AUSTRALIAN RAIL TRACK CORPORATION LTD

**Ref No:** 08-08-11-016

# New Equipment & Systems Approval - Pandrol Resilient Fastening Assembly for Timber Sleeper Conversion (Lock in shoulders).

## 1. Determination of Need.

Step 2 of ARTC's 5 step holistic approach to track maintenance strongly supports the use of resilient fastenings on timber sleepered track.

*"Resilient fastenings to provide track continuity and lateral and vertical rigidity. Resilient fastenings improve track modulus and capability"*

Resilient fastenings are far superior to dogspiked track as they provide continuous restraint between rail and sleepers thus making track much more stable and reducing maintenance costs.

This conversion uses existing double shoulder baseplates and can be installed without removal of rail or baseplates and without boring additional holes in the timber sleepers. This can provide significant savings on the conversion of timber sleepered track from dogspiked to resilient fastenings.

A similar product (from another supplier) has been installed in timber sleepers in the NE Line in Victoria since 2000 with satisfactory results.

The Southern and Western Regions in NSW have requested Type Approval for this installation. However, it is considered that this approval should be for all of ARTC.

## 2. Significant Change or Not

This change in equipment is assessed as **MINOR**

## 3. Review Panel

- John Cowie - Manager, ISP, Standards and Systems
- Tim Calver - Standards and Technical Services Engineer
- Lloyd Silver – Senior Track and Civil Consultant



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## 4. Equipment Suitability

This installation has been used in heavy haul railways in North America and Liberia.

In 2000 the system was independently tested by Micron metrology Services in the UK. Signed report has been seen by ARTC staff.

Approx 200,000 have been used in the Regional Fast Rail Project in Victoria during 2003/4/5. Feedback from the DOI and the Contractor involved (John Holland) has generally been positive.

Testing completed by Pandrol – summary report No 719A is attached. ARTC's Lloyd Silver inspected the tests on 4 May 2005 and reported favourably. He recommended confirmation of creep resistance and some field trials – these are currently underway near Wagga. The creep resistance/longitudinal restraint test was covered in the Pandrol report – see below.

**Code Requirements – AS 1085.19**

| Code Section | Requirement | Test result | Comment |
|---|---|---|---|
| 2.2.2 | Assembly test | Satisfactory in laboratory | Wagga staff arranging a field test in July 2005. John Holland and DOI (Vic) advise generally satisfactory installation in Vic. |
| 2.2.3 & 4 | Insulation test | N/A | Timber sleepered track – insulation not an issue |
| 2.2.5 | Lateral load restraint test | Tested to 15.3 kN | Satisfactory |
| 2.2.6 | Longitudinal restraint test | Passed test in laboratory with load of 10 kN. | Satisfactory |
| 2.2.7 | Fastening uplift test | Tested to 23 kN | Satisfactory |
| 2.2.8 | Fastening repeated load test | Completed satisfactorily for 3,000,000 cycles | Satisfactory |

**Other Requirements**

Pandrol is a Quality Accredited to AS/ISO 9001:2000 for the manufacture of these materials



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## 5. Conditions of Approval

- That field installation tests are satisfactorily completed at Wagga – this is expected to be done by mid July 2005.
- Appropriate standards, specification, procedures are revised to match this option.
- That Corridor/Delivery/Asset Managers must:
    - Assess each site to determine suitability for this product
    - Assess cost/benefit of this process at locations chosen.
    - Ensure that installation is in accordance with the manufacturers instructions
- That the supplier remains accredited to ISO 9001 – for the manufacture of these particular products. ARTC reserves the right to conduct its own audits of the manufacture and supply of these components – subject to Australian Standards and normal audit procedures.

## 6. Recommendation

That Pandrol Lock in shoulders be approved for use across ARTC, subject to successful installation trials at Wagga in July 2005.

Note: These are NOT loading/fatigue life type tests. They are purely to indicate ease of installation by field staff.

