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RESEARCH AND TEST DEPARTMENT

EVALUATION OF NAIL PLATES AS AN
ANTI-SPLITTING DEVICE FOR
TIMBER TIES

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| 13. ABSTRACT <p>During 17 years of in-track service tests, ties with and without nail plates applied to the tie ends were periodically inspected to evaluate the effectiveness of the nail plates as anti-splitting devices for timber ties.</p> <p>Six separate inspections of these test ties were made over the 17 year period, and the progress of the checking and splitting was measured and recorded.</p> <p>This report summarizes the results of the sixth inspection, and, at the request of AREA Committee 3-Ties, presents an evaluation of nail plates as anti-splitting devices.</p> | | |
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EXECUTIVE SUMMARY

A nail plate is used as an anti-splitting device at the end faces of timber ties. It is stamped from 18-gauge galvanized sheet steel and perforated to form multiple nails of varying lengths.

During April and May of 1964, 90 test ties were installed in the eastbound main track of the Milwaukee Road at Spaulding, Illinois. Forty-eight of the ties had nail plates applied at the tie ends as anti-splitting devices, and the remaining 42 ties were designated as control ties (those having no anti-splitting devices). During a 17 year period of in-track service, six inspections of these test ties were made, in order to evaluate the development of tie end checking and splitting.

This report summarizes the results of the sixth inspection and, at the request of AREA Committee 3-Ties, presents an evaluation of the effectiveness of the nail plates as anti-splitting devices for timber ties. The results indicate that during the 17 service years the ties with applied nail plates showed much less splitting and checking growth at the tie ends, as compared to the control ties. The nail plates generally displayed no deterioration in the form of rusting or breakage during this test period.

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1.0 INTRODUCTION

A nail plate is used as an anti-splitting device at the end faces of timber ties. It is stamped from 18-gauge galvanized sheet steel and perforated to form multiple nails of varying lengths.

This test was started in December, 1962 at the T. J. Moss Company's tie treatment plant in Granville, Wisconsin. A total of 90 Grade 4 and 5 unseasoned ties were selected for the test. Nail plates were applied to 48 of these ties; the remaining 42 were left "as is" for control purposes.

On January 29, 1964, an inspection was made of this group of 90 ties after they had been seasoned. Each tie was carefully examined for checks and splits on both ends, and, in general, no splits were found. Only 16 of the 48 nail-plated ties had checks, ranging from 1/32 to 1/8 inch in width. Most of the control ties, however, had 1/32 to 1/8 inch wide checks; three of these ties had splits of this same small magnitude. It was also noted that, in general, where checks had started in the nail-plated ties, they had progressed from the surface to the edge of the nail-plated area, but did not extend into it.

All of these 90 test ties were numbered with brass tags and arranged in an alternating order, e.g., nail-plated tie, control tie, nail-plated tie, etc.

The nail plates that were used in this test measured 5-5/8 x 7-3/4 inches, and were made of 18-gauge galvanized steel with 200 nails on one side. They were applied to the end faces of each tie by impacts from a maul.

