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Electricity Specification 400F3

Issue 3 November 2021

Installation of Fibre Optic Cable(s) on Steel Tower 132kV Circuits (including Fibre Wrap Method)

Amendment Summary

ISSUE NO. DATE	DESCRIPTION	
Issue 3	New Template applied.	
November 2021	Prepared by:	D M Talbot
	Approved by:	Policy Approval Panel and signed on its behalf by Steve Cox, Engineering and Technical Director

Contents

1 Introduction

This Specification comprises general and technical requirements for the installation of fibre optic cable on appropriate 132kV circuits on lattice steel towers and masts owned by Electricity North West Limited (Electricity North West), as Distribution Licensee. A schedule of 132kV circuits is included in Appendix A.

2 Scope

This Specification covers the requirements for the attachment of fibre optic cables on either the earth wire or lower phase wire on certain 132kV circuits and, fittings, splice points, conduit and joint enclosures attached to transmission lattice steel towers.

3 Definitions

Approval	Sanction by the Electricity North West Overhead Line Circuits Manager that specified criteria have been satisfied
Contract	The agreement between Electricity North West and the Contractor for the execution of the Works including therein all documents to which reference may properly be made in order to ascertain the rights and obligations of the parties under the said agreement.
Contractor	The person or person's firm or company, including personal representatives, successors and permitted assigns, who's Tender has been accepted by Electricity North West.
Project Manager	The telecommunications person nominated to complete the 21CN project which will move 132kV protection facilities based on BT pilot/cabling to private fibre optic circuits before 2010. Upon completion of that project, the person who requires fibre-optic wrap in the future.
Specification	The Specifications and schedules (if any) agreed by the parties for the purpose of the Contract.
Sub-Contractor	Any person (other than the Contractor) named in the Contract for any part of the Works or any person to whom any part of the Contract has been sub-let with the consent in writing of the Electricity North West Overhead Line Circuits Manager, and the legal representatives, successors and assigns of such person.
Supplier	Any person or person's firm or company who supplies goods to Electricity North West or to its Contractor.
Tender	An offer in writing to execute work or supply goods at a fixed price.

4 General Requirements for Approvals and Testing

4.1 Product not to be Changed

No change in the product, packaging or labelling shall be made after Approval has been granted without prior notice to the Electricity North West Overhead Line Circuits Manager, and receipt of a written agreement to the proposed change from the Electricity North West Overhead Line Circuits Manager.

4.2 Electricity North West Technical Approval

The Tenderer shall submit, with this Tender, proposals for testing which will demonstrate, to the satisfaction of the Electricity North West Overhead Line Circuits Manager, compliance with this Specification. Such tests shall be carried out without expense to Electricity North West.

Alternatively, technical reports and other data may be submitted that the Tenderer considers will demonstrate, to the satisfaction of the Electricity North West Overhead Line Circuits Manager, compliance with this Specification. Acceptance of this evidence shall be at the discretion of the Electricity North West Overhead Line Circuits Manager but will not be unreasonably withheld.

Approval shall be 'factory specific' and is not transferable to another factory without the written Approval of the Electricity North West Overhead Line Circuits Manager.

The Supplier and product shall comply with all the relevant requirements of Electricity North West documents EPD311 and CP311.

4.3 Quality Assurance

The Tenderer shall confirm whether or not Approval is held in accordance with a quality assurance scheme accredited under ISO 9000. If not, the Tenderer shall submit a statement of the quality assurance procedures employed to control the quality of the product, including the performance of Suppliers and Sub-Contractors.

The right is reserved for the repeat of such tests, from time to time, that the Electricity North West Overhead Line Circuits Manager may deem to be reasonably necessary to demonstrate continued compliance with the Specification.

The Tenderer shall submit, with the Tender, a list of tests and inspections which are carried out on the product prior to despatch which shall demonstrate, to the satisfaction of the Electricity North West Overhead Line Circuits Manager, fitness for installation and service.

The Tenderer shall provide free of charge to Electricity North West such samples as may, in the opinion of the Electricity North West Overhead Line Circuits Manager, be reasonably required for inspection and/or retention as quality control samples. The Electricity North West Overhead Line Circuits Manager will confirm the requirement for samples at the time of Tendering.

The right is reserved for inspections to be made of Tenderer's facilities, from time to time, as deemed reasonably necessary by the Electricity North West Overhead Line Circuits Manager to ensure compliance with this Specification and any Contract of which it forms a part.

The Tenderer shall submit, with the Tender, such details of product packaging disposal, as will enable Electricity North West to comply with the requirements of BS EN ISO 14001 - Environmental Management Systems.

4.4 Formulation

The Tenderer shall submit, with the Tender, such details of the formulation and use of the product and associated substances as will enable Electricity North West to comply with the obligations of the Health and Safety at Work Act 1974 and the Control of Substances Hazardous to Health Regulations 2002, in the use, storage and disposal of the product. The Tenderer may stipulate, prior to submission of such information, that it is to remain confidential, and the Electricity North West Overhead Line Circuits Manager will, if requested, confirm agreement to this prior to receipt of the information.

4.5 Identification Markings

The Tenderer shall submit, with the Tender, details of markings which it is proposed to apply to the product or packaging to identify manufacturing batches or items. The forms and content of such markings shall be subject to the Approval of the Electricity North West Overhead Line Circuits Manager and shall in all cases include the Electricity North West approved description and commodity code number.

The Tenderer shall submit, with the Tender, such details of marking gross weight on components, assemblies and packages, as will enable Electricity North West to comply with the Health and Safety Manual Handling Operation Regulations 1992, for components, assemblies and packages supplied with a gross weight over 1kg. The forms and content of such markings shall be subject to the Approval of the Electricity North West Overhead Line Circuits Manager.

4.6 Minimum Life Expectancy

The minimum life expectancy of all products covered by this Specification is 25 years.

4.7 Product Conformity

Preference will be given to those Suppliers who can provide suitable product conformity certification to a recognised or specified standard, or an equivalent certification.

4.8 Confirmation of Conformance

The Tenderer shall complete the conformance declaration sheets in Appendix D. Failure to complete these declaration sheets may result in an unacceptable bid.

5 Requirements for Type and Routine Testing

The Electricity North West Overhead Line Circuits Manager shall set out the requirement of the following tests to be carried out by the Supplier at the Supplier's cost.

5.1 Requirement for Type Tests at Suppliers Premises

These are a series of one-off type tests, which are carried out to ensure the satisfactory performance of the product design, under extremes of operating stresses, and of endurance, as may be appropriate, to be determined by the Electricity North West Overhead Line Circuits Manager.

These may or may not be destructive tests.

5.2 Requirement for Routine Tests at the Supplier's Premises

These tests may be required to be carried out on every individual unit or component, as specified, or at some regular frequency to be determined by the Electricity North West Overhead Line Circuits Manager.

The results of these tests may be required to be supplied to Electricity North West with each unit purchased or retained for inspection, at a period to be determined by the Electricity North West Overhead Line Circuits Manager.

6 System Requirements

Work activities shall be undertaken in line with the Asset Service Agreement (ASA).

6.1 Description

The installation system shall provide fibre optic cable on the existing earth conductor or lower phase conductor on the specified lattice tower 132kV circuit. The Linesmen shall climb or descend on the appropriate climbing leg for the dead circuit on the lattice tower, from ground level to as close as is reasonably practicable to the top of the tower. The linesmen shall use fall-arrest attachments at all times, whilst on the tower. Consideration shall be made to ensure third party interference cannot occur whilst work is in progress. (Refer to Distribution Safety Rules)

The Construction, Design and Management Regulations 2007 and the associated Approved Code of Practice shall be complied with.

