Treated Glulam in Residential and Light Commercial Construction

October 20th, 2013

What Is Pressure Treatment?
Pressure treatment is a process that forces chemical preservatives into wood. Wood products are placed inside a closed cylinder then a combination of vacuum and pressure is applied to force the preservatives deep into the wood fiber. This process protects the wood from attack by termites, other insects, and fungal decay. Most untreated wood will decompose when four conditions required for decay and insect attack occur:

1. high moisture content (above 19%)
2. a favorable temperature (between 32 and 100 degrees Fº)
3. oxygen
4. food source (wood fiber)

If any one of these conditions is removed, infestation and decomposition cannot occur. Eliminating wood fiber as a food source by pressure treating wood products is an easy solution. Research shows that wood can be expected to last for many decades when properly treated and installed for its intended use.

Proper Design and Construction
Pressure treated wood is not entirely immune to rot and decay. Thoughtful design detail and construction practices will extend the life of any structure. For instance poor design can create collection zones for organic matter such as dirt and leaves that can cause moisture to collect and become trapped. Organic matter can collect in cracks and in between poorly detailed or flashed connections creating a perfect environment for fungi growth. At the design stage, every effort should be made to allow for ventilation or air circulation and water to shed off - this is particularly critical at connections.

Preservative treatment creates an envelope of protection around the wood. Field fabrication involving cutting, notching or drilling after treatment breaks this envelope, exposing untreated wood to attack by decay fungi and insects. Decay potential in field-drilled holes and sawn surfaces can be reduced with proper field treatment of the cut surfaces during construction; however, wood treated in the field is less resistant to decay than wood treated by pressure processes. A more effective prevention method involves fabrication (cutting and boring) prior to preservative treatment. This practice results in thoroughly protected wood, reducing the risk of decay, minimizing potential maintenance costs, and reducing the time required for field erection. Timber members should be fabricated before preservative treatment whenever practical. The AWPA recommends field application of a copper naphthenate solution on field fabricated treated wood as specified in accordance with AWPA Standard M4 .

Field Treatment
It is strongly recommended that all fabrication, trimming and boring of glulam be performed prior to pressure treating. All field cuts, holes or beam damage that occurs after treatment must be field treated to protect the exposed wood material. Application of a copper naphthenate solution having a minimum 2% metallic solution is specified in accordance with AWPA Standard M4. Some of the 2% (metal) products that are currently available are:

Cupernol –	Green #10
Wolmanized –	End Cut Solution
Jasco –	Ternin-8, Copper Green, Copper Brown

Building Code Requirements
Specific code requirements for pressure-treated wood are detailed in your local building code. Generally, building codes require preservative-treated or naturally durable wood for protection in the following applications:

- Wood in contact with the ground or fresh water
- Wood used above ground in contact with concrete or masonry. Example: Sill plates on a concrete slab
- Wood used above ground where specified distances from exposed earth are not met. Example: Floor assembly when wood joists are closer than 18 inches to exposed earth, or wood girders closer than 12 inches
- Wood providing structural support and exposed to the weather. Example: Balcony joists without adequate protection to prevent moisture or water accumulation on the surface or at joints between members
- Wood floor framing in areas where hazard of termite damage is known to be very heavy, unless provided with approved methods of termite protection.
- Wood used below the Design Flood Elevation (DFE)
- When used in locations where drying in service cannot readily occur, codes require that pressure-treated wood have a moisture content of 19 percent or less before covering or enclosure.

Pressure Treatment Categories
Pressure treated wood falls into three broad classes consisting of waterborne, oil-borne and creosote.

Waterborne
Waterborne preservatives as their name implies, utilize water as the carrier for the chemical. Rosboro does **not** recommend waterborne treatments for glulam. Glulams are manufactured from kiln-dried lumber and waterborne treatments would cause the beam to take on a high moisture content resulting in dimensional changes such as warping, twisting, excessive checking, splitting, and raised grain, resulting in an unacceptable finished appearance. Severe checking or splitting that extends beyond the treated envelope can allow moisture or insects to gain access to untreated wood.

Several typical waterborne preservatives used in building applications include: Chromated Copper Arsenate (CCA-C), Alkaline Copper Quat (ACQ-C, ACQ-D, ACQ-D Carbonate), Micronized Copper Quat (MCQ), Copper Azole (CBA-A & CA-B) and Sodium Borates (SBX/DOT).

