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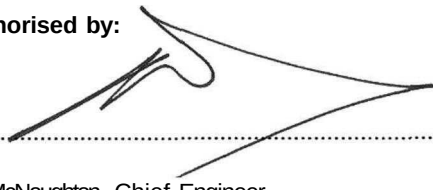
Business Process Document

Unit Twin Copper Telecommunications Cable (formerly RT/E/PS/00015)

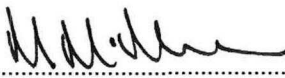
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Issue record

Issue	Date	Comments
1	August 2001	ZHLS cable added. 2 pair cable specified as a quad. Different insulation colour scheme used for quads than for larger cables. References updated. Sheathing options rationalised. Test methods revised. Specific sample testing plan deleted – quality plan to be agreed.
2	June 2003	Minor changes to reflect change of Company name to “Network Rail”, including sheath markings. Whole document reformatted.
3	April 2006	Document re-numbered as part of standards framework process and revised in line with template.

Implementation

This standard shall be implemented from April 2006.

Compliance

This Network Rail Product Specification is mandatory and must be complied with by Network Rail and its Contractors from April 2006.

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

Where the Head of Telecoms has specified that all projects will comply with the requirements, specific authority not to comply can be sought in the usual manner using the appropriate non-compliance authority processes described in Network Rail Standard, [NR/SP/STP/045](#) Managing the Process for Non-compliance Authority (formerly RT/LS/P/045).

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1 Purpose

This document is for use in procurement contracts for polyethylene sheathed and zero-halogen low-smoke (ZHLS) sheathed external copper telecommunications cables.

2 Scope

2.1

This document specifies the requirements for telecommunications cables of unit twin construction containing 0.63 mm or 0.90 mm diameter copper conductors.

2.2

Steel tape armoured and ZHLS versions are specified. The type of cable, conductor diameter and the number of pairs will be specified in the contract. The number of pairs will be in the range 2 to 100 pairs.

3 Reference documentation

Reference is made in this specification to the following publications:

NR/CS/ACC/029 (RT/LS/P/029)	Product Acceptance.
GE/RC8505	Recommendations for the Fire Safety of Materials at Operational Premises.
BS 3573	Specification for Polyolefin Copper-Conductor Telecommunications Cables.
BS 4727	Glossary of Electrotechnical, Power, Telecommunication, Electronics, Lighting and Colour Terms.
BS 5099	Specification for Spark Testing of Electric Cables.
BS 6234	Specification for Polyethylene Insulation and Sheath of Electric Cables.
BS 6360	Specification for Conductors in Insulated Cables and Cords.
BS 6469-99.2	Insulating and Sheathing Materials of Electric Cables. Test Methods used in the United Kingdom but not Specified in BS EN 60811 or Other Parts of BS 6469. Electrical Tests.
BS 6724 (1990)	Specification for Armoured Cables for Electricity Supply having Thermosetting Insulation with Low Emission of Smoke and Corrosive Gases when Affected by Fire.
BS EN ISO 62	Plastics. Determination of Water Absorption.

BS EN 50268-1	Common Test Methods for Cables Under Fire Conditions. Measurement of Smoke Density of Cables Burning Under Defined Conditions. Part 1: Apparatus.
BS EN 50268-2	Common Test Methods for Cables Under Fire Conditions. Measurement of Smoke Density of Cables Burning Under Defined Conditions. Part 2: Procedure.
IEC 60332-3	Tests on Electric Cables Under Fire Conditions. Tests on Bunched Wires or Cables.
Defence Standard 81-20	Drums, Cable – Metric Units.
IEC 60304	Standard Colours for Insulation for Low-Frequency Cables and Wires.
NS/G/1235/W/100025	General Approval for Connection of Cable, Wiring and Wiring Accessories for Connection Between Certain Telecommunications Apparatus.

Health and Safety at Work etc. Act 1974.

The Telecommunications Act 1984.

In the case of references to the above documents, the latest issue is to be used unless stated otherwise. The Manufacturer is entirely responsible for ensuring that they are in possession of the correct issue of any document.

4 Definitions

For the purpose of this specification only the definitions given in BS 4727 shall apply.

5 Copper Conductors

5.1 General

5.1.1

Conductors shall consist of a solid wire of plain annealed copper, smoothly drawn, circular in section, uniform in quality and free from defects.

