AUSTRALIAN RAIL TRACK CORPORATION LTD

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Category
Signalling

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Traction Return (1500V DC)

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Document Control

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The technical content of this document has been approved by the relevant ARTC engineering authority and has also been endorsed by the ARTC Safety Committee.

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About This Standard

This Standard defines the precautions and procedures to be followed when carrying out maintenance activities associated with the 1500V DC Traction Return.

Document History

Primary Source – RIC Standard SC 00 52 00 27 SI Version 2.0

List of Amendments –

ISSUE	DATE	CLAUSE	DESCRIPTION
1.1	01/09/2004		▪ Reformatting to ARTC Standard
1.2	14/03/2005	Disclaimer	Minor editorial change

Contents

1 GENERAL

THE RELEVANT REQUIREMENTS OF NETWORK RULE NWT 318 and SMP 26 REGARDING ENGINEERING WORK WHICH EFFECTS TRACTION RETURN CURRENTS OR TRACK CIRCUITS MUST BE COMPLIED WITH.

In a 1500v dc electrified area, before any interference with the rails forming part of the traction return is permitted, adequate provision shall be made for the traction return current.

A safe path shall be provided for the traction current to the substation or section hut.

At the same time the signalling equipment shall be safeguarded against damage due to a possible dangerous rise in traction return voltage.

2 PRECAUTIONS WHEN RENEWING BONDS OR REPLACING RAILS

When the absence of traction return current in the rails is assured, no special precautions to prevent a dangerous rise in traction return voltage are necessary, but where the absence of traction return current cannot be assured the following precautions shall be observed. Special arrangements shall be referred to a Signal Engineer for direction.

2.1 Track Circuited Lines

Before any interference with the rails forming part of the traction return circuit on a track circuited line is permitted, the feed and relay of the track circuit shall be disconnected at the outgoing terminals.

This action isolates the equipment from a rise in D.C. traction current and eliminates a source of possible circulating A.C. track circuit current.

2.2 Single Lines and Single Rail Track Circuits

On a single line track or on the traction rail of a single rail track circuit, before the fishplates or the bond of a bonded rail joint are taken off, the rails on each side of the joint shall be connected together by means of temporary traction jumper bonds.

Before a rail is removed from a single line track or before the traction rail is removed from a single rail track, temporary jumper bonds shall be provided and connected for an alternative traction return path to take the place of the rail which is to be removed.

Both rails of a single line or of a single rail track circuit shall not be broken at any one time until an alternate path is provided. Signalling maintainers shall refer all such cases to a Signal Engineer for direction regarding the special arrangements necessary.

2.3 Double Lines

On double lines, where the four rails are used for traction return, the continuity of the circuit shall not be broken in more than one of these four rails in the section between any two adjacent cross bonds at any one time.

2.4 Quadruple lines

On quadruple lines, where the eight rails are used for the traction return, the continuity of the circuit shall not be broken in more than two of these eight rails in the section between any two adjacent cross bonds at any one time.

Note: The requirements laid down in 2.2. 2.3 and 2.4 above are the minimum rail requirements to ensure a low resistance path is provided for the traction return currents. However circumstances may arise where it is not possible, due to the nature of the work, to provide the minimum rail requirement. Where such circumstances arise the matter is to be referred to the Maintenance Signal Engineer for determination of the traction return current arrangements. The Maintenance Signal Engineer is to liase with the ARTC General Manager ISP or nominated Signalling representative to ensure and agree on the proposed traction return arrangements, this may necessitate temporary track bonding design being issued where a level of complexity exist or as determined by the ARTC GM ISP or nominated Signalling representative.

2.5 Impedance Bonds

Before an impedance bond is disconnected, the feed and relay of the track concerned shall be disconnected and temporary bonding connections provided for traction return between the neutral point of the impedance bond of the adjacent track circuit and one of the rails of the track circuit from which the bond is to be disconnected. Where the adjacent track circuit is single rail, the same effect can be obtained by connecting one of the rails to the traction rail of the adjacent single rail track circuit.

