

 Eskom	Guideline	Technology
--	------------------	-------------------

Title: **DUCT FIBRE INSTALLATION
PLANNING GUIDE**

Unique Identifier: **240-125010764**

Alternative Reference Number: **N/A**

Area of Applicability: **Engineering**

Documentation Type: **Guideline**

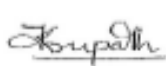
Revision: **2**

Total Pages: **15**

Next Review Date: **March 2026**

Disclosure Classification: **Controlled
Disclosure**

Compiled by



Krupa Jose
Engineer

Date: 09 March 2021

Approved by



Cornelius Naidoo
**Telecomms T&S CoE
Manager**

Date: 2021/03/12

Authorized by



Nelson Luthuli
**PTM&C Engineering Senior
Manager(Acting)**

Date: 14 March 2021

Supported by SCOT/SC



Kgomotso Setlhapelo
**Telecommunications SC
Chairperson**

Date: 11 March 2021

Content

	Page
1. Introduction	4
2. Supporting clauses	4
2.1 Scope	4
2.1.1 Purpose	4
2.1.2 Applicability	4
2.2 Normative/informative references	4
2.2.1 Normative	4
2.2.2 Informative	4
2.3 Definitions	4
2.3.1 General	4
2.3.2 Disclosure classification	5
2.4 Abbreviations	5
2.5 Roles and responsibilities	5
2.6 Process for monitoring	5
2.7 Related/supporting documents	5
3. Duct Fibre Installation	5
3.1 Fibre Optic Specifications to Consider	6
4. Underground Duct Fibre Installation Procedure	6
4.1 Planning and Preparation Phase	6
4.1.1 Cable route survey	6
4.1.2 Cable Pull Plan	6
4.1.3 Manhole inspection and plans for closure	7
4.1.4 Installation plan	7
4.1.5 Factors to be considered	7
4.2 Pre Installation	7
4.2.1 Project Management	7
4.2.2 Training and skills	7
4.2.3 Scope of work	8
4.2.4 Right of Way	8
4.2.5 Cable Inspection and Pre tests	8
4.2.6 Storage	8
4.2.7 Design Verification	8
4.2.8 Co-ordination with stakeholders	8
4.2.9 OHS requirements	8
4.2.10 Environmental Management Plan (EMP)	8
4.2.11 Documentation Completed	8
4.2.12 Project Schedule	9
4.2.13 Security requirements	9
4.2.14 Traffic Management Plan	9
4.2.15 Notifications	9
4.3 Installation	10
4.3.1 Receipt, Handling and Storage of Cables	10
4.3.2 Installation methods	10
4.3.3 PPE	11

4.3.4	Private Property	11
4.3.5	Trenching	11
4.3.6	Barricading	12
4.3.7	Overload Protection	12
4.3.8	Cable Bending and guiding systems	12
4.3.9	Crossings (Road/River/Bridge)	12
4.3.10	Manholes.....	12
4.3.11	Noise Pollution	13
4.3.12	Record Keeping	13
4.3.13	Safety	14
4.4	Restoration	14
4.4.1	Cleaning up	14
4.4.2	Testing the cable.....	14
4.4.3	Documentation and Handover	15
4.4.4	Analysis and evaluation of the work	15
5.	Authorization.....	15
6.	Revisions	15
7.	Development team	15
8.	Acknowledgements	15

1. Introduction

This standard specifies the methods and processes for the installation of duct fibre optic cable. Duct fibre installations are deployed between buildings and or equipment, within buildings example substations, and within rooms example relay rooms.

This document provides an overview of the various steps and procedures involved in duct fibre installations and general knowledge that should prepare those involved in such installation to understand how to proceed.

2. Supporting clauses

2.1 Scope

This document serves as a standard for the installation of duct fibre. The two most commonly used methods of installing duct cables are using the direct buried and underground duct methods. This standard shall cover the methods for underground ducted fibre.

2.1.1 Purpose

This document explains the steps involved in duct fibre installation and factors that needed to be taken into consideration while doing such installations.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Divisions.

