



AUSTRALIAN RAIL TRACK CORPORATION LTD

Discipline: Engineering (Track & Civil)

Category: Specification

Manufacture and testing of pre-assembled glued insulated rail joints

ETA-01-01

Applicability

ARTC Network Wide	✓	CRIA (NSW CRN)	
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Primary Source

ARTC NSW Standard TPS 05 Version 1.2

Document Status

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1.2	8 March 2011	Standards	Manager Standards	Exec Manager SS&P 16/3/2011	CEO

Amendment Record

Version	Date Reviewed	Clause	Description of Amendment
1.0	16 October 06	All	Supersedes NSW Standard TPS 05 Version 1.2
1.1	21 November 06	3	Table showing live loadings expanded
1.2	8 March 2011	2	Table for 3.43 m GIJs removed

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1 Purpose

This Technical Specification sets out ARTC’s requirements for the manufacture and testing of pre-assembled, glued insulated rail joints to meet the requirements of the latest edition of AS 1085.12. In addition the requirements for production and prototype testing are specified.

2 General description

The insulated rail joint shall provide an electrical break in the rail for signalling purposes. It shall consist of two lengths of rail rigidly joined by a pair of fishplates, insulating material, an insulating end post separating the two rails, six high strength fasteners and other hardware, such as washers, ferrules and bushes.

Overall length of the rail joint shall be specified on the Purchase Order. The minimum overall length of joint should normally be 4.0 metres. Shorter joints may only be installed where track conditions preclude longer lengths e.g. near turnouts. The tolerance on the length on manufacture shall be +50/-0mm.

NSW standard curved 4.57m insulated rail joints are shown in Tables 1 below. If other length is specified mid-ordinate details should be given on the purchase order.

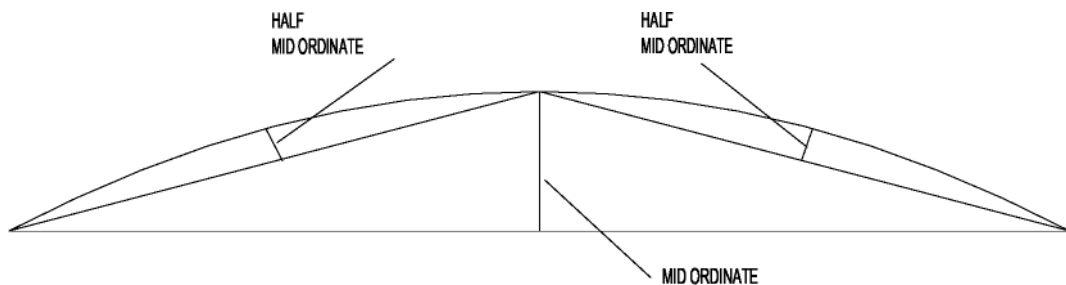


Table 1 - 4.57 metre Long Glued Insulated Joint Curvature Tolerances

Nominal Radius	Designated Mid Ordinate	Full Mid Ordinate	Half Mid Ordinates
250m	10mm	8.5 to 11.5mm	1.5 to 3.5mm
500m	5mm	3.5 to 6.5mm	0.5 to 2.5mm
Straight	0	Clause 6	Clause 6

3 Performance requirements

The joints will be subjected to live loading as follows:

Rail Size	60kg/m	53kg/m	47/50kg/m
Nominal Axle Load/Speed combinations	30T @ 80 or 60km/h (mostly at 60km/h) 25T @ 80km/h 23T @ 115km/h	25T @ 80km/h 23T @ 115km/h 21T @ 115km/h	25T @ 60km/h 23T @ 80km/h 21T @ 115km/h
Average Dynamic Wheel Load	370 kN	260 kN	260 kN
Estimated Number Of Load Cycles Per Annum	2 Million	0.7 Million	0.7 Million

The joint will also be concurrently subjected to tensile or compressive forces up to 115 tonnes caused by thermal rail expansion over the range of -10°C to +65°C.

The joint shall not bend or fail under vertical or lateral wheel loads and shall not deteriorate during its service life in such a way that signal failure may occur as a result of electrical conduction across the joint.

The joint shall also resist longitudinal slippage under thermal expansion and contraction effects of the rail so that the insulated joint will not allow one rail to move relative to the other rail within the joint in excess of that specified in clause 6.

The joints shall provide a minimum electrical resistance of 1 megohm rail to rail and rail to fishplate.

Insulated rail joints shall be Grade A or Grade B in accordance with AS 1085.12. The grade shall be specified by the Purchaser but would normally be Grade A for main lines and Grade B for branch lines and sidings.

4 Materials and components

4.1 Materials

All materials shall be free from defects and conform to the relevant Australian Standards.

4.2 Rails

Standard 50kg, 53kg and 60kg head hardened rail shall be in accordance with AS.1085.1 and AS.1085.1 and shall be free from defects considered detrimental to service requirements. Certificate of Conformance shall be provided upon request.

Head hardening of 50kg, 53kg and 60kg rails shall be in accordance with AS 1085.12.

Head hardened rail is not available for 47kg rail. 47kg/m insulated rail joints shall therefore be manufactured from flame hardened standard carbon rail in accordance with clause 5.2.

Rails with a cross-section other than specified in AS 1085.1 shall be supplied only with the written approval of ARTC.

4.3 Fishplates

Fishplates shall be of the six hole bar type and conform to the general requirements of AS.1085.2. When fixed in position, fishplates shall be capable of supporting and transferring all loadings between rails without relative movement between the rails and fishplates.

