. Soaks up penta readily.

**Heartwood**

Dark, old, dead wood in center of tree, forming its support. More durable than sapwood; often very decay-resistant: difficult to treat.

**Good Posts for Treating**

- —have a minimum of heartwood.
- —have at least one inch of sapwood surrounding the heartwood.

and the sapwood. The center of the trunk or the heartwood is generally darker in color than the sapwood which surrounds it (see figure 1). This difference is primarily due to the presence of substances called extractives which are deposited as a result of the tree's growth processes. The extractives of some wood species are toxic to rotters making their heartwood very durable for use in areas of high decay hazard. However, a dark-colored heartwood does not necessarily indicate a durable wood.

Since sapwood does not contain extractives it is nondurable even in species with heartwood of high durability (see figure 2). Table 1 lists the heartwood durability of various woods commonly available and their estimated ranges of service life.

The durability of heartwood varies not only between species but between trees of the same species and within the tree itself. As a result, wide ranges of service life in the lumber of even a highly durable wood may be experienced and rapid decay is occasionally reported. A proper preservative treatment is usually more reliable when using wood in soil or water contact than naturally durable species and normally at less cost. Untreated lumber of highly durable species, such as the heartwood of redwood or western red cedar, gives excellent service in areas of low to moderate decay hazard in above ground use. Outdoor decks, rails, stairways, and siding are good examples.

## III. Commonly Used Preservatives

Through experience and experimentation, wood preservatives commonly used today have proved to be highly toxic to wood destroying organisms. Preservatives are generally divided into two groups: oil-type and waterborne salts.

Because oil-type preservatives are insoluble in water, they are resistant to leaching and do not cause wood to swell during treatment. Creosote and pentachlorophenol are the two most commonly used oil preservatives.

Creosote is a brownish-black oil composed of hundreds of organic compounds. It is made for preservative use by distilling coal tar, and it can also be made from wood or petroleum. Creosote treating gives wood a dark brown to black color and has been used extensively in treating poles, piles, crossties, and timbers.

Creosote is often combined with coal tar or heavy petroleum oil to lower preservative costs. Although this may decrease toxicity to fungi it often increases service life because oils and tar help reduce weathering and checking by preventing rapid uptake of moisture. Crossties are usually treated with creosote coal tar or petroleum solutions.

Pentachlorophenol, also known as penta or PCP, must be dissolved in petroleum oils or more volatile organic solvents such as mineral spirits, liquified petroleum gas, and methylene chloride in order to treat wood. The more volatile solvents will evaporate leaving only preservative present. Treating solutions normally contain 5% penta by weight. Depending upon the solvent used,

**Table 1. Life Expectancy of Various Species of Untreated Heartwood in Ground Contact**

| Durability | Species | Life Expectancy of Untreated Heartwood (years) |
|---|---|---|
| Very Durable | Eastern red cedar | 30+ |
| | Redwood | 10-30 * |
| | Western red cedar | 10-25 |
| Durable | White and burr oak | 10-15 |
| | Northern white cedar | 5-15 |
| Moderately Durable | Tamarack | 8-10 |
| | Red oak | 6-8 |
| | Douglas fir | 4-6 |
| Nondurable | Red and jack pine | 2-6 |
| | Aspen (poplar) and cottonwood | 3-4 |
| | Ponderosa pine | 3-4 |
| | White birch | 3-4 |
| | Spruce and balsam fir | 3-4 |
| | Basswood | <5 |
| | Maples | 2-4 |
| | Ashes | <5 |
| | Willow | <5 |

**Although tests at the Forest Products Laboratory in Madison, Wisconsin show that redwood durability can be good, it is at best quite variable. Their recommendation is treatment of redwood whenever it is used in ground contact.*

penta treated wood will vary from light to dark brown in color. Penta has been used extensively in the millwork industry and the treating of posts and poles.

Specialized oilborne preservatives include copper naphthanate and Copper-8-quinolinolate. Copper naphthanate is safe for use where living plants contact the wood. Copper-8-quinolinolate is unique because it is safe to use where food and feed come in contact. Both compounds are very expensive, limiting any extensive use as preservative.

Waterborne preservatives are soluble in water during treatment. Since water is used as a carrier for the chemicals, the wood should be redried after treatment to a moisture content of 19% or less unless otherwise specified. There are two basic types of waterborne preservatives: leach-resistant and leachable.