2.2 Normative/informative references

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

- [1] ISO 9001, Quality Management Systems.
- [2] NRS 088-1: Duct and Direct Buried underground fibre optic cable Part 1: Product Specification
- [3] NRS 088-2:2009 Duct and Direct Buried Fibre-Optic Cable Part 2: Installation guidelines

2.2.2 Informative

- [4] 240-46264031 Fibre-Optic Design Standard – Part 2: Substations
- [5] ITU-T G652 Characteristics of a single-mode optical fibre cable.
- [6] IEC 60793-2-10 Optical fibres - Part 2-10: Product specifications - Sectional specification for category A1 multimode fibres
- [7] SANS10340-2 Installation of telecommunication cables – Part 2: outdoor fibre optic cables

2.3 Definitions

2.3.1 General

Definition	Description
Duct	Pipe, normally HDPE, into which the optical fibre cable is installed for protection.

Definition	Description
Wayleave	A Wayleave is a means of providing rights for a company to install and retain their cabling or piping across private land in return for annual payments to the landowner.

2.3.2 Disclosure classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 Abbreviations

Abbreviation	Description
ADSS	All dielectric self-supporting
HDPE	High Density Polyethylene
OPGW	optical power ground wire
ROW	Right Of Way

2.5 Roles and responsibilities

Not applicable.

2.6 Process for monitoring

Not applicable.

2.7 Related/supporting documents

Not applicable.

3. Duct Fibre Installation

Eskom only uses unarmoured/non-metallic duct cables. Duct fibre installation offers a route for the new cable installation or old removal without damage to the streets, pavements etc. This is the most common practice in urban areas. The ducts are manufactured using rigid, very rugged, abrasion resistant material and shall be buried underground between 1-1.2 meters deep to reduce the likelihood of accidentally being dug up. This provides extra protection for the cables and also offers some installation advantages.

Another benefit is that fibre cables without armor can be used. The process usually begins with digging a trench to bury the conduit which is a Class 6 110 mm High Density Polyethylene (HDPE) pipe, sometimes with pre-installed inner duct (also called duct liner) with a pulling tape to facilitate the actual cable pulling process.

For single mode duct fibre cables, the HDPE piping should be a yellow colour, wherever possible. For multimode duct fibre cables, the HDPE piping should be an orange colour, wherever possible, in accordance with 240-46264031.

Inner duct or duct liner is slightly less sturdy plastic tubing designed to fit within larger conduits. Without providing the primary protection for the cable, inner duct serves several functions. Many manufacturers offer inner duct in diverse colours to assist in cable identification and maintenance. Inner duct affords a clean path for new cable installations: where cables are already placed in duct it is difficult and often impossible to pull new cable in the same duct. Cables can rub together, and sometimes block the conduit when new cable is installed along with the old. Inner ducts keep cables separate to prevent future installation cable damage

Ducts can economically be installed for applications where a second trenching operation would be impossible. Ducts may be placed under concrete banks, landscaping, farmland or private premises where it would be extremely undesirable to disturb the soil after some time has elapsed. Cables may be chosen, added and installed at a later time without disrupting the environment. When duct capacity may be perceived to be constricted, it may be advisable to run extra fibres in the cable to be installed to be prepared for prospective uses.

3.1 Fibre Optic Specifications to Consider

- 1) Tensile Strength
- 2) Bend Radius
- 3) Crush and Impact Resistance

All fibre optic specifications and tests, including marking, labelling and packaging requirements should comply with NRS 088-1:2007 Duct and Direct Buried Underground Fibre –Optic Cable

All splicing requirements should comply with the Eskom standard 240- Fibre Optic Acceptance Test Specification

4. Underground Duct Fibre Installation Procedure

This document explains the steps involved during the planning phase, installation phase and restoration / close out phase. This also specifies requirements for training and safety and other factors to be considered.

Fibre optic cables generally have a lower strain limit than that of metallic conductor cables so care needs to be taken for successful installation without causing damage to the cable. Pay particular attention to the cable manufacturer's recommendations and stated physical limitations. Do not exceed the tensile load rating for a particular cable. Overloading during installation while not causing immediately visible damage can lead to failure years later.

