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 pressure treated wood product. Detailed information is included on solution preparation and maintenance, treating processes, quality control and safety procedures.

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

Background

Alkaline Copper Quat is a copper based waterborne preservative that contains other carbon-based co-biocides. This type is known generically as a copper wood preservative. NatureWood products are designated as Alkaline Copper Quat (ACQ) which are standardized under American Wood Protection Association (AWPA) U-1.

ACQ 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. Quaternary compounds, Carbo-NT or DAC-QM , the co-biocide components, are fungicides that have broad spectrum efficacy against Basidiomycota decay fungi, including copper tolerant brown rot fungi.

Uses for NatureWood Treated Wood

NatureWood pressure treated wood is approved for use where the International Building Code (IBC) and International Residential Code (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 UC1 – UC4C. Refer to AWPA U-1 Standards for further information.

Industry Standards and Building Codes

- The ACQ system is listed in AWPA U-1 and must be treated in accordance to the standards. The inspection and quality control procedures for treating plants producing NatureWood 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

ACQ work solutions consist of a blend of a two-component system, copper and quat, and miscellaneous additives diluted in water. The blended work solutions are made with a 2:1 ratio of copper oxide (CuO) to quat (DDAC) or with a 1:1 ratio of CuO to DDAC. The copper portion of ACQ work solutions can consist of copper amine (CMC 10.3) and/or copper ammoniacal (NW 200-C). The quat portion is either DAC-QM or Carbo-NT. An ammoniacal and amine hybrid based copper quat treatment is primarily used to maximize preservative penetration in refractory species, such as green incised Douglas fir. Treated wood products with this blend may conform to AWPA Standards for ACQ.

CMC 10.3 Wood Preservative

- *Description*: Dark blue liquid, mild amine odor
- *Concentration*: 10.3% actives in copper metal
- *Density: (25°C)*: approx. 10.6 lbs/gallon
- *Specific Gravity (24°C)*: 1.27 (H_2O = 1)
- *pH:* 8-10
- *Delivery Method*: Bulk truckload (8,000 active pounds) and totes (330-gallon tote, 400 active pounds) (ask for amounts)
- *Hazard Information:* Harmful if swallowed. Harmful if inhaled. Avoid contact with eyes, skin, or clothing. Avoid breathing spray mist or vapor. Refer to the product SDS and label for detailed information (health hazards, emergency/first aid, personal protective equipment, etc.).

NW 200-C Copper Concentrate

- *Description*: Dark blue liquid, mild amine odor
- *Concentration*: 8% copper metal active
- *Density: (25°C)*: approx. 9.75 lbs/gallon
- *Specific Gravity (24°C)*: 1.17 (H_2O = 1)
- *pH:* 9.21
- *Delivery Method*: Truckloads of approximately 8,000 total pounds
- *Hazard Information:* Corrosive. Causes irreversible eye damage. Causes skin burns. Do not get in eyes or on clothing. Harmful if swallowed. Harmful if inhaled. Avoid breathing vapor or spray mist. Wash thoroughly after handling and before eating, drinking, using tobacco products or using the toilet. Do not eat, drink, or use tobacco products during those parts of the application process that may involve exposure to this product or its treatment solutions. Refer to the product SDS and label for detailed information (health hazards, emergency/first aid, personal protective equipment, etc.).

DAC-QM

- *Description*: amber-colored, clear solution
- *Concentration*: 50.0% total actives
- *Density: (25°C)*: approx. 7.75 lbs/gallon
- *Specific Gravity (25°C)*: 0.93 (H_2O = 1)
- *pH:* 7-9
- *Viscosity:*28.7 mm2/s, 391 cSt @ 24°C

- *Delivery Method*: Truckloads of approximately 22,500 active pounds; 275-gallon totes containing approximately 1,000 active pounds; or 55-gallon drums with approximately 212.50 active pounds
- *Handling and Hazard Information*: Should be stored at or above 10º C (50º F) due to viscosity/pumping issues. Corrosive. Causes irreversible eye damage and skin burns. May be fatal if swallowed, absorbed through skin or inhaled. Do not get in eyes, on skin or on clothing. Do not breathe vapor or spray mist. Wear a NIOSH approved respirator with an organic vapor (OV) cartridge with a combination N, R, or P filter (NIOSH approval number prefix TC-84A). Wear goggles or face shield, chemical-resistant gloves and protective clothing when handling. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Remove contaminated clothing and wash before reuse. Refer to the product SDS and label for detailed information (health hazards, emergency/first aid, personal protective equipment, etc.).

