

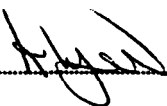
Ref	NR/GN/ELP/27019
Issue	2
Date	April 2006

Business Process Document

Design and installation of composite aluminium/ stainless steel conductor rail and associated equipment for d.c. electrified lines

Endorsement & Authorisation

Endorsed by:



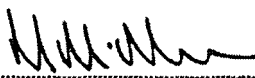
K. Lydford, Head of Electrification & Plant Engineering

Authorised by:



A. McNaughton, Chief Engineer

Accepted for issue by:



M. McManus, National Standards Manager

This document is the property of Network Rail. It shall not be reproduced in whole or part nor disclosed to a third party without the written permission of the Standard Owner.

© Copyright 2006 Network Rail

Uncontrolled copy once printed from its electronic source.

Published & Issued by. Network Rail 40 Melton Street, London NW1 2EE



Ref:	NR/GN/ELP/27019
Issue:	2
Date:	April 2006

Issue record

Issue	Date	Comments
2	April 2006	Re-issued as a SAF3 Business Process Document (<i>formerly RT/E/C/27019</i>)

Disclaimer

In issuing this document for its stated purpose, Network Rail makes no warranties, express or implied, that compliance with all or any documents it issues is sufficient on its own to ensure safe systems of work or operation. Users are reminded of their own duties under health and safety legislation.

Supply

Copies of documents are available electronically, within Network Rail's organisation. Hard copies of this document will be available to Network Rail employees on request to the document controller and to other organisations from IHS Technical Indexes (01344 404409)

Contents

1	Purpose	5
2	Scope	5
3	Reference documentation	5
4	Definitions	5
5	Aluminium/stainless steel conductor rail	6
5.1	Rail construction	6
5.2	Rail section	6
5.3	Manufactured rail lengths	6
5.4	Conductor rail joints	7
5.5	Rail identification	7
5.6	Dynamic and electrical clearances	7
5.7	Position of conductor rail	7
5.8	Conductor rail expansion and anchoring arrangements	7
5.9	Conductor rail ramps	8
5.9.1	Side ramps	8
5.9.2	End ramps	8
6	Support insulators	8
6.1	General	8
6.2	Material of manufacture	9
6.3	Porcelain	9
6.4	Insulator caps	9
6.5	Marking	9
6.6	Insulator spacing	10
6.7	Ramp end insulators	10
6.8	Securing of insulators	10
6.8.1	Timber sleepers	10
6.8.2	Concrete sleepers with prepared holes	10
6.8.3	Concrete sleepers requiring drilling	11
7	Protective boarding and shrouding	11
7.1	General	11
7.2	Location of protective boarding	11

7.3	Single protective boarding	11
7.4	Double protective boarding	12
8	Cables and cables connections	13
8.1	General	13
8.2	Cables sizes	13
9	Jointing and termination of cables	13
9.1	Cable lugs	13
9.2	Position of cable connections	14
9.3	Jointing and termination of cables	14
10	Track cable routing	14
10.1	General	14
10.2	Routes between sleepers	15
10.3	Cables adjacent to lineside buildings and apparatus cases	15
10.4	Crossing of cable routes	15
10.5	Buried duet routes	16
10.6	Routes through authorised walking routes	16
10.7	Cable risers	16
10.8	Cables adjacent to AWS track magnets	16
11	Manual isolating switches	16
11.1	Hook switches	17
11.1.1	Position of hookswitches	17
11.1.2	Types of hook switch	17
11.1.3	Un-commissioned hook switches	17
11.2	Track isolating switches	17
11.2.1	Position of track isolating switches	17
11.2.2	Types of track isolating switches	18
12	Anti-trespass guards	18
Appendix A	Tests on conductor rail insulators	19
Appendix B	Tests on conductor rail protective boarding	21
Appendix C	Tests on manual isolating switches	23

1 Purpose

This guidance note states the best practice for the design, manufacture, installation and testing of aluminium/stainless steel composite conductor rail and associated equipment on Network Rail D.C. Electrified Lines.

This document is to be read in conjunction with the Electric Track Equipment drawings and [NR/SP/ELP/21104](#) 'Design and Installation of Electric Track Equipment for D.C. Electrified Lines'.

2 Scope

This guidance note applies to aluminium/stainless steel composite conductor rail and associated electric track equipment on D.C. Electrified Lines designated 'standard current', including the requirements for new installations and alterations to existing equipment.

3 Reference documentation

NR/SP/ELP/27224	Network Rail Business Process Document – Specification for Installation of Cable Routes, Cable Laying, Testing and Jointing of Cables Forming Part of the Traction Distribution System
NR/SP/CIV/044	Network Rail Business Process Document – Design & Construction of Undertrack Crossings
NR/SP/ELP/21101	Network Rail Business Process Document – Track Cable for D.C. Electrified Lines
NR/GN/ELP/27021	Network Rail Business Process Document – Electric Track Equipment Layout for D.C. Electrified Lines
BS 137	Whiteheart Malleable Iron Castings
BS 309	Blackheart Malleable Iron Castings
BS 476	Fire Tests on Building Materials and Structures
BS 729	Hot Dip Galvanised Coatings on Iron and Steel Articles
BS EN 50123	Railway applications. Fixed installations. D.C. switchgear.
BS EN 60529	Specification for degrees of protection provided by enclosures (IP code)

4 Definitions

For the purpose of this specification the following definitions should apply:

British Standard	A standard published by the British Standards Institution. Its alphanumeric identity is prefixed by BS.
Electric Track Equipment	Equipment associated with the railway track used for the transmission and collection of electrical current for traction purposes.