The climbing equipment, harnesses, rope and jib shall match the requirements of the Rapid Rail fixed tower system or tower step bolts where no fixed tower system is installed. The requirements of Code of Practice 308 shall be complied with.

The climbing equipment shall match the requirements of Electricity Specification 400H3 or conform to the BS EN standards mentioned in this document.

The team working on the lattice tower shall possess a tower rescue kit that matches the requirements of Electricity Specification 400R1 or conforms to the BS EN standards mentioned in this document. The team working on site shall have recently attended a tower rescue course, approved by Electricity North West Limited.

The Contractor/Sub-Contractor shall be responsible for the pre-use inspection and the quarterly formal inspection of the climbing equipment and tower rescue equipment. Copies of records shall be made available to Electricity North West or its Contractors.

6.2 Materials

The cable to be used shall be 48 fibres Optical Attached Cable (OPAC) type fibre optic cable. The line splice facilities used, splice points, associated canister and tower mounted splice shall have the Approval of the Project Manager.

The installation equipment will comprise the spinning equipment, cassette, drum and associated counter balance. The tug and spinning equipment shall have two retaining clips to ensure that the equipment cannot come free of the earthwire or phase conductor.

The inspection requirements for the installation equipment under The Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) shall be the responsibility of the Contractor/installation Sub-Contractor. Records shall be made available to Electricity North West, or its Contractor on request.

The Contractor/Sub-Contractor shall be responsible for the pre-use inspection of the installation equipment.

The Contractor/Sub-Contractor shall be responsible for the provision of the earthing (grounding) cables on any item involved in the work before work commences.

The Contractor/Sub-Contractor shall be responsible for the provision of the barriers around the tower legs to control access arrangements at the spin tower, transitional towers and finishing tower.

The Contractor/Sub-Contractor shall be responsible for the control of access to the control access areas.

A method of gaining access up to and through the anti-climbing guard using fall-arrest protection shall be included as part of work activities. Details shall be included in appropriate Method Statements.

The contactor/Sub-Contractor shall be responsible for the operation/ control of the installation equipment during the wrapping activity. The speed and tension applied shall be agreed prior to commencement of the work. The combined weight of the tug, spinning machine (complete with fibre optic cable) and recovery tug and ancillary machinery shall not exceed the maximum loads related to conductor temperature. Electricity North West require design calculations and clearance calculations to any live conductor to be provided.

The consent of the appropriate DSMC control engineer will be required for the commencement of each day's activities

Operational activities including safety documents shall be the responsibility of the nominated Electricity North West Senior Authorised Person.

6.3 Technical Details – Installation of Fibre Optic Cable and Components

The fibre optic cable (OPAC) used for this project shall comply with BS EN 60794:4 2003 and BS EN 60794:3:2002. Fusion splicing techniques shall be used.

The fibre optic cable shall have its lightning protection confirmed by the method defined in IEC 60794 – 1-2 Method H2.

The fibre optic cable shall have its shotgun protection confirmed by the method defined in IEC 60794 – 1-2. Method E13B

The fibre optic cable and associated items shall have its susceptibility to external electro-magnetic coupling confirmed by BS EN 61300 – 2-39:1997

Any system that employs the use of dissimilar metals shall incorporate measures to reduce the effects of electrolytic reaction to acceptable levels. Method of protection against electrolytic reaction shall be stated by the Supplier. To validate the statement, test results that show the effectiveness of these measures shall be available for inspection by Electricity North West.

Contactor/Sub-Contractor shall ensure that the batch details, number of fibres of the installed fibre optic cable are recorded for each span. Upon completion of each circuit, the route plan detailing batch numbers, number of fibres, date installed, and date tested shall be provided to Electricity North West and its Contractor.

The pulling force of the tug shall not be greater than 50% of the ultimate tensile strength (UTS) of the optic cable.

Under no circumstances shall the maximum tension in the earthwire or lower phase conductor exceed 45% of its weight. The speed of the tug shall be the normal walking speed of the person holding the remote control, with regard to the location, terrain and environment. A system to deal with tug failure mid span and recovery of equipment shall be provided.

The conduit, canister, J pipe and fittings shall be installed on the inside of the lattice tower steel work. The standard tower identification plates, line colours etc shall not be obstructed by any equipment installed during this activity.

The splice canister shall include a galvanised steel protection hood inside which will be the splice box with the necessary internal splice enclosure to house the fusion splices and racetrack to accommodate the underground cable coming onto the lattice work tower. The splice box shall provide sufficient ways to match the requirements of Electricity North West.

The splice canister shall be positioned 1 metre above the gate of the anti-climbing device on the climbing leg of the isolated circuit. It shall be on the inside face of the lattice frame steelwork

The cable(s) running up from ground level shall not provide an access route thorough the anti climbing guard with adequate metal protection to prevent third party interference.

The canister shall be earthed by firm attachment to the lattice steel framework of the tower to ensure that faults on the 132kV circuit do not cause failure of the fibre optic equipment on the lattice frame steel work or the associated overhead fibre optic cable. The fibre optic cable is non-conductive (all dielectric).

6.4 Health and Safety Requirements

Risks shall be reduced by planning and doing the work in accordance with Electricity North West best practice as detailed in the following documents.

- Operational Codes of Practice (600 series), e.g. CP614 for list of authorisations.
- The Distribution Safe Working Practices Manual.
- The Code of Practice or Specification for the task, e.g. CP420 for overhead line work.
- Health and Safety at Work Act etc 1974
- The Electricity at Work Regulations 1989
- The Provision and Use of Work Equipment Regulations 1998.
- Health and Safety Manual Handling Operation Regulations 1992
- Construction, Design and Management Regulations 2007

- Lifting Operations and Lifting Equipment Regulation 1998
- The Electricity Safety, Quality and Continuity Regulations 2002.
- Distribution Safety Rules.
- IEC Technical Report 62263
- Overhead Line exceeding 45kV National Normative Aspects (NNA) for the United Kingdom and Northern Ireland Based on EN 50341:2000

6.5 Operational Requirements

6.5.1 General

The activities on the 132kV lattice tower circuits shall be undertaken in line with the Distribution Safety Rules. The necessary outage for the work shall be agreed with Outage Planning the month before the intended work commences.

A draft programme of each year's activity shall be prepared.

Installation of the fibre optic cable on a phase conductor shall be carried out with that circuit dead.

The training, assessment and authorisation procedure shall follow the requirements of Code of Practice 614. The linesmen shall be fully authorised being able to receive safety documents and apply/remove circuit main earths etc. The Contractor/Sub-Contractor shall be responsible for the costs of this activity.

Where practicable, the tug and spinner shall be raised and lowered separately within the tower body with the ropes, jibs etc also within the tower body. The separate tug and spinner only being taken outside the lattice tower either at the lower phase cross arm position or as near as possible to just below the earth wire. At these positions the equipment and materials should be threaded thorough the steel work and installed on either the earthwire or lower phase conductor using a lifting jib.

6.5.2 Access

The safe access requirements shall be as stated in Safety Rule 5.10.1. This means that all persons gaining access to and during work on towers, poles and high structures **Shall** make proper use of **Approved** safety equipment and **Shall** be in visual range of another person. All persons concerned **Shall** be fully conversant with **Approved** rescue procedures. Ladders shall be of an **Approved** type. **Safety Notices**, barriers and screen shall be fixed or moved only under the **Personal Supervision** of a Electricity North West **Authorised Person**.

6.5.3 One Circuit Live

Work requirements for Lattice Tower 132kV with one circuit live on double circuit line shall be as stated in Safety Rule 5.12.3

A Permit to Work shall be issued and the following done:

- Before commencing work and during the course of the work, the **Senior Authorised Person** in charge **Shall** at the point of work take steps to avoid **Danger** from steelwork being Live.