**Figure 2. Untreated cedar post—sapwood at groundline has been destroyed by fungi after only two years of service. The heartwood is completely sound. (Photo courtesy of North Carolina State University.)**

**Table 2. Compositions of the 3 Types of CCA and Their Trade Names**

| Components | Percentages by Weight Type I | Type II | Type III |
|---|---|---|---|
| Chromium | 61 | 35.3 | 47 |
| Copper | 17 | 19.6 | 19 |
| Arsenic | 22 | 45.1 | 34 |
| TOTAL | 100 | 100.0 | 100 |
| Trade Names | Greensalt | Boliden CCA | Wolman CCA |
| | Langwood | Koppers CCA-B | Wolmanac CCA |
| | Erdalith | Osmose k-33 | Chrom-ar-cu |
| | Tanalith | | Koppers CCA-C |

Leach-resistant preservatives react chemically to form insoluble compounds that bond to the wood. Subsequent rewetting of the wood will not cause preservative loss. Leachable compounds do not bond with the wood and should not be used in areas of high decay hazard. Two of the most commonly used waterborne salts are chromated copper arsenate (CCA) and ammoniacal copper arsenate (ACA). Both are classified as leach-resistant and suitable for ground contact.

CCA mixtures contain copper, arsenic, and chromium compounds. There are three different types varying in the percentage of these chemicals. Table 2 lists the types and trade names under which these preservatives are available. All three types are equally effective and are used to treat lumber, plywood, and timbers where cleanliness is important. CCA gives wood a greenish tint that eventually weathers to gray, although a new process has been developed giving CCA treated wood a brown color.

ACA is used for many of the same uses as CCA. Copper and arsenic compounds are dissolved in ammonia. After treatment the ammonia evaporates leaving leach-resistant copper arsenate in the wood. ACA is commonly available in the western United States and Canada.

Three other waterborne preservatives have found limited use in treating wood. Acid copper chromate (ACC) is a leach-resistant preservative recommended for use above ground and for nonstructural items in ground contact. Chromated zinc chloride (CZC) and Fluor chrome arsenate phenol (FCAP) are leachable preservatives that have been only moderately effective in ground contact or very wet conditions.

## IV. Wood Suitability and Preparation

In order for a preservative treatment to be effective three factors must be considered. These are:

- Retention
- Penetration
- Uniformity

The proper amount of preservative must be absorbed or forced into the wood to provide adequate toxicity. Retention is the amount of preservative present in the wood and is measured in pounds per cubic foot. Retentions vary by preservative, product, and potential for decay. Penetration refers to how deeply the preservative enters the wood. The thicker the outer protective zone, the greater the protection afforded to the untreated core. Uniform retentions and penetrations are very important in providing maximum protection. Poorly treated sections often provide an avenue for decay to enter.

The sapwood of most species can be easily penetrated by preservative, but the heartwood is normally difficult to treat (see figure 3). When treating round stock such as posts, poles, and pilings, the aim is to penetrate as much of the sapwood as possible to provide a protective barrier around the heartwood.

Aspen is a species with both sapwood and heartwood that is difficult to treat, even if incised.* This results in nonuniform penetrations and retentions causing highly variable service lives for treated aspen products. It is reported that aspen can be ade-

**Incising is the process where the wood is penetrated by sharp knives creating small holes or slits that aid in increasing the preservative penetration.*

**Figure 3. This southern pine bridge timber suffered heartwood decay. Because heartwood does not usually "treat" as easily as does the surrounding sapwood, the wide treated sapwood band on the right and the thin treated border of heartwood on the left have outlasted the untreated exposed heartwood core. Source: Baechler, R., and Gjovik, L. *Selection, Production, Procurement and Use of Preservative Treated Wood.* U.S. Forest Products Lab General Technical Report FPL-15. 1977.**

quately pressure treated with ACA if incised. However, at the present time no treating plants in Minnesota use ACA preservatives in this manner.

Although heartwood is generally difficult to treat, some species are more easily penetrated than others. Table 3 lists the treatability of heartwood of various species. When selecting a preservative treated product, the wood species used is extremely important in determining the quality of treatment.