These test ties were then transported to Spaulding, Illinois,

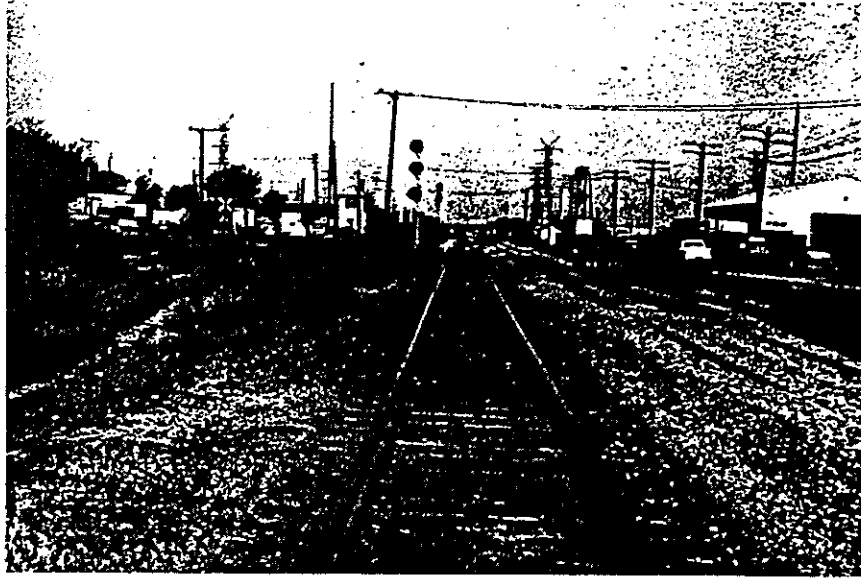


Figure 1. View Looking West Along the Milwaukee Road's Eastbound Main Track at Spaulding, Illinois, Showing the Test Tie Installation Site.



Figure 2. South End of Tie Number 70, Showing the Typical Restraining Action of a Nail Plate in Arresting the Growth of a Check and Potential Split.

approximately 25 miles west of Chicago, and installed in the Milwaukee Road's eastbound main track (Figure 1) during April and May of 1964. The rails at this location are 132 lb. RE and the track has gravel ballast. The ties were inserted in numerical order, with Number 1 at the west end and Number 90 at the east end of the test section.

2.0 CONDUCT OF THE FIELD INSPECTIONS

Six inspections were made of these test ties at two and five year intervals, and one ten-year interval, over the 17 years of in-track service since 1964, noting the progress of the width of checks and splits at both ends of each tie. The team at each inspection usually consisted of Milwaukee Road Engineering and Track Department representatives, a manufacturer's or track supply company's representative and an AAR representative. The first inspection was made at the time of installation, and subsequent inspections were made in late 1964, 1966, 1971 and the last in 1981. From the widths of the checks and splits recorded at each inspection, it could be readily seen how most of the checks and splits in the control ties progressed or increased in width, whereas in the nail-plated ties they generally remained at their original width or increased only slightly.

3.0 SIXTH INSPECTION RESULTS

The results from the measurements of test tie check and split widths during the sixth inspection in July, 1981 were used to evaluate the relative in-service performances of the nail-plated and control ties during the 17 year test period. Figures 2 through 5 illustrate typical tie conditions at the time of the sixth inspection and Figure 6 summarizes the results.



Figure 3. South End of Control Tie Number 7, Showing a Typical Split that was Only 1/16 Inch Wide at the Time of Installation in 1964.



Figure 4. South Ends of Nail-Plated Tie Number 35 (Left), Control Tie Number 36 (Center), and Nail-Plated Tie Number 37 (Right), Showing a Split in the Control Tie and the Restraint to Splitting Caused by the Nail Plates.

