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December 4, 1998

Mr. James C. Gauntt
Executive Director
The Railway Tie Association
115 Commerce Drive, Suite C
Fayetteville, GA 30214
FAX: (770) 460-5573

Dear Mr. Gauntt:

Attached is a report on the AAR Annual Research Review that I attended on December 1-2, 1998.

If you have any questions or comments, please give me a call.

Sincerely,

Allan M. Zarembski, Ph.D., P.E.
President

AAR Research Review
December 1-2, 1998

Report to RTA

In general, while a significant number of wood ties were in test at the FAST loop, there was a minimum level of discussion on the results of the wood tie testing. Most of the attention was focused on the plastic ties, as was the apparent attention during the track inspection itself.

During the presentations (Day 1), Ties (in general) were discussed during the overall FAST Heavy Axle Load presentation. The following specific points were noted:

- The latest test program, using Premium trucks with significantly reduced lateral loads (Figure 1) shows a much lower rate of gage widening and lateral track strength degradation.
  - Gage widening, as measured by the geometry car, was reduced by over 60% on Oak and Fir ties on the 5 degree curve in Section 7.
  - Static track strength degradation was reduced by almost 90% when compared to previous HAL tests under conventional trucks. This is illustrated in Figure 2.
  - Gage retention performance of the Southern Yellow Pine laminated ties was comparable to Oak (under the premium trucks).

- The Parallam ties were reported as performing well with 165 MGT of tonnage. (Field inspection confirmed this, see attached Photo 1).

- The plastic ties were likewise reported as generally performing well. However cracking at the pre-bored screw spike holes (bored undersized) was reported. See visual observations (below).
  - Lateral resistance tests of the plastic ties (single tie push tests) showed that the smooth sided ties had lower lateral resistance than typical wood ties. However, the roughened surface ties (see Photo 2) had a higher lateral resistance than the wood ties. This is illustrated in Figure 3. Note; all reported plastic ties were U.S. Plastics & Lumber (USP&L). There were also several proprietary plastic ties in track, but no information was provided about these other ties.

- Of the steel ties, two of the inverted trough design (T&TS and NARTSCO) were reported as performing well except where rail joints were present (see Figure 4). With rail joints present, surfacing was required every 3 MGT. With joints removed, surfacing was required every 15 MGT.

- Lateral resistance tests (panel push tests) showed that the lateral resistance of the steel tie types was greater than that of wood ties.

- Concrete ties were not discussed at all and the field observation showed no new activities or behavior.

- Revenue field tests results were reported as showing an 8 degree curve test site having good gage widening strength. The reported gage increase was 0.128 inches per 100 MGT. This corresponds to approximately 800 MGT needed to widen gage by 1 inch.

Additional visual observations (Day 2) were as follows:

- 1988 Oak ties in Section 7 continue to perform well. Over 880 MGT cumulative tonnage.

- Softwood ties in section 25 performing well (premium truck operations)

- Cracks were observed coming from the spike holes (undersize pre-bored holes for screw spikes) of several USPL ties in Section 7. See Photos 3 and 4.

- Concrete "ladder" sleepers in Section 38 were performing well after approximately 160+ MGT.