5.1.2

The conductors shall meet the requirements in Table 1 below for diameter and the requirements of section 10.1 for elongation.

Nominal Diameter	Maximum Diameter
0.63 mm	0.64 mm
0.90 mm	0.91 mm

Table 1: Limits for Diameter of Conductors

5.2 Insulation

5.2.1

The conductors shall be uniformly covered with a solid insulating compound such that the finished cable meets the requirements of this standard. The insulation shall be polyethylene compound Type 03 to BS 6234.

5.2.2

The nominal diameter of the insulated 0.63 mm and 0.90 mm conductors shall be 1.15 mm and 1.50 mm respectively.

5.2.3

For 2 pair cables only, four conductors shall be uniformly twisted together to form a compact and symmetrical quad. The conductor insulation shall be colour coded as detailed in Table 2. The colours shall be a reasonable match to IEC 60304.

Pair No.	Conductor Insulation Colour	
	A-Leg	B-Leg
1	Orange	White
2	Green	Black

Table 2: Conductor Insulation Colour Scheme for 2-Pair Quads

5.2.4

For all other cable sizes, two appropriately coloured conductors shall be twisted together to form a pair. Similarly, the conductor insulation shall be colour coded as detailed in Table 3 and the colours a reasonable match to IEC 60304.

Pair No.	Conductor Insulation Colour	
	A-Leg	B-Leg
1	White	Blue
2	“	Orange
3	“	Green
4	“	Brown
5	“	Grey
6	Red	Blue
7	“	Orange
8	“	Green
9	“	Brown
10	“	Grey

Table 3: Conductor Insulation Colour Scheme

6 Polyethylene Sheathed Cable

6.1 Service Life

The design and construction of the cable shall be such that when installed in a trackside concrete cable troughing route or buried duct route, it shall have a service life in excess of 25 years.

6.2 Cable Core

6.2.1

The cable shall be of unit twin construction in accordance with BS 3573.

6.2.2

The lay of the cable pairs, sub-units (5 pairs) and units (10 pairs) shall be such that the completed core forms a compact and circular core to comply with the requirements of this standard. The pair lay in the completed cable shall not exceed 150 mm.

6.2.3

Cables with more than one unit shall have an open lapping of colour tape applied over each sub-unit and unit. The colour scheme to be used is shown in Table 4. The colour sequence is from the centre of the cable outwards. The length of the lay of the tapes shall not exceed 100 mm when laid in the same rotation as the pairs, or 200 mm when laid in the opposite rotation.

Table 4: Unit Identification Tape

Unit Number									
1	2	3	4	5	6	7	8	9	10
Blue	Orange	Green	Brown	Grey	White	Red	Black	Yellow	Violet

6.3 Filling Compound

The interstices of the cable core (i.e. the crevices/gaps around the insulated conductors) shall be completely filled with compound to prevent water penetration within the cable core. The filling compound shall comply with BS 3573. The requirements of section 10.2 of this standard shall be met.

6.4 Core Binder

The laid up units shall be bound by a core binder which shall be one of the following:

- One or more wrappings of fully impregnated paper and/or one or more wrappings of non-hygroscopic plastic tape.
- An extruded layer of non-hygroscopic material.

6.5 Moisture Barrier

6.5.1

The completed cable core shall be enclosed in a continuous aluminium/polymer laminate tape. The laminate tape shall be applied longitudinally with a minimum overlap of 5.0 mm or 20 % of the moisture barrier circumference, whichever is the smaller, at the longitudinal seam.

6.5.2

The aluminium tape shall have a nominal thickness of 145 µm. The tape shall have a polymer coating with a minimum thickness of 40 µm on the outside only.

6.6 Sheath

6.6.1

The complete cable core shall be enclosed in a sheath extruded from a Type 03C polyethylene compound, as defined in BS 6234, in such a manner that the sheath bonds to the polymer film of the moisture barrier.

6.6.2

The manufacturer may include up to two ripcords to aid the removal of the sheath. Where two ripcords are provided, they shall be diametrically opposite.

6.6.3

The sheath material shall be subjected to and shall pass the relevant tests specified in BS 6234.

6.6.4

The sheath shall have a minimum radial thickness of 1.60 mm at any point. At any cross-section, the ratio of the minimum sheath thickness divided by the maximum sheath thickness shall exceed 0.75.