Carbo-NT

- *Description*: amber-colored, clear solution
- *Concentration*: 48.0% total actives
- *Density: (25°C)*: approx. 8.0 lbs/gallon
- *Specific Gravity (25°C)*: 0.96 (H_2O = 1)
- *pH:* 9-11
- *Viscosity:* 350 mPas @ 21°C
- *Delivery Method*: Truckload of 21,600 active pounds; or 275-gallon totes containing approximately 960 active pounds
- *Handling and Hazard Information*: Should be stored at or above 10º C (50º F) due to viscosity/pumping issues. It will freeze solid at 14° F, but it will not break down during a freeze/thaw cycle. When frozen Carbo-NT has been warmed up to above 50° F, it will still be completely functional. When thawing frozen Carbo-NT, do not allow heating surfaces greater than 120° F to be in direct contact with the quat. Corrosive.
  Causes eye damage and skin burns. May be fatal if swallowed or inhaled. Do not get in eyes, on skin or clothing. Do not breathe vapor. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco. Harmful if absorbed through the skin. Refer to the product SDS and label for detailed information (health hazards, emergency/first aid, personal protective equipment, etc.).

Other Miscellaneous Additives

Dilute ACQ treating solutions require the use of Cleanwood® mold inhibitors. In addition, Koppers brand water repellants and/or MicroShades® color additives are also available for use with this system.

Refer to the Cleanwood Mold Inhibitors, Water Repellants, and MicroShades sections of this manual for specific recommendations for use with the ACQ preservative system.

NatureWood Pressure Treated Wood

The appearance of ACQ treated wood products depends largely on the wood itself. Southern pine typically appears very similar to CCA after the wood has become surface dry. At higher retention levels or processes leaving excess liquid at the surface, it can appear a darker green with more of a blue overtone than is typical of CCA treated wood. 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 ACQ wood product 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 pools on the lumber surface, a patchy appearance may result.

Materials Compatibility

ACQ work 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 ACQ concentrates and work solutions up to 120˚ F.

If chloride levels become elevated, some corrosion may occur with ACQ solution in new mild steel plants that is not evident at converted CCA facilities. This is because, over time, used mild steel surfaces become passivated or protected against corrosion by the chromium in CCA.

Kiln Drying after treatment (KDAT) of NatureWood

Kiln drying freshly treated NatureWood treated lumber can be more challenging than with CCA treated wood products. Significant amounts of amine in the ACQ formulation require that care be taken in the initial stages of a kiln charge.

Any free liquid preservative left pooled or dripping down the sides of lumber may turn a very dark blue to a black color if placed in a hot kiln. The use of treating cycles to minimize free liquid is strongly recommended for KDAT stock. In addition, lumber should be stickered as soon as possible after treatment, if not before.

Dry at a low temperature and wet-bulb depression, and with maximum venting, for the first four hours to condition board surfaces, then ramp up gradually. Never exceed 160˚F. Stagger gaps to avoid a vertical air route from top to bottom of packs. And never use sticks that were previously used for drying CCA treated lumber to minimize sticker staining.

Fastener Recommendations

Structural fasteners that are more corrosion resistant than uncoated or flash electro-galvanized mild steel are recommended for use when building with NatureWood treated lumber. They should be compliant with IRC and IBC fastener requirements; typically, hot-dip galvanized or stainless steel. Alternative alloys or coatings that have been tested and recommended by fastener manufacturers may provide good service. If chloride levels in ACQ solution become elevated, then galvanized fasteners applied to the lumber before treatment may experience problems. Such fasteners include end-tag staples, lattice staples, and prefabricated fence panel nails and staples. Molten zinc coating formulations often include some aluminum and can react with copper when chloride content is high. Reddish rust-like deposits on galvanized fasteners in these situations are mostly plated copper deposits rather than iron oxide or rust.