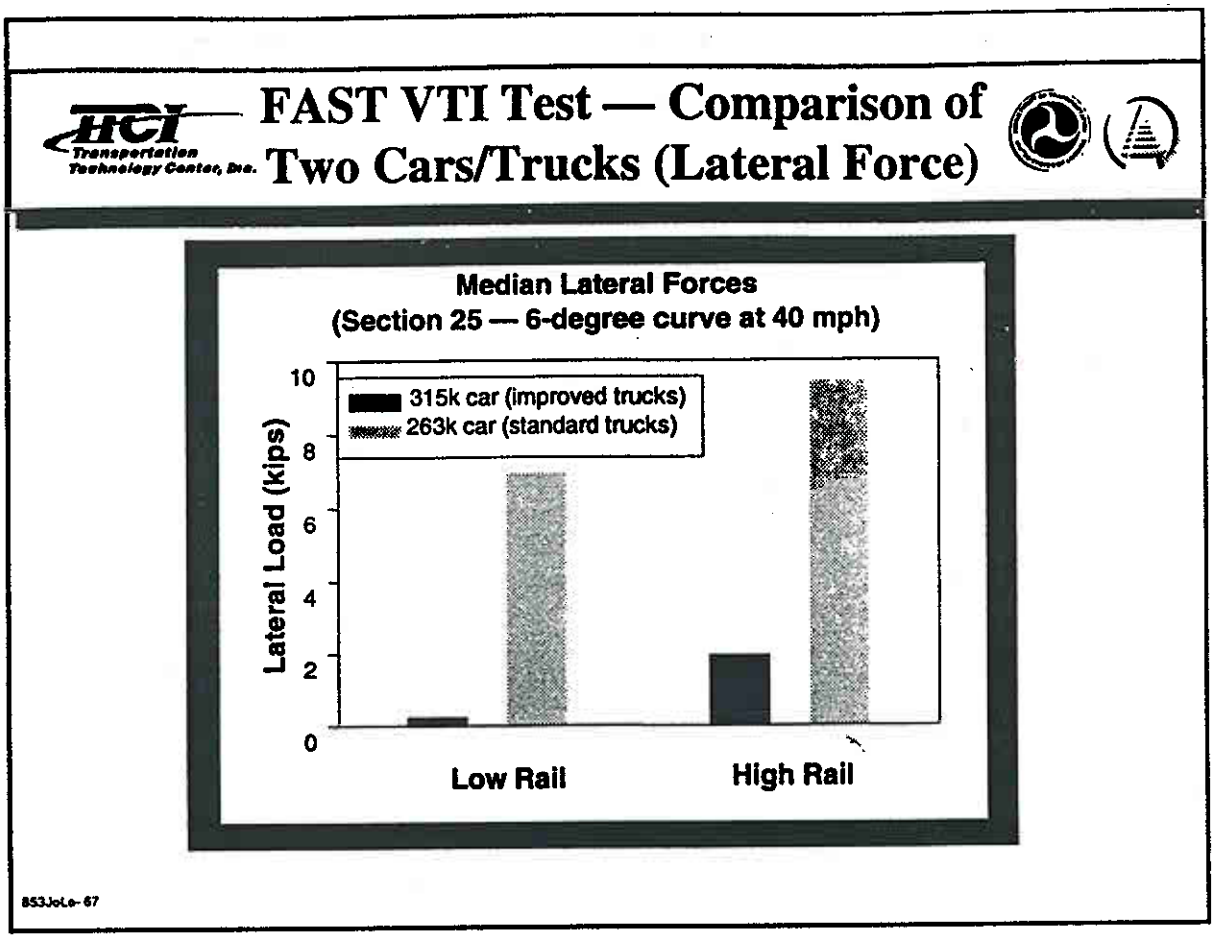
FAST VTI Test — Comparison of Two Cars/Trucks (Lateral Force)
Transportation Technology Center, Inc.
Median Lateral Forces
(Section 25 — 6-degree curve at 40 mph)
315k car (improved trucks)
263k car (standard trucks)
Lateral Load (kips)
10
8
6
4
2
0
Low Rail
High Rail
853JoLo-67

