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FOR IMMEDIATE RELEASE

Be a Wood Tie Champion: Prolong Wood Tie Service Life on Your Railroad

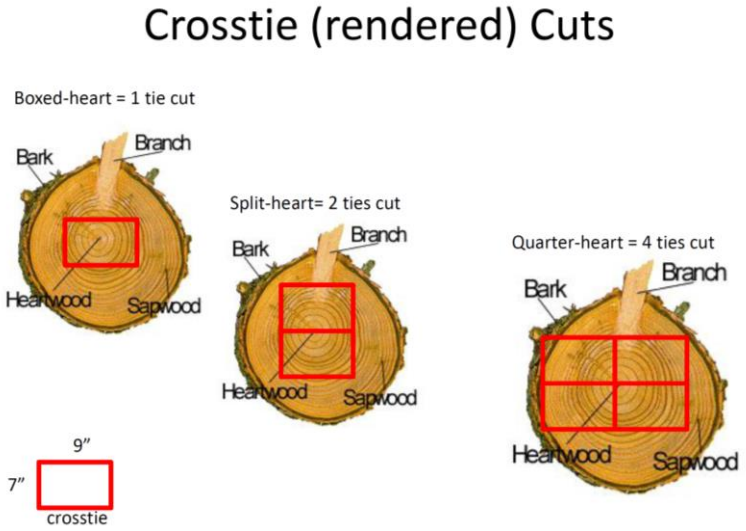
VICKSBURG, Miss.— In a recently published article, Nate Irby, Ph.D., executive director of the Railway Tie Association (RTA), called on railroad industry leaders to become wood tie champions by embracing best practices that extend wood tie service life, improve track safety, and reduce latent long-term maintenance costs. With more than 136,000 miles of freight rail track shaping the U.S. economy, ensuring the health and longevity of wood track infrastructure is critical to continued growth and sustainability.

Expert Perspective: A Call to Action from Dr. Nate Irby

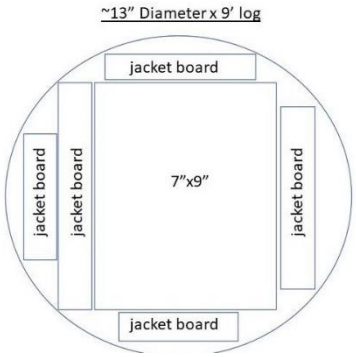
North American railroads make up more than 136,000 miles of track and have a staggering economic impact on our country (source: rsiweb.org). Railroads continue to push safety and gain efficiency, and the cost to move freight by rail compared to other outlets is increasingly competitive and environmentally friendly. RTA can further help railroads become even safer and efficient: WE can help train you on

1. How to correctly identify wood ties fit for railroad service.
2. Understand wood tie dynamics better.
3. How to install wood ties properly for safer and longer railroad service life.

A concern about premature wood tie failure was first brought to my attention near Beaumont, Texas, in 2014 while working for Union Pacific railroad. The engineering special car had rolled through, and the wood ties observed along the subdivision heading west out of Beaumont appeared off-color, echoing complaints from the local track maintenance team about shorter wood tie life in recent years. They asked I go down and take a first-hand look, with the wood tie supplier accompanying me. Once on site, we immediately identified the problem: more than half the wood ties had been installed in track upside down, with the wood heartwood oriented up, leading to premature wood tie failures.



