

Ref:	NR/L3/SIG/11303/2A10
Issue:	2
Date:	4 September 2010
Compliance date:	4 December 2010



Level 3 Module

Signalling Installation – Cabling: Jointing and Termination

Endorsement and Authorisation

For endorsement and authorisation, please refer to NR/L3/SIG/11303.

This module is a reformatted version of the previous Signalling Installation Handbook with no change to the content other than correction of terminology.
It represents historic best practice which may no longer be relevant.

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 Network Rail.
© Copyright 2010 Network Rail.

Uncontrolled copy once printed from its electronic source.

Published and Issued by Network Rail, Kings Place, 90 York Way, London. N1 9AG.

Ref:	NR/L3/SIG/11303/2A10
Issue:	2
Date:	4 September 2010
Compliance date:	4 December 2010

Issue record

Issue	Date	Comments
2	September 2010	Reformatted version of previous document incorporating the text of the installation handbook.
1	August 2000	First issue.

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 4 December 2010.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 4 to continue to comply with the Issue of any relevant Network Rail Standards current when GRIP Stage 4 was reached and not to comply with requirements contained herein, unless the designated Standard Owner has stipulated otherwise in the accompanying Briefing Note.

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 may be available to Network Rail people on request to the relevant controlled publication distributor. Other organisations may obtain copies of this document from IHS. Tel: 01344 328039.

Ref:	NR/L3/SIG/11303/2A10
Issue:	2
Date:	4 September 2010
Compliance date:	4 December 2010

Contents

1 Introduction	4
2 Cable Types	4
3 General	4
4 Jointing Kits	5
5 Cable Sealing Gland Kits	6
6 Jointing Copper Cables Using Heat Shrinkable Systems	7
7 Aluminium Power Cable	8
8 Solid Core Aluminium Power Cable	8
9 Solid Core Aluminium Power Cable : Method Of Termination	9
10 Solid Core Aluminium Power Cable : Method Of Jointing	10
11 Stranded Core Aluminium Power Cable	11
12 Stranded Core Aluminium Power Cable : Method Of Termination	11
13 Stranded Core Aluminium Power Cable : Method Of Jointing	12
14 Testing External Main and Tail Cables and Power Cables	12
15 Jointing Track Circuit 2.5 mm ² (F) Tail Cables	13

Document Reference: NR-L3-SIG-11303-2A10

Ref:	NR/L3/SIG/11303/2A10
Issue:	2
Date:	4 September 2010
Compliance date:	4 December 2010

1 Introduction

This introduction defines the types of cable which come within the scope of signalling installation staff to carry out permanent jointing and termination.

Only the following types of cable are covered here. For specialised and older cables refer to local Instructions.

2 Cable Types

- External multicore, Type B2 (0.75 & 2.5mm²)
- Emergency multicore, Type MD3
- External single, flexible, Type C1
- External multicore, flexible, Type C2
- Power cable, copper
- Power cable, solid aluminium
- Power cable, stranded aluminium (now non-standard)
- SSI datalink, 1 pair
- CCTV coaxial (Level crossing installations)

3 General

Cables will be damaged if they are bent too much. When laying in, or preparing a cable for jointing or termination, do not make the radius of a bend less than:

- 10 times its overall diameter for unarmoured cables (but see below).
- 15 times its overall diameter for armoured cables.

The bend radius for unarmoured cables may be considerably reduced for single core 2.5 mm²(f) cable used for track circuit leads. With care and an even bend, the minimum radius may be reduced to three times the overall diameter where space is restricted, although a larger radius bend is preferable.

Endeavour to prevent kinks from forming in cables. If one does form, carefully untwist it without pulling on the cable.

Cables should not be pulled against sharp corners, have heavy objects dropped on them, or be run over by vehicles.

Take special care to avoid even the slightest damage to cables that are ZHLS (Zero Halogen Low Smoke) sheathed (used in underground areas). These sheaths are neither so robust nor have the same degree of resistance to moisture penetration as those of standard outdoor cables.

