TREATED WOOD - A RAILWAY'S PERSPECTIVE

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SUMMARY

Treated wood used by the railways in Canada annually runs in the tens of millions of dollars in materials alone. Track maintenance runs in the hundreds of millions of dollars. In terms of the treated wood product, the best treated wood may not always be the most effective treatment. This paper sheds some light as to what a railway requires in terms of the treated wood product.

INTRODUCTION

Canadian Pacific Railway, like other class 1 roads operating in North America, annually spends hundreds of millions of dollars maintaining thousands of miles of track across its system (approx. 18,000 miles). New track is often added and track is also abandoned. What the railway wants, what this railway wants in my opinion, centers on three primary factors for its treated wood material: 1. Price, 2. Quality & 3. Logistics Treated wood used in the railway has to meet existing standards in terms of its engineering, and treating qualities as well as being available for use when required, and all at a "best" price. This paper is specific to the CPR, but at the same time typical to most railways.

THE PRODUCT

CROSS TIES

Canada: 40 % softwoods and 60 % hardwoods
Softwoods: Douglas fir, Southern yellow pine, lodgepole pine, ponderosa pine, hemlock, larch

Hardwoods
1. Oak: white oak, red oak
2. Mixed hardwoods: hickory, birch, beech, hard & soft maple, black & red gum, ash, cherry, honey & black locust, sassafras, walnut etc.

	Grade		Acceptable
Dimensions:	6"x8"x8'0"	- #2 SWD & HWD	Face is not more than 1/4" scant
	7"x9"x8'0"	- #1 SWD & HWD	in seasoned ties and not more than
	7"x9"x8'6"	- #1 HWD	1/2" thicker or wider and not more than
	7"x9"x9'0"	- #1 HWD	3" longer.

U.S. : 100 % hardwoods

	Grade		Acceptable
Dimensions:	6"x8"x8'6"	- #3	Face is not more than 1/4" scant
	7"x8"x8'6"	- #4	in seasoned ties and not more than
	7"x9"x8'6"	- #5	1/2" thicker or wider and not more than
	7"x9"x9'0"	- #5	3" longer.

The primary timber resource for hardwoods is the East Central and Southern U.S. with oak comprising 3/4 of all the material treated in the U.S. with white oak making up 3/4 of the oak classification.

SWITCH TIES

Used in the construction of turnouts for sidings, and spur tracks.
Primarily oak with some mixed hardwoods. This much larger dimension track material, is much more expensive than cross ties and the price increases exponentially as the length of switch tie increases. The standard dimension of this material is 7"x9" with lengths ranging from 9 feet to 24 feet. Another common dimension is for power switch ties with a dimension of 8"x10"x 13'. Power switch ties must be 100% end-plated (end-plates are anti end-splitting devices pressed or hammered into the ends of a tie, and are similar to roof truss plates. S-irons and C-irons are no longer used by CPR as they are much less effective). Switch ties 18 feet and greater must be 100% end-plated, ties 17 feet and less must be selectively end-plated.

Dimensions: 7"x9"x9'0" to 24'
8x10x13'0" & 13'6"

Species: Primarily oak and select hard maple, and also mixed hardwoods.

CROSSING PLANK

Crossing plank differs significantly from the Canadian to the U.S. side of the border with 100 % untreated hemlock and Douglas fir being the norm North of the border and 100% treated oak and mixed hard woods being the norm South of the border. All crossing material in the U.S. are 100% end-plated.

Why such a pronounced difference? A simple answer is "tradition", that's the way it has always been done, good or bad. Further investigation should reveal more tangible reasons for this tradition.

Canada: 100% untreated hemlock & Douglas fir, no end-plating.
Dimensions (typical): 4"x8",
5"x8, 5"x10",
6"x8",6"x10",
7"x8",7"x10",
8"x10"
Lengths: 12',14',16',18',20'
U.S.: 100% oak & select mixed hardwoods, 100% end-plated

Dimensions: Differ considerably to Canadian sizes, below are typical dimensions.

5-3/4"x8", 5-3/4"x9"
6-1/4"x8", 6-1/4"x9"
7-1/2"x8", 7-1/2"x9"
8-1/4"x8", 8-1/4"x9"
Lengths: 8' & 12'

TIE PLUGS

100% Eastern white cedar in Canada
100% Oak and mixed hardwoods in the U.S.

Treated and untreated.

RECEIVING / INSPECTION & MACHINING OF MATERIAL

Untreated, "Green" material is brought into the treating plant by rail and truck. It is then inspected and graded according to specification and is stacked according to size, grade, and species. Oak and hickory are stacked together since they take 2 to 3 months longer to air season than mixed hardwoods. Each row is marked with a reference number, species, grade and the date the material was put up for seasoning.

Prior to being stacked for seasoning, the ties are run through the mill and are 100% incised, end trimmed and either selectively end-plated or 100% end-plated depending on plant location. Ashcroft treating, located in the extremely dry area of Ashcroft, B.C., approx. 80 km's west of Kamloops, end-plates 100% for CPR hardwood cross ties.