4.1 Planning and Preparation Phase

4.1.1 Cable route survey

It is recommended to conduct a survey of the cable route. Manholes and ducts should be inspected to determine the optimum splice point locations and duct assignments. In the case of new routes, access points and manhole locations should be identified accordingly.

The maximum cable tension can be calculated and compared to the stated mechanical performance of the cable in order to provide confidence that a particular installation operation can be successfully achieved. The formulae and method for calculating the cable tension are detailed in SANS 10340-2:2006, Installation of telecommunication cables part 2: Outdoor fibre optic cables.

Identify potential problems with inner duct and cable placement at this time. Also investigate the soil condition in order to determine the installation depth. The cable route survey will help us to choose the right method of installation and also the obstacles on the way if any.

4.1.2 Cable Pull Plan

Based upon the cable route survey and the equipment/manpower resources available, develop a cable pull plan. The main steps involved are as follows:

Identify the:

- 1) Environment where the cable will be installed.
- 2) cable type and specifications
- 3) cable route
- 4) manhole and joint locations

ESKOM COPYRIGHT PROTECTED

- 5) drum and reel positions and accessibility to these locations during installation
- 6) appropriate hardware support required
- 7) positioning of technicians during installation

4.1.3 Manhole inspection and plans for closure

Inspect manholes in which cables will be spliced and make plans for closure and cable slack racking. Be sure to consider the accessibility of manholes to splicing vehicles.

4.1.4 Installation plan

After you do the cable route survey and inspection, develop a plan which must include the following.

- 1) Planned commencing and completion date
- 2) Resources
- 3) Equipment
- 4) Safety Procedures
- 5) Notifications etc. (relevant authorities, property owners etc.)

4.1.5 Factors to be considered

- 1) Environmental limits (exposure, moisture, temperature, load etc.)
- 2) Installation limits (no twisting, installation load, bending radius, installation temperature range, storage temperature range)
- 3) Compliance to regulations
- 4) End Preparation (for splicing, connector installation etc.)

Planning and Preparation Phase	
4.1.1	Cable route survey
4.1.2	Cable Pull Plan
4.1.3	Manhole inspection and plans for closure
4.1.4	Installation plan.
4.1.5	Factors to be considered

4.2 Pre Installation

4.2.1 Project Management

Once the network design is verified the process of physically installation can commence. The Network Owner or Customer appoints a Project Manager who appoints a Contractor to execute the Works. The Eskom Project Manager ensures that the Contractor is experienced in fibre optic installations. References should be provided of similar works done.

4.2.2 Training and skills

The technicians doing the installation should be trained and certified by the relevant organisations. This includes splicing and horizontal directional drilling activities. Certification of technicians provides a level of confidence that the installation technicians are knowledgeable and have the skills needed for the work involved.

4.2.3 Scope of work

A scope of work shall be compiled including the requirements for the project, project management, detailing what is to be done by the Contractor, site and route surveys, ROW (Right of Way) process, design verification, supply and delivery of material, civil construction, testing and as-built and equipment documentation to be provided.

4.2.4 Right of Way

Establish that the planned route is accessible and available in accordance with the design. The Contractor should advise the Project Manager of all proposed deviations. Obtain wayleaves. A wayleave agreement must be obtained prior to installing any telecommunications equipment. Companies/contractors doing work in a Road Reserve shall at all times keep a copy of the wayleave on site.

4.2.5 Cable Inspection and Pre tests

Check that the cable specified has been procured. Inspect the cable drum for signs of excessive weathering and/or damage. Do not accept delivery of an optical fibre cable should the drum be damaged. Cable ends shall be sealed. All optical fibre cables shall be tested whilst on the drum, prior to deployment.

4.2.6 Storage

Fibre Optic cable reels shall be kept in an upright position. Always place a wedge so that the reel can't roll. If the cables are stored outside, a cap must be placed at both ends to avoid water infiltration. Storage temperature range specified for each cable should be adhered to.

4.2.7 Design Verification

Before project execution the design needs to be reconfirmed in light of any changes that may have occurred since design approval.