Adequate clearance shall be provided between the toe of the rail and the outer face of each fishplate to allow electrical clearance between fishplates, bolts, nuts and fastenings.

4.4 Insulating end post

The profile of the end post shall be in accordance with AS 1085.12. The thickness shall be 6.0mm + 1mm-0.

4.5 Bolts and nuts

Bolts and nuts shall be minimum M24 steel bolts and nuts and washers of type equal to or better than high strength bolts, nuts and washers described in AS/NZS.1252.

4.6 Swage fasteners

If swage fasteners are used, they shall be C50L type, M24mm high grade.

4.7 Test certificates

All material certificates and mechanical test certificates required by relevant Australian Standards covering all components used in the joint shall be provided upon inspection.

If these certificates are not available, a letter of compliance to Australian Standards signed by the Contractor will be acceptable.

4.8 Identification of joints

Each joint shall be marked with the information specified in AS.1085.12 such that it will remain during the life of the joint.

4.9 Records

A detailed record of all insulated joints produced by the Contractor shall be made available for inspection at the Superintendent's request.

5 Manufacture

5.1 Cutting, bending and drilling

Cutting, bending and drilling shall be carried out in accordance with AS.1085.12.

Rail ends shall be angle cut with the rail ends at the insulating post cut at 15 degrees to the right angle of the longitudinal axis (see Figure 1).

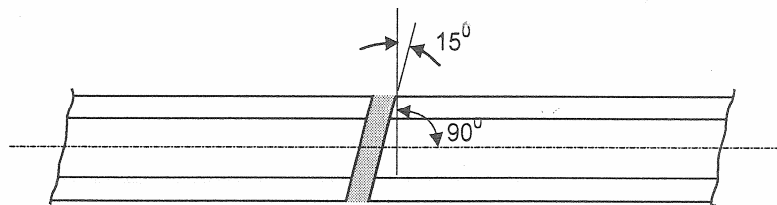


Figure 1 – Rail End angle

5.2 Rail end hardening of 47kg rail

The rail ends to be joined shall be flame hardened as specified in AS1085.12. Hardness testing shall be in accordance with Appendix H of AS 1085.12

The Contractor shall document a quality plan or work procedure, and implement a flame hardening process which ensures that the rail hardness is controlled.

Evidence that this requirement is being achieved shall be demonstrated upon request. A sample for testing shall be supplied by the Contractor if requested.

5.3 Assembly, gluing and bolting

The insulated joint area of rail shall be prepared as specified by the adhesive manufacturer. The joint shall be assembled in accordance to AS 1085.12.

The adhesive or gluing material shall be applied in accordance with the manufacturer's instructions.

The bolts shall be installed so that alternate bolts face opposite directions and a washer shall be placed under each nut.

The bolts shall be tensioned by turning the nuts in sequence 3 4 2 5 1 6 or 4 3 5 2 6 1.

The bolts shall be tensioned by a method approved by the Superintendent. The tension after the adhesive has fully cured shall be at least 180 KN (800Nm). The manufacturer will be required to demonstrate this tension during testing.

All bolts are to be readily removable to ensure adequate electrical clearances to the track fastenings.

Where swage fasteners are used they shall be applied in accordance with the manufacturer's instructions and the requirements of AS 1085.12.

6 Production testing

The complete joint shall have a smooth surface which shall not act as a trap for water, dust or any element which may reduce its life.

The Superintendent shall have free access to the Contractor's works to ensure that all stages and aspects of the joint manufacture are being carried out to the required standards.

Testing of the joints shall be carried out at the Contractor's works, at his expense, or at such other location as may be agreed.

The Superintendent has the right to check any or all joints to ensure that they conform to the requirements of this Specification.

All testing equipment shall be approved by the purchaser, tested in accordance with the manufacturer's instructions and certified for accuracy by an approved Testing Laboratory.

Production testing shall be undertaken in accordance with the table below.

Test	Frequency	Pass Criteria	Description
Electrical	Every joint	Table 1 of 1085.12	Appendix C of AS 1085.12
Pull apart	As specified in Appendix A of AS 1085.12	Table 1 of 1085.12	Appendix D of AS 1085.12
Alignment test	Every joint	Table 1 of 1085.12	Appendix G of AS 1085.12
Curve alignment where applicable	Every curved joint	As specified in clause 2 of this specification	Measurement of full mid-ordinate and half mid-ordinate
Hardness testing of flame hardened rails	1 in 10 joints	As specified in clause 7.3.2 of 1085.12	Appendix H of AS 1085.12

7 Delivery

After having been inspected and passed by the Inspector the insulated joints shall be delivered to the destination specified on the Purchase Order.

8 Warranty

The Contractor shall be responsible for the total labour and material cost of in-track replacement of any joint which fails due to faulty workmanship or material, except for rails, within the first two (2) years of service life.

9 New product - prototype testing and approval

9.1 General

When submitting a prototype glued insulating rail joint for approval, it shall meet the requirements of AS 1085.12 and this specification. The application shall be supported by the results of the tests specified in Appendices C to H of AS 1085.12 which shall meet the pass criteria specified in Table 1 of AS 1085.12.

9.2 Information to be provided

The following information and documentation shall be submitted by the Contractor and approved by the Superintendent: -

- 1) Information as specified in Appendix B of AS 1085.12.
- 2) Material and Component Specifications. The use of materials to Foreign Standards may be permitted provided that the Standards are not inferior to Australian Standards and will be subject to the Superintendent's approval.
- 3) Certificate of testing carried out in accordance with the tests specified in Appendices C to H of AS1085.12, verified by an independent testing organization such as a NATA accredited laboratory.