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Guidance Note

Telecommunications Cable Routes and Installation

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1 Purpose

This document provides guidance to the installation of telecoms cables and telecoms cable route.

2 Scope

This document provides guidance to the key aspects which should be taken into consideration when the Principal Contractor, maintainer or Project is engaged with the installation of telecoms cable and cable route. The practices detailed are based on those adopted by the Fixed Telecoms Network Project. A Project should be clear in whether it plans to follow this guidance in full or only in parts.

This document is split into two main components;

- New cable route installation.
- Cable route renovation.

References are made to other documentation which specifies the requirements for safety and construction.

3 Definitions

AC	Alternating Current
ADM	Add-Drop Multiplexer
ATEH	Active Transmission Equipment Housing
BOP	Box On Post
BT	Booster Transformer
CRE	Contractor's Responsible Engineer
DBS	Directly Buried Sub-Duct
DI-SAC	Double Insulated Super Armoured optical fibre Cable
DSL	(high bit-rate) Digital Subscribers Line
ELR	Engineer's Line Reference: a unique 4-letter code for each railway line
EVA	Ethylene Vinyl Acetate
FTE	Fast Transient Earth
FTN	Network Rail's Fixed Telecoms Network
GPS	Global Positioning System
GLT	Ground level troughing
GRC	Glass Reinforced Concrete
GRP	Glass Reinforced Plastic

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GSM-R	Global System for Mobiles, for Railways
HSE	Health & Safety Executive
HDPE	High Density Polythene
HV	High Voltage
LDPE	Low Density Polyethylene
MDPE	Medium Density Polythene
MP	Mile post
OSGR	Ordnance Survey Grid Reference: 12 digit
PES	Public Electricity Supplier
PMuX	Primary Multiplexer
Project	Network Rail Group in charge of delivering the work
PVC	Polyvinyl Chloride
PTO	Public Telecommunications Operator
RC	Return Conductor
REB	Relocatable Equipment Building
RR	Return Rail (refer to Glossary)
S&T	Signalling and Telecoms
SC	Screening conductor
SCT	Surface Concrete Troughing (Same as GLT)
SDH	Synchronous Digital Hierarchy
SPT	Signal Post Telephone
STM-1	Synchronous Transfer Module One; A SDH term depicting transmission at 155Mbit/s
STM-16	Synchronous Transfer Module Sixteen; A SDH term depicting transmission at 2.5Gbit/s
Type 13, 16B	Configuration of transmission node
UFx	Under Farm Crossing - occupational and residential crossings
UftX	Under Foot Crossing
uPVC	Unplasticised Poly Vinyl Chloride
URx	Under Road Crossing
UTx	Under Track Crossing
WHD	Width, height and depth
ZHLS	Zero Halogen, Low Smoke

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4 Construction of New Cable Route

4.1 The extent of the works

The construction of new cable routes should, where necessary, include the following:

- a. The transportation of all route materials to site.
- b. Excavation and levelling of covering terrain and the removal of lineside debris to expose the line of route.
- c. Excavation and installation of new materials.
- d. Installation of posts or support brackets where elevated troughing routes are necessary.
- e. Construction of platform duct routes, hard surfaced walkway duct routes, public crossing duct routes and under track duct routes.
- f. Construction of manholes complete with covers and frames.
- g. Fabrication and installation of metalwork troughing supports.
- h. Installation of troughing route supports, ballast boards, brick retaining walls or other forms of route support.
- i. Installation of cable supports for vertical routes using steel ladder racking, steel trunking, clamps or cleats fixed directly to vertical surfaces. All new metal work should be treated against deterioration in accordance with NR/L3/CIV/039.
- j. Construction of cable routes under road / rail access points.
- k. Where asbestos is found, appropriate safety precautions should be taken and where necessary it should be removed by a specialist contractor only.

4.2 General

- a. The route design will specify whether a new route should be constructed or the existing route renovated. The new cable route should not block access to existing routes or access points.
- b. A new route should be installed when the existing:
 - i. Route passes adjacent to catch points or behind buffer stops.
 - ii. Route is buried and full or inaccessible.
- c. New cables should be installed within the railway boundary no more than 4.5 metres from the nearest sleeper ends. Where the new route is within 4 metres of the running rail, Table 1 should be followed.