These treatments are often referred to by trade names such as: Wolmanized Natural Select™ (Copper Azole), Preserve and NatureWood® (ACQ), MicroPro™, Smart Sense™ (MCQ), and Advance Guard® (Borate). Each preservative usually has a number of variations available so care should be exercised when specifying treated wood.

Oil-Borne
High Clear II, Copper Naphthenate and Pentachlorphenol are some of the most common oil-borne preservatives that are readily available throughout the US. One advantage of these treatments is that they do not create swelling, checking and splitting in the wood however, there is generally an added cost compared to water-borne treatments.

Hi-Clear II – and Permethrin
HI-Clear II provides protection for wood intended to be used for above ground interior and exterior applications. HI-Clear II is a two-component mineral spirits-based wood preservative system containing Permethrin (insecticide that is effective against the Formosan Termite). HI-Clear II is a clear treatment designed for high value architectural and engineered wood products including Molding, Millwork, Plywood, Laminated Beams, Lumber, and Timbers. Common glulam applications include; decks, porches, trellises and balconies. Rosboro Hi-Clear II Treated Glulam should be specified with a retention level of .055 combined pfc.

Copper Naphthenate
Copper Naphthenate should be specified with a mineral –spirit carrier to avoid leaching. This treatment is an oil-soluble wood preservative that is low in toxicity and can be employed with a high degree of safety. It provides an ideal fungicide and insecticide for the long-term preservation of wood products in both ground contact and above ground uses**.** Copper Naphthenate is effective against the Dampwood termite, Drywood termite and subterranean termites including Coptotermes Formosanus. The treated wood is clean, non-corrosive to fasteners, water repellent, with a color range from chocolate-brown to dark green. When used in contact with the ground it should be specified with a retention level of .060 pfc.

Pentachlorophenol
Pentachlorophenol is the most common oil-borne preservative that is often used for treating utility poles, bridge components, cross arms and other industrial products. Pentachlorophenol is seldom specified for residential construction due to its restriction to exterior use only. Penta as it is commonly called protects against decay fungi and insects. There are two types of Pentachlorophenol treatments available:

Type A
Utilizes petroleum distillates and tends to give wood a dark appearance.

Type C
Utilizes light hydrocarbon solvent (mineral spirits), and typically leaves a natural wood appearance.

Creosote
Creosote is a coal tar product containing a multitude of chemical compounds that are toxic to decay fungi, insects and most wood destroying marine organisms. It has a dark, oily surface appearance which generally cannot be stained or painted and possesses a strong odor. Creosote is primarily used for treating railroad ties, utility poles, guardrail posts, and timbers used in marine structures.

Treatment Comparison Table

Feature	High Clear II	Copper Naphthenate	Waterborne
Color	none	dark green or brown	Light green or grey-brown
Decay Resistance	high with low chemical loading	high with high chemical loading	high
Termite Resistance	resists insect attack and protects against the Formosan termite	resists insect attack	resists insect attack
Odor	slight at time of manufacture	lingering naptha odor	low
Reaction to Fasteners	none	slight	high
Interior Use	approved	not allowed	approved
Exterior Use	approved	approved	approved
Paint	oil based paint	dark color hard to cover – use stain blocking primer	dark color hard to cover
Stain	oil based stain	dark colored heavy body stains	Dark color heavy body stains
Mammalian Toxicity	very low	low	low
Fresh Water Immersion	not approved	allowed	allowed
Salt Water Immersion	not approved	not approved	only at very high retentions
Ground Contact	not approved	approved	approved

Fire Treated Engineered Wood Products

There is a great deal of confusion surrounding fire retardant treatments that can be applied to wood products. Several manufacturers have tested their products and have received code approval for use on framing lumber and plywood. Today there is no code or UL approved fire retardant treatment for Engineered Wood Products (EWP) such as; glulam, I-Joist, LVL and strand lumber products. Such treatments may perform well on EWP but the testing and approval process is expensive and time consuming.