4.2.8 Co-ordination with stakeholders

Stakeholders, example the CNC, local municipality, traffic services and Network Management Centre should be notified or liaised with. The Project Manager ensures that requests for network outages are done well in advance and in accordance with network contingency studies.

4.2.9 OHS requirements

A project specific SHE plan shall be submitted by the Contractor and approved by the SHE practitioner before the Works commences.

4.2.10 Environmental Management Plan (EMP)

A project specific EMP shall be submitted by the Contractor and approved by the Environmental Management Officer before the Works commences if the work area is in an environmentally sensitive area. The Contractor shall at all times take reasonable measures to minimise the negative environmental impact of the construction activities.

4.2.11 Documentation Completed

- 1) Final Route Design
- 2) Approval for all crossings
- 3) Wayleaves
- 4) SHE plan

4.2.12 Project Schedule

A project schedule should be created. It must include

- 1) Ordering material
- 2) Expected delivery times
- 3) Prices
- 4) Labour
- 5) Training requirement if needed
- 6) Kick off, outage, milestone and completion dates.

Review the schedule with all stakeholders.

4.2.13 Security requirements

Material delivered to site may require security due to theft/vandalism. If required arrangements should be made to have overnight guards on site before and during the installation while trenches are open and exposed.

4.2.14 Traffic Management Plan

No work should commence on a public roadway without obtaining a way leave from the road authority concerned. Disruption of normal traffic flow shall be minimised and alternative routes must be made available where possible. Work carried out on busy roads, should be restricted to outside the following periods; from 06:30 to 09:00 and 15:30 to 18:00, to ensure the free flow of traffic during peak hours. Roads shall be kept free of debris or equipment.

4.2.15 Notifications

Businesses / property owners shall be informed one week (7-days) in advance of any construction activities commencing in the vicinity of their properties. These notices will announce upcoming work tasks and potential impacts, such as traffic, parking, and access changes, noise, utility interruptions, vibration, etc.

If a private driveway or footway constructed with non-standard materials is to be excavated, the owner of the property concerned must be informed in advance and in writing of the intended work.

Pre Installation Phase	
4.2.1	Project Management
4.2.2	Training and skills
4.2.3	Scope of work.
4.2.4	Right of Way
4.2.5	Cable Inspection and Pre tests
4.2.6	Storage
4.2.7	Design Verification
4.2.8	Co-ordination with facilities and Electrical personnel
4.2.9	OHS requirements.
4.2.10	Environmental Management Plan (EMP)
4.2.11	Documentations Completed
4.2.12	Project Schedule
4.2.13	Security requirements.

Pre Installation Phase	
4.2.14	Traffic Management Plan
4.2.15	Notifications

4.3 Installation

4.3.1 Receipt, Handling and Storage of Cables

Fibre optic cable, equipment and supplies should be scheduled for delivery to the work site as closely to the time of use as possible to minimize possible damage from other construction, weather or theft. Coordinating deliveries can be difficult so delivery to a staging area offsite or providing a locked storage container onsite should be arranged. When initially received, all fibre optic components should be carefully inspected for damage and tested for continuity or loss if damage is suspected. Ensure that all components and parts have been shipped, received, match quantities ordered (e.g. fibre optic cable contains the number and type of fibre ordered and is the length ordered), and that any discrepancies or damaged goods are noted, the supplier notified and replaced as required.

Handle reels of fibre optic cable with care. All reels, regardless of size or length, should have both ends of the cable available for continuity testing. The cable reels should be moved carefully to avoid damage to the cable. Move small, lightweight spools of fibre optic cable by hand. Move larger reels with appropriate lifting equipment or using two or more installers skilled in the moving operation. Lifting equipment should only move reels with a matched set of slings or chokers, attached to an appropriately sized piece of pipe inserted into the hole in the centre of the reel. Slings and chokers should never be attached around the spooled cable area of the reel.

All equipment and cabling should be stored in a clean and dry location, protected from harsh environments such as extremes of cold and heat. Due to the value of the cable and potential for theft, all components should be in secure storage with guards provided when or where necessary.

