

R&D Briefing:

Borates as Pre-treatment Preservative Enhancers.

STUDY SITE:

University laboratories and field sites
throughout the United States.

PURPOSE:

Evaluate the potential for using borates to protect wood crossties from insects and decay fungi during air seasoning. Also, determine the potential for using borates to improve service life of creosote-treated ties by increasing resistance to insects and decay fungi through lowering susceptibility to iron degradation and the subsequent loosening of spikes (spike kill).

METHOD:

Ongoing laboratory and field research projects. Of particular note are studies conducted by Mississippi State University (MSU) researchers in cooperation with The Association of American Railroads (AAR) and The Railway Tie Association (RTA).

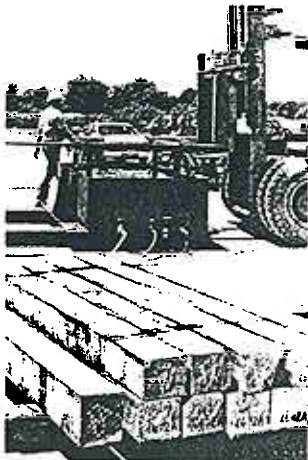
Research spawns more research.

In the late 1970's, the borate research related to forest products concentrated on testing boron compounds for protecting imported tropical hardwoods. The results of those initial studies led to expanded U.S.-based research on borates for wood preservative enhancement.

Today, borate wood treatment research encompasses a number of ongoing programs including the evaluation of borates plus chemical additives, and the treatment procedures for the protection of unseasoned hardwood lumber from damage by fungi and insects. The AAR, in cooperation with the RITA, The Santa Fe Railway, Norfolk Southern Corporation, and several tie producers and chemical suppliers, is sponsoring research on the development of methods for improving the life of wood crossties and has included borates in the program.

Treatment effectiveness.

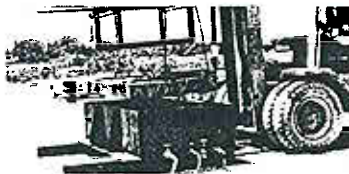
Laboratory tests have demonstrated that borate treatments are effective in preventing decay by both brown-rot and white-rot fungi in wood that is undergoing air-seasoning. Tests have also shown that the level of borates in those treatments is in excess of the required lethal dose for lyctid beetle larvae.



Prior to conventional creosote treatment, unseasoned ties were dipped in a borate solution.



Crossties completely submerged in a borate solution bath.

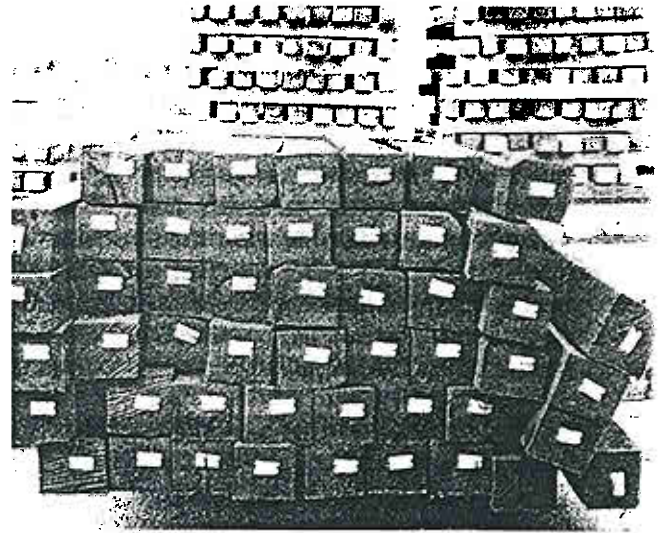


After being removed from the borate solution bath, crossties went on to be dried by conventional air-drying methods, or by a six-week covered storage then air-drying or vapor drying.

Treatment of wood crossties with borate prior to air seasoning.

Fresh, unseasoned ties of white oak, red oak and gum were utilized to determine if borates would protect the ties from deterioration prior to conventional preservative treatment.

