



PUTTING RESEARCH TO WORK

BRIEF

Evaluation of Wood Species and Preservatives for Wisconsin Transportation Sign Posts

The Wisconsin Department of Transportation (WisDOT) administers approximately 11,800 miles of state highways. It uses preservative-treated wood posts for much of the signage along these highways because wood is relatively inexpensive, easy to install, and has the necessary strength properties to tolerate typical Wisconsin wind loads.

What's the Problem?

Although WisDOT's experience with wood sign posts has been generally positive, there are some areas of concern, as well as opportunities for diversifying the wood species and preservatives used.

Use of locally sourced wood for the sign posts decreases transportation costs and potentially benefits Wisconsin industries. Currently red pine is the preferred wood species because it is locally grown and locally treated, but southern pine posts are also used when there is insufficient supply of red pine. Southern pine is easily treated with wood preservatives and readily available, but is primarily grown in the southeastern United States. Possible alternative species include those currently allowed under WisDOT specifications (Douglas fir, jack pine, white pine and oak) as well as other softwood and hardwood species that occur commonly in Wisconsin. However, some of these species may not be locally available in sufficient quantity, while others may not grow to sufficient size, have sufficient strength or be treatable with preservatives.

Most Wisconsin wood species do not have sufficient natural durability to be utilized in direct contact with soil. To provide the necessary durability, the wood must be pressure treated with preservatives that are toxic to wood-decaying fungi. Currently, WisDOT is specifying that posts be treated with chromated copper arsenate (CCA). CCA is an effective and inexpensive preservative that has been widely used for treatment of wooden construction materials for decades. In the past decade, numerous alternatives to CCA have been developed, and some have gained substantial market share. Compatibility with aluminum signs is an important consideration for alternative preservative treatments.

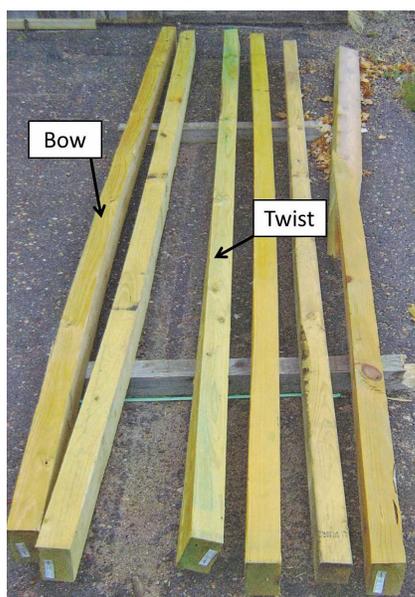
Problems with wood signposts include bowing, twisting and warping.

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Examples of bow and twist in signposts.



Warp appears to be more common, or at least more visible, in single-post than two-post signs.

Research Objectives

In early 2013, WisDOT and USDA, Forest Products Laboratory (FPL) collaborated on a project to evaluate the potential of alternative wood species and wood preservatives in sign posts, and to consider factors that affect sign post performance. The objectives were as follows:

- Review properties of wood preservatives and evaluate their potential for use in treatment of sign posts manufactured from Wisconsin wood species
- Review properties of Wisconsin wood species and evaluate their potential for use in sign post applications.
- Review current WisDOT post storage practices and recommend options for minimizing warp during storage and use.

Methodology

FPL conducted a comprehensive literature review and problem assessment.

Results

WisDOT's current practice of utilizing red pine or southern pine posts treated with CCA is logical and may be the optimum combination of wood species and preservatives currently available. Red and southern pines are readily available wood species with relatively large and treatable sapwood zones. They are also relatively strong compared to many other softwood species. Pressure-treated southern pine is widely used for structural purposes, including for sign posts by other states. Use of red pine is more geographically limited, but it is an important local resource and a logical choice for use in Wisconsin. The use of CCA wood preservative is also a logical choice. CCA is an effective preservative with a long track record, and is compatible with aluminum signs. Although CCA does contain arsenic, and is a Restricted Use Pesticide, it is still commonly used for treatment of utility poles, marine piles and bridge timbers. It also appears to be the preservative most widely used by other states for treatment of sign posts. A potential disadvantage of CCA is that it does not appear to protect hardwood species as well as it does softwood species. If WisDOT begins utilizing hardwood species for sign posts, it may be necessary to either increase the CCA retention requirement or specify that the hardwoods be treated with an oil-type preservative.

Recommendations

Considerations for Alternative (Wisconsin) Wood Species

In addition to red pine, WisDOT's current specification lists jack pine, eastern white pine, and oak as acceptable Wisconsin species. The researchers suggested additional species of interest not currently listed in WisDOT specifications. They are the soft maples and ash. Soft maples are abundant in Wisconsin, and their rate of growth greatly exceeds that of their utilization. Soft maple also appears to be fairly treatable, although as with other hardwood species they appear to be most durable when treated with oil-based preservatives or higher retentions of water-based preservatives. Ash is currently being harvested by various local governments in anticipation of emerald ash borer infestation, and there is interest in finding value-added applications for these trees. However, there is relatively little experience with ash treatability and durability, or its susceptibility to warp when used in long dimensions.

Considerations for Alternative Preservatives

Potential alternatives to CCA fall into two categories: water-based preservatives and oil-based preservatives. The water-based preservatives that are suitable for sign posts rely primarily on copper for efficacy, and appear to present an increased risk of corrosion of the aluminum signs. There are no obvious alternatives to CCA among the current water-based preservatives.

All of the common oil-type preservatives (creosote, copper naphthenate and pentachlorophenol) would effectively protect sign posts from decay, and all have the additional advantage of compatibility with aluminum. In addition, they are effective in protecting both softwood and hardwood species and are likely to diminish the occurrence of warp in the sign posts. However, creosote and pentachlorophenol are Restricted Use Pesticides, and thus would not overcome potential toxicity concerns associated with CCA. Copper naphthenate is not a Restricted Use Pesticide and may be a reasonable alternative to CCA. It does, however, have a noticeable odor, and wood may initially have an oily surface.

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*This brief summarizes Project 0092-13-15,
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