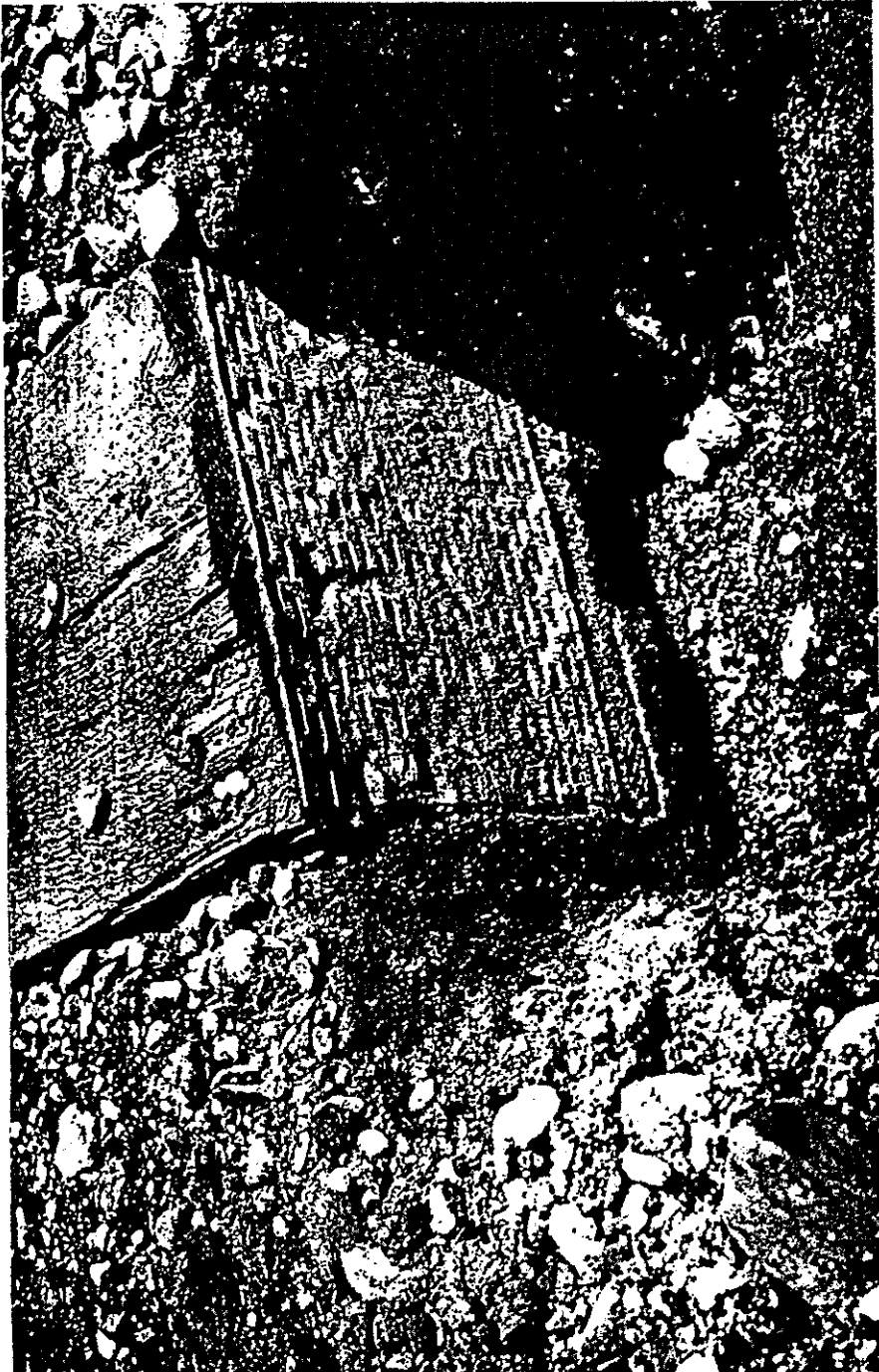


Figure 5. Exposed End of a Nail-Plated Tie, Showing the Typical Condition of a Nail Plate After 17 Years of In-Track Service.

As shown in Figure 6, 25% of the nail-plated ties had no checks or splits; 58.5% had only 1/8 inch checks; 11.5% had 1/4 inch checks and 5% had 3/8 inch checks. None of the nail-plated ties had splits.

In contrast, only 7% of the control ties had no checks or splits; 44.5% had 1/8 inch checks (one with a split); 24% had 1/4 inch checks with one split; 12% had 3/8 inch checks; 11% had 1/2 inch checks; 0.5% had 5/8 inch checks; 0.5% had 1 inch checks and 0.5% had 2-1/4 inch checks, with one having a large split.

In summary, the results from the sixth inspection after 17 years of in-track service revealed the following:

- a. 14 control ties had checks enlarged to more than 1/4 inch;
- b. 27 control ties had checks enlarged to 1/4 inch or less;
- c. 3 control ties had splits that had enlarged, in one case from 1/8 inch to 2-1/4 inch;
- d. Of the nail-plated ties that had checks, none were larger than 3/8 inch;
- e. Of special interest was the fact that for all of the checks in the nail-plated ties, the check appeared to stop at the edge of the plate area and did not progress beyond. In the case of Tie No. 70 (Figure 2), the nail plates appears to have halted the progress of a potential split;