4.3.2 Installation methods

Installation methods for the underground ducts include installation by winching, hand pulling or installation by roll out. The duct is a HDPE pipe into which the optical fibres is installed for protection.

Installation of the cable include installation by winching/ hand pulling or installation in ducts by blowing. The duct shall be a Class 6 110 mm High Density Polyethylene (HDPE) pipe, sometimes with pre-installed inner duct (also called duct liner) with a pulling tape to facilitate the actual cable pulling process.

4.3.2.1 Install end plugs

After the fibre optic cable is installed into a duct or inner duct, end plugs should be installed to provide a water seal. No debris should be able to enter the duct or inner duct, and watertight should always be maintained for the duct or inner duct.

4.3.2.2 Duct and inner duct should be properly sized for future expansion possibility

Allowing for future expansion is crucial for good projects. A maximum of 40% fill ratio is a good practice to follow. The duct size should be increased for long installation lengths with many turns. A larger duct can help to reduce cable-pulling tensions. Standard duct sizes vary from 3 to 8 inch ID and inner Cable installation depth: up to 40 inches

The depth that fibre cables should be buried is determined by the soil conditions and surface usage. In colder areas, fibre cables are typically buried below the frost line to prevent the cables from being damaged by ground frost heaves.

4.3.2.3 Warning Labels

Fibre cable warning labels should be buried directly above the cable. Fibre optic warning cables are typically buried directly above the cables to warn future digging operations. Or concrete slabs can be buried below the warning label but above the cables to provide even more protection.

4.3.3 PPE

- 1) A high-visibility reflective vest
- 2) A white hard hat
- 3) Steel-toed safety boots
- 4) Full length pants or coveralls - no shorts
- 5) During rainy weather, highly visible rainwear
- 6) Ear plugs

4.3.4 Private Property

- 1) Where possible, excavations on private property shall not be left open outside normal working hours (08:00 to 17:00). Where unavoidable, the Contractor must take adequate precautions to safeguard such excavations.
- 2) The Contractor shall be responsible for the protection of all trees, shrubs, fences, and other landscape items adjacent to or within the work area.
- 3) The occupants of the properties must be kept informed at all times of how their access will be affected.
- 4) Surfaces shall always be reinstated to the original state or better.
- 5) Where a Contractor must undertake tree and bush cutting and/or shrub clearing he must prior to undertaking such work, obtain approval in writing from the relevant authority and/or property owner.
- 6) The Contractor shall dispose of all cuttings and cleared material.
- 7) The Contractor shall be solely responsible and accountable to remedy any damages and/or claims, arising due to his activities.
- 8) All drainage systems must be cleared daily.
- 9) In residential areas the reinstatement of paving, grass or landscaping must be done to the property owner's satisfaction.
- 10) Remove all material and equipment not needed onsite, as soon as possible.

4.3.5 Trenching

- 1) All excavation work must be performed under the supervision of a responsible person who must be competent to exercise such supervision.
- 2) Proper excavation and preparation of the trench will inhibit unanticipated longitudinal and cross-sectional strains and stresses on the duct.
- 3) Trench walls shall be vertical for at least the height of the bedding and then as vertical as possible.
- 4) Exercise care when trimming trench floors to ensure that they are level.
- 5) The Contractor shall use trenching equipment that is suitable to excavate to the specified width and depth.
- 6) If any street furniture (street names, traffic signs, bus shelters, etc.) have to be moved, arrangements must be made with the relevant authority for the removal, storage and re-erection.

- 7) A victory for common sense is to have a 'good housekeeping' policy.
- 8) Keep the trench as straight as possible.

4.3.6 Barricading

Provide adequate warning, guidance and protection for motorists, pedestrians, cyclists and workers from all foreseeable hazards.

In terms of regulation Occupational Health and Safety Act 85 of 1993, General Safety Regulation 13 (H) (i) & (ii), every excavation that is accessible to the public, or that is adjacent to a road or thoroughfare, or which endangers the safety of people, shall be:

- 1) Adequately protected by a steel barrier, netting or fence of height at least 1.0 m and as close as possible to the excavation and
- 2) Provided with red warning lights at night or any other clearly visible boundary indicators at night or when visibility conditions are poor.