Figure 2

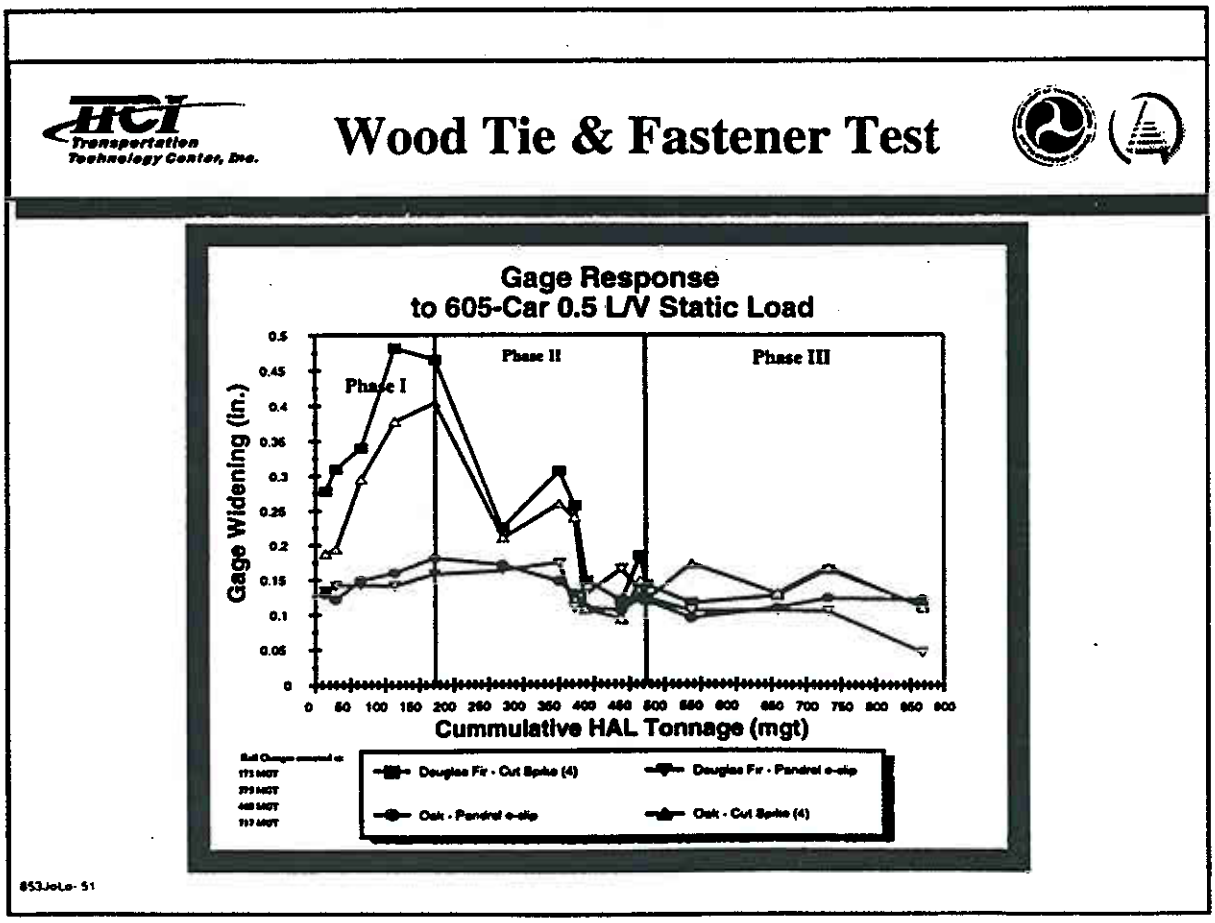
Wood Tie & Fastener Test
Transportation Technology Center, Inc.
Gage Response
to 605-Car 0.5 L/V Static Load
Phase I
Phase II
Phase III
Gage Widening (in.)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900
Cummulative HAL Tonnage (mgt)
Douglas Fir - Cut Spike (4)
Douglas Fir - Pandrol e-clip
Oak - Pandrol e-clip
Oak - Cut Spike (4)
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Figure 3

TTCI Transportation Technology Center, Inc.

Single Tie Push Test

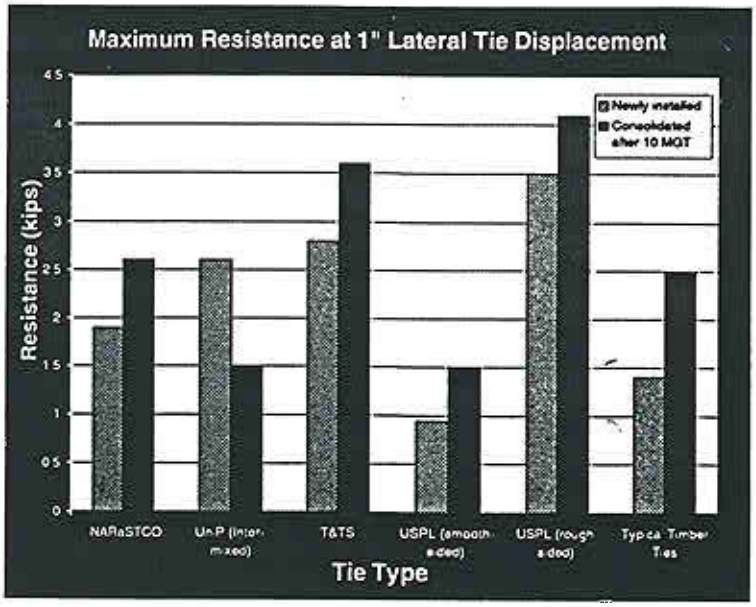

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Figure 4

TTCI Transportation Technology Center, Inc.