After the proper wood is selected, it must be prepared for treatment. Peeling is essential to remove bark from wood. Bark prevents the penetration of preservative and even small patches will have untreated wood underneath. The bark will eventually fall off providing an opening for decay to reach the core. If possible, all cutting, framing, and boring should also be done before treatment to prevent the exposure of untreated wood.

Wood that is difficult to penetrate is often incised prior to treatment. Wood absorbs preservative most effectively through the end grain. Incising, in effect, exposes more end grain by puncturing the wood with holes, usually ½-¾ inches deep. Proper spacing of the holes by the treater provides for uniform penetration. Incising is often required on sawn timbers with exposed heartwood, and poles or posts with narrow bands of sapwood.

Drying of the wood is essential before most preservative treatments because excess water prevents uniform penetration and retention. Also, by drying before treatment, checks and splits that develop are treated instead of opening after treatment and possibly exposing untreated wood. Air drying is the most widely used method of seasoning.

## V. Treatment Methods

Many different commercial treatment methods have been developed to protect wood from deterioration. The degree of success in using treated wood depends not only on the preservative and wood species but on the treatment method as well. These methods are divided into two main classes: pressure and nonpressure.

Pressure treatments force preservative into wood under higher than atmospheric pressures. Treating wood with pressure is more common than all other methods combined. In many species, deeper and more uniform penetrations (especially across the grain) and higher retentions are possible than when using nonpressure methods. Penetration of 2.5 inches or more across the grain is possible in southern pine timbers. Properly pressure treated wood is recommended for use in situations of high decay hazard (ground line contact).

A wide variety of nonpressure treatments have been developed, each differing in the retentions and penetrations attained. Although some of the treatments give good results, they are generally not as satisfactory as pressure treatments. Nonpressure methods include the thermal process, vacuum treatment, double diffusion, cold soaking, and superficial applications.

The thermal process or hot-cold bath involves placing wood in a tank of hot preservative oil followed by immersion in cold preservatives. The hot bath heats and expands the air within the wood, forcing some of the air out. The wood is then immersed in the cold bath and the heated air contracts pulling preservative in with it. The thermal process is frequently used in treating utility poles, especially western red cedar, with either creosote or pentachlorophenol solutions.

In the vacuum process, wood is placed in a sealed container and as much air is pumped out as is possible, creating lower than atmospheric pressure in the wood cells. Preservative is flooded into the tank and the seal is broken creating a partial vacuum which sucks preservative into the wood. The vacuum method is often used to treat millwork with penta and a water repellent in a volatile solvent.

Double diffusion is one of the few processes that uses green wood for treating. The wood is treated successively in two waterborne salt solutions that react with each other to form an insoluble compound. The chemicals move into the wood by diffusing from a solution of high concentration to an area of low concentration. It has produced excellent results on softwood roundstock but has not been widely used.

Cold soaking in solutions of creosote or penta has been moderately effective in treating roundstock of species with thick, easily treated sapwood, such as that of many pines. Cold soaking should not be used when heartwood is exposed. Normal soaking times vary from 24 to 48 hours and there is little control over retention and penetration.

Superficial methods include brushing, spraying, or dipping wood in preservative for short periods of time. They are the simplest and least effective of all treatments, suitable only for use under conditions of mild decay hazard. Penta and a water repellent in volatile solvents are commonly used in superficial treatments of millwork, siding, and decking. Penetration across the grain is minimal, though absorption through the end grain can be appreciable. Because decay occurs primarily in end grain at joints above ground use, these treatments can be quite effective.

For use in ground contact the superficial treatments are not suitable, possibly giving only 1 to 3 years of additional service life. The nonpressure methods that are suitable for ground contact usually require peeled wood (in the round form) conditioned to 25% MC or less. This provides a ring of easily treated sapwood that forms a protective layer around the heartwood core. Round posts of white oak and jack pine cold soaked in penta for 48 hours have average service lives in the range of 18 and 27 years respectively. Any wood, such as a landscape timber, that is sawn on two or four sides, exposing heartwood, should be pressure treated and incised if specified. Pressure methods give the best retentions, penetrations, and uniform treatment, with many methods currently in use providing up to 30+ years of service life.