PLANT OPERATIONS

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

Solution Preparation and Maintenance

Preparation and maintenance of ACQ work solutions is presented using several examples from mixing new tanks to various concentration adjustments. These examples are for plants not equipped with the KPC process control system or those that need to calculate mixes independent of the computer. The quat component of ACQ is much more reactive to wood fiber than the alkaline copper. With prolonged cycling, the quat concentration in work tanks will stabilize at a lower than nominal level due to preferential absorption into the wood. This tendency will occur quicker as the difference between gross absorption and net absorption increases in a treating cycle. Significant amounts of kickback solution returned to a work tank can have major effects. The example in Calc 7 describes how to return the system to a 2:1 balance with additional quat concentrate.

Copper-to-quat Ratio

KPC recommends the maintenance of working solution at a 2:1 or 1:1 CuO to quat ratio. This can be done by frequently adding quat to work solution in order to replace the quat that has stripped. From an operating perspective, this method can simplify things by providing a baseline solution balance. Operators merely need to “reset” to the target ratio after each charge.

Solution management can become more challenging with ACQ. Since quat reacts quicker and absorbs more onto wood fiber relative to CuO, the balance of actives in the solution can change much more quickly and plants are provided the means to adjust quat levels as needed.

Solution Storage and Stability
ACQ work solutions are relatively stable and not greatly affected by wood extractives content and temperature. Copper may precipitate from solution at very low levels depending on treating habits, water quality, and nature of the commodities treated.

Solution Evaluation Frequency
It is important for ACQ work solutions to be sampled and tested for CuO and quat content before and after any adjustments to solution concentration and before each charge. Routine mixes may typically be done on a CuO basis.

Prolonged cycling of work solution creates potential for the quat to be found out of balance or low. This tendency will occur quicker when modified or low weight cycles are in use. Quat content needs to be tested by titration at the plant routinely at a frequency determined by operator experience. At start up, quat should be monitored with every charge and mix until plant personnel are confident with its behavior with continued cycling. At that time, the frequency of quat testing can be adjusted accordingly.

CuO is analyzed using an x-ray fluorescence (XRF) analyzer as described in AWPA A9. The quat analysis is done by titration methods based on AWPA A17.

Multiple Preservative Operation
Treatment with ACQ and CCA in the same treating plant is not recommended. ACQ is alkaline while CCA is very acidic. If inadvertently mixed, they react immediately forming large amounts of insoluble solids or sludge requiring clean up and disposal as a hazardous waste.

Additional engineering and vigilance by operators are required to minimize cross-contamination. If CCA and ACQ must be used in the same plant, then common pipe work must be kept to an absolute minimum. The cylinder, pipe work, and sumps should be drained completely at changeover and flushed or washed thoroughly with water. Care must be taken in collecting the wash water since the incompatibility still applies. These precautions are particularly important when switching from CCA to ACQ.

Even when thoroughly flushed, it is virtually impossible to achieve absolutely no cross contamination. A separate system is the only sure way to eliminate the possibility of chromium and arsenic contamination of ACQ treatment solutions. If CCA and NatureWood treated wood is placed on the same drip pad, separate drainage areas and sumps must be established.

ACQ is compatible with Advance Guard DOT and fire retardant treatments. Even though they are all similar in pH and tolerant of one another, care must be taken to minimize cross contamination with good housekeeping and thorough rinsing procedures.

Manual Mix Calculations

Preparation of Initial Mix

CALC 1

Target		**Volume**		**CMC 10.3**		**Gal CMC 10.3**
Solution %		Gallons		Factor		Needed
1.0	x	15,000	x	0.06298	=	945 gal

Routine Mix to the Same Concentration

When increasing working tank volume and keeping the same concentration, determine the gallons of CMC 10.3 present in the existing solution and subtract from the total gallons needed to make the target volume as shown in Calc 2.

CALC 2

Target		**Volume**		**CMC 10.3**		**Gal CMC 10.3**
Solution %		Gallons		Factor		Needed
1.0	x	15,000	x	0.06298	=	945 gal
Existing		**Volume**		**CMC 10.3**		**Gal CMC 10.3**
Solution %		Gallons		Factor		Present
1.0	x	10,275	x	0.06298	=	647 gal
		Target		**Existing**		**Gal CMC 10.3 to Add**
		945	-	647	=	298 gal

Mixing Existing Solution to a Higher Concentration

Raising the concentration of ACQ work solution is done identically as mixing to the same concentration. The amount of CMC 10.3 to add is the target minus existing gallons of CMC 10.3 determined by inserting the appropriate volumes and concentrations, as in CALC 3.