Steel Tie Test

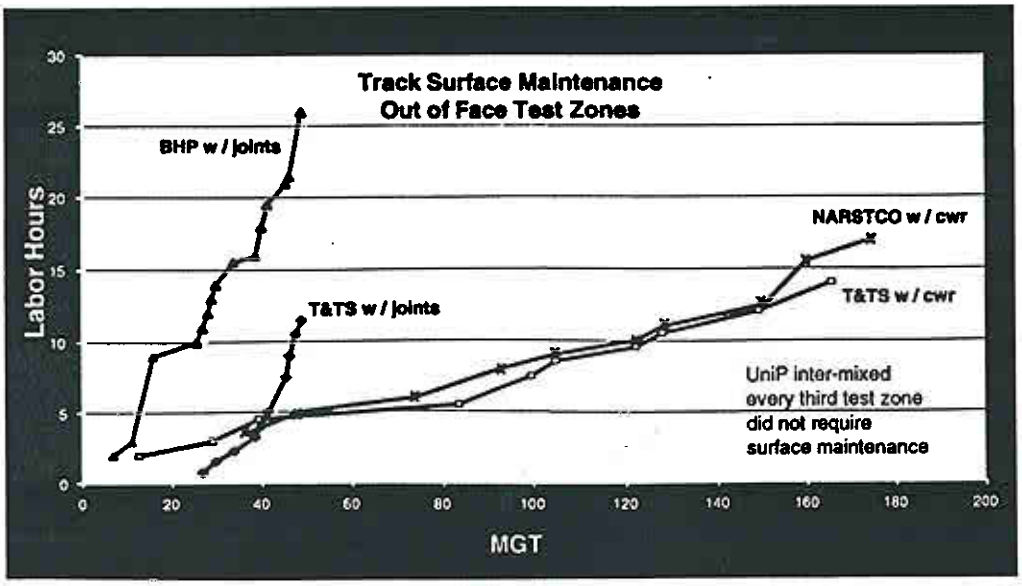

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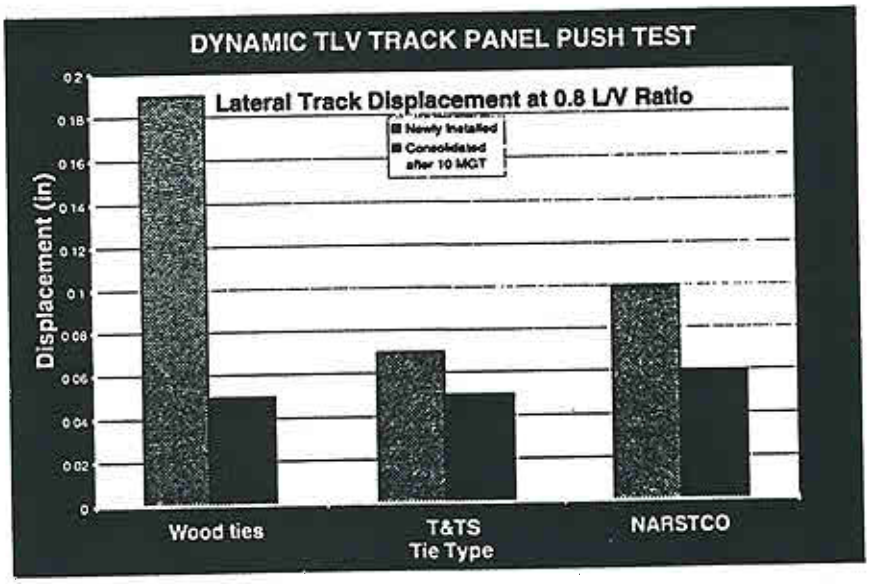
Figure 5

TTCI Transportation Technology Center, Inc.