**Table 3. Treatability of Heartwood of Various Species**

| | Softwoods | Hardwoods |
|---|---|---|
| Group 1. Heartwood Least Difficult to Penetrate | Bristlecone pine<br>Pinyon pine<br>Redwood | American basswood<br>Beech (white heartwood)<br>Green and white ash<br>Black and water tupelo<br>Pin cherry<br>River and sweet birch<br>Red oaks<br>Slippery elm |
| Group 2. Heartwood Moderately Difficult to Penetrate | Baldcypress<br>California red fir<br>Douglas-fir (coast)<br>Eastern white pine<br>Jack pine<br>Southern pine<br>Ponderosa pine<br>Red pine<br>Sugar pine<br>Western hemlock | Bigtooth aspen<br>Black willow<br>Chestnut oak<br>Cottonwood<br>Mockernut hickory<br>Silver and sugar maple<br>Yellow birch |
| Group 3. Heartwood Difficult to Penetrate | Eastern hemlock<br>Engelmann, sitka, white spruce<br>Grand, noble, white fir<br>Western larch<br>Lodgepole pine | American sycamore<br>Hackberry<br>Rock elm<br>Yellow-poplar |
| Group 4. Heartwood Very Difficult to Penetrate | Alpine, corkbark fir<br>Douglas-fir (Rocky Mountain)<br>Northern white cedar<br>Tamarack<br>Western red cedar | Beech (red heartwood)<br>American chestnut<br>Black locust<br>Sweetgum<br>White oaks |

## VI. Posttreatment Handling

Care must be exercised when handling treated wood so as not to break or penetrate the protective outer layer and expose the untreated core. Sharp instruments such as tongs should not be used to handle the wood, and throwing or dropping treated wood should be avoided.

Unfortunately, treated wood must often be cut or bored after treatment. In order to protect the untreated wood, a grease containing 10% penta is often applied. The grease provides a protective long lasting coating that can be slowly absorbed into the wood. Grease treatments are also used as remedial measures when untreated wood is placed in areas of high decay hazard. Brush on solutions of penta or creosote are also used and a 5% (by weight) penta solution is commonly available at many lumberyards. A 5% waterborne preservative solution should be used on exposed areas when creosote or penta treatments are not practical.

Pressure treating with waterborne preservatives forces large amounts of water into the wood. Unless otherwise specified, lumber 2 inches or less in thickness should be dried, after treatment, to a moisture content of 19% or less. For thicker material, the wood should be redried before it is placed in the structure if shrinkage would cause problems in use. Redrying is also important with some waterborne salts in order to complete the chemical reactions that make the preservative leach-resistant.

Both pentachlorophenol and creosote are skin irritants and gloves and protective clothing should be worn when handling freshly treated wood. Contaminated clothing should be washed before reuse. When cutting treated wood including waterborne salts such as CCA, a respirator should be used to prevent irritation by treated wood dust.

## VII. Selection and Use

There are many factors involved in selecting the proper preservative for use. These include cleanliness, the ability to be painted, odor, toxicity to humans and plants, strength, and flammability. The following discussion emphasizes the uses of landscape timbers although it is applicable to treated wood in general. Since creosote, penta, and CCA are the most commonly available preservatives, the discussion will be limited to these.

Landscape timbers treated with penta or creosote in heavy oils leave an oily residue on the surface and can exude preservative, especially on hot, sunny days. This can be true even with railroad ties that are many years old. These timbers should not be used where they might come into frequent contact with clothing. CCA or penta in volatile solvents should be used where a clean paintable surface is required.

Most creosoted wood cannot be painted satisfactorily. This is also true of penta in heavy oils. Wood pressure-treated with penta in volatile solvents may be difficult to paint due to surface deposits. Such deposits should be removed by sanding or washing with a suitable solvent. Wood treated with waterborne preservatives can be painted if allowed to adequately redry, although a light brushing or sanding may be necessary. Dipping or brush treatments of penta for wood in areas of mild decay hazard can generally be painted without problems. Best results for staining are obtained after weathering for one year.

The odors of some preservatives can be quite disagreeable (or even toxic) and should not be used indoors in residences or offices, or in confined spaces. Creosote and pressure treated penta timbers can have fairly strong odors. Wood treated with CCA has essentially no odor since the chemicals are strongly fixed in the wood.

All wood preservatives are toxic substances and care should be used in their selection. As stated before, pressure treated penta and creosote can irritate skin and should not be used where skin contact is frequent. However, in low retentions such as superficial treatments, penta is essentially free of irritating skin effects. Since CCA is strongly fixed in the wood, negligible amounts of arsenic will be picked up through skin absorption making CCA safe for use where contact is frequent.

Many broadleaved plants may be injured or killed if their roots or stems touch freshly treated penta or creosote landscape timbers. After a few years, as the wood weathers, this effect diminishes. Old, discarded railroad ties seldom injure plants. Some plants, including many grasses, are not affected even by freshly treated wood. Fumes from wood freshly treated with creosote or penta can also cause injury and should not be used in enclosed places such as greenhouses. CCA treated wood has no contact effect on growing plants and is safe for use as vine stakes and greenhouse flats.

Wood freshly treated with oil-type preservatives ignites and burns more easily than untreated wood, producing a dense, black smoke. However, once the surface oil evaporates, treated timbers ignite no more easily than untreated wood. Waterborne preservatives do not easily ignite but once fired may have prolonged glowing combustion due to the presence of chromium salts. When disposing of treated wood it should not be burned, as potentially toxic chemicals may be given off. It should be buried or hauled to sanitary landfills.

The reaction of waterborne preservatives with wood does not affect most strength properties. Resistance to impact is the only one appreciably reduced. Oil-type preservatives cause no strength loss. However, using excessive temperatures and pressures in treating can damage wood and reduce its strength.

Corrosiveness to metal fastenings can be a problem whether wood is treated or not. Common iron fasteners used under moist conditions such as ground contact will rust. Heavy oil-type preservatives can help retard corrosion of fasteners but water borne preservatives will not. Where there is need for long service life such as wood foundations, corrosion resistant fastenings should be used. Examples are stainless steel, galvanized copper, and silicon bronze. For use in less critical areas such as landscape timbers, corrosion resistant fastenings may not be necessary.

Factors involved in selecting the proper degree of treatment include potential decay hazard, structural importance, and length of service life required.

Potential for decay is important in determining the proper retentions and penetrations. Areas of high decay hazard, such as ground contact or very wet conditions (wood with a moisture content >20%), need pressure treatment for maximum penetrations. In areas of moderate or low decay hazard, pressure treatments of lower retentions or superficial treatments are often adequate.

Structural importance is also a factor in specifying the degree of treatment. Failure of a bridge timber or a treated wood foundation is normally much more serious than decay of a nonstructural landscape timber. Treated woods in critical applications are specially treated with high retentions to get maximum service life from each piece. Wood for use in areas of moderate decay hazard should also be treated for maximum service life if replacement costs are extremely high in comparison to the initial cost of using treated wood. Non-structural landscape timbers in ground contact are pressure treated for maximum penetration but with lower retentions.

If a structure is needed only for temporary service of a few years, a dip or soak treatment may be quite adequate for its intended life span. But if a retaining wall or fence post is intended to last as long as possible, pressure treatment is highly recommended.

## VIII. Purchasing Treated Wood

Specifications on treating wood have been developed to insure that the purchaser is receiving the proper product for the intended use. The

American Wood Preserver's Association (APWA) Book of Standards provides specifications on the treatments of various wood products by pressure methods and the thermal treatment of cedar poles. The information contained specifies minimum penetrations and retentions for various products of approved species. Table 4 lists the woods for which specifications on timber products have been developed. Southern, jack, and Norway pines are the most commonly used timbers for landscape purposes. The specifications also include: inspection methods, incising requirements, and limits on temperatures and pressure to prevent damage to the wood. Table 5 lists the AWPA specifications for retentions in treated products for farm use

The U.S. Government has developed Federal Specification TT-W-571 "Wood Preservation: Treating Practices" that is used for purchasing pressure treated wood for government use. The specifications are very similar to the AWPA's standards. Table 6 lists retentions of different preservatives for nonstructural (landscape) timbers in ground contact.

Minimum penetration and incising requirements in the AWPA Standards vary according to species. Penetration of preservatives in lumber of southern yellow, red, or ponderosa pines must be at least 2.5 inches or 85% of sapwood depth in 90% of pieces sampled. The requirements for softwood timbers 5 inches and thicker, other than the above mentioned species, is at least .5 inches and 90% of sapwood depth. All softwood timbers and lumber greater than 2 inches (nominal) in thickness with the exception of southern yellow, red, and ponderosa pine shall be incised on four sides.