- A green flag **Shall** be affixed near ground level on the **Dead** circuit side of the pole or tower. Similarly, a Red Flag **Shall** be affixed on the **Live** circuit side. The position of the flag/notices shall be agreed with the **Senior Authorised Person**. Refer to Appendix C.

- The **Conductors Shall** remain **Earthed** and safety procedures agreed with the **Senior Authorised Person** shall remain in position until all other working members have descended the tower when the nominated **Competent Person** can then remove them.

6.5.4 Work on Upper Portion

Work requirements for work on the upper portions of 132kV lattice towers carrying live conductors shall be as stated in Safety Rule 5.10.6.

- When work is to be carried out on towers with all **Conductors Live**, above the position specified in Rule 5.10.5.2, (marker plate) the zone of work and/or route for climbing **Shall** be defined by a **Senior Authorised Person** and a **Limitation-of-Access Shall** be issued and the **Control Engineer** notified.

- Where reasonably practicable, work **Shall** be carried out from within the body of the tower where the design of the tower permits. Work and climbing on the outside faces of a tower **Shall** be in accordance with an **Approved** procedure. No part of a **Person's** body or tool that is being carried or used **Shall** at any time encroach the **Safety Distance** surrounding a **Live Conductor.**

The Approved Procedure No 30 provides safe to climb clearance of 2.5m based upon body depth of 0.8m, Safety Distance of 1.4m (132kV) and the application factor of 0.3m. The use of Basic Safety Clearance will not be permitted by Electricity North West.

Access outside the upper bodies of towers is subject to the movement of insulators and Conductors due to wind.

Where the design of the particular towers permits the access conditions may be waived to the following extent.

The access onto the outer faces parallel to the Conductor is permitted subject to Working and Access Clearances. It is necessary for consideration to be given to the movement of the insulators and conductors due to wind.

The Senior Authorised person shall specify the positions at which red pennants must be fixed to define the limits of access. It shall be positioned at the junction of the cross arms and the tower body. The person doing this shall be under the personal supervision of the document recipient or another Component Person who forms part of the working party from ground level. The green flag shall be affixed near ground level on the dead circuit side of the tower under the immediate supervision of the Senior Authorised Person.

The requirements of IEC Technical Report 62263 shall be applied. Refer to Appendix B.

6.6 Consents

Installing the fibre optic cable requires access to every tower for men and equipment. It is therefore important that land owners are informed if access to their land is required. Obtaining initial consent shall be arranged by the Senior Estates and Wayleaves Officer, Estates and Wayleaves. The prior-to-work discussions shall be dealt with by the Contractor/Sub-Contractor.

The Contractor/Sub-Contractor shall be responsible for the cost of the repairs or compensation to any landowner who suffers damage to his/her property due to the activities of the Contractor/Sub-Contractor. Formal negotiations shall be carried out by the UU Estates and Wayleave Officer together with the appropriate person from the Contractor/Sub-Contractor.

6.7 Life Expectancy

As a whole, the installed fibre optic system shall be given a life expectancy of at least 25 years.

6.8 Company Method Statement

The written method statement will be dependent on the tower type, conductor sizes and line clearances on each particular fibre optic cable wrap project. The method statement shall meet the requirements of Distribution Safety Rules, IEC Technical Report 62263, appropriate BS Standards and the Contractor/Sub-Contractor's internal procedures and manuals.

The Sub-Contractor can be involved in the preparation of the written Method Statement, but the statement shall be assessed /submitted by the nominated Senior Authorised Person for each 132kV circuit involved.

The method statement shall be agreed by the person mentioned in Approved Procedure No 17 of the Distribution Safety Rules.

A draft method statement is provided in Appendix C.

7 Work Planning

7.1 Site Risk Assessment and Job Planning Informal Meeting

Before work begins, the project supervisor shall travel the work site from puller site to tensioner site. This is to ensure that all potential contact points with existing energized equipment or conductors are identified and adequately protected from contact with the optical fibre cable being installed. Protection shall be achieved by clearance, by insulating covers, and meeting the relevant requirements of the Highways Authority, Canal or River Authorities or Network Rail.

Also, the condition of the existing conductor shall be visually checked to ensure that there is no damage. Obstructions such as splices, aircraft warning spheres etc. shall be noted and allowed for.

The agreed method Statement shall be discussed with the working party by the nominated Senior Authorised person in the presence of the Contractor /sub-Contractor's Field Engineer. The items in Appendix B shall be discussed.

The document holder shall be issued with the appropriate safety document and appropriate wristlets etc.

The names of the persons attending the meeting shall be recorded by the Senior Authorised Engineer or nominated person provided by the Contractor/ sub-Contractor.

If the scope of the job changes, or if job personnel change, the work procedures and duties shall be explained once again to all personnel affected.

7.2 Audits

The work shall be undertaken to match the requirements of IEC Technical Report 62263, "Live Working - Guidelines for the Installation and Maintenance of Optical Cabling -: Overhead Power Supply Lines". The agreed method statement shall be followed at all times. Audits shall be carried out by the Contractor/sub-Contractor's Field Engineer on a daily basis in accordance with their procedure. Independent audits shall also be carried out by nominated Electricity North West staff (Senior Authorised Person and Electricity North West audit team)

7.3 Emergency Plans

If the tug/spinner stops along the span or there are any signs of possible clashing with a tower or another conductor or if these conditions occur, then the Contractor/Sub-Contractor shall have available an emergency plan which will include the following:

- Stop tug immediately
- All persons shall be withdrawn immediately to a distance greater than 2.5 m from exposed conductors and not climb any lattice work towers until the risks have been assessed by the nominated person, selected by the Contractor/Sub-Contractor.
- The immediate area below the equipment shall be barriered off to prevent access
- The System Control Engineer shall be informed immediately
- The Senior Authorised Person shall be informed
- The Contractor/Sub-Contractor shall demonstrate that he has prepared a method of retrieval of the equipment if a failure of the wrapping machine occurs.

7.4 Record Keeping

The Contractor/Sub-Contractor shall provide As Made Cassette/Reel Plan, Route Schematic, Fibre optic Reports-Post installation and Handover Completion Certificate. The accuracy of the Programme of Works shall be maintained because of the clear outage requirements.

8 Method of Work

8.1 Statement of Installation under Live Conditions

The Contractor/Sub-Contractor shall provide Electricity North West with a detailed method statement for installation of the system on towers under live-line conditions. The method statement has to consider the safety distance, application factor and body depth referred to in 6.5. If there are any indications that working under live conditions will lead to access clearance problems and clashing between the installation equipment and adjacent phase conductors, then the proposal will not be acceptable to Electricity North West.

8.2 Statement for Installation under Dead Conditions

The Contractor/Sub-Contractor shall provide Electricity North West with a detailed method for this activity. The requirements of the Distribution Safety Rules and items mentioned in 6.5.4 shall be complied with.

8.3 Statement for Installation under One Side Dead Conditions

The Contractor/Sub-Contractor shall provide Electricity North West with a detailed method for this activity. The requirements of the Distribution Safety Rules and items mentioned in this document shall be complied with.

8.4 Working Clearances and Tower Design

Most towers will require an outage but special consideration shall be given for work on Heavy Angled Towers, Terminal Towers and Tee-Off Towers. The nominated Senior Authorised Person shall consider all aspects of the work and be on site at appropriate times.

The Distribution Safety Rules Approved Procedure No 30 provides a safe to climb distance of 2.5m. Code of Practice 420 part 2 Chapter 15 provides the logic behind the clearances between the working party and live conductors.

