



Treatment & Processing Specifics

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INTRODUCTION

Purpose

This manual is intended to provide guidance and support for KPC customers to efficiently and consistently produce a properly treated NatureWood-CA® pressure treated wood product. Detailed information is included on solution preparation and maintenance, treating processes, quality control and safety procedures.

This manual should be reviewed to become familiar with the preservative and to understand the processes necessary to produce a properly treated NatureWood-CA product. Used in conjunction with the *Plant Operations Manual* and the *Health and Safety Manual*, this manual should help enable the safe and efficient production of a high-quality NatureWood-CA treated wood product.

Background

NW-CA® is a copper based waterborne preservative that contains other carbon-based co-biocides. This type is known generically as copper azole wood preservative. NW-CA is designated as a Copper Azole Type C (CA-C) which is standardized under American Wood Protection Association (AWPA) U-1.

NW-CA is recognized for use in above ground, ground contact – general use, heavy duty and extreme duty applications to resist attack by fungal decay and subterranean termites including Formosan termites.

Historically, various copper-based products have been used successfully in many agricultural and materials protection applications. Studies have shown copper has a relatively low toxicity to humans yet is an effective biocide against termites and decay fungi. Propiconazole and tebuconazole, the co-biocide components, are triazole fungicides that have broad spectrum efficacy against Basidiomycota decay fungi, including copper tolerant brown rot fungi.

NW-CA preservative concentrate is a water-based mixture of copper ethanolamine blended with the emulsified azole co-biocides.

Uses for NatureWood-CA Treated Wood

NatureWood-CA pressure treated wood is approved for use where the IBC and IRC model building codes require wood to be resistant against fungal decay and termites. Service conditions include above ground, ground contact, critical structural applications (heavy duty and extreme duty) and fresh water immersed applications. The applicable AWPA use categories are UC3B – UC4C. Refer to AWPA U-1 Standards for further information.

Industry Standards and Building Codes

The CA-C system is listed in AWPA U-1 and must be treated in accordance with the standards. The inspection and quality control procedures for treating plants producing NatureWood - CA treated wood products are required to follow the procedures in AWPA Standards M22, M23, and M25.

Treated wood products listed and treated in accordance with AWPA U-1, are compliant to the IBC and IRC model building codes

PRESERVATIVE COMPONENTS AND PROPERTIES

In addition, KPC is pleased to offer an ammonia-based CA-C concentrate, NW-CA 200, to help maximize preservative penetration in refractory species, such as green incised Douglas Fir. The NW-CA 200 is to be mixed with the NW-CA 100 concentrate to make dilute hybrid solution. The ratio of NW-CA 200 to NW-CA 100 should not exceed 60:40 on an actives basis. CA-C preservative system is copper based and contains other carbon-based co-biocides. The NW-CA WC and NW-CA 100 concentrates are a water-based mixture of copper ethanolamine blended with the emulsified azole co-biocide at a 25:1 ratio. Solutions can be mixed to varying concentrations. The NW-CA 100 contains a proprietary quaternary surfactant which enhances the copper preservative penetration. Furthermore, a KPC brand water repellent can also be added to CA-C treating solutions for the purpose of improving weathering characteristics such as reduced checking or splitting of the treated wood. Finally, all CA-C treating solutions require the use of KPC brand mold inhibitor(s). Refer to the product SDS(s) containing safety handling, emergency, and first aid information.

NW-CA WC Wood Preservative Concentrate

- *Description:* Dark blue liquid, mild amine odor
- *Concentration:* 9.63% total actives (9.25% expressed as Copper Equivalent from Ethanolamine Complex, 0.19% expressed as Propiconazole and 0.19% expressed as Tebuconazole)
- *Density:* (25°C): approx. 10.4 lbs/gallon
- *Specific Gravity* (24°C): 1.24 (H₂O = 1)
- *pH:* 9.2 (10% solution)
- *Viscosity:* 39.3 centipoise @ 24°C
- *Delivery Method:* Truckloads of approximately 4,300 active pounds; or 330-gallon totes containing approximately 300 active pounds or 300 gallons
- *Hazard Information:* This chemical is corrosive and can cause irreversible eye damage or skin burns. May be fatal if absorbed through skin. Harmful if swallowed. Avoid contact with skin, eyes, or clothing. Wear goggles, face shield or safety glasses, and rubber gloves when handling. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco. Remove contaminated clothing and wash before reuse. Refer to the product SDS for detailed information (health hazards, emergency/first aid, personal protective equipment, etc.)