CALC 3

Target		**Volume**		**CMC 10.3**		**Gal CMC 10.3**
Solution %		Gallons		Factor		Needed
1.2	x	15,000	x	0.06298	=	1134 gal
Existing		**Volume**		**CMC 10.3**		**Gal CMC 10.3**
Solution %		Gallons		Factor		Present
1.0	x	11,275	x	0.06298	=	710 gal
		Target		**Existing**		**Gal CMC 10.3 to Add**
		1134	-	710	=	424 gal

Mixing Existing Solution to a Lower Concentration

Lowering the working concentration of CMC 10.3 is also done in a similar manner as mixing to the same concentration. The exception is a determination of tank capacity or room available to dilute must be made. Calc 4 shows a similar calculation and yields a negative number. The negative number indicates there is not enough room in the tank to lower concentration to the target by adding water.

CALC 4

Target		**Volume**		**CMC 10.3**		**Gal CMC 10.3**
Solution %		Gallons		Factor		Needed
0.8	x	15,000	x	0.06298	=	756 gal
Existing		**Volume**		**CMC 10.3**		**Gal CMC 10.3**
Solution %		Gallons		Factor		Present
12	x	11.575	x	0.06298	=	875 gal
		Target		**Existing**		**Gal CMC 10.3 to Add**
		756	-	875	=	-119 gal

One can either treat with the concentration left that is somewhat above the target or remove enough of the higher concentration to provide room in the tank for appropriate dilution. Calc 5 displays how to estimate the concentration left after an incomplete dilution to the target concentration.

CALC 5

Gallons		**Volume**		**CMC 10.3**		**% CMC 10.3**
CMC 10.3 Present		Gallons		Factor		Achieved
875	÷	15,000	÷	0.06298	=	0.93%

Quat Balancing Mix

When analytical results on the quat component indicate a need to adjust the CuO:quat balance of the working solution, adjustment can be made with the addition of DAC-QM concentrate. Calc 6 below tracks the mixing of quat concentrate to achieve the desired quat content.

Given Existing Solution by Analysis Target Concentration

CuO = 1.013% CuO = 1.067%

Quat = 0.375% Quat = 0.533%

CALC 6

Target		**Volume**		**BAC-QM**		**Gal as BAC-QM**
Quat %		Gallons		Factor		Only Needed
0.533	x	15,000	x	0.02041	=	163.2 gal
Existing		**Volume**		**BAC-QM**		**Gal as BAC-QM**
Solution %		Gallons		Factor		Present
0.375%	x	11.275	x	0.02041	=	86.3 gal
		Target		**Existing**		**Gal as BAC-QM Conc. to Add**
		163.2	-	86.3	=	76.9 gal

Two-Component Mix

Two-Component Initial Mix

As indicated in Calc 7 below, multiply the desired concentration of each component by the desired gallons. Then multiply by the appropriate factor to get gallons of each component required to mix 15,000 gallons of 1.0% ACQ solution. This first example is for a Generation III solution with Carbo-NT as the quat. With a 1.0% target at a 2:1 CuO:quat ratio, the target for CuO will be 1.0 x 0.667 = 0.667% and the quat target is 1.0 x 0.333 = 0.333%

CALC 7

Target		**Volume**		**CMC 10.3**		**Gal CMC 10.3**
CuO%		Gallons		Factor		Needed
0.667	x	15,000	x	0.06298	=	630 gal
Target		**Volume**		**Carbo-NT**		**Carbo-NT**
Solution %		Gallons		Factor		Needed
0.333	x	15,000	x	0.02300	=	115 gal

Two-Component Increased Concentration Mix

When increasing working ACQ concentration, determine the gallons of each component present in the existing solution and subtract from the total gallons of each needed to get the target volume as shown in Calc 8. To raise a 0.9% work tank to 1.2% ACQ solution, each component must be calculated separately. The existing concentration of each should be from the XRF and titration test data.

CALC 8

COPPER						
Target		**Volume**		**CMC 10.3**		**Gal CMC 10.3**
CuO%		Gallons		Factor		Needed
0.800	x	15,000	x	0.06298	=	756 gal
Existing		**Volume**		**CMC 10.3**		**Gal CMC 10.3**
CuO%		Gallons		Factor		Present
0.630	x	12,130	x	0.06298	=	481 gal
		Target		**Existing**		**Gal CMC 10.3 to Add**
		756	-	481	=	275 gal
QUAT						
Target		**Volume**		**Carbo-NT**		**Gal Carbo-NT Conc.**
Quat %		Gallons		Factor		Needed
0.400	x	15,000	x	0.02300	=	138 gal
Existing		**Volume**		**Carbo-NT**		**Gal Carbo-NT Conc.**
Quat %		Gallons		Factor		Present
0.270	x	12,130	x	0.02300	=	75 gal
		Target		**Existing**		**Carbo-NT to Add**
		138	-	75	=	63 gal

Mixing Two-Component Existing Solution to a Lower Concentration

Lowering the working concentration of a two-component ACQ tank is also done in a similar manner as mixing to the same concentration. The exception is a determination of tank capacity or room available to dilute. Calc 9 shows a similar calculation and yields a negative number for both components. A negative number indicates there is not enough room in the tank to lower concentration to the target by adding water. At this point some solution can be moved to another tank to create room or the tank can be diluted to volume with water only and the higher concentration can be used.

CALC 9

COPPER						
Target		**Volume**		**CMC 10.3**		**Gal CMC 10.3**
CuO%		Gallons		Factor		Needed
0.600	x	15,000	x	0.06298	=	567 gal
Existing		**Volume**		**CMC 10.3**		**CMC 10.3**
CuO%		Gallons		Factor		Present
1.067	x	10,430	x	0.06298	=	701 gal
		Target		**Existing**		**CMC 10.3**
		567	-	701	=	-134 gal
QUAT						
Target		**Volume**		**Carbo-NT**		**Gal Carbo-NT Conc.**
Quat %		Gallons		Factor		Needed
0.300	x	15,000	x	0.02300	=	104 gal
Existing		**Volume**		**Carbo-NT**		**Gal Carbo-NT Conc.**
Quat %		Gallons		Factor		Present
0.502	x	10,430	x	0.02300	=	120 gal
		Target		**Existing**		**Carbo-NT to Add**
		104	-	120	=	-16 gal

One can either treat with the concentration left that is somewhat above the target or remove enough of the higher concentration to provide room in the tank for appropriate dilution. Calc 10 displays how to estimate the concentration left after an incomplete dilution to the target concentration.

CALC 10

COPPER						
Gallons		**Volume**		**CMC 10.3**		**%CuO**
CMC 10.3 Present		Gallons		Factor		Achieved
701	÷	15,000	÷	0.06298	=	0.742%
Gallons		**Volume**		**Carbo-NT**		**% Quat**
DAC-Q Present		Gallons		Factor		Achieved
115	÷	15,000	÷	0.02300	=	0.333%
% ACQ 0.742 % CuO + 0.333% Quat = 1.075% ACQ						

Mixing West Coast Hybrid Formulations

On the West Coast ammonia is often formulated into ACQ 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 with CMC 10.3 and NW 200-C concentrates. The mixing of hybrids can be done in the same manner as two-component mixes.

QUALITY CONTROL

A treating plant is ultimately responsible for the quality of its treated wood products. Third party monitoring and other overview services provide only a spot-check or indication of how well internal QC is performing.

Plant internal quality control is governed by AWPA Standard M25, the treating industry's overall quality control standard.

Treated Wood Sample Analysis

Analysis of your core borings will determine if the commodity that you have treated meets the minimum requirements. QC tests are typically performed at the plant while charges are still on the drip pad.

Copper can easily be determined using AWPA A9 XRF. Benchtop XRF analyzers are common to most treating plants. Refer to an XRF manufacturer's operating manual for techniques as they may vary by model.

Results of Treatment

Following treatment, every charge of treated material must be bored and tested by plant personnel to determine conformance to penetration and retention requirements.