Safety Distances, Working and Access clearances will be based on the dimensions provided by the Distribution Safety Rules

National Normative Aspects for the United Kingdom and Northern Ireland Based on EN 50341:2001 provides information to be used to calculate the forces applied to the lattice tower when additional items are installed on conductors etc. It provides guidance on clearances to be achieved between phase, earth conductor and tower steel work. These calculations shall be done by the Contractor/sub-Contractor to ensure safety.

Calculations of clearances on each tower and clash risk mid span shall be undertaken by the Contractor/Sub-Contractor prior to preparing their method statement. These calculations shall be assessed and confirmed by an independent person nominated by Electricity North West. The Method Statement shall be approved by the nominated person.

Towers shall be checked to ensure that they are capable of supporting the additional weight of the cable, equipment and line team required to install the fibre-optic wrap system. This check shall be undertaken by the Contractor/Sub-Contractor prior to preparing their method statement. The calculations shall be assessed and confirmed by an independent person nominated by Electricity North West. The Method Statement shall be approved by the nominated person

9 Training

Training in all aspects of use of the system shall be provided by the Supplier and included in the offer.

10 Documents Referenced

DOCUMENTS REFERENCED	
Health and Safety at Work Etc Act 1974.	
Control of Substances Hazardous to Health Regulations 2002.	
Manual Handling Operations Regulation 1992.	
The Electricity at Work Regulations 1989	
The Provision and Use of Work Equipment Regulations 1998	
Construction, Design and Management Regulations 2007	
ACOP Management of Health and Safety in Construction	
The Lifting Operations and Lifting Equipment Regulations 1998	
Distribution Safety Rules	
BS EN ISO 9000:	Quality management systems.
BS EN ISO 14001:2004	Environmental Management Systems
BS EN 60794:4:2003	Optic fibre cables Sectional Specification Aerial Optical Cable adjacent to Electrical Power Line.
BS EN 60794:3:2002	Optic fibre cables Part 3 Sectional Specification Outdoor Cable

BS EN 61663:1:2000	Lightning Protection Part 1 Fibre Optic installation.
BS EN 353-1	Personal protective equipment against falls from a height. Guided type fall-arresters including a rigid anchor line
BS EN 353-2	Personal protective equipment against falls from a height. Guided type fall arresters including a flexible anchor line
ENATS 43-2	Design of Steel Tower Overhead Transmission Lines at 132kV and Higher Voltages.
ENATS 43-8 Issue 3, 2004	Overhead Line Clearances
CP308	Working at Heights
CP311	Equipment Approval Policy and Process
CP420-2	Steel Towers, Chapter 15
CP430-2	Linesmen's Manual - Towers
CP614	Authorisation
ES400H3	Safety Harness for Work on High Structures

11 Keywords

Safety; Tower.

Appendix A – Schedule of Circuits for Fibre Optic (OPAC Type) Cable-Fibre Wrap Installation System

If the OPGW projects in the XD4 and XD5 schemes do not meet the intended programme, fibre wrap may be used on extra circuit. This decision shall match the requirements of clause 8.4

This list is dynamic and may not reflect the whole routes planned

CIRCUIT NAME	CIRCUIT REF	TOWER NO	NO. OF	TYPE
Stalybridge-Stuart St GT1- Hyde GT1check L3	DK	DK1 - DK21	20	PL16 (ALL)
Stuart St - Droylesden	XQ	XQ 1 to XQ 43	43	L3 construction
Stalybridge - New Mills	AA	AA55 - AA1	57	PL16 (ALL)
Penwortham - Wrightington teed to Leyland	EF,E_2	EF1 - EF53B, E2102 - E2103	53, 2	L7(34), L4M, PL16(2)
Whitebirk - Lower Darwen	M,N,CP	M71 - M50, N50, CP14 - CP1 M Line Single Circuit L4 Tower type No M50 to M71	27,1,13	L4M, PL16(8)
Natland to Ulverston) Circuit go into Sellafield Natland - V9 tower	V	V1 - V9	8	DDT 90 PL10
Natland - Lancaster Grid 3 (BR involved)	AM F2	AM & F2 Line	83	4PL7, 1PL16,rest PL4
Limehurst - Stalybridge	K	K28 - K45R	21	S10 E20 PL1 Term PL16
New Mills - Stalybridge	AA	AA1 - AA55	55	D2 PL16 (ALL)
Sellafield 103 - Egremont - Penrith GT2A or Sellafield 603- Egremont - - Harker 803	AS	St Bees AS42 - AS35	8	D30 E10 PL16 (8)

Siddick G1 Sellafield 505 Harker 103	S	S174 - S183	9	D2 PL4 & PL8

(x) refers to number of PL16 tower type on circuit.

Appendix B – Extract from IEC Technical Report 62263

LIVE WORKING - GUIDELINES FOR THE INSTALLATION AND MAINTENANCE OF OPTICAL CABLING - OVERHEAD POWER SUPPLY LINES

General

It is especially important where the possibility of the optical fibre cable being installed can become energized through induction, or when working near existing energized conductors, that all members of the work crew understand the hazards involved. They should have the work procedures and their duties clearly explained immediately before work begins. They should be aware of the necessity of using the earthing and bonding systems described herein, and they should know how to install and use these earthing and bonding systems properly. The degree of earthing protection required for a given optical fibre cable installation project depends upon the exposure to electrical hazards which exist within the particular work area on the project.

When new optical fibre cable is installed in an area remote from other energized lines, or when adjacent lines on the same tower are de-energized, and with no thunderstorm activity present, the minimum earthing requirements, at least, shall be used. These minimum requirements include bonding and earthing of all equipment involved at pull and tension sites. In addition, running earths should be installed on all metallic pulling ropes, on the optical fibre cable, and on the existing earthwire (if it is to be used as a pulling rope), in front of the pulling and tensioning equipment. When minimum earthing requirements are used, it should be noted that protection of workers from step and touch potential does not exist.

In contrast to the above, for a project located in a congested area involving the exposure to numerous energized parallel lines, or when working adjacent to existing energized lines on the same transmission tower, or if the project calls for the crossing of existing energized lines, and if there is a high probability of thunderstorm activity and adverse weather conditions, then maximum earthing requirements shall be used.

Such maximum earthing requirements include bonding and earthing of equipment, the use of running earths, earth mats at work sites, and stringing block earths on each stringing block. These earths and mats shall be sized and designed for a fault current where direct contact with an energized line is possible.

Sizing of the individual earth clamps, earth cable, or earth rods are not detailed here, but some general guidelines can be found below.

In addition to making sure the appropriate switches on the line where the new optical fibre cable is being installed are open and disabled, earthing and other protective measures shall be employed to ensure reasonable and adequate protection to all personnel. The best safety precaution is to consider all equipment, and the optical fibre cable as if it could become energized at any time. The degree of protection provided for a specific project shall be a decision made by the project supervisor, subject only to the applicable regulations in force for that situation, and based on a clear understanding of the potential hazards

Work Sites shall be surrounded with fencing and warning signs prominently posted to alert onlookers to the danger. When working in populated areas where onlookers could inadvertently wander into work site areas, additional measures for isolating the work site, such as safety observers are required.

Where a puller, tensioner and other associated equipment are required for the fibre optic cable installation, a fenced equipotential zone or earth mat should be created to provide electrical protection to the personnel operating the equipment.

A running earth should be used adjacent to both the tensioner and the puller to guard against the effects of induced voltages in the earthwire or cable, during the installation process.

It is recommended that the integrity of the earth bonding between the tower peak and the earthwire be verified before commencing work.