- Treating company warranties for fire retardants typically cover lumber and plywood but do not cover engineered wood.
- Fire retardant treatments have not been tested, certified or approved for engineered wood.
- Engineered wood treated with fire retardants may not meet building code requirements however, local building codes may recognize specific treatments.
- Fire retardant treated lumber and plywood require strength reductions to be taken per the table listed in each manufacturer's code approval. Since EWP is not code approved reduction tables have not been developed for these products.
- The EWP manufacturer's warranty may be voided if their product is fire retardant treated. Check with the EWP manufacturer before product is treated.

One Hour Rated Glulam

Buildings constructed with large structural timbers have excellent fire-resistive qualities. U.S. model building codes recognize this and provide guidelines for ensuring fire resistant timber structures. Two distinct approaches are included in the codes: Heavy Timber Construction and Fire Resistive Construction.

Heavy Timber Construction has long been recognized by the model building codes as fire resistant. To meet the requirements of Heavy Timber Construction, limitations are placed on the minimum size, including depth and thickness, of all load-carrying wood members.

The performance of Heavy Timber Construction under fire conditions is markedly superior to most unprotected "non-combustible" construction. Unprotected metals lose strength quickly and collapse suddenly under extreme heat. Steel weakens dramatically as its temperature climbs above 450° Fahrenheit, retaining only 10% of its strength at about 1380°F. The average building fire temperatures range from 1290°F to 1650°F.

Wood typically chars at a rate of 1/40" per minute therefore after 30 minutes of fire exposure only the outer ¾" of the glulam will be damaged. The glulam adhesives burn at about the same rate as the wood and do not affect the overall fire performance of the member. The char that develops insulates the glulam member, therefore most of the cross section of the glulam will remain intact and the member will continue to support the load.

See APA Calculating Fire Resistance of Glulam Beams and Columns technical note EWS Y245B for more detail.

What Species of Wood Can Be Pressure Treated

Trees / logs have a number of different layers. The two primary layers are called heartwood and sapwood. Heartwood provides most of the "structural" strength to the living tree while the sapwood transports the sap from the base of the tree up to the leaves. Wood preservatives penetrate sapwood easier than heartwood. Southern Pine has a high percentage of sapwood and readily accepts treatment. When Douglas fir is treated it is important to specify ***Coastal Region*** Douglas fir. Inland region Douglas fir is difficult to treat and typically will not meet minimum retention and penetration requirements

Preservative Penetration and Retention
Penetration is the measure of how deeply the preservative penetrates the cross section of the timber. Retention level refers to the amount of preservative that remains in the wood after the treatment process is complete. It is measured on a weight basis and is typically expressed as pounds of preservative per cubic foot (pcf) of wood. Generally, the harsher the condition the wood is exposed to, the higher the retention level must be. Retention and penetration requirements vary by species and treatment.

There are major regional differences in the potential for deterioration of wood as shown in the Deterioration Zone map. In some cases multiple retentions are shown in the AWPA Standard, so users may address variances in potential deterioration in their area. The higher retention levels should be specified when treated wood is installed in the higher deterioration zones, as shown in the following map.

Deterioration Zones from AWPA Standards

Fasteners and Connectors
The potential for corrosion of hardware in contact with treated wood occurs when metals in the preservative (such as copper) are different from the metals in the hardware (the iron in steel, or aluminum). In a wet environment these dissimilar metals create a small electrical current that triggers a chemical reaction resulting in galvanic corrosion. To select proper hardware, the specifier should first consider the end-use application and exposure conditions. In damp or wet exposure, hardware in contact with pressure-treated wood must be corrosion resistant. Hardware includes fasteners (e.g. nails, screws, and bolts) and all connectors (e.g. joist hangers, straps, hinges, post anchors, and truss plates).

Regardless of exposure condition, fasteners and connectors should be specified in compliance with the hardware manufacturer's recommendations and the building codes for their intended use.

DO NOT use galvanized fasteners with stainless steel connectors. Stainless steel fasteners should be used with stainless steel connectors. Galvanizing (zinc) and stainless steel are considered to be dissimilar metals which can cause the zinc to corrode when placed in contact with the stainless steel. This would result in the galvanized fasteners losing their protective coating faster than expected.

Hi-Clear II
Non-corrosive when in contact with mild or stainless steel fasteners.