Buying wood treated to either AWPA or federal specifications can help insure a quality product. But how does the purchaser know the treated wood offered for sale is treated to specifications? There have been many cases of disreputable treaters dipping timbers in dark oil with a little creosote for odor or a green dye to imitate CCA.

Large users such as the railroads have their own inspection departments to insure that the treated wood

**Table 4. Wood Species for Which AWPA Specifications on Pressure Treatment of Timbers Have Been Developed**

| | | |
|---|---|---|
| Southern pine | Sugar pine | Hemfir |
| Ponderosa pine | Red (Norway) pine | Western larch |
| Jack pine | Douglas-fir (coast) | Redwood |
| Lodgepole pine | Douglas-fir (interior) | Oak |
| Northern white pine | Western hemlock | Black or red gum |
| Western white pine | | |

Source: AWPA Standard C2

**Table 5. Minimum Retentions of Preservatives in Wood, Pressure Treated for Farm Use (Specified in AWPA Standard C 16)[1]**

| Type of Wood and Use | Creosote | Creosote coal tar | Creosote petroleum | Pentachlorophenol | ACC | ACA | CCA | CZC | FCAP |
|---|---|---|---|---|---|---|---|---|---|
| | Minimum retentions in pounds per cubic foot of wood | | | | | | | | |
| Poles and post[2] as round structural members | | | | | | | | | |
| Southern pine, ponderosa pine | 7.5 | 7.5 | NR[3] | .38 | NR | .60 | .60 | NR | NR |
| Red pine | 10.5 | 10.5 | NR | .53 | NR | .60 | .60 | NR | NR |
| Coastal Douglas-fir | 9.0 | 9.0 | NR | .45 | NR | .60 | .60 | NR | NR |
| Jack pine, lodgepole pine | 12.0 | 12.0 | NR | .60 | NR | .60 | .60 | NR | NR |
| Western red cedar, western larch, intermountain Douglas-fir | 16.0 | 16.0 | NR | .80 | NR | .60 | .60 | NR | NR |
| Poles and posts, sawn four sides as structural members | | | | | | | | | |
| All softwood species | 12.0 | 12.0 | 12.0 | .60 | NR | .60 | .60 | NR | NR |
| Posts, fence | | | | | | | | | |
| All softwood species | | | | | | | | | |
| Round, half-round and quarter-round[4] | 8.0 | 8.0 | 8.0 | .40 | .50 | .40 | .40 | .62 | .31 |
| Sawn on four sides | 10.0 | 10.0 | 10.0 | .50 | .62 | .50 | .50 | NR | NR |
| Lumber | | | | | | | | | |
| All softwood species | | | | | | | | | |
| In contact with soil | 10.0 | 10.0 | 10.0 | .50 | .62 | .50 | .50 | NR | NR |
| Not in contact with soil | 8.0 | 8.0 | 8.0 | .40 | .25 | .25 | .25 | .45 | .25 |
| Millwork | | | | | | | | | |
| All softwood species | NR | NR | NR | .30 | .25 | .25 | .25 | .45 | .25 |
| Grapestakes[5] | | | | | | | | | |
| All species, sawn four sides | 10.0 | 10.0 | 10.0 | .50 | .62 | .50 | .50 | NR | NR |

1. *Reprinted with permission of AWPA.*
2. *Posts used as structural members will be assayed according to Standard C4.*
3. *NR-not recommended.*
4. *Creosote-coal tar is not recommended for Douglas-fir, western hemlock, western larch, and these species are not recommended for half-round or quarter-round posts.*
5. *All retentions are assay, based on the 0-0.6 inch zone. Assay sample must be taken from the center interior stakes of each bundle. Minimum penetration must be 0.4 inch.*

*Source: DeGroot, R., and Johnson, B.* Preservative Treatment of Wood For Farm Use. *University of Wisconsin Extension.*

**Table 6. Minimum Retentions for Sawn Nonstructural Timbers (Landscape) as Specified in Federal Standard TT-W-571**

| Type of Wood In Use | Retention in Pounds Per Cubic Foot (PCF) Creosote | Creosote coal tar | Creosote petroleum | Pentachlorophenol | ACC | ACA | CCA | CZC | FCSP |
|---|---|---|---|---|---|---|---|---|---|
| Nonstructural Timbers in Ground Contact | 10.0 | 10.0 | 10.0 | .50 | .50 | .40 | .40 | NR* | NR* |
| For Use Above Ground | 8.0 | 8.0 | 8.0 | .40 | .25 | .25 | .25 | .45 | .25 |

**Not recommended.*

meets specifications. Other companies use independent testing agencies to perform the same function. However, it generally is not practical for the purchaser of small amounts of treated lumber to inspect the treatment. Retentions must be determined in the laboratory and penetrations, except for creosote and other dark oils, are difficult to detect. Chemical sprays must often be used that cause a color reaction with the preservative.