Where earth rods are used, the resistance of the earth rods shall be electrically tested (meggered) to ensure the resistance of the earth rod is less than 25Ω.

NOTE It is important to check that the protection on any energized line, which could contact the fibre optic cable being installed, is designed to clear the fault current if the impedance of the earth rod is as high as 25Ω.

If an earth rod resistance of less than 25Ω cannot be obtained, an earth mat at the work site shall be used if the work site is at ground level, or an equipotential earthing system used in elevated work sites.

In order to ensure that the different earth rods at each work site have the same potential, they shall be bonded together with full sized earth clamps and earth cables.

When installing earth rods, caution should be taken to avoid all underground utilities such as existing energized underground electric lines, gas, sewer, and water pipes, communications cables, etc. A check of underground utility services in the area may be needed before earth rods are installed.

Choosing the Size of Earths, Earth Cables and Bonds

The size of earth cables and clamps for bonding and earthing shall be adequate for the maximum steady-state induced currents as well as the largest fault currents to which they are likely to be exposed.

The three categories of possible current exposure are as follow:

- lightning current;
- fault current;
- induced current.

Where a fault current is a possibility, the earthing equipment shall carry this current long enough to allow the line protection system to operate. After the earthing equipment has carried a fault current, all components of the earthing system so exposed shall be immediately replaced.

All components of the earthing system shall be sized to carry a current of 20,000A symmetrical for 20 cycles and still continue to pass the steady-state current induced without interruption. This will protect against most instances of the above possibilities of current exposure. However, the possibility of a larger fault current occurring deserves special consideration.

When the possibility exists of the optical fibre cable coming into contact with an existing live conductor, during the new cable installation process, the earthing system shall be capable of carrying the maximum expected phase-to-earth or phase-to-phase fault current which the live circuit may deliver.

Such possibilities of contact occur when the new cable passes over an existing transmission or distribution line, and it is not feasible to de-energize the existing line, or where blowout of the cable could cause live conductor contact.

NOTE In cases of severe or maximum induction, the above current-carrying capability may not be adequate, and the magnitude of the induced current should be determined by measurement or calculation and appropriately sized earthing and bonding cables selected.

Engineering considerations of Optic Fibre Cables

Helical fittings with a reinforcing layer are preferred for maximum optical and mechanical protection of the optical cable. They will ensure that mechanical loads are evenly spread and the cables are not crushed, thereby affecting the optical performance.

Splice closures should be resistant to damage, and are located where possible, out of public reach.

Minimum bend radii, as specified by the optical fibre cable manufacturer, should be observed during all installation processes in order to preserve the integrity of the optical fibres. This will dictate the minimum diameters of tensioner bullwheels, stringing blocks, sagging/tensioning devices, or clamps which are to be used.

The optical fibre cable manufacturer may require that the stringing blocks have an elastomer lined sheave. In this case, a stringing block ground will be necessary to provide the required earthing path

To ensure maximum reliability and avoid cable damage, it is important to ensure that all fittings chosen are compatible with the optical cable system selected.

The optical fibre cable should be installed smoothly with no sudden changes. Maximum stringing speed recommended by the Cable Manufacturer should be followed. If the Cable Manufacturer does not specify a maximum stringing speed, a conservative value is 40 metres per minute.

The tension on the optical fibre cable during stringing should be measured at the tensioner and should not exceed the manufacturer's maximum tension recommendations which are normally 15% of the ultimate tensile strength of the cable. Some Utility Specifications require that a strip chart recorder be incorporated into the Tensioner such that a printed or electronic record of actual tension on the cable is provided.

The optical fibre cable should be allowed to initially settle after pulling into place and before clamping in. However, this should not exceed 24 hours. Typically Cable Manufacturers require a minimum time for this to be done.

The continuity of all fibres for each reel of optical fibre cable should be checked when the reel arrives at the work site, and before it is installed on the structures. After completion of this test, the cable ends should be re-sealed against water entry.

Continuity should also be checked after the optical fibre cable has been installed on the transmission line to ensure continuity remains.

Continuity should be checked once again after any splices are made.

It is also recommended that the cable be checked for attenuation loss when the repeater section has been completed.

Safety Issues

Choosing the Correct Equipment

For the cable installation process it is important to choose equipment with sufficient capacity to perform the work to be done. This should ensure a margin of safety beyond the actual requirements of the work.

Pre-work Check of Equipment

When installing new optic fibre cable near existing energized circuits where electrical contact or induction may occur, it is especially important that the equipment used such as pullers, tensioners, and tugs be thoroughly checked beforehand by competent trained persons to ensure they are functioning properly. In particular, braking systems should be checked to ensure correct operation and maximum load holding capability.

The puller and the tensioner should have controls which will allow the operator to preset the maximum linepull or tension which will not be exceeded. This will prevent overstressing of the fibre optic cable as it is being installed.

Pulling ropes should be examined for possible damage that may severely reduce their strength. It is recommended that a sample of synthetic ropes used as pulling or pilot ropes be tested for ultimate strength at least once each year. Weak or damaged ropes should be replaced.

Where synthetic ropes are used as pulling or pilot ropes, they should not be considered as insulating. They may initially present a high resistance electrical path, but experience has shown that over time and with use, the surface of the synthetic rope becomes sufficiently contaminated to be conductive, particularly in wet conditions.

It is also important to choose a pulling rope which has low elasticity or stretch when under load. The rope should also match the weight per meter of the fibre optic cable or be even lighter so the rope will not sag lower than the fibre optic cable thus ensuring electrical clearance is maintained.

Where an existing earthwire is to be replaced with an optical fibre cable, often the existing earthwire is used as a pulling rope to pull in the new optical fibre cable. Since the mechanical strength of the existing earthwire, and particularly the compression joints, may be very questionable, this procedure should require extra caution. It is highly recommended that the existing earthwire be examined beforehand to determine if wire breakage, or other deterioration has occurred. If such significant damage is detected, the existing earthwire should not be used as a pulling rope.

If the existing earthwire is used as a pulling rope, passing old earthwire joints or splices around the bullwheels of a double bullwheel, multi groove puller, where they are bent and then straightened as the joints on the existing earthwire pass from groove to groove on the bullwheels, can cause sudden failure of the joints. The existing earthwire and the fibre optic cable may drop causing damage to the cable or the line structures, and may cause dangerous electrical contact.

A preferred procedure is to cut out the compression joint when it arrives in front of the puller, and to fit a woven wire grip on both ends of the severed earthwire. This grip is passed through the puller bullwheels, and

can be removed before the earthwire is wound on the reel winder. Also this problem can be eliminated without cutting out the compression joint by the use of a single V-groove bullwheel puller.

Running earths, earth cables, earth clamps, and stringing block earths should be checked to ensure they are operating correctly and have no broken or damaged parts that would negatively affect the desired low resistance earth path.

Pre-work Conference

It is especially important where the possibility of the optical fibre cable being installed can become energized through induction, or when working near existing energized conductors, that all members of the work crew understand the hazards involved. They should have the work procedures and their duties clearly explained immediately before work begins. They should be aware of the necessity of using the earthing and bonding systems described herein, and they should know how to install and use these earthing and bonding systems properly.

If the scope of the job changes, or if job personnel changes, work procedures and duties shall be explained once again to all personnel affected.

Before work begins, the project supervisor should travel the work site from puller site to tensioner site. This is done to ensure that all potential contact points with existing energized equipment or conductors are adequately protected from contact with the optical fibre cable being installed by clearance, by insulating covers, or rider poles and nets.

Trained Operators

The specialized equipment used in the stringing of optical fibre cable requires that operators be given special training beforehand in its safe and proper use. This is particularly important when they will be working on projects where earthing procedures are required, due to the possibility of the cable or equipment becoming energized.