Electric Track Equipment Drawings	A series of Network Rail Drawings prefixed by an alphanumeric identity RT/ETE which detail information related to the Electric Track Equipment. These are commonly referred to as ETE Drawings.
European Standard	A standard published by the European Committee for Standardisation or by the European Committee for Electrotechnical Standardisation. Its alphanumeric identity is prefixed by EN.
International Standard	A standard published by the International Electrotechnical Commission. Its alphanumeric identity is prefixed by IEC.
Procurement Specification	The contract specific Network Rail documentation, such as, Invitation to Tender or Technical Workslope.
Standard current traction systems.	A d.c. system capable of supplying trains with a sustained peak total traction current below 6.5 kA.

5 Aluminium/stainless steel conductor rail

5.1 Rail construction

The rail should be provided with a durable stainless steel contact surface of at least 5 mm thickness.

The average interface resistance of rails between head and lower section for rails using mechanical bonding should not exceed 20 microhms per rail length when measured between the top contact surface and the top surface of the bottom flange.

5.2 Rail section

The conductor rail section should be appropriate for the resistance value per kilometre specified in the procurement specification.

Each installed length of conductor rail should include one rail with wear indicator grooves machined across the head of the rail at 1 mm, 2 mm and 3 mm depths.

5.3 Manufactured rail lengths

Rails should be supplied in nominal 15 m lengths unless specified otherwise in the procurement specification.

Ref:	NR/GN/ELP/27019
Issue:	2
Date:	April 2006

5.4 Conductor rail joints

Each successive length of rail or ramp should be joined by fish-plates of similar aluminium alloy as the conductor rail.

All contact surfaces of the fish-plated joint should be wire brushed and coated with electrolytic grease prior to assembly with self-torquing bolts secured to 5 ton torque load or alternatively 12 mm diameter stainless-steel bolts torqued to 100 Nm. Self-torquing bolts should be coated with Galvafroid after assembly.

The maximum gap between conductor rail ends in each joint should not exceed 2 mm and the step between the stainless steel conductor surface between adjacent rails should not exceed 0.2 mm.

5.5 Rail identification

Rails should be uniquely marked with a durable means of identification and appropriate records kept to ensure that each rail can be traced back to its original manufacturing batch.

5.6 Dynamic and electrical clearances

The static distance between any exposed conductor rail and any metalwork connected thereto, and any other fixed metalwork should be at least 75 mm. Metal parts of protective board supports may, infringe the 75 mm dimension.

The minimum vertical clearance between the lowest part of any collector shoe and the running rail should be 25 mm.

5.7 Position of conductor rail

The conductor rail should be positioned with its centre line 405 mm from the running rail gauge face at a height 76 mm above it.

5.8 Conductor rail expansion and anchoring arrangements

The maximum length of jointed rail including ramps should be limited to 310 m.

Installed lengths of conductor rail of any length up to the maximum should be anchored at the midpoint with two adjacent, separate anchor arrangements.

Gapping arrangements should be made at the end of each length of conductor rail to accommodate longitudinal expansion.

Ref:	NR/GN/ELP/27019
Issue:	2
Date:	April 2006

5.9 Conductor rail ramps

5.9.1 Side ramps

Where required, a side ramp to suit the associated switch and rolling stock should be installed with fastenings appropriate to the type of conductor rail and located in accordance with the standard drawing.

5.9.2 End ramps

A conductor rail ramp with a gradient appropriate for the line speed should be provided at all locations where the conductor rail terminates.

Conductor rail ramps should be single bend and manufactured from stainless steel and attached to the conductor rail with the same components and method used for rail joints.

The ramp should have a horizontal base and should be supported on standard insulators used for the horizontal rail.

The conducting surface of the ramp should be at least 10 mm thick.

Ramps used on lines with a maximum speed of 70 kilometres per hour or below should be 1830 mm in length with a gradient of 1 in 30.

Ramps used on lines with a maximum speed above 70 kilometres per hour should be 3050 mm in length with a gradient of 1 in 48.

6 Support insulators

6.1 General

The conductor rail system should be capable of continuous operation with one support insulator missing.

Insulators on concrete sleeper track should have a resilient rubber base pad and insulators on timber sleepers a durable bottom packing.

The gauge height should be maintained with packing pieces.

The support insulators should secure and align the conductor rail and permit sliding due to longitudinal expansion and contraction.

The conductor rail should be readily removable from the support insulator for track maintenance purposes.