NW-CA 100 Wood Preservative Concentrate

- *Description:* Dark blue liquid, mild amine odor
- *Concentration:* 9.63% total actives (9.25% expressed as Copper Equivalent from Ethanolamine Complex, 0.19% expressed as Propiconazole and 0.19% expressed as Tebuconazole)
- *Density:* (25°C): approx. 10.4 lbs/gallon
- *Specific Gravity* (24°C): 1.24 (H₂O = 1)
- *pH:* 9.2 (10% solution)
- *Viscosity:* 39.3 centipoise @ 24°C
- *Delivery Method:* Truckloads of approximately 4,300 active pounds; or 330-gallon totes containing approximately 300 active pounds or 300 gallons
- *Hazard Information:* This chemical is corrosive and can cause irreversible eye damage or skin burns. May be fatal if absorbed through skin. Harmful if swallowed. Avoid contact with skin, eyes, or clothing. Wear goggles, face shield or safety glasses, and rubber gloves when handling. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco. Remove contaminated clothing and wash before reuse. Refer to the product SDS for detailed information (health hazards, emergency/first aid, personal protective equipment, etc.)

NW-CA 200 Wood Preservative Concentrate

- *Description:* Dark blue liquid, moderate amine odor
- *Concentration:* 9.63% total actives (9.25% expressed as Copper Equivalent from Ethanolamine Complex, 0.19% expressed as Propiconazole and 0.19% expressed as Tebuconazole)
- *Density:* (25°C): approx. 9.68 lbs/gallon
- *Specific Gravity* (25°C): 1.17 (H₂O = 1)
- *pH:* 9.82
- *Delivery Method:* Truckloads of 8,000 pounds
- *Hazard Information:* This chemical is corrosive and can cause irreversible eye damage or skin burns. May be fatal if absorbed through skin. Harmful if swallowed. Avoid contact with skin, eyes, or clothing. Wear goggles, face shield or safety glasses, and rubber gloves when handling. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco. Remove contaminated clothing and wash before reuse. Refer to the product SDS for detailed information (health hazards, emergency/first aid, personal protective equipment, etc.)

Other Miscellaneous Additives

Dilute MCA treating solutions require the use of Cleanwood® mold inhibitors. Refer to the Cleanwood Mold inhibitors section for specific recommendations for use with the CA-C preservative system.

Materials Compatibility

- NW-CA working solutions are corrosive to certain metals. Valves, fittings, internal components of pumps, and other equipment containing copper, brass, bronze, zinc, and aluminum are to be avoided. Be sure to check all silver-colored fittings common on

smaller diameter valves or sight glass fittings as they may be nickel-plated brass. Mild steel, stainless steel, fiberglass, polyethylene, polypropylene, PVC, Buna-N, EPDM, and Viton are all compatible with NW concentrate and work strength solutions up to 120° F.

NatureWood-CA Pressure Treated Wood

The appearance of NatureWood-CA treated wood products depends largely on the wood itself. Southern pine typically appears medium green in color. At higher retention levels or processes leaving excess liquid at the surface, it can appear a darker green with more of a blue overtone. Douglas-fir and other heartwood species will be darker olive to brown and often two-toned with the heartwood and sapwood. Freshly treated wood will generally quickly weather to an attractive brown-bronze, although original color will be more persistent at higher retentions. When dry, properly processed NatureWood - CA treated wood is relatively odor free and clean to the touch.

Excessive surface resin deposits from the lumber can sometimes preferentially absorb preservative and become colored. The color may range from a bright green-blue color that can persist for several months and eventually turn into a white to yellow powder. Lumber containing large amounts of surface resin should be avoided where appearance requirements are high. Air-dried lumber can be more of a problem due to resin or pitch not being “set” by kiln high temperatures. Treatment schedules used should strive to be drip free for the appearance of treated product to reach its full potential. If excess solution is allowed to pool on the lumber surface, a patchy appearance may result. When using NW-CA 200 to make a hybrid treating solution, exceeding the recommended ratio of NW-CA 200 to NC-CA 100 will cause a blue copper powder to appear on the wood surface upon drying. If this happens, the treating solution ratio should be corrected, and the affected wood either retreated or pressure washed.

Kiln Drying After Treatment of NW-CA

Kiln drying freshly treated NatureWood-CA treated lumber requires proper processing to produce a quality product.

Any free liquid preservative left pooled or dripping down the sides of lumber may turn a dark blue to a black color if kiln dried. The use of treating cycles to minimize free liquid is strongly recommended for KDAT stock. Treaters may want to consider tilting bundles on the drip pad to enhance drying and leaving wood stickered for 2-3 days after treatment to pre-condition or pre-dry the wood products prior to kiln-drying. Kiln drying this product will result in light patches under the banding and kiln sticks. Given enough UV exposure (sunlight), these light patches will weather and there will be less color contrast.

It is recommended to dry at a low temperature and low wet bulb depression and with maximum venting for the first four to twelve hours to condition wood surfaces and then ramp up gradually. Never exceed 160° F. Stagger gaps between bundles to avoid a vertical air route from top to bottom of packs. In order to minimize staining, never use sticks that were previously used for drying lumber treated with any chemical other than the NW-CA preservative system.

Fastener Recommendations

For interior or exterior applications, use fasteners and hardware that are in compliance with the manufacturer’s recommendations and the building codes for their intended use. As with any good design and construction practices, NatureWood-CA treated wood should not be used in applications where trapped moisture or water can occur. Where design and/or actual conditions allow for constant, repetitive or long periods of wet conditions, only stainless-steel fasteners should be used.

For exterior applications, galvanized protected connectors coated at a G185 level or its equivalent (1.85 oz/ft²) and other hardware and fasteners which meet building codes for exterior use can be used in direct contact with NatureWood-CA treated wood.

Aluminum building material products cannot be placed in direct contact with NatureWood-CA treated wood products.

PLANT OPERATIONS

Treating plant operation involves the coordination of many day-to-day activities to help produce a high-quality NatureWood-CA pressure treated wood product in a safe and consistent manner. Operational guidelines are provided herein which should help operate a treating plant in a safe, efficient, and cost-effective manner.

Solution Preparation and Maintenance

Preparation of NW-CA work solutions is accomplished by determining existing work tank conditions and calculating required addition of NW-CA concentrate based on target work tank conditions. Example forms are available for plants not equipped with the KPC PCS process control system or for those that need to calculate mixes independent of the computer. A spreadsheet can be provided to plants with a need to perform manual mix calculations. The forms illustrate mixing calculations and are applicable whether increasing or decreasing solution concentration.

Copper-to-Azole Ratio

KPC recommends the maintenance of working solution at the percentages below. The tolerances are as listed in AWWA P48.

NW-CA Solution Composition		
Active Ingredient	Ratio of Actives	Tolerance
Copper, as Cu	96.1%	95.4 – 96.8%
Propiconazole	1.95%	1.6 – 2.3%
Tebuconazole	1.95%	1.6 – 2.3%

The composition of treating solution in use may deviate outside the limits specified in the above table provided: (a) the preservative retention in treated material is determined by assay and the

retention determined conforms to the requirements set forth in this manual; and (b) immediate action is taken to adjust the composition of the treating solution.

When treating, a significant amount of kickback solution returned to a work tank can have a considerable effect on the balance of the treating solution. Solutions should be checked regularly for copper and azole concentrations. At the very least, solutions should be analyzed following every modified full cell or low weight treatment. Solutions should be freshly mixed to help achieve correct chemical balance. Work tanks should be kept at minimum volumes to ensure that work solutions are frequently mixed, thereby keeping solutions in balance.

Solution Storage and Stability

When held in work tanks, amine-based copper azole treating solutions do not require agitation when they are used regularly. If a treating solution is unused for more than a week, it should be agitated or circulated before any treating is done.

NW-CA concentrate and treating solutions should be kept above 35°F. If the concentrates are allowed to freeze, they must be thawed before being used.

Solution Evaluation Frequency

KPC recommends that NW-CA work solutions be analyzed for copper content before and after any adjustments to solution concentration and before each charge. At the very least, solutions should be analyzed following every modified full cell or low weight treatment. Solutions should be freshly mixed to help achieve correct chemical balance. Work tanks should be kept at minimum volumes to ensure that work solutions are frequently mixed, thereby keeping solutions in balance.

Copper content need to be tested at the plant routinely at a frequency determined by operator experience. At start up, chemicals should be monitored with every charge and mix until plant personnel are confident in tank behavior with continued cycling. At that time, the frequency of testing can be adjusted accordingly.