Communications

The ability of the equipment operators, supervisory personnel, and observers at critical points in the pull section (such as at energized line crossings), to communicate clearly and quickly with one another is extremely important when installing optical fibre cables.

These personnel shall each have a radio system with a channel that is free from outside interference, and is located at their operating position. Included in this communication channel should be the puller operator, the tensioner operator, the supervisor(s) and, if applicable, the person following the anti-twist running board as it moves from tower to tower, and persons at intermediate check points.

Failure of any radio in the system shall be cause for immediate stoppage of the pulling operation.

The radio or telecommunication system used by the puller operator and the tensioner operator shall be a portable set with earphones and microphone, but with no conductive wire connection from the operator to the machine, which could become a dangerous electrical path to the operator in case of electrical contact during stringing and if the operator were to leave the bonded area with his radio still attached to his person.

To ensure that there are no undetected problems due to machinery becoming jammed or ropes snagged, it is recommended that observers are placed at regular intervals along the section so that they have a continuous view of the work being conducted.

Other Safety Requirements

The minimum safety clearance as, specified in the applicable local Safety Rules are to be maintained at all times. This is often most critical at angle/terminal towers.

Throughout the installation process, if the minimum optical fibre bending radius can be maintained, ropes and cables at the puller and tensioner ends of the pull section should be routed through the body of the tower from the tower peak to the tensioner or puller at ground level. Equipment shall be hauled up the centre of the tower, or on a face perpendicular to the earthwire, or by helicopter, particularly when both circuits are live. Control of ropes and equipment is critical in the vicinity of any live circuit. Where one circuit can be de-energized on a double circuit tower, all work is restricted to the de-energised side of all towers.

All towers, components and equipment must be protected from overloading by appropriate methods of working. The method of working should ensure that, in the case of a component failure, the necessary restraint is provided to prevent the optical fibre cable moving towards a live circuit.

Emergency procedures must be in place in case of unforeseen events which could result in minimum safety clearance being infringed or personnel being endangered in any other way.

Work should proceed only if weather conditions permit. Wind, humidity, lightning storms and visibility are all important considerations in this regard.

During interruption of the work period, the optical fibre cable section should be secured in a safe and appropriate manner.

It is recommended that water-blocked and sheathed ropes are used when working near live circuits in order to avoid induced currents in wet ropes which can cause burning as they dry out. Where synthetic ropes are used as pulling or pilot ropes, they should not be considered as insulating. They may initially present a high resistance electrical path, but experience has shown that over time and with use, the surface of the synthetic rope becomes sufficiently contaminated to be conductive, particularly in wet conditions. When working on the installation of optical fibre cable which is close to a line carrying high electrical loads, or to an adjacent live circuit, care should be taken to accommodate by means of earthing and bonding the high electromagnetic and electrostatic-induced currents and voltage which can occur in the optical fibre cable.

In the case of live single or multiple circuit lines, work can be undertaken on OPAC and ADSS systems if sufficient electrical safety clearance to the live circuit is obtained. Work can be undertaken on OPGW systems with the circuit or circuits live if sufficient electrical clearances are achieved.

For single-circuit and multi circuit lines which are de-energised, all types of fibre optic cable may be installed and maintained as they would for dead circuit conditions depending on the positioning of the earthwire(s), but induction from adjacent live lines or live lines crossing the fibre optic circuit may still be an important consideration.

Work on live lines shall be conducted with the Delayed Auto Recloser (DAR) switched out, and it should be tagged with a note to indicate that the DAR is in fact switched out.

Work on lines which have either one or more circuits energized should only be undertaken where it is unreasonable for all circuits to be de-energized, for the time period essential for carrying out the work. The System Network Management Control should confirm that fact in writing, giving reasons if any network circuit outages would be available for a shorter period and under what conditions.

OPAC Cable

General

OPAC cable is a non metallic fibre optic cable lashed or attached to an existing earthwire or a phase conductor.

OPAC cable systems (see Figure 5) have been installed on existing earthwires and also on conductors at lower system voltages, where similar phase to earth optical arrangements to OPPC will be needed. The techniques to allow installation on earthwires without a power system outage have been available for some time and OPAC cable has been widely selected for post-fit applications.

Helical wrap OPAC cable is designed to be helically wrapped around the existing conductor or existing earthwire.

Lashed OPAC cable is designed to be placed longitudinally beside the host existing conductor or existing earthwire, and a tape or tapes are wrapped around the pair to hold the lashed fibre optic cable in place.

Preform attached cable is similar to the lashed cables except that the method of attachment involves the use of special preformed spiral attachment clips.

Engineering Considerations

Normally, helical wrapping or lashing is carried out on existing earthwires, but on system voltages below 150kV conductors of a de-energized circuit may be helically wrapped or lashed. The installation requires unrestricted travel of the tug and wrapping/lashing machine along the existing earthwire or conductor, since any loose strands could unravel and foul the tug or wrapping/lashing machine as they pass. Therefore, prior to installation, it is recommended that the existing earthwire or conductor is inspected and any damage, such as loose strands, are repaired, before installation commences. The normal recovery procedure cannot be used where a tug or wrapping machine is entangled with broken earthwire or conductor strands. In this situation, a single-circuit outage should be arranged if necessary and a crane used to effect the recovery.

Detailed design of the tug and wrapping/lashing machine should be to a high standard to ensure they cannot fall from the earthwire/conductor by using gates that fully close around the earthwire/conductor. Removable parts of the tug and wrapping/lashing machine, such as counter-balance weights and cable drums, should be secured to the main body of the machine using fixings with locking pins to provide a high degree of integrity.

To ensure that safety clearance is maintained, the equipment ropes should be carefully controlled during lifting to ensure that they cannot blow out into the conductors. This can be best achieved by lifting all the equipment inside the tower body if there is sufficient space. The other method of lifting is on the tower face perpendicular to the line. When using this method, control slings should be used to maintain the rope and equipment on the tower centre line.

When machinery is being moved around the tower peak, it should be tethered to the tower to prevent it from falling if mishandled.

The success of the wrapping/lashing technique is critically dependant on the installed tension of the fibre optic cable, since, once tension is lost, it cannot be restored and loose loops will form. Adequate tension is required to ensure that, under all environmental conditions, the wrapped/lashed cable remains tight to the existing earthwire or conductor. The wrapping/lashing of the cable around the earthwire or conductor is to be undertaken in a controlled manner at constant tension, speed, and lay length, to avoid loops forming at a later stage. The tug and wrapping/lashing machine design should ensure that, while it is stationary, the cable or lashing tension can be maintained for a prolonged period.

Installation Procedures

OPAC cables are cost effective when they are installed onto an existing earthwire or conductor which is judged to have sufficient remaining servicable life. No heavy equipment or vehicles are needed, installation is quick and requires no earthing protection. OPAC cables are especially suited to existing lines where induced voltage gradients prevent the installation of self-supporting aerial cables such as OPGW. OPAC cables may be the only viable solution where ground clearances or tower loading prevent the use of ADSS cables and difficult terrain or limited access may prevent the use of alternative systems.

OPAC cable is installed on an earthwire or a de-energized conductor with specially developed machinery normally provided by the cable Supplier and matched to the cable to be installed. With an installation on the earthwire, the circuits can remain live, depending on local working regulations. Obviously, installation onto conductors is not feasible for a double-circuit line with both circuits energised. Nor can OPAC cables be wrapped or lashed onto bundled conductors. The installation machinery consists of a counter-balanced wrapping/lashing machine pulled by a radio-controlled motorised tug, or pulled manually from the ground for lower OPAC cables. Machines have also been developed to remove wrapped cable and it is recommended that these be considered as an integral part of the wrapping system.