AWPA has revised the M25 Internal Quality Control Standard with new provisions specific to alternative alkaline copper based preservative systems. For these products, M25 specifies that each and every charge must be analyzed for copper penetration and also the retention of copper oxide. At the discretion of an ALSC accredited third party inspection agency, a reduced frequency of retention testing for co-biocides may be followed, provided that data exists that will support operating at a given CuO level. To remain in compliance with third party quality programs, the minimum level that a plant is required to test for the co-biocide is 1 out of 20 charges.

This means that each plant can multiply the retention of CuO by 1.5 for a 2:1 for type D and 1:1 for type A copper to quat ratio and by 2 for 1:1 copper to quat ratios to arrive at the total ACQ retention as a beginning method. A plant may then establish a correlation or estimate for a quat contribution to total retention based on the CuO assay for operational purposes. Then, as long as monitored charges fully analyzed by inspection companies maintain acceptable conformance rates, a reduced frequency for internally testing quat in the wood is allowed. Again, the actual test frequency is at the discretion of the accredited third-party inspection agency and will be no less than 1 out of 20 charges for each commodity type treated.

Contact KPC Customer Service Representative for a discussion of methods one can use to track quat retention based on the CuO x-ray result, cycle absorption data, and solution concentration.

Quat Method Titration for Testing ACQ Solution

Upon request, KPC has available laboratory titration methods for use in the plant to manage quat levels in work tanks. The methods are based on volumetric titration with known reagents and assessment of a color indicator to render % quat in solution. Titrations work the best if done between 50 and 85˚ F. Upon startup, customers are supplied all necessary QC equipment and training needed to manage quat levels in work solutions.

NatureWood Minimum Retentions

Table 3 shows the minimum allowable retention of individual ACQ components. One or the other active ingredient can be lower, but the total must still meet the minimum.

TABLE 3A – Minimum Retentions for ACQ-D

PCF Retention Requirement	Minimum Individual Component Retention		Total ACQ by Analysis, PCF
	Copper Oxide	Quat	
0.15	0.080	0.040	0.150
0.25	0.130	0.070	0.250
0.40	0.210	0.110	0.400
0.60	0.320	0.160	0.600

TABLE 3B – Minimum Retentions for ACQ-A

PCF Retention Requirement	Minimum Individual Component Retention		Total ACQ by Analysis, PCF
	Copper Oxide	Quat	
0.15	0.060	0.060	0.150
0.40	0.16	0.106	0.400

ENVIRONMENTAL AND PLANT SAFETY

Wood preservatives are hazardous substances and can potentially cause harm if used improperly. Precautions can be taken to minimize exposure and your risk of harm. Exposure can be prevented by engineering or operational controls, but sometimes this is not enough. For all activities with ACQ preservatives and treated wood products, personnel must follow PPE regulations as stated on the EPA-registered labels. Applicators must wear gloves, eye protection, and protective clothing impervious to wood treatment solutions in all situations where contact may occur.

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

ACQ Concentrate and Working Solution Safety

Toxicological and environmental testing has been conducted on ACQ concentrate in accordance with EPAs protocol for pesticide registration. Our testing shows that ACQ has low mammalian toxicity, although it was found to be corrosive to skin. It should be noted that all quat products are extremely corrosive and can cause irritation and/or burning on skin/eyes upon contact. **Use extreme caution when dealing with any quat products.**

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. Also note that splinters from NatureWood treated wood will give a burning sensation much like the sensation that is felt when a wound is washed with soap.

KPC recommends that ACQ plant operators maintain their pesticide applicator licenses. Check with your state Department of Agriculture for requirements.

As noted on the product label, persons who enter pressure treatment cylinders must wear properly fitting, well-maintained, high-efficiency respirators that are MSHA/NIOSH approved for ammonia. A full-face respirator with a multi-gas vapor cartridge **and** a P-100 particulate filter should cover the respirator requirements for NW 200-C.

If ammonia levels in the plant are unknown or exceed 35 ppm STEL (short term exposure limit: 15 minutes) or 25 ppm (ACGIH) of air averaged over an 8-hour work period, air monitoring programs, procedures, and record retention and submission must be conducted in accordance with OSHA standards.

Safe Handling of Freshly Treated NatureWood

NatureWood treated products are toxicologically similar to untreated wood. The primary health hazard posed by NatureWood treated wood would be the inhalation of airborne wood dust. Engineering controls and protective equipment to minimize exposure to wood dust is recommended.