AUSTRALIAN RAIL TRACK CORPORATION LTD

Discipline: Engineering (Track & Civil) **Category: Standard**

Specification for the Supply of Field Assembled Mechanical Insulated Joint Components

ETA-01-03

Applicability

New South Wales	✓	**CRIA (NSW CRN)**	

Primary Source

ARTC NSW Standard TPS 06

Document Status

Version	Date Reviewed	Prepared by	Reviewed by	Endorsed	Approved
1.1	18 Jun 10	Standards	Manager Standards	Exec Manager SS&P 21/06/2010	CEO

Amendment Record

Version	Date Reviewed	Clause	Description of Amendment
1.0	01 Dec 09		Implementation draft. Supersedes NSW Standard TPS 06 v1.2
1.1	18 Jun 10		Banner added regarding mandatory requirements in other documents and alternative interpretations.

Contents

Mandatory requirements also exist in other documents.

Where alternative interpretations occur, the Manager Standards shall be informed so the ambiguity can be removed. Pending removal of the ambiguity the interpretation with the safest outcome shall be adopted.

1 Scope, Description and Requirements

1.1 Scope

This document specifies the material and testing requirements for field assembled mechanical insulated joint components complying with the requirements of AS 1085.12 for Field Assembled Insulated Joints.

1.2 Description

The insulated joint shall consist of two rolled steel fishplate sections encapsulated in an insulating material, an insulating end post separating the two rails to be joined, six high strength fasteners and other hardware, such as washers and bushes.

The joint shall be suitable for field assembly in straight track or curved track of no less than 160m radius. The fishplate shall be supplied in straight pieces only. Curved track sections with insulated joints shall be formed in the field from straight fishplate pieces.

1.3 Performance requirements

The joints are to be suitable for use in tracks subjected to dynamic loads (impact factor of 2.5) imposed by locomotives and rolling stock having maximum nominal axle loads of 25 tonne and speeds of 120km/h with an expected joint life of 35 million gross tonnes. The rail sizes are 47kg/m, 50kg/m, 53kg/m or 60kg/m.

The joint will also be subjected to tensile or compressive forces as shown in section 4. The axial forces are caused by thermal rail expansion over the rage of -10°C to +60°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 by more than 3.0mm (e.g. expansion or contraction of end post gap).

The Contractor shall submit with his tender documents independent tests and case histories to demonstrate that the nominated joint is capable of all the specified performance requirements.

Special installation requirements, such as rail surface preparation on fishplate contact surfaces, tolerances on drilled rail web holes, installation procedures etc. must be clearly stated. Any limitations in the use of insulated joints must also be stated, in particular if existing rail web holes are used for the replacement of a failed field assembled joint.

2 Materials

2.1 General

All the materials used shall be of a quality which results in an expected minimum service life of 10 years under conditions in Clause 1.2, free from defects and in accordance with the relevant Australian Standards or such other standards as may be specifically mentioned in this Specification or approved by the Superintendent.

2.2 Fishplates

Fishplates steel grade is to be AS 1442, S1045 or better. The fishplate to be of the six hole bar type and at least 760mm long. When fixed in position, fishplates shall be capable of supporting and transferring all loadings between the two rails without relative movement between the rails and fishplates.

The position and size of the holes is to conform to AS 1085.2 to allow installation of standard (non-insulated) fishplates if required. The profile of the fishplate shall be such that when encapsulated it provides the optimum moment of inertia within the dimensional constraint of the space available. The space is bound by the rail section and the standard ARTC rail fasteners.

A test certificate and material specification must be included in the submission to ARTC before acceptance of a new batch of insulated joints can be granted.

2.3 Insulation Material

The fishplates shall be manufactured to a size which allows adequate space for insulation material to encapsulate the steel fishplates. The minimum thickness of insulation material shall be 3mm which shall encapsulate the complete fishplate.

The contractor shall specify the tensile strength, compressive strength, Youngs modulus, melting point, coefficient of linear expansion, specific electric resistance and water absorption properties of the insulating material.

The insulating end post shall be of 6mm thickness and made from an insulating material with a high compressive strength and adequate electric resistance necessary for the assembled joint to perform.

The insulated joint is to perform under wet conditions without the application of any glues or resins.

2.4 Swage Fasteners

Fasteners included in the items composing a kit that is needed for an insulated joint shall be M24 high grade Huck Bolts. Standard grade Huck Bolts shall not be used.

3 Manufacture

3.1 General

The Contractor shall submit a detail drawing of the joint giving all necessary dimensions and tolerances of the individual components forming part of the joint. Allowances for rail tolerances must be made in the fishplates. Variations in the joint gap (squareness and width) and fishplate holes (diameter and position) shall be provided in the insulated joint.

3.2 Fishplate Holes

For replacement of existing field assembled joints fitted to rails with standard fishplate holes of larger size, suitable ferrules of adequate bearing strength must be supplied with the joint. The hole spacing and position of the insulated fishplates shall confirm to the holes of Australian Standard fishplates, this also includes the positions of the holes from the rail ends with allowance for the end post thickness.

3.3 Rail ends

Rail ends shall be cut square across the rail head.

3.4 Rail End Hardening

The rail ends of the track to be joined by the insulated joint will be hardened by the Contractor or his representative to a hardness of 340 to 390 Brinell. The head hardened zone will extend at least 40mm longitudinally from the rail end and have a minimum depth of 5mm from the top of the rail head and 2mm from the sides of the rail head to minimise rail head flow across the end post insulator. Head hardened rails possess adequate head hardness at the point and do not require any further heat treatment.

3.5 Finish

The components of the insulating joint should be finished in a first class workmanship. The completed joint shall have smooth surfaces which shall not act as traps for water, dust or any element which may reduce its life. The joint shall not interfere with the standard ARTC fastening systems.

3.6 Quality Control

The contractor shall provide reports of test procedures developed and used during the manufacture of the joint to ensure the product conforms to the specification and manufacture requirements. Detail of quality control shall be made available to ARTC.

4 Acceptance

On request ARTC shall have free access to the Contractor's works to inspect joints prior to acceptance. Testing of at least one assembled joint shall be carried out at the Contractor's work at his expense, or at such other location as may be agreed upon.

The joint under test shall be assembled with standard components and tensioned in accordance with the recommended procedure and equipment. The joint shall be capable of withstanding the minimum tensile and compressive longitudinal loads:

Rail Size (kg/m)	Load (Tonne)
47	90
50	95
53	100
60	115

The load shall be applied along the centroid of the rail axis for a minimum of five minutes. Simultaneously a vertical load of 20 tonne is to be applied to the vertical axis of the joint for fifteen seconds, released and then re-applied for a further three minutes. The vertical load is supported by two equidistant blocks at 600 spacing.

The joint will be considered to have failed the test if the permanent longitudinal extension exceeds 3.0mm or the electrical resistance is less than 1 mega ohm (using a 500V direct current insulation tester).