Copper is analyzed using an x-ray fluorescence (XRF) analyzer as described in the *Analytical Procedures* section of this manual. The azoles and mold inhibitor analysis is performed using High Performance Liquid Chromatography (HPLC) based on AWP A28. Analysis by HPLC can be used if desired. An outline of the propiconazole/tebuconazole chromatographic procedure can be found in the *Analytical Procedures* section of this manual.

Multiple Preservative Operation

NW- CA treating solution is amine based and shows some tolerance to the ACQ preservative system. On the other hand, amine copper azole solutions are not compatible with most other treating solutions or effluent including CCA. Care must be taken to minimize, if not eliminate, cross contamination. The cylinder, common piping, and sumps should be drained completely at changeover and flushed or washed thoroughly with water. Care must be taken in collecting flush water back to the proper tank. Ideally, it is preferred to have a separate treating system that is completely isolated from other products.

If inadvertently mixed, they react immediately forming insoluble solids or sludge requiring clean up and disposal as a hazardous waste.

If NatureWood-CA treated wood and other freshly treated wood products are placed on the same drip pad, separate drainage areas and sumps should be established, and the drippage should be routed back to the appropriate tank (i.e., NatureWood-CA drippage to an NW-CA tank, LifeWood treated wood drippage to an MCA tank, etc.). If you are planning to use a different preservative in the same treating system as NW-CA, please contact your KPC customer service representative for further information.

Mixing West Coast Hybrid Formulations

On the West Coast, ammonia is often formulated into NW solution for enhanced penetration of refractory wood species. Rather than handle and store concentrated ammonia directly, KPC provides ammonia formulations for this purpose. A blend or hybrid of amine and ammonia-based concentrates is recommended typically at a 50/50 hybrid level. NW-CA 200 is the ammonia-based analogue to NW-CA 100. The mixing of hybrids can be done in the same manner as two-component mixes.

QUALITY CONTROL

The manufacture of NatureWood-CA treated wood products under *AWPA Standard U-1* requires the use of an internal quality control program as well as an appropriate third-party monitoring agency program in compliance with AWPA M22.

Wood Analysis

Analysis of core borings will determine if the treated commodity meets the minimum requirements of AWPA U1 and T1 for chemical loading and penetration. Quality control tests are typically performed at the plant while charges are still on the drip pad.

Core borings should be sprayed with copper penetration reagent and heartwood/sapwood indicator solutions A and B (if pine). The assay zone should be analyzed for copper retention using an x-ray device and propiconazole and tebuconazole (total azoles) retention using a chromatographic method. The quality control supervisor should sample charges for retention on a frequency based on maintaining the plant's satisfactory performance on independent agency audits as defined in AWPA M25.

Refer to the *Quality Control* section of this manual for a detailed description of how to obtain wood core borings, and for more information on analysis of penetration.

Results of Treatment

The following table represents limits from the AWPA Standards and shows the minimum allowable retention of individual CA-C components. Total retention must be met as well as minimum individual component retentions for proper treated wood performance. The product must meet these standards to be backed by an KPC warranty.

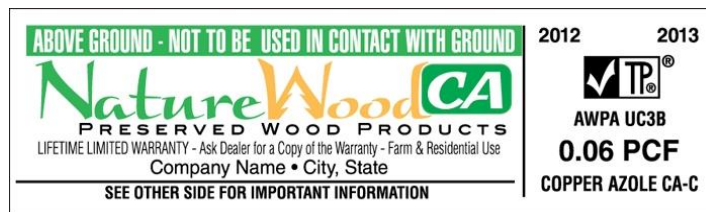
CA-C Retention Requirements						
Retentions Expressed as Copper Metal and Total azoles per AWWA Standards						
Application	Minimum Retention Requirement PCF	Target Actives		Minimum Individual Component Retention		Minimum Total CA-C by Analysis, PCF
		Copper, as Cu metal	Total Azoles	Copper, as Cu metal	Total Azoles	
Above Ground – General Use, Decking, Fencing UC3B	0.060	0.0577	0.0023	0.057	0.0019	0.060
Ground Contact – General Use UC4A	0.15	0.144	0.0058	0.14	0.0046	0.15
Ground Contact – Structural, Foundation, Freshwater, Salt water splash UC4B & UC4C	0.31	0.30	0.012	0.30	0.0097	0.31

Total CA-C actives are derived by adding copper and propiconazole/tebuconazole (total azoles). For example, at the 0.060 pcf retention, the minimum copper, as Cu, retention is 0.057 pcf, and the minimum total azole retention is 0.0019 pcf. In addition to meeting minimum requirements for each component, the sum total of the two components must be no less than 0.060 pcf.