All barricading shall be well supported.

Wear high-visibility vests (at all times), safety boots and hard hats when working at or near a public street or highway or when working at night.

When excavations are in progress next to the road, ensure proper and sufficient warning road signs placed at distances well before and after the work in progress. To warn approaching traffic, a flag person must be placed at least 40m before a "men at work" sign. Approved road cones must be placed at regular intervals along the whole route where trenching is in progress.

Backfill as soon as possible

4.3.7 Overload Protection

Ensure that the cable / hauling rope connection and cable overload protection mechanism are provided in a manner suitable for the particular cable, as stated by the manufacturer.

4.3.8 Cable Bending and guiding systems

A general rule of thumb for fibre optic systems' bending radius is to maintain a minimum bending diameter of 20 times the cable diameter. When cable is installed under tension this ratio should be doubled.

4.3.9 Crossings (Road/River/Bridge)

- 1) The contractor shall inform the relevant authority 48-hours prior to the commencement of the work.
- 2) All rail lines and major roads shall be crossed by means of horizontal directional drilling or pipe jacking, unless the Contractor obtains permission for alternative crossing methods from the relevant authority.
- 3) All excavated material and equipment must be placed and demarcated in such a way to not inconvenience vehicles and pedestrians.
- 4) No person may off-load on a public road, any materials that are likely to cause damage to a road surface.

4.3.10 Manholes

- 1) Manholes shall be positioned as far away as possible from road junctions.
- 2) Manholes must to be built according to prescribed dimensions and specifications.
- 3) Duct entry points into manhole must be drilled, without cracking or damaging the surrounding structure.
- 4) No entry holes must be made into private structures without the written consent of the owner.

ESKOM COPYRIGHT PROTECTED

-
- 5) The internal height of the manhole needs to be determined by the person that needs to work inside the pit, unless otherwise specified in the project plan.
 - 6) In walkways and on pavements, safety of the public and other traffic must be adhered to at all times in ensuring an even walkway that is level without posing any risks by extruding or submersed manhole roofs or lids – i.e. manhole roof levels and lids must be at ground level as far as possible. Manhole roofs (including chimney tops) should not extend above ground level in the pedestrian areas, public areas or the roadside where it can pose risks to pedestrians, the public, vehicular traffic or any damage to vehicles, etc. The manhole frame and lid must be at the same level.
 - 7) On gradients or in areas where normal contours or sloping of the area will not suffice (or is not possible) to ensure a level manhole roof area, a small retaining wall / structure must be provided. At the same time, the risk of a retaining wall must be considered and must be visible above ground level for public safety. In the unlikely circumstances of a manhole constructed where high risk is involved, danger (chevron) markings must be provided onto the manhole roof side/s or pole-fitted next to the manhole. High, extending manhole roofs should not be allowed in flat areas where unnecessary filling is applied to make good for the extending manhole to be level with the surface – i.e. it should not be necessary to form a mound to accommodate the manhole top.
 - 8) Manhole / Jointing Pits should be aligned with the trench direction (for perpendicular duct entry) or the curb/road and should only be shifted or adjusted to by-pass obstructions by other services (if the manhole cannot be re-located). Written permission of deviation from plans / specifications must be obtained from the Project Manager
 - 9) Underground plant such as gas, water or sewerage mains, electricity supply-cables and storms water drains, which obstruct the construction of manholes, must be brought to the notice of the project Manager. Where there is no other alternative these will be moved.
 - 10) On completion of a manhole, the Contractor shall re-instate the area around the manhole to its original state or better.
 - 11) All manhole specifications should comply with SANS 10340-2 Installation of Outdoor fibre optic cables
 - 12) Demolition of existing concrete or masonry necessary to enable inadequate manholes to be re-constructed must be undertaken in such a way that cables or joints are not damaged. Cable joints must not be moved or allowed to sag. Where joints must be moved, the Area Manager must be advised at least eight working hours in advance so that Supervision and subsequent pressure testing of such joints may be arranged where necessary. Existing Manhole covers and frames as well as roof supporting rails must be recovered for possible re-use. Split pipes in conjunction with ropes must be used to support existing cables and joints

4.3.11 Noise Pollution

In accordance with the Occupational Health and Safety Act, Act 85 of 1993: When working in built-up areas, the Contractor shall provide and use suitable and effective silencing devices for pneumatic tools and other plant that would otherwise cause a noise level exceeding 85-dB(A) during work. Alternatively he shall effectively isolate the source of any such noise in order to comply with the said regulations.

