

What's in That Pressure-Treated Wood?

Wood in contact with the ground, or aboveground wood that often gets wet, will be attacked by decay fungi and insects. With the exception of naturally durable species such as redwood and cedar, wood used in these applications should be pressure treated with preservatives if it is expected to last more than a few years. Several new wood preservatives have been developed in recent years. With the variety of preservatives in use, consumers may become confused about what is in their pressure-treated wood or what type of pressure-treated wood they should be using.

Wood preservatives are broadly classified as either water based or oil type, depending on the chemical composition of the preservative and the carrier used during the treating process.



Water-based wood preservatives are often used to treat lumber used in deck construction.

Water-Based Wood Preservatives

Water-based preservatives react with or precipitate in the wood substrate, thus becoming “fixed” and resistant to leaching. Because water-based preservatives leave a dry, paintable surface, they are commonly used to treat wood for residential applications such as decks and fences. They are primarily used to treat softwoods because hardwoods treated with these preservatives may not be well protected from soft-rot attack. Water-based wood preservatives can increase susceptibility to corrosion, so all metal fasteners used with the treated wood should be hot-dipped galvanized or made of stainless steel. Borates, another type of water-

based preservative, do not become fixed in the wood and thus are readily leached if exposed to rain or wet soil.

Chromated Copper Arsenate

Chromated copper arsenate (CCA) is the most widely used wood preservative in the United States. Containing chromium, copper, and arsenic, CCA protects against attack by decay fungi, insects, and most types of marine borers. CCA-treated wood is used in decks, fences, poles, piling, and bridge timbers. Obtaining adequate treatment with CCA can be a problem with difficult-to-treat species such as Douglas-fir. CCA-treated wood is widely available at retail lumberyards as “green treated” lumber and is also sold under many different trade names. It is typically light green in color, but it is often stained or dyed by the manufacturer to various shades of brown. CCA-treated wood may also have been treated with a water repellent, which helps to prevent splitting and checking when the wood is used on a horizontal surface, such as decking. CCA-treated wood has no added odor and can be painted or stained.

Ammoniacal Copper Zinc Arsenate

Ammoniacal copper zinc arsenate (ACZA), containing copper, zinc, and arsenic, is a refinement of the original formulation (ACA). ACZA protects against attack by decay fungi, insects, and most types of marine borers. It is used to treat poles, piling, and timbers. Because of its ability to penetrate Douglas-fir and other difficult-to-treat wood species, it is most widely used on the West Coast. The color of the treated wood is olive to bluish green. The wood initially has a slight ammonia odor, but this dissipates soon after treatment. ACZA-treated wood can be painted or stained.

Alkaline Copper Quat

Alkaline copper quat (ACQ) is one of several recently developed wood preservatives. It contains copper and a quaternary ammonium compound. ACQ protects against decay fungi and insects but has not been standardized for use in marine applications. There are two types of ACQ: ACQ-B and ACQ-D. ACQ-B is manufactured using ammoniacal copper. Like ACZA, ACQ-B is able to penetrate Douglas-fir and other difficult-to-treat wood species, and so is used primarily on the West Coast. Wood treated with ACQ-B has a dark greenish brown color. ACQ-D is manufactured with amine copper, which gives the treated wood a light brown color. ACQ-D is not as effective



as ACQ-B in penetrating difficult-to-treat woods. Both ACQ-B- and ACQ-D-treated wood can be painted or stained.

Ammoniacal Copper Citrate

Ammoniacal copper citrate (CC) is a recently developed preservative that contains copper and citric acid. The copper protects against decay fungi, insects, and marine borers, and the citric acid aids in the distribution of copper within the wood. Because CC has been developed very recently, it is not yet widely available. As with other preservatives containing ammonia, CC is able to penetrate difficult-to-treat species such as Douglas-fir. The color of the treated wood varies from light green to dark brown. The wood initially has a slight ammonia odor, but this dissipates soon after treatment. Treated wood can be painted or stained.

Copper Azole

Copper azole (CBA) is a recently developed wood preservative that contains copper, boric acid, and tebuconazole. These three active ingredients work together to protect against decay fungi and insects. CBA has not been standardized for use in seawater. Because CBA has been developed very recently, it is not yet widely available. CBA is standardized for treatment of Southern Pine and hemlock–fir species groups but not for Douglas-fir lumber. CBA-treated wood has a uniform greenish brown color and little or no odor. It can be painted or stained.

Copper Dimethyldithiocarbamate

Copper dimethyldithiocarbamate (CDDC) is a reaction product formed within the wood after treatment with two different treating solutions. It contains copper and sulfur compounds. CDDC protects against decay fungi and insects; it has not been standardized for use in seawater. Because CDDC has been developed very recently, it is not yet widely available. CDDC is standardized for treatment of Southern Pine and some other pine species. CDDC-treated wood has a brown color and has little or no odor.