The American Wood Preserver's Bureau (AWPB) in cooperation with the AWPA has a program of periodic unannounced inspections at participating treating plants. If the plant's treating practices meet AWPA specifications they are allowed to stamp the AWPB quality mark on their treated products. This mark indicates that the wood was treated under an independent quality control program. Figure 4 shows some AWPB quality marks used on waterborne salt pressure treated lumber. The FDN mark indicates treated wood having passed stringent specifications to be suitable for use in wood foundations. If treated wood is suitable for use in ground contact, it must be stated on the quality mark along with the designation LP-22.

Normally, wood treated by reputable treating firms is marked with an identification brand or tagged. The federal specification TT-W-571 standard requires that sawn material greater than 2 inches (nominal) in thickness should be individually branded or tagged to identify wood species, preservative, retention, supplier, and year of treatment. These brands give the purchaser greater assurance of a properly treated product.

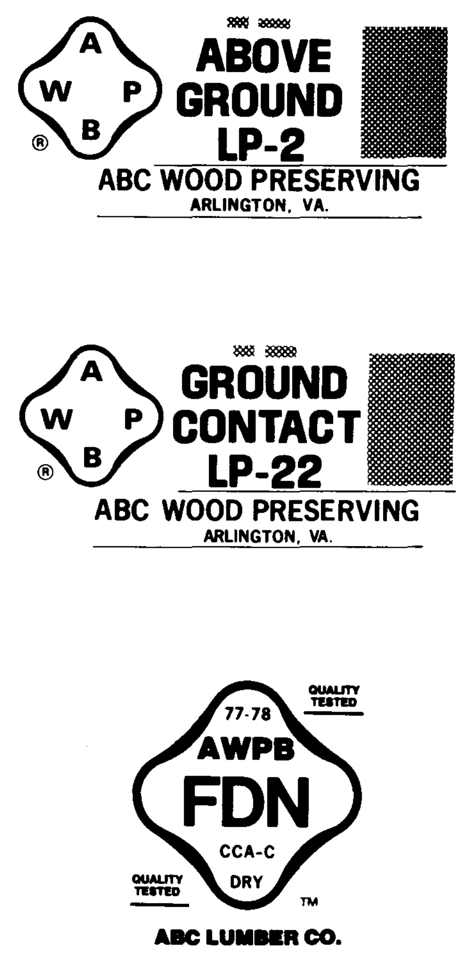
Recently a large number of treated aspen landscape timbers have been marketed. Aspen treated wood is not covered in the AWPA specification, and in general, takes treatment poorly. The purchaser of aspen treated timbers is taking a risk of getting adequately treated timbers for ground contact since there are no specifications to guarantee proper treatment. This is also true of other species not commonly treated (i.e. white spruce).

If treated wood is not branded or does not have a quality control mark, the buyer should ask the dealer to provide assurance that the treated wood meets AWPA or federal specifications. Reputable treating firms will usually provide this certification to dealers who sell treated products to consumers.

## IX. Recommendations on Landscape Timbers

Landscape timbers should be pressure treated to AWPA or federal specifications for use in ground contact. Only species for which specifications have been developed should be used. These include southern, jack, lodgepole, Norway, or ponderosa pines and certain hardwoods (see Table 4). In areas where there are exacting requirements for cleanliness, nontoxicity to plant life or frequent human contact, waterborne salts such as CCA should be used. Otherwise, penta or creosote treated timbers are acceptable. The purchaser should be suspicious of treated wood that is not marked or tagged if the dealer will not provide proper certification of treatment. These methods are the only means by which the purchaser of small amounts of treated wood can be assured of a proper treatment.

**Figure 4. AWPB Quality Control Stamps used on waterborne pressure treated lumber.**

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