The crossties were dipped in a borate solution prior to air seasoning. Some crossties were dipped, stacked and air dried according to usual practices. Other ties were bulk-stacked and covered with



Creosote-treated crossties that first were dipped in borate solution.

a tarp for six weeks of covered storage, allowing the borate solution to diffuse through the tie. After six weeks, most of the bulk-stacked ties were restacked for air-drying, while others were vapor dried.

Increment cores, taken from these pre-treated crossties, were studied. All ties were subsequently treated with creosote. After treatment, additional increment cores were taken for analysis of creosote penetration and retention.

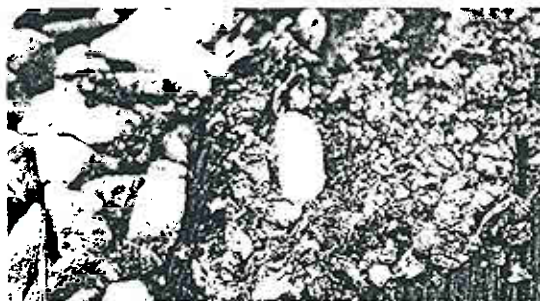
Treated crossties from these tests were placed in track and are inspected annually to determine differences in checking, splitting or spike loosening.

Results and reports.

Results showed that, while significant amounts of borates are lost from crossties seasoned by vapor drying before treating with creosote, very little borate is lost during air-seasoning of similar ties. It is hoped that oil-borne preservatives will enhance borate retention in the ties and that the combination will provide protection at the center of the ties as checks and splits expose wood beyond the oilborne preservative protected zone.

The potential effect of borate treatments in reducing spike kill is also being studied. The steel spikes and plates used with wood ties produce iron oxide which contributes to iron degradation of wood. In turn, the iron degraded wood contributes to the further degradation of steel. It is hoped that the combinations of borate solutions and oil-borne preservatives may retard that destructive process thereby reducing the occurrence of spike kill.

Approximately 1400 additional unseasoned ties have been treated with borates and subsequently treated with creosote as part of the study sponsored jointly by the AAR, Santa Fe and the RTA. These ties are now undergoing long-term evaluation in track on the Santa Fe and Norfolk Southern Systems.



Borate rod being inserted in the tie plate area.

The indications and results stated above are based on evaluations conducted at various laboratories and field sites. An interim report describing the ongoing borate research will soon be available. In coming months, the RTA will have further updates of ongoing research efforts available upon request.

Additional information can be obtained by filling out and returning the enclosed reply card.



Inspection of ties in Lorenzo, Illinois test track.

Treatment of ties in service.

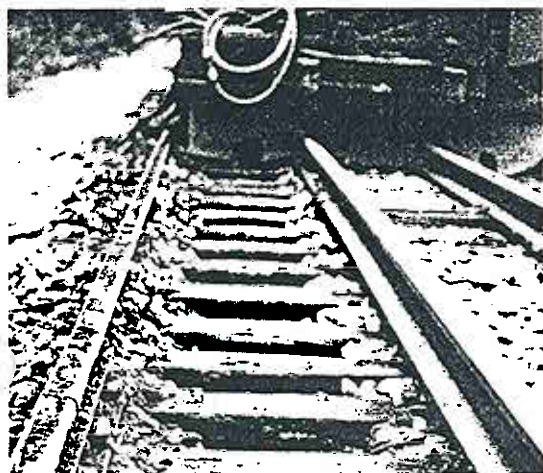
Sections of track on the Santa Fe system were chosen for this study. The study consisted of 100 ties that are 1-10, 10-20 and 20-30 years old.

Crossties in these treatment test studies were either sprayed with borate or copper naphthenate solutions, or drilled and fitted with borate rods.

Sample cores were taken at each inspection and were examined for decay. The amount of spike loosening was also recorded.

A wood preservative paste consisting of a borate and a cobioicide is also being tested to determine its effect in protecting in-service wood crossties. In conjunction with rail replacement, this paste has been applied under tie plates on conventionally treated crossties to determine its ability to protect the rail seat area from decay.

Additional experimentation, utilizing non-borate products to protect this area of the ties, is in preliminary stages.



Adzing ties prior to experimental in-place treatment.



Spraying borate on test track.