Warning devices, such as aircraft warning spheres and bird flight diverters, and vibration dampers etc. should be removed immediately prior to installation of the OPAC cable. At the designated start point (known as a spinning tower) the tower is rigged to raise the installation machinery to the appropriate position on the tower. The first items to be raised and placed onto the existing earthwire or conductor are the motorised tugs. OPAC wrapped cable is normally supplied on drums, wound back to back as a cassette, which ensures maximum distance between splices. However, in some circumstances, a single drum may be used. The cable drums are then installed on the wrapping machine, the whole assembly raised up the tower, transferred onto the existing earthwire or conductor and coupled to the tugs. When the wrapping/lashing machine and tug are positioned on the conductor or earthwire, safety locks which prevent the machines from leaving the conductor, are engaged. The optical fibre cable, which has been designed for earthwire or conductor installations, is secured around the tower and on both span ends before the wrapping/lashing installation starts. This is done at every tower by using a cable clamp and a mechanical bridging device around the tower. Similar devices are used to bridge conductor fittings such as vibration dampers. Wrapping or lashing then proceeds in either one or both directions from the tower.

From the spinning tower, one span is usually completed before starting the other which ensures that there will be no interaction between the radio control units of each tug. A helicopter can also be used to tow the machine in certain applications. The use of helicopters to move machines and people from structure to structure speeds up the installation significantly.

On completion of a span, it is essential to secure the optical cable to the conductor to prevent loss of tension during transfer of the machinery to the next span. Due to its weight, the machinery is transferred around the tower using a small jib and hand winch.

When the wrapping/lashing machine reaches a designated splice point or terminal tower, the remaining cable is unwound from the drum. The cable is then passed through a conduit which had previously been secured down the tower leg.

Safety Issues

The wrapping/lashing machinery should control the cable such that, should a failure occur, long loops of cable cannot form, possibly infringing the safety clearance. This is particularly relevant to cable removal machines.

Before an installation commences the condition of the existing earthwire or conductor and fittings should be assessed to ensure that they can safely take the load of the tug, and the wrapping/lashing machine, a full payload of cable and recovery equipment which will be used if a breakdown occurs. Adequate factors of safety should be allowed when considering the load on the earthwire or conductor.

The Approval process of a wrapping/lashing system should include a full risk analysis of the machinery and procedures to ensure that it is safe for use under live line conditions. There should be an appropriate emergency plan within the procedures which adequately describes the actions to be taken if, during installation, there is a danger of the safety clearance being infringed.

Motorised tugs should be equipped with an emergency stop facility to allow line crews to halt the tug at the span end if radio control is lost.

Major factors affecting safety include:

- the use of properly trained, competent staff, certified in installation procedures;
- adequate survey of conditions before work commences;
- the pre-planning of procedures to be adopted in the event of an emergency;
- the use of risk-analysis techniques to identify and minimise risk;
- minimising the risk of loss of control of cables or conductors;
- earthing practice to prevent dangerous induced current or voltages, or electrical contact;
- maintaining an adequate electrical safety clearance at all times;
- continuous monitoring of weather conditions;
- the use, where appropriate, of equipotential zones or earth mats;
- the use, where appropriate, of sheathed and water-blocked ropes;
- delayed auto-reclose facilities to be disabled during optical fibre cable installation.

Illustrations of Cable/Equipment

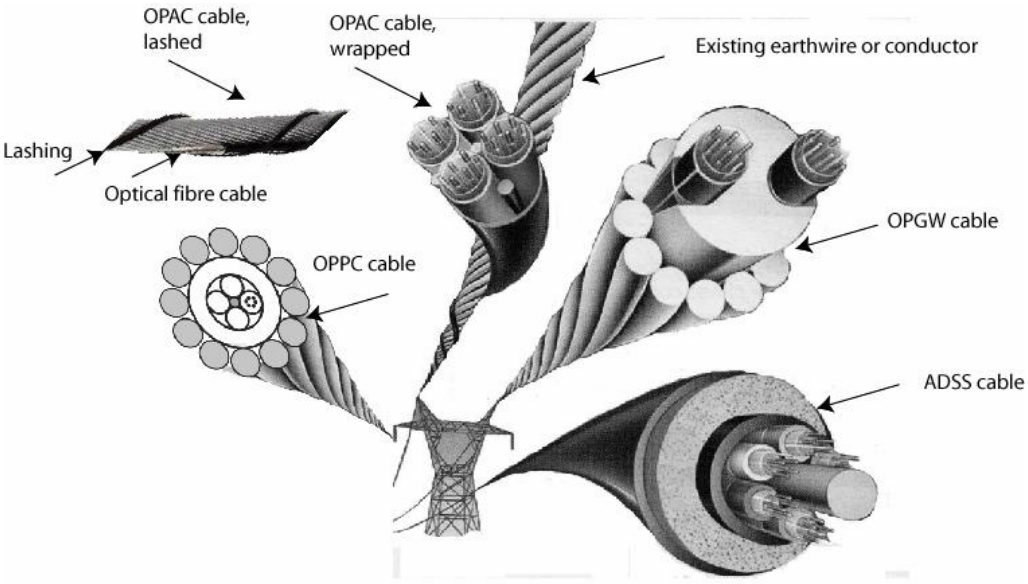

Figure 5 - Typical types of fibre optic cable

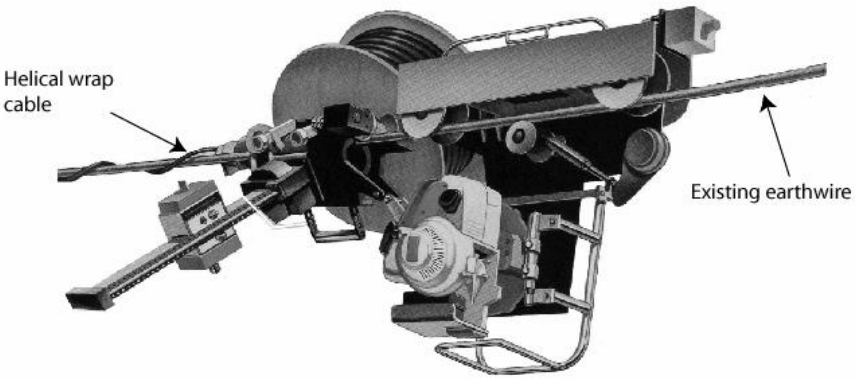

Figure 6 - Typical fibre optic cable motorized tug and wrapping machine

Appendix C – Draft Company Method Statement

Sample of existing earthwire or conductor to be obtained to allow judgement to be made that conductor has sufficient remaining serviceable life.

Type of conductor, dimensions etc to be ascertained.

Dimensional drawing to be obtained, for each tower. Accurate dimensions of steelwork, insulator strings around the position where the lifting devices are to be positioned.

General Arrangement drawing of insulators, clamps etc.

Tower number, height of tower and elevation to be obtained. Horizontal distance between towers and line profile for both earth wire and top phase conductor or equivalent items if wrapping is being done on lower phase conductor.

Position of spin towers and splice towers to recorded on suitable map, recording tower position(s), road access points etc.

Position of overhead lines, roads, rivers and railway lines to be recorded on the same map. Photographs of any significant observations, eg side elevation of tower line etc, to be obtained.

Information to be provided to Contractor/sub-Contractor for calculation of route length, conductor spacing between earth wire and nearest line conductor and clash risk.

Calculations to be audited by independent party, nominated by Electricity North West.

Obtain from Outage Planning written confirmation that double circuit outage cannot be obtained.