Ties are either end or side branded with CP, the date of machining, and the treating facility on the end or sides of the tie. No pre-boring of tie-plate spiking patterns is practiced anymore for CPR material. It has been deemed unnecessary as the spike rarely is inserted into these holes. It then becomes an unwelcome reservoir for water.

SEASONING OF MATERIAL

Normal seasoning periods and optimal moisture content (MC) in the outer two inches of cross and switch ties and crossing plank are as follows:

Species	Months	MC
A) Oak	10 - 12	<50%
B) Mixed Hwd	6 - 8	<40%
C) Softwood	6 - 8	<30%

The above is typical for 4 of 5 of the treating plants involved with CPR's material. Ashcroft treating seasons its material 25 - 35 % quicker due to the arid climate.

MC testing is done in accordance to the procedures outlined in AWPA's section C2 (Timbers), C6 (Cross & Switch Ties) and M2 by qualified personnel. Only if the material being tested is within the acceptable MC parameters will it be deemed treatable. Material can only be Boultonized upon approval by designated CPR personnel. Material that has degraded due to seasoning (seasoning defects) will be removed prior to treating and will be considered a reject if it cannot be cut-back to another length, depending upon the type of defect. For example: 8'6" ties cut back to 8'0", and 20' switch tie cut-back to 16'. An 8'0" tie cannot be cut back any further and would be taken out of inventory..

PHYSICAL REQUIREMENTS

General Quality

CPR ties are to be free from any defects that may impair their strength or durability as cross ties, including decay, large splits, large shakes, slope of grain or large or numerous holes or knots. No ties manufactured by quartering or halving large logs and/ or not having a well boxed heart will be accepted. Particular attention will be paid to the Rail Bearing Area (RBA). The area in which the tie plate rests on the tie.

TREATMENT

The following specifications ensure a quality product for CPR :

All cross ties must be properly seasoned prior to treatment.

The Preservative Mix

All material must be treated with either a 60/40 Creosote/Coal Tar solution or a 50/50 Creosote/Petroleum Oil solution in accordance with AWPA Standard P2 or P3, respectively. Salt water applications and certain bridge timbers must be treated with a 100% Creosote solution in accordance with AWPA Standard P13

The methods, requirements, and specifications to insure proper treatment of all material shall be governed by American Wood-Preservers' Association (AWPA) Standards C1, C2, C6, M1, M2, M3 and M4.

Treatment shall be not less than 7 pounds per cubic foot or refusal, for most material. Net retention for salt water applications and for bridge timbers shall be not less than 16 and 10 pounds per cubic foot, respectively.

The method of treatment used is the Reuping empty cell process. Full cell treatments are required for all salt water applications.

A Charge Report must be kept for each charge of treated material. A typical charge is 700 to 1000 cross ties, depending on grade. This report details all segments of the treating cycle - times, pressures, temperatures, vacuums, net retentions and material.

Information from each charge report is transferred on to CPR monthly treating reports and is retained on file. The treater is responsible for performing a visual inspection as well as taking borings from each charge in order to determine the depth of treatment and to ensure proper retention levels. These borings are to be retained at the plant for a one year period.

Should proper retention levels not be met, the material can be re-treated but not more than twice.

SHIPPING AND LOADING

Typical car capacities:

57 foot gondola: 375 pieces #1 8'0" Hwd - 84,000 lbs.
56 foot bulkhead flat car: 648 pieces #1 8'0" Hwd - 145,000 lbs.

LOGISTICS

Sufficient inventory must be kept on hand in order to ensure emergency requests such as derailments. Requests for material is constant throughout the year. Material is received and put up for air seasoning 6 to 12 months ahead of actual treating, shipping and in track maintenance. Unexpected projects and special orders can leave the track material planner short of seasoned material ready for treating unless the treating plant is equipped for Boultonizing. Boultonizing is not the preferred method of treatment, in part due to its higher cost, but will provide treated material to the field in a prompt manner. Tie gangs that are running at $10,000 - $20,000 per day should not be delayed. Boultonizing offers the service of "just in time" delivery. This green treatment reduces inventory and is a great aid in terms of last minute requests and specialty orders.

One of the greatest challenges in logistics is rail car movement. A million plus ties moving by rail loads by the thousands traveling thousands of miles of track. Car assignments have to be monitored in order to have the limited amount of cars available on the move as much as possible. Shipping schedules have to be coordinated with unloading schedules, ties can be shipped but there has to be men and equipment at destination in order to unload and release tie-cars back to the treating plant in order to repeat the turn-around cycle.

CONCLUSIONS

Wood track material continues to play a significant role in the railway of the nineties. As the price of materials continues to increase one must seek ways to increase the service life of the wood cross tie. Laminated ties may just be the solution in extending tie life in an economical fashion, they are proven performers, however the price still remains too high and remains as an alternative for the future.

A better tie can be had, but at what cost?

Price is the ultimate bottom line that determines what is acceptable.