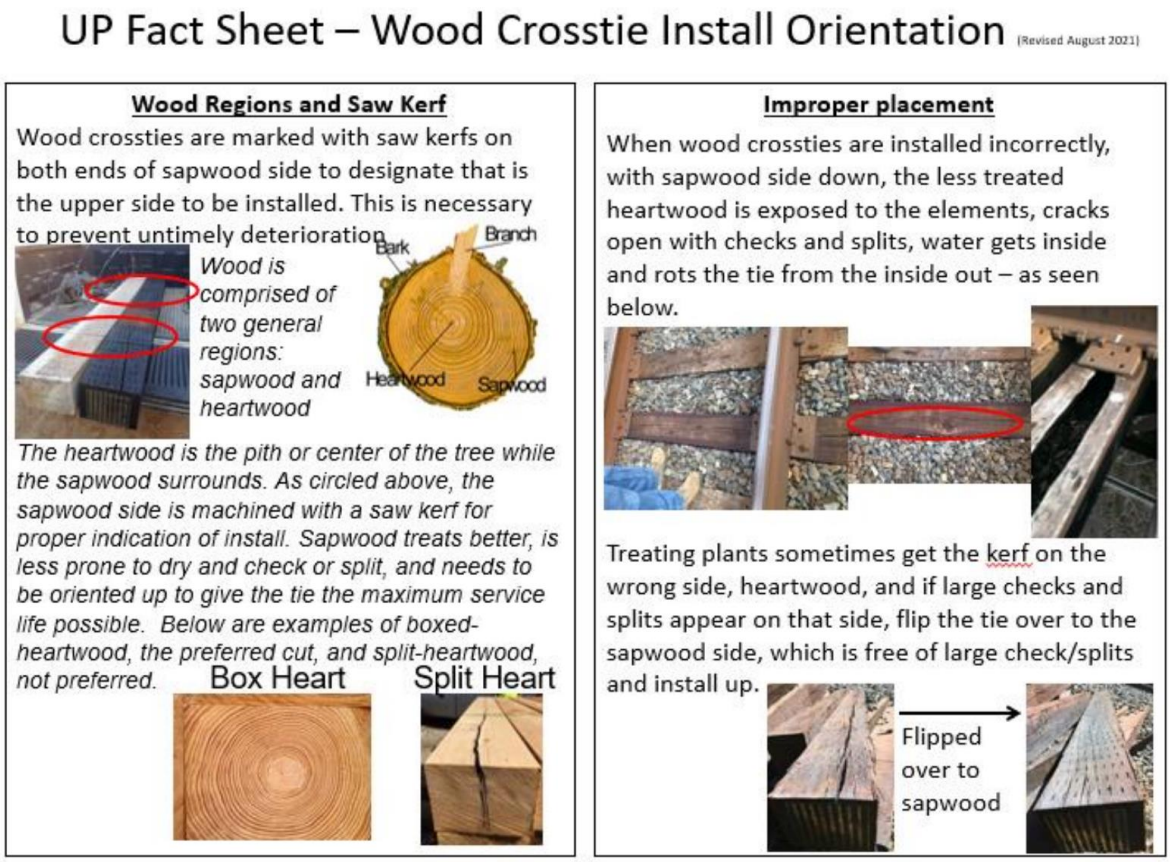
Wood anatomical characteristics differ according to wood zones: heartwood (pith center) and sapwood (outer) regions have varying characteristics from drying, preservative uptake, and color. When trees/logs get bigger, the sawing solutions can change. With multiple wood tie renderings possible from bigger trees/logs, this creates potential for wood ties with non-boxed heartwood be sawn, thus increasing the probability for wood ties to be installed in track incorrectly with heartwood up and exposed to the elements.



A rendering of a typical sawlog optimization at a wood sawmill, with a cutting solution shown with a boxed-heart wood tie and subsequent lumber sizes surrounding.

Ways to identify improperly installed wood ties includes the color (like observed when the engineering special rolled through Beaumont), lack of saw kerf visible on top (or supplier applied the saw kerf on the wrong side of the wood tie), and advanced drying defects like checks, splits, and shake pronounced sophomorically in exposed heartwood (for a primer on forest products/wood terminology, see: https://ohioline.osu.edu/factsheet/F-85).

I developed a series of forest products best practices fact sheets during my tenure at Union Pacific, and immediately after the Beaumont findings, created a brief on wood crosstie install orientation for a dual purpose—to train internally and externally. Wood tie suppliers can do everything in accordance with the railroad specification to deliver an "on-spec" wood tie, but if the railroad tie gangs are not educated on wood ties and/or saw kerf indication of sapwood and direction to orient up, and the wood ties are installed improperly, wood ties will not experience their full life expectancy. The singular deficit was implementing proper training on wood tie track installation orientation.



UP Fact Sheet – Wood Crosstie Install Orientation (Revised August 2021)

Wood Regions and Saw Kerf

Wood crossties are marked with saw kerfs on both ends of sapwood side to designate that is the upper side to be installed. This is necessary to prevent untimely deterioration.