Borate Preservatives

Borate preservatives are salts such as sodium octaborate, sodium tetraborate, and sodium pentaborate that are dissolved in water. Borates are effective preservatives against decay fungi and insects. Borate preservatives are diffusible, and with appropriate treating practices they can achieve excellent penetration in species that are difficult to treat with other preservatives. However, the borate in the wood remains water soluble and readily leaches out in soil or rainwater. **Borate-treated wood should be used only in applications where the wood is kept free from rainwater, standing water, and ground contact.** An example of such a use is in the construction of wooden buildings in areas of high termite hazard. Borate-treated wood is odorless and colorless and may be painted or stained.



Oil-type preservatives are commonly used to treat laminated beams.

Oil-Type Wood Preservatives

The most common oil-type preservatives are creosote, pentachlorophenol, and copper naphthenate. The oil-type preservatives are commonly used for applications such as utility poles, railroad ties, piling, and laminated beams. They are not usually used for applications that involve frequent human skin contact or inside dwellings because they may be visually oily, oily to touch, or have a strong odor. Because of their oily nature, these preservatives also act as water repellants and can help to prevent checking and splitting.

Creosote

Creosote is made from coal tar, which is a by-product of the carbonization of coal during steel production. Unlike other oil-type preservatives, creosote is not dissolved in oil, but it does have properties that make it look and feel oily. Creosote contains a chemically complex mixture of organic molecules, most of which are polycyclic aromatic hydrocarbons (PAHs). Creosote is effective in preventing attack by decay fungi, insects, and most marine borers. Creosote is widely used in railroad ties, utility poles, bridge timbers, and piling. Creosote-treated wood has a dark brown–black color with an oily surface and strong odor. It is very difficult to paint, stain, or seal. It is not recommended for use inside dwellings or areas where it may come into frequent contact with human hands, such as handrails.

Pentachlorophenol

Pentachlorophenol is a crystalline solid that can be dissolved in different types of oils. Pentachlorophenol is very effective against fungi and insects but does not protect well against ocean marine borers. It is widely used to treat utility poles, bridge timbers, laminated beams, and foundation and fresh-water piling. The appearance of pentachlorophenol-treated wood depends greatly on the type of oil in which it is dissolved. The wood may have a very light brown color and dry surface if a light oil is used,

or a dark brown color and somewhat oily surface if a heavy oil is used. Pentachlorophenol-treated wood is generally more durable if a heavy oil is used, so light oil is most often used for aboveground applications. Pentachlorophenol itself is odorless, but the odor of the oil in which it is dissolved may be noticeable near the treated wood. Pentachlorophenol-treated wood should not be used inside dwellings, and it is generally not recommended for areas where it may come into frequent contact with human hands, such as handrails. The treated wood is difficult to paint or stain unless pressure treated using a light oil.

Copper Naphthenate

Copper naphthenate is a mixture of naphthenic acids and copper salts dissolved in oil. It is effective against decay fungi and insects but is not recommended for use in marine applications. Copper naphthenate is not as widely used as creosote or pentachlorophenol, but it is used for the treatment of utility poles and in highway construction. Like pentachlorophenol, the properties of copper naphthenate are dependent on the type of oil in which it is dissolved. The most commonly used oils are fuel oil and mineral spirits. The color of the treated wood varies from light brown to dark green, depending on the type of oil and the treating process. The odor of the oil may be noticeable near the treated wood. The treated wood is difficult to paint or stain unless pressure treated using a light oil. Copper naphthenate is not a restricted-use pesticide, and the liquid preservative can be purchased at retail lumberyards and hardware stores. It is widely used to treat field cuts of pressure-treated wood that are made during construction.

Availability

Suppliers of different types of treated wood can be found by contacting local lumberyards or trade associations that work with treated wood manufacturers. Several such trade associations include the following:

American Wood Preservers Institute, 2750 Prosperity Ave., Suite 550, Fairfax, VA 22031-4312. Tel: (703) 204-0550; Fax: (703) 204-4610; Website: <http://www.awpi.org>.

Western Wood Preservers Institute, 7017 NE Highway 99, Suite 108, Vancouver, WA 98665. Tel: (360) 693-9958 or (800) 729-WOOD; Fax: (360) 693-9967.

Southern Pressure Treaters Association, P.O. Box 2389, Gulf Shores, AL 36547. Tel: (334) 968-5726; Fax: (334) 968-6008.

For additional information, contact

Stan Lebow

USDA Forest Service

Forest Products Laboratory

One Gifford Pinchot Drive

Madison, WI 53705-2398

Phone: (608) 231-9411; FAX: (608) 231-9508

E-mail: slebow@fs.fed.us