Where possible, the work shall be undertaken during normal working hours (08H00-17H00). The working crew shall abide by the local laws regarding noise. Should an extension of the upgrading hours be required, the adjacent property owners are to be informed in writing (at least 2 days) in advance of any overtime activities.

4.3.12 Record Keeping

The project manager should visit the site on a regular basis and shall keep record of all the findings and meetings with the contractor. Notice of non-compliance shall be issued to the contractor whenever transgressions are observed. The non-conformance and remedial actions should be documented.

4.3.13 Safety

The factors to consider under safety are as follows

- 1) Awareness of safety procedures
- 2) Appropriate safety gear
- 3) Electrical hazards –Fibres installed in the vicinity of power cables, familiarise with NEC standards and installation practises.
- 4) Proper ventilation
- 5) Barricading
- 6) Flagging

The safety file should comprise of the following.

- 1) Risk assessments
- 2) Incident records
- 3) Inspection register
- 4) List of subcontractors
- 5) List of visitors

Installation Phase	
4.3.1	Receipt, Handling and Storage of Cables
4.3.2	Installation methods
4.3.3	PPE
4.3.4	Private Property
4.3.5	Trenching
4.3.6	Barricading
4.3.7	Overload Protection
4.3.8	Cable Bending and guiding systems
4.3.9	Crossings (Road/River/Bridge)
4.3.10	Manholes
4.3.11	Noise Pollution
4.3.12	Record Keeping
4.3.13	Safety

4.4 Restoration**4.4.1 Cleaning up**

After the installation is complete, the contractor should carefully clean up the site. All fibre scraps shall be sealed in disposable containers and removed from site.

4.4.2 Testing the cable

After installation, all cables will be tested for verification of proper installation in accordance with 240-70732888 Fibre Optic Cable Acceptance Testing Standard. Eskom has the right to witness the testing before handover.

4.4.3 Documentation and Handover

Documentation is an integral part of the design, installation and maintenance process for the fibre optic network. It facilitates installation, allows planning for upgrading, simplifies testing and future changes. The as-built document package shall be supplied to Eskom to specify the path that every fibre, including intermediate connections and connector types. Documentation should also include all the test results and GPS co-ordinates of the route position at regular intervals.

4.4.4 Analysis and evaluation of the work

Once the report is submitted by the contractor, Eskom will analyse and evaluate the work done for site acceptance and approval.

Restoration	
4.4.1	Cleaning up the job site.
4.4.2	Testing the cable
4.4.3	Documentation and Handover.
4.4.4	Analysis and evaluation of the work

5. Authorization

This document has been seen and accepted by:

Name and surname	Designation
Mfundiso Hina	Senior Manager - Eskom Telecommunications (Acting)
Lenah Mothata	Senior Manager - Grids
Barry Clayton	Chief Engineer – Transmission Secondary Plant, Work Planning and Centralised Services
Sikelela Mkhabela	Senior Manager - Distribution
Prudence Madiba	Senior Manager - Generation
Maureen Mokone	Senior Manager – Group Information Technology (Acting)
Botse Sikhwitshi	Senior Manager – Group Security (Acting)

6. Revisions

Date	Rev	Compiler	Remarks
March 2021	2	K Jose	Updated the document.
Feb 2018	1	K Jose/Fadeelah Kenny	First issue

7. Development team

The following people were involved in the development of this document:

- Vanessa Naidu

8. Acknowledgements

- Reginald Morgan

ESKOM COPYRIGHT PROTECTED