Wood is comprised of two general regions: sapwood and heartwood

Bark Branch Heartwood Sapwood

The heartwood is the pith or center of the tree while the sapwood surrounds. As circled above, the sapwood side is machined with a saw kerf for proper indication of install. Sapwood treats better, is less prone to dry and check or split, and needs to be oriented up to give the tie the maximum service life possible. Below are examples of boxed-heartwood, the preferred cut, and split-heartwood, not preferred.

Box Heart Split Heart

Improper placement

When wood crossties are installed incorrectly, with sapwood side down, the less treated heartwood is exposed to the elements, cracks open with checks and splits, water gets inside and rots the tie from the inside out – as seen below.

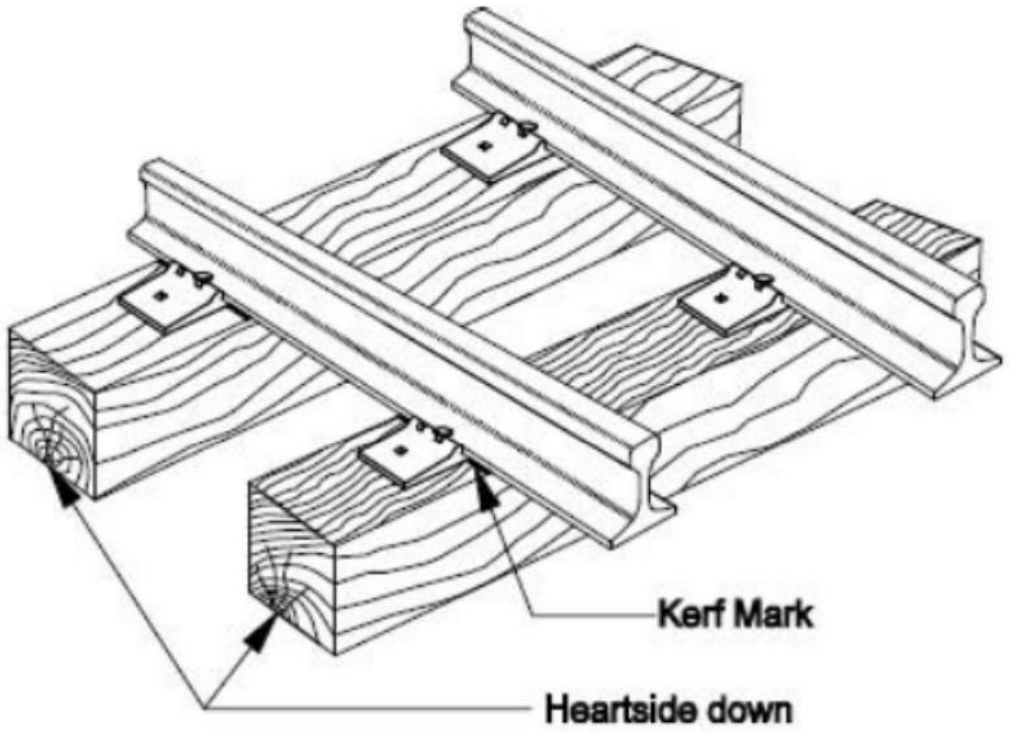
Treating plants sometimes get the kerf on the wrong side, heartwood, and if large checks and splits appear on that side, flip the tie over to the sapwood side, which is free of large check/splits and install up.

Flipped over to sapwood

Reference:

https://www.up.com/cs/groups/public/@uprr/@suppliers/documents/up_pdf_nativedocs/pdf_suply_forest_prod.pdf

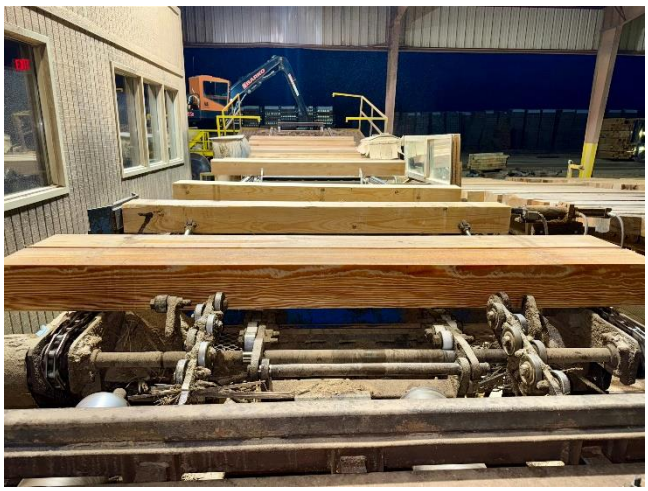
Union Pacific incorporated an infographic in their engineering track maintenance field manual on proper orientation of wood ties in track, denoting the saw kerf and illustrating the wood heartwood zone needs to be down:



Reference:

https://www.up.com/emp/engineering/mapcontent/fieldhandbook/Complete%20Book/Redacted%20Track%20Maintenance%20Field%20Handbook.pdf

Some railroad specifications require a saw kerf be placed on the sapwood side of wood ties. This assists track maintenance personnel in easily identifying which way to orient the tie in track. Other roads have saw kerfs for other reasons, but generally speaking, it creates a line-of-sight for track workers during installation on proper orientation for insertion.



Saw kerf saws (bottom of tie shown, inset from each end 17.75") at a supplier facility sawing kerf marks on the sapwood side of the wood tie. The wood tie grader can flip each tie multiple times in the production line to, a) grade all 4 sides and both ends of each wood tie per the railroads specification, and b) to orient the wood tie as it runs through the saw kerfs to saw sapwood side kerfs.

While some railroads might consider this too much wane in the rail-bearing area for their application, the photo depicts the saw kerf was accurately placed on the sapwood side, and with evidence the pith center is in the middle of the wood tie, covered by the anti-split plate.

Color of preservative treatment uptake and corresponding coloration varies in wood zones: heartwood and sapwood. The sapwood region of wood more easily accepts preservative treatment and can appear darker, while the heartwood does not, and coincidingly appears lighter than the sapwood after treatment. When ties are installed upside down in track, you see the heartwood portion generally appearing lighter in color compared to the sapwood regions, as shown.

Wood ties will fail prematurely when railroad field teams do not understand wood and are unaware of the potential issues with installing ties upside down in track (left photo). Color is an easy way to identify the lighter treated areas as heartwood, which should be oriented down, versus the darker treated portions which are mostly sapwood, and should be oriented up. The photo on the right, illustrates the problem when lesser-treated heartwood is installed in track facing up, extensive checks can develop and expose the inner, untreated portions of the tie, allowing rainwater to enter and degrade the tie biologically far faster than mechanical degradation.

Checks in wood develop in heartwood more than sapwood, especially when heartwood is exposed. Wood ties installed improperly, with heart side up, will check more extensively and cause rainwater to ingress into the inner portion of the 7”x9” tie and rot from the inside out well before the intended service life is achieved.

This tie was saw kerfed incorrectly from the supplier, as you can see by the extensive check, and is already developing rot as this top surface is mostly heartwood. Proper training was done at their facility after to incorporate best practices fact sheets (i.e., work instructions with visual aids) at appropriate workstations throughout their facility to bring awareness of this. Such training tools should be added and implemented out on railroad track workstations/equipment to complete the circle of awareness.

Heartwood exposed to weathering shortens tie life to as low as one maintenance cycle in the higher biodeteriation regions (South, Gulf states, and Upper Pacific Northwest). It is imperative all involved in wood ties—from sawmill to processing facilities to end-user railroads—understand wood and how to install wood ties properly in track to maximize service life and protect workers and communities.

There are prospective research projects in the works to accumulate real data for wood ties installed incorrectly—and correctly in track. Furthermore, you can investigate on your own railroad as "positive controls," right now, with training from RTA. Having an embedded "wood person, i.e., a Wood Tie Champion" employed directly by each railroad to advocate

proper installation of wood ties in track and help train the workforce, will see positive results in system performance and future cost savings, by order of magnitude.

Take the Next Step—Champion Proper Wood Tie Practices

Proper wood tie installation starts with proper education. Contact the Railway Tie Association to discuss workforce training. Together, we can strengthen track infrastructure, lower costs, and support the long-term success of America's railroads.

Visit www.rta.org or contact Dr. Nathan Irby directly at nirby@rta.org or 601-218-6004 to learn more about RTA's educational programs and how to train your workforce for success.