Inspection of the Advanced Engineered Lumber Railroad Ties at the New Meadows Bridge

Final Report
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16. Abstract (Limit 200 words)

In 2003, Engineered Materials of Maine (EMM, Bangor, Maine) fabricated forty-eight (48) 8-inch wide, 10-inch deep, 12-foot long Advanced Engineered Lumber (AEL) mixed hardwood glue-laminated (glulam) railroad bridge ties. Over a two day period in September of 2005 the AEL ties were installed on the east span of the New Meadows railroad bridge as shown in Figure 1. During the same time period, the solid sawn 8-inch wide, 10-inch deep southern yellow pine ties were installed on the remaining three spans. On June 7, 2007 the AEL ties were visually inspected by Olivia Sanchez (AEWC Center, UM), Brian Marquis (MDOT) and George Jackman (MDOT, Railroad Division). Overall, the ties remain in fair condition, with the ties showing face bonding delamination along the overhang portion of the ties, as well as longitudinal cracks along the top lamination.

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FINAL REPORT

Inspection of the Advanced Engineered Lumber Railroad Ties at the New Meadows Bridge AEWC Project 048

Submitted to:
Dale Peabody
Transportation Research Division
Maine DOT

Prepared by:
Olivia Sanchez
Research Engineer

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Inspection of the Advanced Engineered Lumber Railroad Ties at the New Meadows Bridge

From: Olivia Sanchez
Research Engineer
The AEWC Center
University of Maine
5793 AEWC Center
Orono, ME 04469

Summary

In 2003, Engineered Materials of Maine (EMM, Bangor, Maine) fabricated forty-eight (48) 8-inch wide, 10-inch deep, 12-foot long Advanced Engineered Lumber (AEL) mixed hardwood glue-laminated (glulam) railroad bridge ties. Over a two day period in September of 2005 the AEL ties were installed on the east span of the New Meadows railroad bridge as shown in Figure 1. During the same time period, the solid sawn 8-inch wide, 10-inch deep southern yellow pine ties were installed on the remaining three spans. On June 7, 2007 the AEL ties were visually inspected by Olivia Sanchez (AEWC Center, UM), Brian Marquis (MDOT) and George Jackman (MDOT, Railroad Division). Overall, the ties remain in fair condition, with the ties showing face bonding delamination along the overhang portion of the ties, as well as longitudinal cracks along the top lamination.

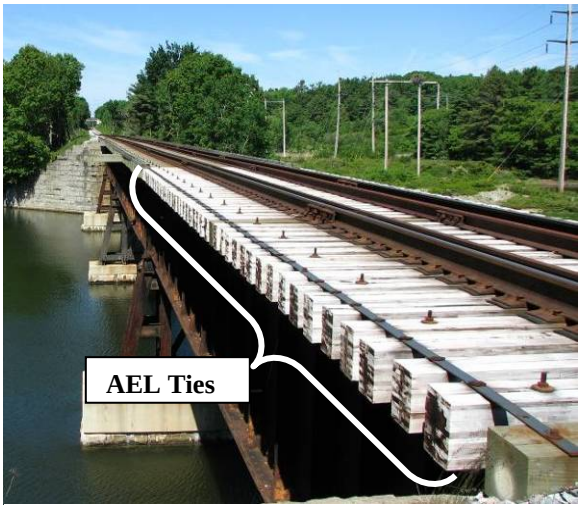

Figure 1: Location of AEL Bridge Ties

Observations

In order to obtain the required 8-inch wide ties, EMM manufactured multiple-lamination glulam beams, where multiple width boards are face bonded edge to edge, with an unbounded edge joint. In this case, the 8-inch ties fabricated using 3.5-inch and 4.5-inch wide boards were used, as shown in Figure 2 (top view of AEL tie). The unbounded edge joint was staggered through the depth of the beam as shown schematically in Figure 3. The following observations were made during the inspection:

Figure 2: Top view of bridge ties

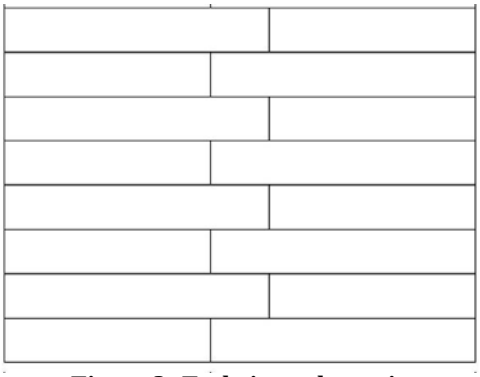

Figure 3: End view schematic of AEL ties (not to scale)

1. Approximately half the ties developed a crack that parallels edge joint of the multiple width boards, as shown in Figure 4. The location of the crack coincides with the location of a J-bolt or a lag screw that is drilled into the tie during installation, as shown in Figure 4.