	AC areas with booster transformers	Other areas
Minimum Distance from nearest running rail	1,980mm	1,980mm
Preferred Distance from nearest running rail	1,980mm	3,000mm

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Table 1: Distances from running rail

- d. An existing cable route should be realigned to 1,980mm from the running rail if:
- i. The area is an AC electrified area with booster transformers.
 - ii. Copper cables are required to be installed into existing reinforced concrete troughing.
 - iii. The edge of the existing cable route is further than 2,600mm from the inside face of the nearest running rail.

4.2.1 Limited Space

Where space is limited by obstructions such as bridges or tunnels, a reduced clearance of 1,250mm from the inside face of the running rail is acceptable in accordance with NR/GN/SIG/11210, Appendix 2A05.

4.2.2 Route between tracks

Where it is necessary to install the route between the railway tracks, the route should be a minimum distance of 1,980mm from the outside edges of the adjacent running lines. Where it is likely that staff will walk on the troughing lids they should be laid so that the top of the lid is flush with the surrounding ground / ballast.

4.3 Double Insulated Super Armoured Optical Fibre Cable (DI-SAC)

4.3.1 Product Overview

DI-SAC comprises of 24 single mode optical fibres equally divided into two stainless steel tubes that are helically wound around a solid aluminium former, with a medium density polyethylene inner sheath followed by a helically-wound, thick steel-wire armour and an over sheath of fire-retardant ethylene vinyl acetate.

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Figure 1 - Example of DI-SAC

4.3.2 Installation

- a. The completed installation should:
 - i. Not directly or indirectly hinder, impair or obstruct the operational railway, in particular, access paths, refuges, retaining walls, point-rodging and signal wire runs, and other cable runs such as tail cables to on-track equipment.
 - ii. Not be able to be placed onto any railway line by miscreants acting without tools.
 - iii. Maintain a reasonably straight line in order for it to aesthetically blend into its surroundings.
 - iv. Promote efficient cable repair or replacement.
 - v. Not constitute a tripping hazard.
- b. During the installation of DI-SAC it should be properly secured at the end of each shift to ensure that the DI-SAC cannot be placed on the track. Both ends of the DI-SAC should be suitably sealed to prevent the ingress of moisture. The minimum bending radius of DI-SAC is 12 times its diameter; this must not be exceeded during installation.
- c. The completed installation should be as close to the ground surface as practicable without breaking the surface. Where the DI-SAC is exposed due to undulating ground, small valleys should be filled around the DI-SAC to cover it. On no account should ballast be taken from the ballast shoulder and the ballast shoulder should not be disturbed.
- d. The installation of the DI-SAC should not create a tripping hazard. In high vandal areas and in areas where staff are expected to walk on the cables regularly, (e.g. shunting yards and at access points) the DI-SAC should be scratch-buried so that it does not protrude above ground level.

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4.3.3 Securing DI-SAC with Ground Anchors

- a. Before installing ground anchors or scratch burying DI-SAC, a buried survey search should be carried out as described in Section 13.
- b. Secure DI-SAC at 40 metre intervals, except where the track deviates from a straight line (e.g. corners) where the DI-SAC should be secured at 10 metre intervals. It should not be possible for the DI-SAC to be placed on the nearest railway track after being secured, if it is then the DI-SAC should be secured at shorter intervals.
- c. Ground anchors should be buried to a vertical depth of 500mm in normal conditions and 750mm where the ground condition is poor. To test the anchor, a man should not be able to move the ground anchor by pulling on a bar placed through the eye of the anchor.
- d. The DI-SAC should be secured to the ground anchor using an approved restraint or cable tie. An example of a ground anchor is shown in Figure 2.



Figure 2 - Example of Ground Anchor

- e. The route design will specify how DI-SAC will negotiate station platforms, bridges, viaducts, cuttings, tunnels or other limited clearance areas. Where a J-hanger is used the DI-SAC should be secured with two approved stainless steel cable ties in an 'X' formation. The DI-SAC, when installed, should not obstruct loading gauges or passengers. An example of a 'J' hanger is shown in Figure 3.