Steel Tie Test



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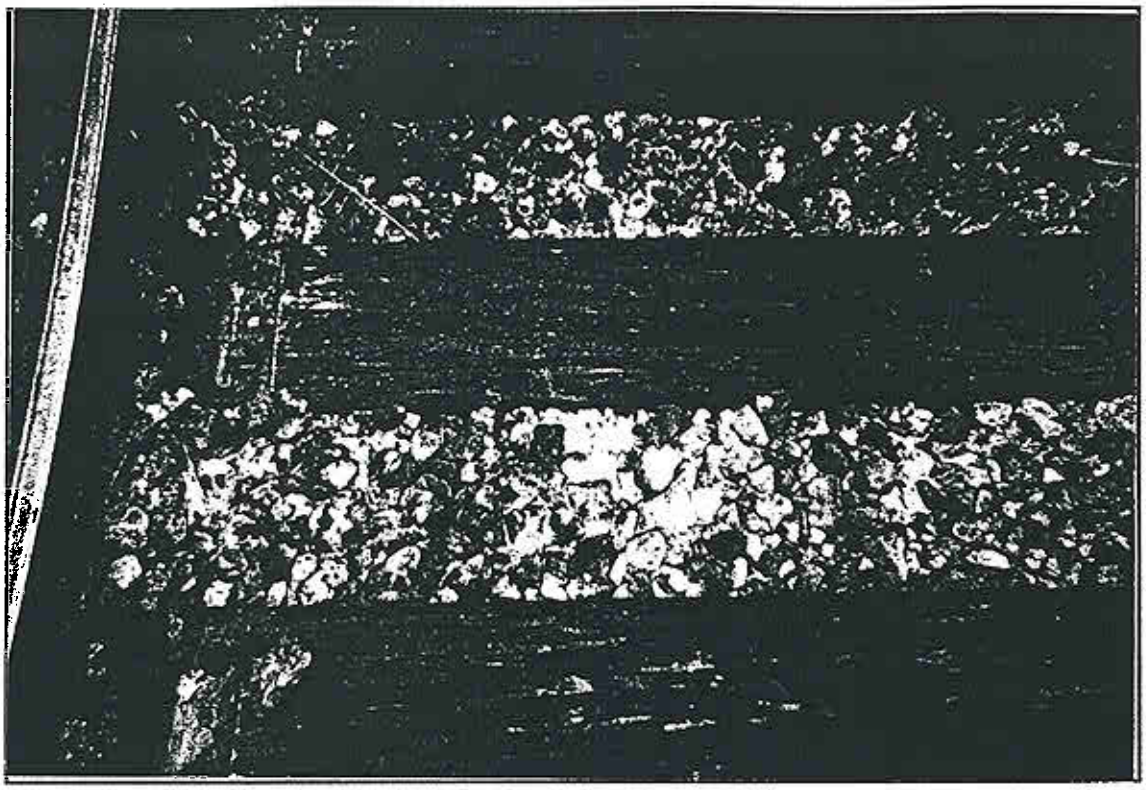
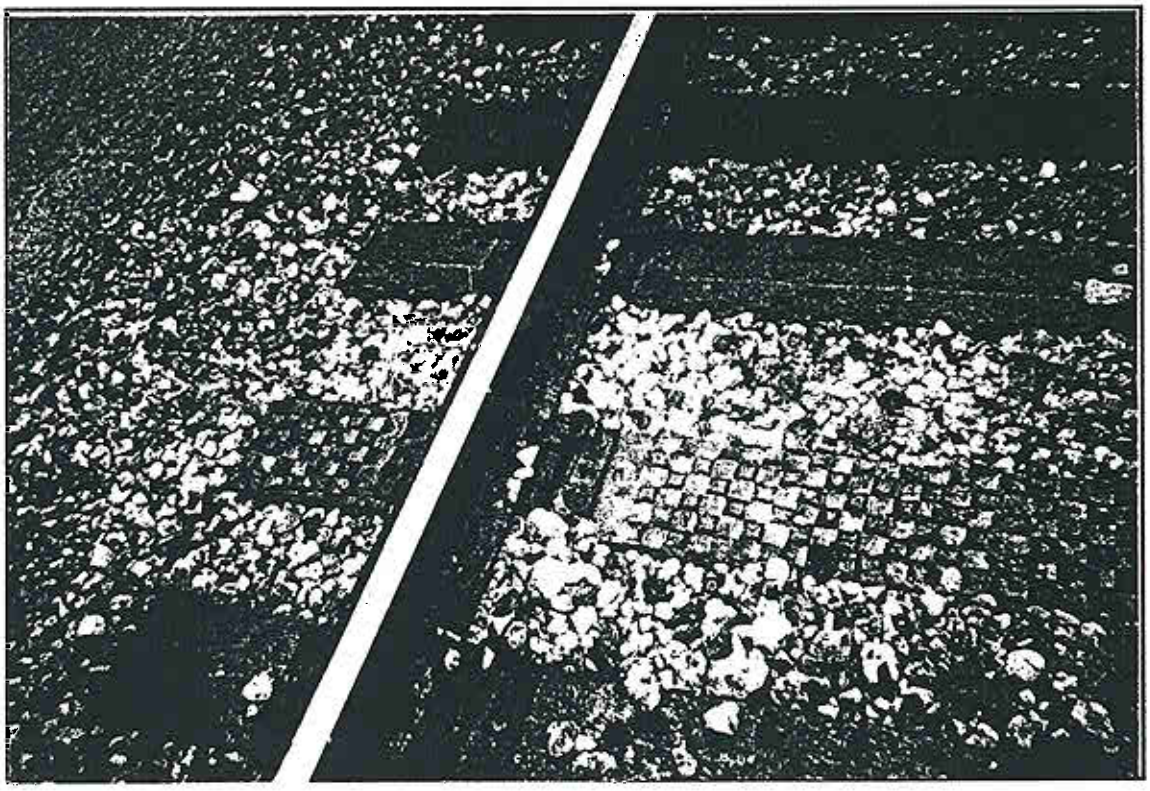