Service Conditions	AWPA Use Category	Typical Applications
Above Ground – Interior Construction, dry	UC1	Interior construction – millwork and furnishings
Above Ground – Interior Construction, damp	UC2	Interior construction – interior beams, timbers, flooring, millwork, and sill plates
Above Ground – Exterior construction, coated and rapid water runoff	UC3A	Exterior – coated millwork, siding, and trim
Above Ground – Exterior construction, uncoated and poor water runoff	UC3B	Decking, rails, spindles, trim and fascia, framing, flooring, sill plates, trellises, gazebos
Ground Contact – General Use	UC4A	Deck support posts, fence posts, retaining walls, docks
Ground Contact – Heavy Duty / Critical Structural (foundation, freshwater, salt water splash)	UC4B	Permanent wood foundations, sawn and round building poles
Ground Contact – Extreme Duty / Critical Structural (or freshwater)	UC4C	Land & Freshwater piling, foundation piling

End Tag Requirements

All products permitted for treatment must be labeled with a KPC approved end tag. One label per piece is required for all products. Non-incised Hem-fir above ground decking products must be labeled “Above Ground Use Only” and all four inch nominal material shall be labeled “Above Ground Use, Non-support, Non-Structural Use Only”. The following is an example of an end tag that may be used to identify this product and its warranty:



ENVIRONMENTAL AND PLANT SAFETY

Wood preservatives are EPA registered pesticides and are designed to inhibit the growth of biological organisms. Precautions should be taken to minimize exposure to any chemical. Proper engineering and operational controls should be employed as well as the use of personal protective equipment (PPE). Applicators must wear gloves, eye protection, face shields, and other protective clothing impervious to wood treatment solutions in situations where contact may occur. See the product SDS for detailed information regarding the appropriate protective equipment.

NatureWood-CA brand wood preservatives are supplied as relatively viscous liquid concentrates and are for use only in commercial vacuum-pressure treatment plants. CA-C preservatives and additive chemicals should not be handled without the necessary safety equipment.

CA-C Concentrate and Working Solution Safety

Toxicological and environmental testing has been conducted on NatureWood-CA concentrate in accordance with EPA's protocol for pesticide registration. Tests show that NatureWood-CA has low mammalian toxicity although it was found to be corrosive to skin. According to OSHA, corrosive to skin means that the material will cause visible destruction of or irreversible alterations in living tissue by chemical action at the site of contact. Refer to NatureWood-CA SDS and product label for more information on required PPE.

CA-C Waste Disposal

NatureWood-CA door pit residue is not listed as hazardous waste and the preservative constituents are not on the EPA toxicity characteristic list and should not be considered hazardous waste. CCA door pit residue is listed and is a hazardous waste (F035). According to EPA rules, door pit residue from "unclosed" drip pads (formerly used for CCA, but not closed in accordance with RCRA Subpart W requirements) currently used for CA-C should be disposed as hazardous waste (F035). In addition, these drip pads should be operated according to Subpart W. More detailed information regarding EPA hazardous waste regulations and Subpart W drip pad operations can be found in the *Health & Safety Manual*.

Door pit residue collected from closed or de-listed drip pads or drip pads never used for CCA, pentachlorophenol, or creosote may be disposed as non-hazardous waste. Non-hazardous waste from these drip pads is required by EPA regulations to be tested by the EPA toxicity characteristic leachate procedure (TCLP) prior to disposal. These test results should allow you to properly dispose of this waste as industrial waste once approved by the landfill owner. As always, please review your state and local regulations to ensure compliance since they may be more stringent than federal regulations. Be reminded that records of drip pad closure and TCLP waste analysis should be maintained in plant files.

Safe Handling of Freshly Treated NatureWood-CA Products

Inhalation of airborne wood dust is possible when handling any treated or untreated wood products. Engineering controls and protective equipment to minimize exposure to wood dust are recommended when handling NatureWood-CA treated lumber.

When handling freshly treated lumber, exposure to treating solution is possible. Wear chemical-resistant gloves (butyl rubber, nitrile rubber, or PVC) and eye protection when opening cylinder doors (after ensuring no pressure remains in the cylinder) and handling freshly treated lumber. Refer to the NatureWood-CA treated wood product SDS, the Wood Dust SDS, and all CA-C chemical SDSs along with product labels for additional health and safety information.