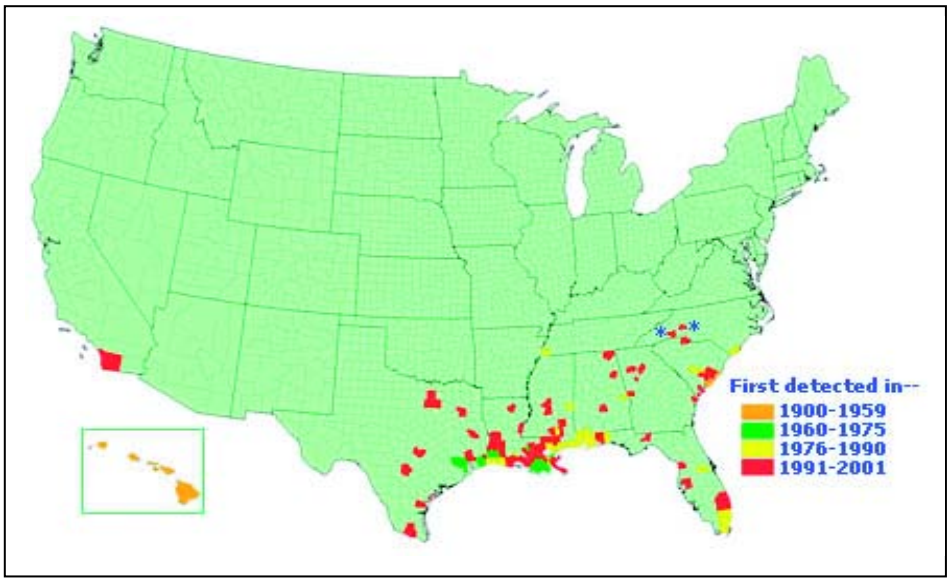
Copper Naphthenate
Copper Napthenate treated wood is clean and non-corrosive to fasteners.

Hardware Used With Waterborne Copper-Based Preservatives
Copper-based formulations may be used in interior or exterior applications and include the traditional Chromated Copper Arsenate (CCA) and new products such as Copper Azole (CA) or Copper Quat (ACQ or Micronized Copper). CA and ACQ have shown an increase in corrosion rates on mild steel compared to CCA and Micronized Copper.

In damp or wet environments hot-dip galvanized or stainless steel hardware is strongly recommended in contact with copper-based preservative treated wood. Hot-dip galvanized *fasteners* should meet ASTM A153. Hot-dip galvanized *connectors* should meet ASTM A653, Class G185 sheet with 1.85 ounces of zinc coating per square foot minimum.

Severe Applications
Type 304 or 316 stainless steel is recommended for maximum corrosion resistance in more severe exterior applications, such as swimming pools or within five miles of salt-water. Stainless steel fasteners are generally required for below-grade applications such as Permanent Wood Foundations. Stainless steel is also a recommended option when CA or Copper Quat formulations are specified at retention levels greater than required for Ground Contact. Standard carbon-steel, aluminum, or electroplated products must not be installed in direct contact with CA or ACQ treated wood. However, aluminum products may be placed in direct contact with Micronized Copper treated wood when used in interior applications, or exterior applications above ground. Always follow treated product manufacturers recommendations for proper specifications of fasteners and connectors.

Formosan Termite
The Formosan subterranean termite is one of some 2,400 known termite species in the world. Originally a native of mainland China, the Formosan termite is believed to have been introduced to the continental United States by the military in packing crates shipped from the Pacific after World War II into New Orleans and a handful of other Southern ports. Today, Formosan termites can now be found in 8 Southern states as well as California and Hawaii. This “super termite” as it has been called, is in fact the most pervasive, aggressive, and destructive breed of termite in the world.



Environmental
Pressure-treated wood is safe and environmentally friendly when properly treated, handled, and installed:

- Proper handling and use of treated wood poses no increased risk to human or animal health.
- Wood preservatives do not aggressively leach into the ground or waterways, drinking water supplies, or adversely affect marine life.
- Wood products last much longer with pressure treatment, which helps conserve a valuable, renewable natural resource — our trees.
- Alternative products such as plastic composites, require more energy to produce, and may also be aesthetically unacceptable to consumers.

AWPA
AWPA is the principal standards-writing body for wood preservation in the United States. The AWPA *Book of Standards* provides guidance on preservatives, wood use and exposure conditions, treatment process, testing, quality control and inspection. Manufacturers submit product data to AWPA for peer review and acceptance in the Standard.

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