**Review Panel:**

John Cowie ..... Date 27.6.05

Tim Calver ..... Date 27/6/05

Lloyd Silver ..... Date 27/6/05

Attachment - Pandrol report No 719A



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|---|---|
| ISSUE DATE: | 20-05-05 |
| ISSUE N°: | 1 |
| CHECKED BY: | K.Sherwood |

**REPORT NO:** 719A

*Customer Confidential*

***Testing of a PANDROL Hook-in assembly for the conversion of plated timber sleepers***

***Ref EWR 2225***

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*SUMMARY & REPORT*

This report describes the testing of a fastening assembly utilising hook-in S.G. Iron shoulders for converting plated timber sleepers to resilient fasteners. This assembly is designed for use on track in the NSW rail system with timber sleepers.

A repeated load test was conducted according to the method set out in AS1085.19-2003, using a L/V ratio of 0.36 ($\alpha$=20°) as nominated in previous standards testing to AS1085.14-1997. A longitudinal restraint test to AS1085.19-2003 was also carried out at the conclusion of the repeated load test. Toe load tests were conducted both before and after the repeated load test.

Components tested

| | |
|---|---|
| Sleeper: | Hardwood Timber, untreated. |
| Baseplate: | Rolled steel baseplate, DF30 hole pattern. |
| Plate Fixing: | L6 lockspikes. |
| Gauge Shoulder: | IS75225 – to SK4883 issue 1. |
| Field Shoulder: | IS75226 – to SK4884 issue 2. |
| Clip: | e1829TC. |
| Rail: | AS60kg. |

The baseplate was secured to the timber sleeper using two L6 lockspikes. The rail was then placed in the rail seat, and secured using the e1829TC clips and the hook-in shoulders. The clips were installed in the 'forward' orientation (figure A.1), with the toe of the clip on the foot of the rail.

The toe load of the clips was measured using a load cell and attachments to lift each clip toe just clear of the rail. A 0.25mm thick shim inserted between the clip and rail was used to determine this point.

The entire assembly was then mounted in the test machine according to figure A.2. A cyclic load, consisting of an upward force of 12kN (provided by two spring nests) and a downward force on the assembly of 140kN, was applied for 3 million cycles at approximately 4 Hz.

At the conclusion of the repeated load test, the assembled sleeper was mounted in order to conduct the longitudinal restraint test, according to figure A.4. A load was applied to the end of the rail as close as practicable to the centroid of the rail foot and increased in increments of 2kN until a load equivalent to ½ of the nominated clamping force of the assembly was reached. This load was held for a total of fifteen minutes once reached, and the movement of the rail recorded once three minutes had passed and again when the load had been released.

After the longitudinal restraint test, the toe load of the clips was again measured, prior to dismantling of the assembly to check the components for fracture or wear.







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***RESULTS***

Toe load:

The initial clip toe loads were:
Gauge side = 9.57kN Field side = 9.96kN
Which gives a total rail seat load of 19.53kN.

Toe loads after assembly repeated load test and longitudinal restraint test:
Gauge side = 9.23kN Field side = 9.5kN
Which gives a total rail seat load of 18.73kN

This loss in toe-load can be attributed to discrepancies in the measurement equipment and settling of the components over the test period.

Repeated Load test:

The hook-in shoulder assembly successfully completed 3 million cycles with no component failures, and no noticeable deterioration.

Longitudinal restraint test:

Nominated Assembly clamping force = 18kN
Maximum load applied = 10kN
Longitudinal movement during the initial 3 min period = 0.24mm
Residual longitudinal movement = 0.01mm
No continuous movement was observed at any stage of the load application