Ref:	NR/L3/SIG/11303/2A10
Issue:	2
Date:	4 September 2010
Compliance date:	4 December 2010

Use the appropriate heatshrink joint for all through joints in PCP signalling cables.

The position of all through joints in cables other than tail cables shall be recorded on your copy of the route survey plan. The Supervisor shall arrange for this information to be added to the permanent records for that site.

When preparing to make heat shrink joints and terminations, the cables should be supported firmly to enable them to be left to cool without moving. Wooden support frames can be made up for use when jointing the various sizes of cables.

If you use a gas flame for heat-shrinking, the correct nozzle should be used. A suitable heater for heatshrink work is the Heat Torch Kit, for use with Primus 2000 and Standard Propane Cylinders, made by Sigmaform (Model SFK 3000). The flame does not protrude from the end of this torch and is therefore less likely to burn the tubing.

Seal cables with a moisture barrier at the point of stripping back of the outer sheath.

Seal any cut end of cable (including that left on the drum) which is not to be jointed or terminated immediately.

Tail cables are to be in 2.5 mm²(f) conductor unless shown otherwise on diagrams.

Where two or more cables enter adjacent to each other, the cores (or tails) of one cable should not be mixed with those of another. Keep them in separate groups as you route them from cable to termination strip.

Spare un-terminated cores need to be insulated by means of a "bomb tail".

4 Jointing Kits

Details of suitable kits may be obtained from your materials supplier. Joint kit numbers for those manufactured by Sigmaform are shown in the following list. Note that some cable types may not be in common use.

Copyright Network Rail

Ref:	NR/L3/SIG/11303/2A10
Issue:	2
Date:	4 September 2010
Compliance date:	4 December 2010

Cable Type	Kit No.	Inc. Connectors?
4c - 19c 0.75 mm ² #	SFK 214	Yes
19c - 37c 0.75 mm ² #	SFK 215	Yes
48c - 61c 0.75 mm ² #	SFK 216	Yes
Test point reclosure 12-27c	SFK 2911	No
37-61c	SFK 1232	No
2c power (inc. aluminium)		
10 to 50mm ²	SFK 407	No
70 to 120mm ²	SFK 332	No
1c 10 mm ²	SFK334	*
1c 2.5 mm ² (f)	SFK 257	*
2c 2.5 mm ² (f) to (2x1c) 2.5mm ² (f)	SFK 234	Yes
2c 2.5 mm ² (f) to (2x1c) 10 mm ²	SFK 233	Yes
1c 2.5 mm ² (f) to (2x1c) 2.5 mm ² (f)	SFK 1173	Yes
2c 2.5 mm ² (f) to (4x1c) 2.5 mm ² (f)	SFK 1174	Yes
4c 2.5 mm ² (f) to (4x1c) 2.5 mm ² (f)	SFK 1204	Yes
4c 2.5 mm ² (f) to (2x2c) 2.5 mm ² (f)	SFK 894	Yes
Moisture barrier 13 – 24 mm dia	SFK 442	**
Moisture barrier 20 – 37 mm dia	SFK 443	**
Moisture barrier 27 - 48mm dia	SFK 444	**
2c Data link	SFK 883	\$
2c Data link (with drain - 15.7mm dia type)	SFK 1131	Yes

Notes:

- * indicates 10 in a pack.
- ** indicates 24 in a pack.
- \$ the aluminium foil moisture barrier should be left un-jointed.
- # for jointing 2.5mm² cable use "blue" crimp splice connectors and suitable heat shrink components.

For coaxial cables, the preferred kits are:

- Raychem CSP75SO2 (for Type A cable)
- Raychem CSP75SO0 (for Type B cable)

5 Cable Sealing Gland Kits

Wherever possible, sealing glands should be used for cable entry to external equipment. The glands are of two basic types: screw fit and clearance fit. These are illustrated in Module 1M05, Figure 3. Where either type can be used, the clearance fit is preferred as removable is possible without having to twist the cable.

Details of suitable kits may be obtained from your materials supplier. Those manufactured by Sigmaform and Egerton are as follows: