Specifications for Treating Bridge Timbers with Cellutreat® DOT Borate and QNAP® Copper Naphthenate

1. Timber buying specifications

1.1 SYP No.1 Dense Bridge Timber:

Unless otherwise specified on the [Railroad Name] purchase order, all pine structural timber shall conform to the grade of No.1 Dense, Section 402.1, and all pine dimension lumber shall conform to the grade of No.1 Dense, Section 312.1, as set forth by the latest edition of the Standard Grading Rules for Southern Pine Lumber of the Southern Pine Inspection Bureau (SPIB), Pensacola, FL.

1.2 Coastal Douglas-fir

All lumber and timber shall be #1 West Coast Douglas-fir per Standard No. 17 Grading Rules for West Coast Lumber published by West Coast Lumber Inspection Bureau. Minimum rough and dressed sizes shall conform to current WCLB rules for Beams and Stringers Section 130. Standard lengths shall be as ordered and precision end trimmed within +1” and -0”. All defects such as knots, shakes, checks, or splits shall conform to current WCLB Grading Rules section 201 and 202.

1.3 Oaks and Mixed Hardwoods

Acceptable species are mixed (red and white) oak and mixed hardwood, with the exception of poplar, cottonwood, willow, basswood, and sycamore. Mixed oak, not counting hickory, must make up a minimum of 50% of the total ties shipped from each supplying location. Ties shall be separated by size and length and oak-hickory shall be separated from mixed hardwoods. Hickories will be included with the oaks for both Boulton- and air‑drying. All ties will be shipped to the treating plant within 30 days after cutting. Thickness and width are considered met if ties are not more than ¼” thinner or narrower than the specified sizes.

2. Conditioning

2.1 Ties and poles shall be conditioned prior to treatment in accordance with the current version of American Wood Preservers’ Association (AWPA) Standards T1 and U1.

2.2 Air-Seasoning. Air seasoning is an acceptable means of conditioning for ties and poles as limited by ANSI O5.1. When air seasoning is permitted, refer to AWPA Standard M1, Standard for the Purchase of Treated Wood Products. Green ties must be pre-treated with DOT prior to air season

2.3 Kiln Drying. Wood products that are kiln dried prior to treatment generally are suitable for treatment without further conditioning. Kiln drying procedures and cycles should be selected to avoid damage to the wood or adverse effects on treatability. Definitions from the 2013 SPIB Dry Kiln manual include:

* Kiln: A chamber having a controlled air-flow, temperature, and relative humidity, for drying lumber, veneer, and other wood products.
* Kiln-Dried: Seasoned in a chamber by means of artificial heat.
* KD15 or KD19: Lumber that is kiln-dried to 15% or 19% moisture content, respectively.
* Kiln Dried After Treatment (KDAT): Treated lumber that has been seasoned in a kiln to a predetermined moisture content following the treating process.

2.4 Heating in the preservative. Wood may be conditioned by heating in oil-type preservatives at atmospheric pressure to facilitate preservative penetration during subsequent pressure periods. When heating in the preservative is used, the preservative shall cover the material in the cylinder. The temperature of the preservative shall not exceed 105°C (220°F). Maximum time limits for heating in the preservative are found in AWPA T1 Section 8.

2.5. Boulton Drying.The vacuum drawn during the conditioning cycle shall be of sufficient intensity to lower the boiling point of the water in the wood below the temperature of the preservative. Conditioning shall continue until the material is sufficiently heated and enough water has been removed to permit acceptable preservative penetration.

3. Preservatives

3.1. Copper naphthenate shall conform to the current AWPA P36 “Standard for Copper Naphthenate (CuN)” and Standard HSA “Standard for Hydrocarbon Solvent, Type A”.

3.2 Disodium Octaborate Tetrahydrate (DOT) shall conform to the current AWPA P25 “Standard for Inorganic Boron (SBX)” as specified in AWPA Standard U1 Commodity Specification C, Ties. The

only  form  of  borate  preservative  that  has  been  adopted  by  AWPA  for  dual  treatment  of  cross-ties is DOT.

4. Borate Pre-Treatment Specifications for Borate Dual Treatment of Cross Ties & Switch Ties

4.1 Dual treatment using an initial borate treatment of green ties prior to overtreatment with copper naphthenate (CuN) is specified to protect green ties and timber against fungal and insect attack and prevent strength loss due to decay during  the  air seasoning process.  Borates diffuse to the heartwood and continue offering protection after installation in track. Dual treatment with borate and copper naphthenate shall conform to the current version of AWPA Standard U1, as cited in Chapter 30, Section 3.6.4 of the AREMA Manual for Railway Engineering.

4.2 DOT shall be applied to green ties and timbers using non­-pressure dipping or pressure treatment operations such that the minimum required DOT retentions are achieved.

4.3 Retention Specifications: AWPA Standard U1 Commodity Specification C specifies dual-treated ties shall contain a minimum retention of 0.25 pounds per cubic foot DOT, equivalent to 0.17 pcf B2O3.

4.4 Ties shall contain a minimum of 0.03 pounds per cubic foot (as copper metal) of CuN for mixed hardwoods, and 0.03 pounds per cubic foot or to refusal for oaks. Note that these retentions are less than the AWPA Standard U1 minimum retention for stand-alone treatment of ties using only copper naphthenate.  When dual-treating ties with DOT borates followed by an oil-type overtreatment as specified in AWPA Standard U1, it is acceptable to reduce the copper naphthenate (CuN) retention.

4.5 Solution must be mixed in a separate mixing tank before introduction to the cylinder.

4.6 Minimum solution concentration of borate treating solution shall be of adequate strength to achieve target retention and penetration, typically 20-30% DOT for non-pressure treatment.

4.7 Solution temperature shall be kept from freezing or above 32°F. A dipping tank for the delivery system may be used as a suitable alternative to pressure-vacuum treatment.

4.8 Volume of dip tank must be large enough to allow for complete submersion of each set of bundles.

4.9 Stored temperature for solution must be maintained to prevent solution fallout or precipitation(refer to Nisus recommendations)**.**

5. Copper Naphthenate Treatment (Stand-alone and Dual Treatment)

5.1. Treatment of air-seasoned ties with Copper Naphthenate Only **–** All air-dried charges of ties shall be held in 180°F oil for a minimum of 6 hours. This time will be a combination of pressure and preheating in oil to achieve sterilization and deeper distribution of copper naphthenate in air-dried material. Preheating time will begin only after 180°F is attained. Each layer of ties on the tram shall be separated with one ¾” steel spacer placed on alternate ends as the layers are built.

5.2 Treatment of DOT-pretreated ties with Copper Naphthenate **–** Preheating in oil for sterilization is not required for ties given a preliminary DOT treatment prior to air seasoning.

5.3 The methods, requirements, and specifications to ensure proper handling, conditioning and treatment of ties shall be governed first by [Railroad Name] specifications and supplemented secondly with AWPA Standards T1-11, M1-08, M2-07, M3-05 and M4-08, with the following exceptions:

* Treatment shall be by the empty cell method with copper naphthenate supplied as an 8% copper concentrate for dilution in either #2 diesel or #4 fuel oil or heavy fuel oil that meets the current specification of AWPA HSA (P9 Type A.)
* Treating operations shall be in accordance with AWPA Standards U1 and T1 using an empty cell process with or without initial air.
* Pressure periods will include only the time at a minimum of 150 psi or more, and will be sufficient to meet desired retentions.

5.4. Consult AWPA Standard U1 for minimum copper retention for the various commodities and Use Categories. Net solution retention shall be not less than five (5) lbs. per cubic foot of wood determined as specified in the AWPA Standards, or at a retention specified by [Railroad Name].

5.5. Retention may be determined by gauge or assay. Assay by zone (0-1" from surface) on a 3" core shall be on each charge or as required by AWPA Standard T1. All retentions shall be calculated as pounds of active (copper or borate) per cubic foot volume.

5.6. Complete plant treating reports shall be submitted with each shipment in accordance with AREMA Manual of Engineering, Wood Preservative, "Records of Treatment and Reports of Inspection”.

5.7 Treating Specifications for Copper Naphthenate-treated coastal Douglas-fir - Prior to treatment the moisture content shall be below 25% per AWPA Standard M-2, “Inspection of Material before Treatment”. All cutting, drilling, dapping, or fabrication shall be done prior to treatment. All Douglas-fir lumber and timber shall be incised per AWPA specification T1 section 1.7.

5.8 All material shall be treated to AWPA UC4B minimum retention of .075 pcf (as copper) by assay. Material shall be inspected after treatment per current AWPA Standard T1 Section 3. Minimum penetration requirements shall be .5” and 90% of sapwood. Assay zone for copper retention analysis shall be 0 to 0.6 inches. Both minimum penetration and retention specifications must be meet before the charge is accepted.