Approved

Ken Sherwood
Technical Director







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## 5. APPENDIX A

*Figure A.1: Clip shown installed in 'forward' orientation.*

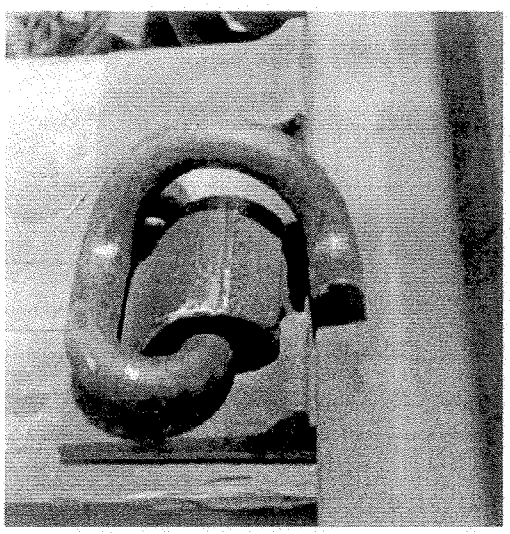

*Figure A.2: General arrangement of repeated load test (taken from AS1085.19-2003, Appendix G)*

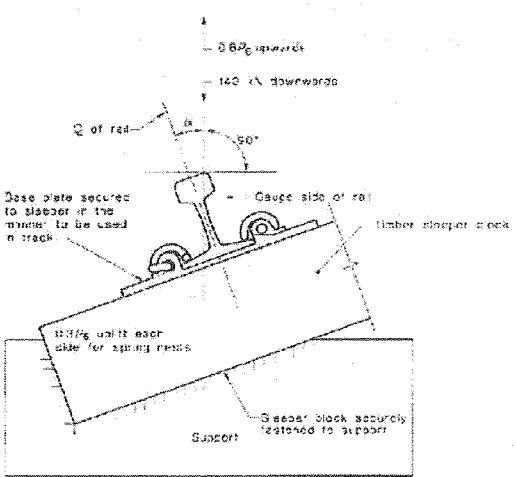


FIGURE G1 TEST ASSEMBLY FOR TIMBER SLEEPERS







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*Figure A.3: Typical arrangement of repeated load test*

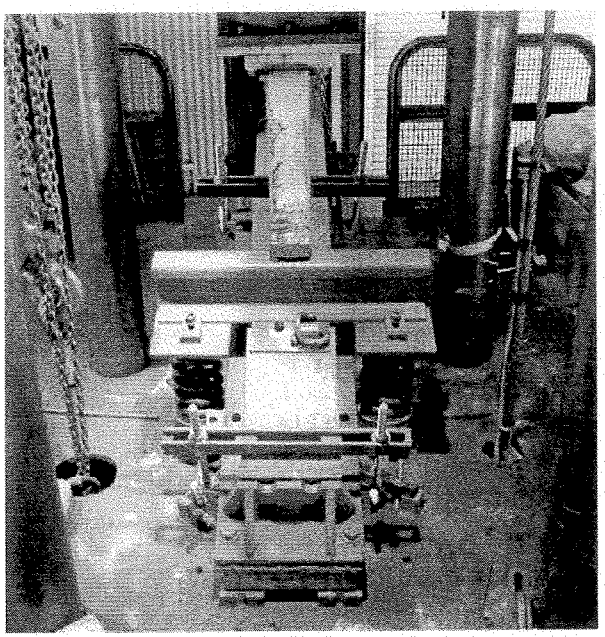

*Figure A.4: General arrangement of longitudinal restraint test (taken from AS1085.19-2003, Appendix E)*

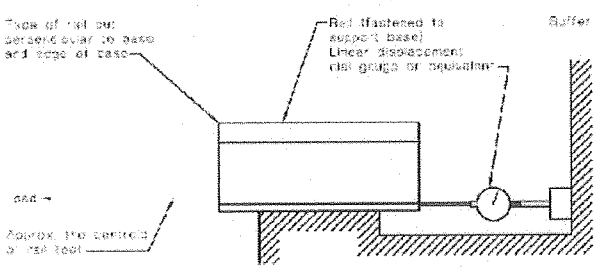


FIGURE E1 TEST ASSEMBLY FOR FASTENING LONGITUDINAL RESTRAINT TEST







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