Figure 4: Crack development near lifting bolt

2. Delaminations were observed on the overhanging portions of the ties, as seen in Figure 5; however, there was minimal sign of delamination along the middle 6-foot long section of the ties between the rails.

Figure 5: End view of AEL ties

3. Based on a limited visual inspection of the overhand portion of the ties, the first three (3) ties on the east end of the bridge appear to have sustained more damage than the other ties. They have larger delaminations, both in length and depth, and there is greater separation between the edges of the boards within a lamination, as shown in Figure 6 and Figure 7. Rail road regulations require people to remain between the tracks when walking on a rail road bridge.
4. When the rail road division inspects ties, they look for tie spike pull out, movement of the ties, and plate cutting in the ties. None of these items were evident in the AEL ties during the inspection.

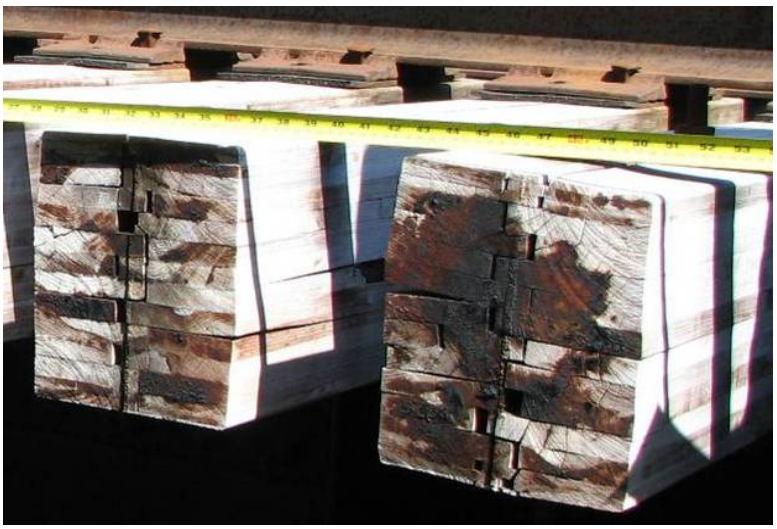

Figure 6: First 2 ties on east end-south overhang

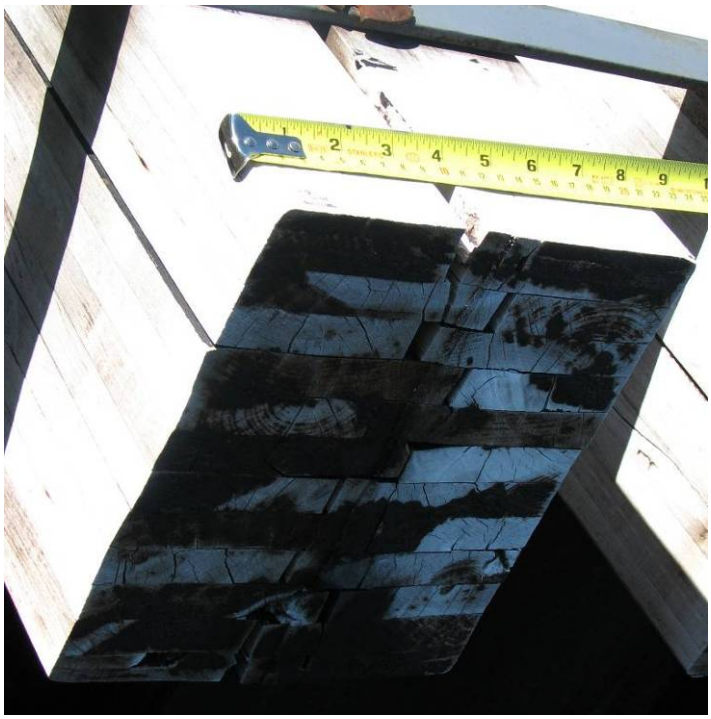

Figure 7: East end tie-north overhang

Recommendations

It is recommended that when the AEL ties are removed from service, a more detailed inspection of the bond lines be conducted, and mechanical testing be conducted to determine the residual strength and stiffness of the ties.

Recommendations – Commentary prepared by Dale Peabody 4/30/12

The railroad ties split along the seam between the 3 – ½" boards and the 4 – ½" boards. Furthermore, the glulam manufacturer is no longer in business. Because of the performance and lack of availability these ties are not recommended for further usage.