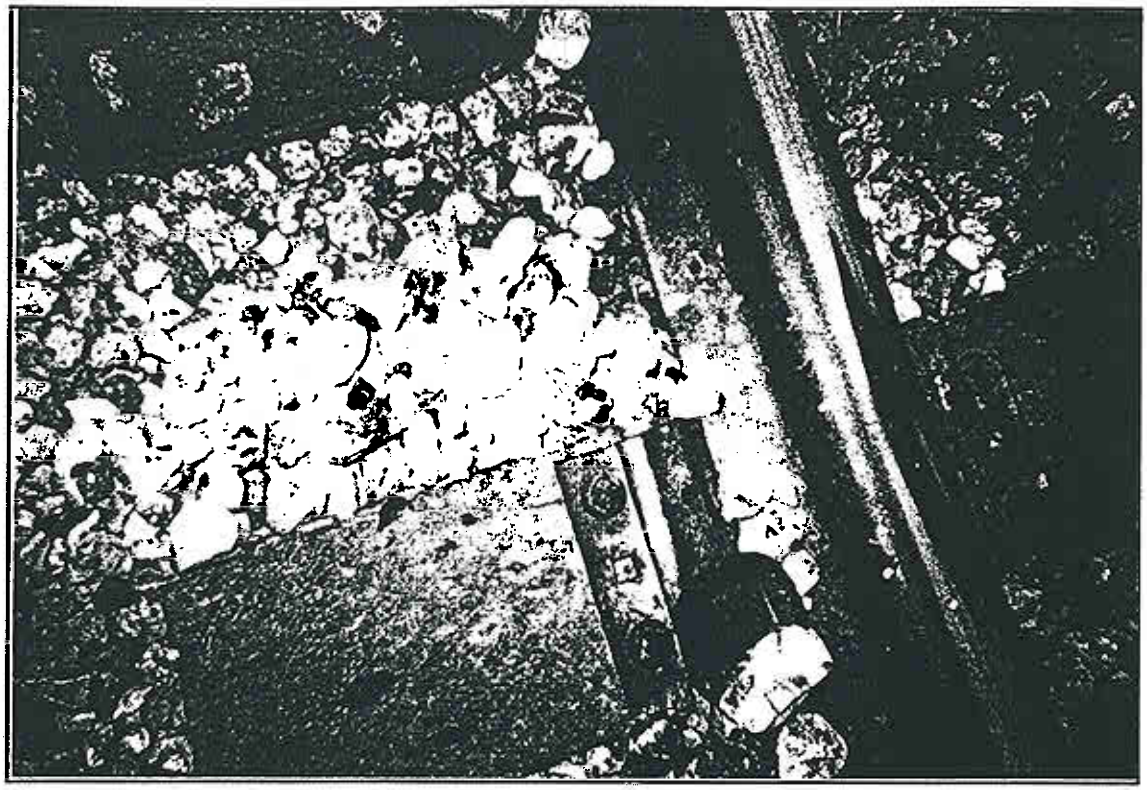


Photograph 1: Parallam Ties

Photograph 2: Rough Surface Plastic Tie





Photograph 3: USPL Plastic Tie with Crack

Photograph 4: USPL Tie with Crack