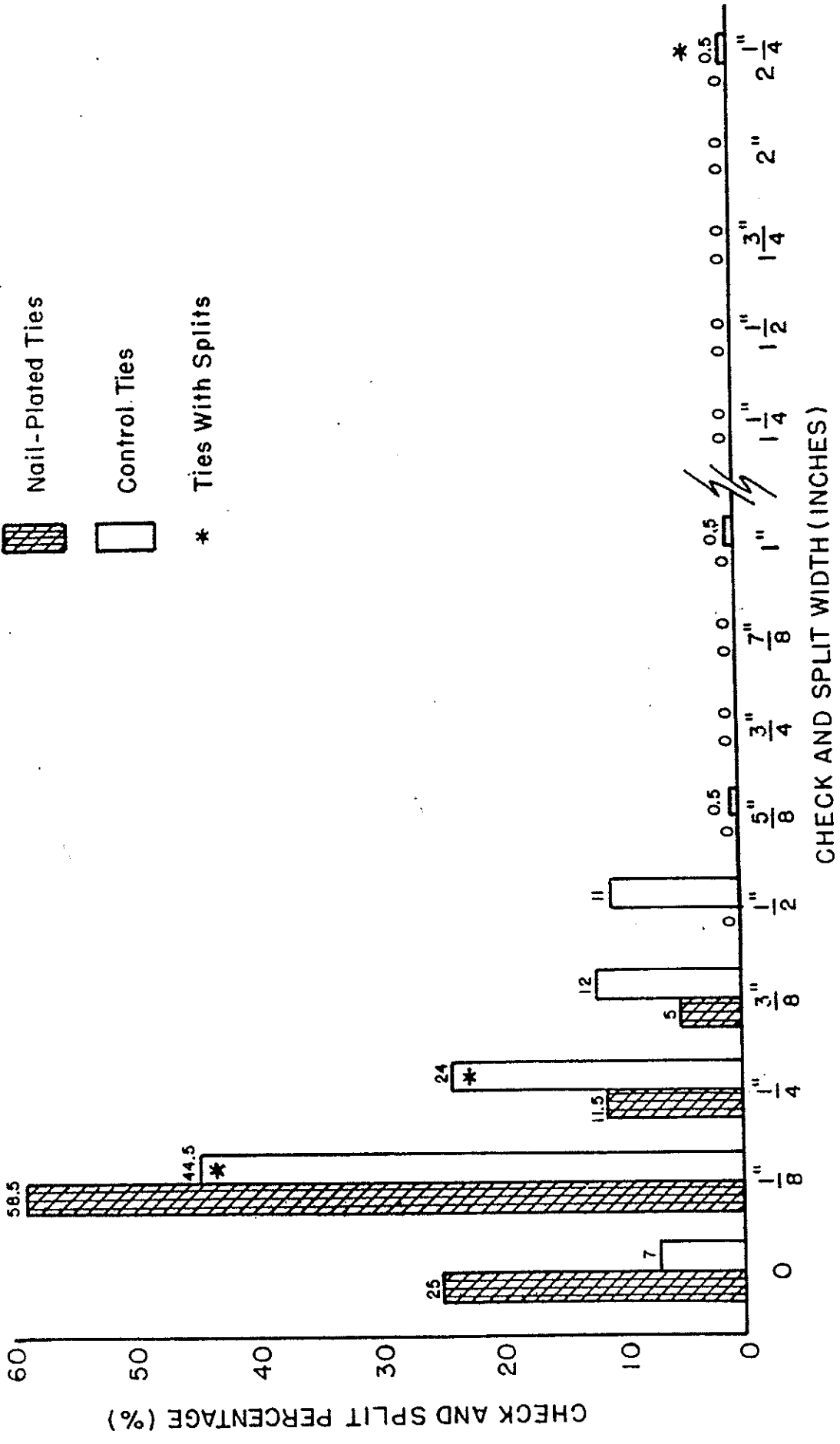


Figure 6. Summary of Test Results from the Sixth Inspection in July, 1981, Showing the Relative Percentages Versus Sizes of Test Tie Checks and Splits, After 17 Years of In-Track Service.

- f. In general, all of the nail plates had not rusted or deteriorated in 17 years, even though they had all been embedded in dirt and ballast throughout the test period.
- g. All of the ties, both nail-plated and control, appeared to be in sound condition. None of the ties had failed or been removed by the time of this sixth inspection.

4.0 CONCLUSIONS

- a. This field test has shown that the nail plate appears to be an effective timber tie anti-splitting device;
- b. Nail plates, when applied to new green ties (before seasoning and treating) held the subsequent checking and splitting to a minimum;
- c. The nail plates showed no significant deterioration after 17 years of in-track service.