2.6 Traction Return Connections to Sub Stations

The traction return to sub-stations is provided by cables connecting either direct to the rail in the case of single rail track circuits or on non track circuited lines, or via impedance bonds in the case of double rail track circuits.

Under no circumstances shall the traction return connections from the track to the sub-station be broken without providing an adequate return to the sub-station.

Temporary arrangements shall be confirmed by a Signal Engineer.

2.7 Negative Connections for 1500v Sectioning Switches.

At automatic sectioning switch locations of the 1500 volt overhead supply, at least two (2) negative cable connections are provided from the section hut to the traction rails.

Older installations:

a) Two negative cable connections are made to the same rail, on either side of a mechanical joint.

b) On no account shall more than one of the negative cables be disconnected at one time.

c) Before either cable is disconnected, a representative from the electrical discipline should confirm the continuity and effectiveness of the remaining cable and connection.

d) Newer installations:

e) Negative cable connections are made to all traction rails at the section hut. On multi-track lines, the Electrical discipline's usual practice is to provide negative busbars on both sides of the tracks, for termination of the rail connections.

On multi-track lines the section hut location is also used as a traction tie-in location.

On double rail tracks the negative cable connections are made by impedance bonds.

h) On single rail tracks the negative cable connections are made directly to the traction rail. A mechanical joint need not be provided so long as at least one busbar connection can be maintained at all times.

i) On no account shall more than one set of negative cable connections from impedance bond or rail to the section hut busbar/s be broken at the same time.

The location of negative cable connections is indicated by a notice plate, generally attached to the sleepers, the inscription reading "Danger 1500 volt negative, do not break cable".

Care should always be exercised in the maintenance of these connections as a break in the cables would result in a potential difference of 1500 volts across the break.

2.8 Rerailing at Sectioning Huts

When rerailing past a section hut care shall be taken that one negative connection to the rail/impedance bonds is maintained at all times.

Where negative cable connections are to a single rail, rerailing shall be done in two stages, up to one side of the mechanical joint as a first stage, and when bonding of that portion is complete and the negative cable connection to the section hut is restored the remainder of the rerailing may be carried out as the second stage.

In the case of negative cable connections to impedance bonds, the rerailing should be carried out on one rail at a time, with the other rail fully bonded and its negative connection complete via the impedance bond.

In all cases where rerailing is to be carried out involving the 1,500 Volt negative rail connection at a sectioning hut or sub-station, the staff of the Discipline responsible for the work must notify the Electrical Trouble Officer of the work to be performed before rerailing commences.

In some areas the mechanical joint has been welded out. Where this is the case and there is only the one set of negative connections the rails must first be cut so as both connections are

not broken simultaneously, the cut in the rail may then be welded out. Where it is not possible for the rail to be cut, isolation of the 1500 volts traction must be obtained.

Where there are multiple negative connections, refer to section 1.2(g) above for precautions with rerailing.

2.9 Rail Spark Gap Arrestors

Certain overhead metal structures to which 1,500 volt wiring is attached are provided with a rail spark gap arrestor and a cable connection to the traction return rail. The rail connections shall be carefully maintained at all times.

Visual inspection of the rail connections and spark gap arrestor shall be carried out during routine maintenance visits and any deterioration of spark gap arrestors reported to the Maintenance Supervisor. The voltage drop across the arrestor shall be checked to prove it is not short circuited.

During routine examination of track circuits any spark gap connection cables which pass under the rails shall be examined for insulation damage and reported to the Maintenance Supervisor if deterioration has occurred.

2.10 Electrolysis Bond Connections

At certain locations indicated on the bonding plans a negative connection is provided to the neutral point of an impedance bond or a special transformer for the purpose of providing a low resistance one way path for "earth" leakage current from adjacent power and telephone cables, gas and water mains, the connection being made through what is known as an electrolysis bond. These connections can also be made to the traction rail of single rail track circuits. These connections shall be carefully checked and maintained at all times.