Decide on the circuit to be isolated – earthed on the basis of the cross arm lengths etc.

Obtain and confirm outage dates and outage number.

Specific Method Statement to be provided by Contractor/sub-Contractor to cover work activity. Special reference to be made to fall arrest system to be used on climbing and whilst moving around on cross-arms.

Preliminary Works.

Work should proceed only if weather conditions permit. Wind, humidity, lightning storms, and visibility are all important considerations in this regard.

The 24 hour weather forecast for the local area should be obtained and the work should not proceed if the predicted wind speed is in excess of 5m/s and /or icing is predicted. If there is uncertainty in the 24 hour prediction, obtain a further forecast nearer the planned time of deployment.

The items being used must be inspected and certified according to the Contractor/sub-Contractor's inspection schedule. Harnesses, lifting equipment and especially any roping being used shall only be released from store with a certificate indicating it has had a thorough visual inspection confirming integrity of the outer sheath with no evidence of cuts or thinning, and that there is no other evidence of kinking or distortion of the rope.

Immediately prior to use any ropes showing signs of deterioration sufficient to cast doubt on their shall be removed from site

Area around the spin tower to be barriered off and appropriate hazard signs to be provided.

The effects of aeolian vibration which is periodic motion of a conductor induced by the wind predominantly in a vertical plane, of relatively high frequency (of the order of 10Hz or more) and small amplitude shall be assessed by the Contractor/sub-Contractor. This would be carried out as part of the Tendering procedure.

The requirements of Code of Practice 606, Procedure S4 - Switching Programme shall be complied with.

The circuit to be made dead will be isolated, locked off, closed to earth, in accordance with the Distribution Safety Rules.

Pre-working briefing of the working party in accordance with the Distribution Safety Rules will be done by the Electricity North West Senior Authorised Person. The Field Engineer(s) for the Contractor/sub-Contractor will be in attendance. During this briefing, the Safety Document to be issued. Names of the persons attending the briefing to be recorded by the Field Engineer(s)

Working party to be told:

- Wristlet colours, tower plate colour, tower numbers involved and climbing leg position. Red pennants shall not be crossed at any time. No tools longer than 0.5m can be taken up the tower and tools used must comply with the Method Statement and Risk Assessments provided for that particular circuit. Safety Distance and application factors appropriate will be decided by the Electricity North West Senior Authorised Person.
- Wristlets to match those on the flagstick/towers to be worked upon to be provided to the working party.
- Additional earths will be applied to the circuit at positions decided by the Electricity North West Senior Authorised Person and listed on earthing schedule.

Control Engineer to be asked via switching programme to remove Delayed Action Reclose and another auto close features on the adjacent live 132kV circuit.

On-site Induction to be delivered to ALL staff shall include:

- Work Requirements
- Emergency Procedure
- Communications

Each day before Work commences all staff involved to be briefed on the nature and extent of the day's activity

Green Flag/Red Pennant mentioned in other parts of this document to be installed on each lattice tower.

Jig to be brought up inside the centre of the tower using ropes with guide rope.

Tug and spinner to be brought up the centre of the tower with two ropes attached to each item (one being guide rope). All items to be brought up separately.

The correct cassette for the circuit/spans involved to be taken up.

Whilst being moved on the outer face of the tower each separate item to be tethered to the steel work with appropriate ropes etc.

Tug and spinner(s) to be flashed earth before being installed on earth wire or lower phase conductor.

The tension on the optical fibre cable during stringing should be controlled and should not exceed the manufacturer's maximum tension recommendations.

Confirmation that the remote control works , and that the remote control operator can see clearly the tug/spinner, applied earths and all working parties shall be confirmed.

The speed of the tug shall be based on the calculations done by the Contractor/sub-Contractor to confirm cassette cable length, clearance to ground, tower steel work and clearances to live conductors on the tower. The clearance of the spinning machine to the live conductor(s) whilst in motion must be considered. Calculation required for predicting clashing.

The speed of the tug must be the normal walking speed of the person holding the remote control, with regard to the location, terrain and environment. The remote control operator shall ensure that no looping of the fibre optic cable away from the earthwire or lower phase wire occurs.

The remote control operator shall ensure that the tug/spinner stops safely at the lattice tower.

The tug/spinner will be transferred over each tower top or phase crossarm attached to the necessary ropes and the installed jib. No one will be allowed to stand immediately under the tower, whilst this activity is going on.

The OPAC guides on each tower top or lower phase cross arm will be installed by the same working party.

When the tug/spinner reach the splice position(s) it will be stopped by the remote control operator.

The fibre optic cable at each end will be lowered in a safe way down the centre of the tower to allow tests on jointing , splicing and Optical Time Domain Reflectometer test (OTDR) to be done.

The tug/spinner/drum(s) will be recovered from the earthwire position or lower phase crossarm by the jig, lifting rope and guide rope.

All items will be examined for damage especially ropes etc.

Working party will recover red pennants, green flags and additional earths under the personal supervision of the competent person holding the Safety Document. All staff to be instructed to come down from the lattice steel towers.

Safety Document to be returned by the competent person and cancelled by the Electricity North West Senior Authorised Person in the present of the complete working party and the Field Engineers for the Contractor/sub-Contractor.

All items issued to be recovered, especially safety document and wristlets.

All staff and working party to be told that any further activities on this circuit, or any other circuit, must be done under the instructions of different Safety Documents.

Appendix D – Conformance Declaration

SECTION-BY-SECTION CONFORMANCE WITH SPECIFICATION

The Tenderer shall declare conformance or otherwise for each product/service or range of products/services, section-by-section, using the following Conformance Declaration Codes.

Conformance Declaration Codes:

N/A =	Clause is not applicable/appropriate to the product/service.
C1 =	The product/service conforms fully with the requirements of this clause.
C2 =	The product/service conforms partially with the requirements of this clause.
C3 =	The product/service does not conform to the requirements of this clause.
C4 =	The product/service does not currently conform to the requirements of this clause, but the manufacturer proposes to modify and test the product in order to conform.

Manufacturer:

Product/Service Description:

Product/Service Reference:

Name:

Company:

Signature:

SECTION-BY-SECTION CONFORMANCE			
Section	**Section Topic**	**Conformance Declaration Code**	**Remarks * (must be completed if code is not C1)**
4.1	**Product not to be Changed**		
4.2	**Electricity North West Technical Approval**		
4.3	**Quality Assurance**		
4.4	**Formulation**		
4.5	**Identification Markings**		
4.6	**Minimum Life Expectancy**		
4.7	**Product Conformity**		
4.8	**Confirmation of Conformance**		
5.1	**Requirements for Type Tests at the Supplier's Premises**		
5.2	**Requirement for Routine Tests at the Supplier's Premises**		
6.1	**Description**		
6.2	**Materials**		
6.3	**Technical Details - Installation of Fibre Optic Cable and Components**		
6.4	**Health and Safety Requirements**		

6.5	**Operational Requirements**		
6.6	**Consents**		
6.7	**Life Expectancy**		
6.8	**Company Method Statement**		
7.1	**Site Risk Assessment and Job Planning Informal Meeting**		
7.2	**Audits**		
7.3	**Emergency Plans**		
7.4	*Record Keeping*		
8.1	**Statement for Installation under Live Conditions**		
8.2	**Statement for Installation under Dead Conditions**		
8.3	**Statement for Installation under One Side Dead Conditions**		
8.4	**Working Clearances and Tower Design**		
9	**Training**		

*** Applicable specifications shall be stated in the Remarks column where alternatives are quoted within a section. The Remarks column shall also be used to indicate cases where the products or services exceed the quoted specifications.**

Additional Notes: