Eskom	Guideline	Eskom Telecommunications

Title: **Scope Of Works for Fibre Optic Repairs**

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Content

1. Introduction

This guideline describes the functional works for Transmission Telecommunications and its contractors, for scheduled maintenance, and break down repairs on the Fibre Optic Network (FON).

2. Supporting Clauses

2.1 Scope

This Guideline covers the works information for repairing and maintaining the Fibre Optic Network.

2.1.1 Purpose

The purpose of this guideline is to clarify the works information for scheduled maintenance and break down repairs of the Fibre Optic Network.

2.1.2 Applicability

This guideline is applicable to

- OPGW cable installations
- ADSS cable installations
- Duct cable installations

This guideline shall apply throughout Eskom Holdings Limited, its divisions, subsidiaries, contractors and entities wherein Eskom has a controlling interest.

2.1.3 Effective date

May 2022

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] ESKPVAEY6 – Operating Regulations for High Voltage Systems

[3] Occupational Health and Safety Act 85 of 1993

[4] ESKPBAAD6 Environmental Management

[5] ISO45001 Health and safety management

[6] ISO14001 Environmental Management

2.2.2 Informative

[7] 240-106170090 Temporal Repair Procedures for Optical Cables on High Voltage Lines

[8] 240-98155775 41-884 The Safe Working on OPGW installations

[9] TGL41-340 Access to farms

[10] TRMPVAEX6 Procedure to Gain Access Above the Anti-Climbing Guards on Transmission Towers

[11] 41-136 Underground Tower to Tower and Tower to Cable Fibre Optic Cable Installation.

[12] 240-46264031 Fibre Optic Design Standard – Part 2: Substations

[13] 240-70732888 Fibre Optic Cable Systems Acceptance testing

[14] 240-8979859 - FIBRE OPTIC CABLE FIRST LINE MAINTENANCE

[15] 240-89279857 AERIAL and SUBSTATION FIBRE OPTIC LINK INSPECTION GUIDELINE AND TICK SHEETS

[16] 240-61227494 ALL-DIELECTRIC SELF-SUPPORTING (ADSS) FIBRE OPTIC LINK INSPECTION GUIDELINE AND TICK SHEETS

[17] 240-57649019 OPGW CABLE AND ADLASH Cable Interface Installation Guideline

[18] 240-140807476 FON Contractor Management Work Instruction

2.3 Definitions

2.3.1 “Accreditation”: Procedure by which an authoritative body gives formal recognition that a body or person is competent to carry out specific tasks (ISO/International Electro-technical Committee Guide 2)

2.3.2 **“**Environment”: The surroundings within which humans exist and that are made up of

- (a) land, water and atmosphere of the earth;
- (b) micro-organisms, plant and animal life;
- any part or combination of (a) and (b) and the interrelationships among and between them; and the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being

2.3.3 “Environmental Management Programme (EMP)”: A programme that seeks to achieve a required environmental end state and describes how activities, that could have a negative impact on the environment, will be managed and monitored and impacted areas rehabilitated

2.3.4 “Preventative/planned Maintenance” The maintenance carried out at predetermined intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the functionality of the item or system.

2.4 Abbreviations

Abbreviation	Explanation
PECN	Private Electronic Communication Network
FON	Fibre Optic Network
FO	Fibre Optic
NOC	Network Operations Centre
NMC	Network Management Centre
FS	Field Services
OI&E	Open Isolated and Earthed
ARC	Auto Re Closer

2.5 Roles and Responsibilities

Eskom Telecommunications

Fibre Optic Network Management – Monitoring of Network Performance and Maintenance activities for Transmission Telecommunications network, Eskom Distribution and Eskom Transmission.

Field Services Managers - Provision and Management of maintenance services.

National Planning – Expansion and Engineering of FON network

BroadBand Infraco

Network Operations Centre – Control Room for the Network

Contractor

Fibre Optic Network repairs – Provide repairs and maintenance of the Fibre Optic Network on an as and when required basis as listed in Table 1 in section 3.14 of this document.

2.6 Process for Monitoring

Implementation of this document will be audited periodically.

2.7 Related/Supporting Documents

N/A

3. Document Content

The aim of this document is to provide guidance and information to Transmission Telecommunications personnel and its contractors to perform various types of repairs and maintenance on the Eskom fibre optic network namely:

Preventative/Planned maintenance - This will be scheduled in conjunction with the servitude owner namely Transmission or Distribution as well as where required, the Infraco NOC and PECN NMC.

Unplanned maintenance – This will be performed during “break down” conditions and is not scheduled. A temporary repair will be performed which will not transgress the safety clearances to the live line and will be in place until a scheduled repair can be performed. Notification of access and the scope of work will be communicated to the servitude owner via the Regional Control officer prior to the temporary repair.

All work on the High Voltage electrical network will be performed by people appointed and authorised in writing by servitude owner namely Transmission or Distribution.

3.1 Notification of Access to Site

All maintenance shall be performed with prior arrangement with the servitude owner namely Transmission or Distribution and where required, in conjunction with the Infraco NOC and PECN NMC.

Transmission Telecommunication’s staff shall notify the respective depots (Transmission or Distribution) of the upcoming planned maintenance or in the event of emergency work request Control to notify the landowner. The depot staff will in turn contact the landowner’s and notify the landowner’s of the number of people, the vehicle type, vehicle registration and the intention of the visit.

Transmission Telecommunications will prior to the works issue a Purchase Order number to the contractor for the required repairs and maintenance. The contractor accompanied by Transmission Telecommunications will access the required works site/s.

Refer to 240-80605256 Access to farms.

3.2 Safety

The safety of staff and contractors is paramount, to ensure the Safety of all staff and contractors the following shall be mandatory:

- Adhere to the Eskom lifesaving rules.
- Perform vehicle pre-trip inspection.
- Perform toolbox talks.
- Perform Risk assessments.
- Adhere to approved Fall Protection plan
- Wear Protective Personal Equipment. (Conductive boots required for climbing live structure above 132 kV)
- Only staff authorised as drivers according to Eskom’s requirement may drive a vehicle.
- Keep to national speed limits.
- Do not exceed the recommended speed for gravel roads of 80 Km/h and adjust the vehicles speed to suite the terrain.
- Do not perform work when conditions are unsafe namely: Rain, Fog, mist, high wind.
- Ensure that good communications are maintained at all times namely between work team/s and Control.

- In rural areas be vigilant of wild animals and livestock crossing roadways.

ALWAYS ADHERE TO THE SERVITUDE OWNER'S REQUIREMENTS, WITH REGARDS TO OUTAGES, RETURN TIME FOR LINE AND SAFETY REQUIREMENTS.

3.3 Safe Work Clearances

ESKOM Operating Regulations for High Voltage Systems that set minimum clearance for personnel accessing and working in proximity of live conductors would be applicable. The table below is an extraction as specified in 5.3.6.3 and 5.3.6.4 of the ORHVS.

Minimum safe work clearances.

800 kV	—	6.0 meters
400 kV	—	4.0 meters
275 kV	—	3.0 meters
220 kV	—	2.5 meters
132 kV	—	2.0 meters
88 kV	—	1.5 meters
66 kV	—	1.3 meters
1 kV to 44 kV	—	1.0 meter

If the minimum safe clearance to the live line cannot be maintained, the line shall be Opened, Isolated and Earthed to enable safe working conditions.

Any work on an OPGW fibre optic installation shall always be performed by creating a safe work area (equipotential zone) by means of safety earths applied between all the optic cables and the tower steel work.

3.4 Identification of Visitors

Visitors shall carry Eskom Holdings identity cards, or other identification as is appropriate, displaying a photograph, unique number and/or national Identity Document number.

3.5 Identification of Vehicles

Eskom vehicles accompanying the contractor shall display the Eskom Holdings logo and identification markings as appropriate. Where vehicles are not permanently marked, use must be made of magnetic logos.

3.6 Gates and Fences

Gates are intended to either permit or restrict the movement of animals on farms. Gates should be left in the state the landowner intended i.e. As found. In order to assist with any possible claims, any visitor will keep a log on the Form for Gate, Access Roads and River crossings register, of each gate that is used stating

- The position of the gate with reference to towers
- The state in which it was found (open or closed)
- The time
- Any other appropriate information (locks etc.)

The climbing or crawling over or through fences without the permission of the landowner is prohibited in terms of section 23 of the Act and visitors should take note of this section. No Eskom contractor may be issued with keys for any Eskom lock. The Eskom Standard locks shall be used in all cases and the Eskom key holder shall ensure that the lock securely locks the gate. Where dual use is made of the gate by Eskom Holdings and the landowner, the Eskom lock shall be locked into the farmers lock as to permit both parties to gain access without inconveniencing either party. No interference with landowner locks will be tolerated. The cutting of landowner's locks except in extreme emergencies will result in disciplinary action.

3.7 Damage caused during a visit

Any damage caused to any road, gate, fence, crop or grazing shall be reported to the line and Servitude Manager who will then refer it to the appropriate Eskom Holdings official for processing. Fires are prohibited and Eskom staff and its contractor shall take care with fires and the use of fires which will only be permitted with the express approval of the landowner.

3.8 Removal of Fauna and Flora

No fauna or flora will be collected or removed from any farm by any visitor without written permission of the landowner, in which case cognisance will be taken of appropriate provincial legislation pertaining to fauna and flora.

3.9 Waste management and refuse

Any visitor will always refrain from littering and remove any refuse when leaving. No litter shall be left within the Container sites; all litter shall be removed and disposed of in appropriate waste bins at the service centres. If any Fibre Optical cables need to be disposed of, the Fibre Optic cable shall be disposed of in an appropriate waste disposal site. Fibre optic splinters shall be kept in a holding container for disposal in an appropriate manner.

3.10 Complaints Register

Each Transmission and Distribution line and servitude manager keeps a register of all complaints received from the landowners regarding servitudes. Complaints will be investigated and closed to the satisfactory of Eskom, its contractor, and the landowner.

3.11 The use of roads

Visitors shall as far as possible use only the servitude roads or roads as determined by the environmental management plan and agreed to with the landowner. Where this is not possible the landowner's permission shall be obtained for the use of any other roads. In all cases care shall be taken not to cause any damage in the process and driving through the veldt must be avoided as far as possible.

3.12 Authorisation

Any contractor or Eskom staff who intends to access any power line structure above the anti-climbing device shall have the appropriate authorisation issued by the respective Transmission Grid or Distribution Operating Unit. Any Eskom person who requires keys for the Transmission and Distribution locks shall be authorised by the respective Grid and shall be the sole user of that key.

Subject to level of authorisation, prerequisites for Eskom staff and its contractor includes but is not limited to the following:

- Required modules for Eskom Operating Regulations for High Voltage Systems.
- Medical certificate of fitness (for climbers above ground level)
- First aid level 2
- Fall arrest system training (FAS)
- Competence to carry out specific safe work procedure will be verified by practical evaluation on site.

3.13 Non-Compliance with this procedure

The relationship between Eskom Holdings and landowners granting access to servitudes is of extreme importance to Eskom Holdings, both during maintenance of power lines as during negotiations for new servitudes. Access to private land must in all cases be conducted by showing the necessary respect for private property and the occupants of the land. The non-compliance with this document may lead to either disciplinary or legal action taken against the person or persons who contravene the stipulations of this document.

3.14 Works Information

A Workplace task order shall be generated for Eskom staff for the capturing of labour hours, work performed and expenses. An Eskom purchase order will be issued to the contractor for the required scope of works derived from table 1 below prior to the works being performed. Before Telecoms service centre staff departs for the site to perform the pre-planned work, the technician will confirm with Infraco NOC if access is granted to the site.

Category	Description
Site Establishment	Transport LDV
	Transport Heavy Duty (4 Ton)
	Transport Extra Heavy Duty (8 Ton)
	Accommodation
	Ablution per day
	T&S
	Documentation (Safety file, test results, as build, records)
Labour Normal Rate	Unskilled
	Artisan
	Supervisor
	Professional (Project Manager, designer, etc)
Labour Overtime 1.1/2	Unskilled
	Artisan
	Supervisor
Labour Overtime Sunday/Public Holiday	Unskilled
	Artisan
	Supervisor
Production Equipment	Manual trenching tools in pickable soil
	Ditch Witch
	Splice Machine
	Crossings using double pulley system
	Winch & tensioner for ADSS incl. sundry equipment
	Winch & tensioner for OPGW incl. sundry equipment
	Directional drilling
	All terrain crane (exclude establishment)
	Road crossing
	Rail crossing
	HV crossing
	River and Dam Crossing
	Scaffolding

Hardware	**FIBRE CABLE**
	ADSS 12core fibre cable - Short Span
	ADSS 24 core fibre cable - Short Span
	ADSS 48 core fibre cable - Short Span
	ADSS 12core fibre cable - Long Span
	ADSS 24 core fibre cable - Long Span
	ADSS 48 core fibre cable - Long Span
	12 Core 10kA OPGW cable
	24 Core 10kAOPGW cable
	48 Core 10kA OPGW cable
	12 Core 12kA OPGW cable
	24 Core 12kAOPGW cable
	48 Core 12kA OPGW cable
	12 Core 16kA OPGW cable
	24 Core 16kAOPGW cable
	48 Core 16kA OPGW cable
	12 Core 21kA OPGW cable
	24 Core 21kAOPGW cable
	48 Core 21kA OPGW cable
	Duct 12core fibre cable
	Duct 24core fibre cable
	Duct 48core fibre cable
	Manhole (Concrete , 1250mm diameter, 1000mm depth)
	Manhole (Pre-cast, Specification: Small (1000 x 1000))
	Manhole Bracket
	Duct Straight Joint Enclosure
	ADSS Hardware Short Span Cable
	Non-Insulated ADSS Strain assemblies
	Insulated ADSS Strain assemblies
	Non-Insulated ADSS Suspension assemblies
	Insulated ADSS Suspension assemblies
	ADSS Spiral Vibration Damper
	Non-Insulated Downlead clamp: DC clamp with PG clamp
	ADSS Hardware Long Span Cable
	Non-Insulated ADSS Strain assemblies
	Insulated ADSS Strain assemblies
	Non-Insulated ADSS Suspension assemblies
	Insulated ADSS Suspension assemblies
	ADSS Spiral Vibration Damper
	Non-Insulated Downlead clamp: DC clamp with PG clamp
	ADSS Accessories
	Eyebolts small
	Eyebolts big
	Hexagon Bracket
	Round Pole Bracket

	Oval bracket
	ADSS 2 Way Joint Enclosure
	ADSS 4 Way Joint Enclosure
	OPGW Hardware 7kA
	Non-Insulated OPGW Strain assemblies
	Insulated OPGW Strain assemblies
	Non-Insulated OPGW Suspension assemblies
	Insulated OPGW Suspension assemblies
	OPGW Slack Bracket
	OPGW Spiral Vibration Damper
	Damper (Range 10mm 19mm)
	Insulated Downlead Clamp
	OPGW Hardware 10kA and 12kA
	Non-Insulated OPGW Strain assemblies
	Insulated OPGW Strain assemblies
	Non-Insulated OPGW Suspension assemblies
	Insulated OPGW Suspension assemblies
	OPGW Slack Bracket
	OPGW Spiral Vibration Damper
	Damper (Range 10mm 19mm)
	Insulated Downlead Clamp
	OPGW Hardware 16kA and 21kA
	Non-Insulated OPGW Strain assemblies
	Insulated OPGW Strain assemblies
	Non-Insulated OPGW Suspension assemblies
	Insulated OPGW Suspension assemblies
	OPGW Slack Bracket
	OPGW Spiral Vibration Damper
	Damper (Range 10mm 19mm)
	Insulated Downlead Clamp
	on Insulated Downlead Clamp
	OPGW Dome Joints
	OPGW Non-Insulated DOME Closure with brackets
	Adjustable VARI-GRIP
	OPGW Insulated DOME Closure with brackets
	PATCH PANEL (Fully populated)
	12-way patch panel LC Multimode
	24-way patch panel LC Multimode
	48-way patch panel LC Multimode
	24-way patch panel SC APC Single Mode
	48-way patch panel SC APC Single Mode
	Brush panel

	Other
	Patch Box
	Galvanised pipe
	Orange pipe
	7m Treated wooden pole
	8m Treated wooden pole
	50mm HDPE piping
	Fibre Disposal

Table 1 – Contractor Scope of Work Item list

On arriving at site Telecom's service centre staff shall notify the Infraco NOC of their intention to enter the site to start testing which shall include notification of an accompanying contractor. To avoid any misconceptions, it is advised that Telecoms staff check the alarm status of the site with the Infraco NOC before entering and then again on departure.

3.14.1 ADSS Works

Maintenance and Repairs to ADSS mounted below the electrical conductors and not in close proximity to the live conductors could be performed in two ways:

1. At the discretion of the Servitude owner, stringing of new ADSS can be done under Live Line conditions with ARC off.
2. Temporary repairs can be performed under Live Line conditions with ARC on.

Scenario 1

Transmission Telecommunication's staff and its Contractors, will provide all labour and equipment to remove sections of cable strung onto the high voltage power lines when required, using accepted ESKOM procedures and replace with new cable using the Manufacturer's Cable Systems procedures. In addition, Transmission Telecommunications staff or if included in the scope of works for the purchase order, the contractor will join the new sections to the existing sections.

Scenario 2

Transmission Telecommunication's staff and its Contractors will provide all labour and equipment to correct or replace Cable attachment hardware, Joint Installations and fibre joints using the Manufacturer's Cable Systems procedures.

Scenario 3

The Transmission Telecommunications staff will provide all labour and equipment to carry out inspection of the Fibre Optic Installation from ground level when required. The following inspection will be carried out:

Bypass Towers

- Condition - Suspension, dead-end assembly condition, mast bypass fibre not tight / chafing against tower members (slacked comfortably).
- Position - Check condition of tower at attachment point.
- Check for dry band arcing

Records of joint boxes positioning

Cable Span

- Vibration dampers on both sides of tower (typically spiral dampers)
- Sag - is there any risk of cables clashing
- Sheath break or imperfections - Exposed yellow yam (Kevlar). Sheath imperfection
- Vegetation - Growth that may expose span to fire risk such that cable may burn.
- Mid-span Height - Relative to accidental hooking and risk of fire.

Joint Tower

- Dead end assembly - In place, no deformities, broken strands.
- Down-lead clamps - Securely held onto tower, all there (Typical 1 – 2 meter separation).
- Box mounting - Securely mounted by three clamps, if it is a dome joint, to be done as per OEM specification.
- Box height - risk of fire, vandalism (Related to vegetation and settlements).
- Box condition - Rusting, missing, cracking, broken, burnt.
- Check for dry band arcing

Environment

- Predatory birds - Are there any Predatory birds in the vicinity of the box.
- Monkeys / Baboons - Are there any Monkeys or Baboons in the vicinity of the box.
- Fire risk - Is there any fire risk prone vegetation with in a 5m radius of the box.
- Hooking risk - Farming operation underneath the line, road, etc.

3.14.2 OPGW works

Scenario 1

With the line Open, Isolated and earthed, Transmission Telecommunication's staff and its Contractors, will provide all labour and equipment to remove sections of cable strung onto the high voltage power lines when required, using accepted ESKOM procedures and replace with new cable using the Manufacturer's Cable Systems procedures. In addition, Transmission Telecommunications staff or if included in the scope of works for the purchase order, the contractor will join the new sections to the existing sections.

Scenario 2

With the line Open, Isolated and earthed, Transmission Telecommunications and its Contractors could provide all labour and equipment to correct or replace Cable attachment hardware, Joint Installations and fibre joints using the Manufacturer's Cable Systems procedures and Eskom accepted/approved safe procedures.

Scenario 3

The Transmission Telecommunications staff to carry out from ground level the inspection of the Fibre Optic Installation when required. The following inspection will be carried out.

Bypass Towers

- Dead-end suspension assembly - In place, no deformities, broken strands.
- Attachment's condition - Suspension / dead-end assembly condition.
- Cable condition - Broken strands, abnormal sagging.
- Insulation and earthing assemblies - and check for installation on insulated towers and earthing assemblies on non-insulated towers

Joint Tower

- Box mounting Securely - mounted and earthed to tower (Unless insulated).
- Box condition - Rusting, missing, cracking, broken, burnt.
- Down-lead cables - Held together from the top.
- Box access loop - Above anti-climb and secured onto tower members.
- Down lead clamps - Securely held onto tower, all there (typical 1 – 2 meter separation)
- Check for installation on insulated towers and earthing assemblies on non-insulated towers

Environment

- Predatory birds - Are there any predatory birds in the vicinity of the box.
- Monkeys / Baboons - Are there any Monkeys or Baboons in the vicinity of the box.
- Bird guards - Does the tower have bird guards.
- Fire risk - Is there any fire risk prone vegetation with in a 5m radius of the box.
- Informal settlements - Are there any in the vicinity of the line and tower.

3.14.3 DUCT Works

Transmission Telecommunications and its Contractors will provide all labour and equipment to install new cable supplied by the Employer using the Manufacturer's Cable Systems procedures as per Transmission accepted/approved safe procedures. In addition, Transmission Telecommunications and its Contractors will supply all labour and equipment to joint the new sections to the existing sections that could be of either ADLASH, ADSS or OPGW technologies and conduct end to end optical tests.

3.14.4 Emergency Works

Transmission Telecommunications and if needed, with the aid of its contractors, will perform temporary repairs between joint enclosures by replacing faulty cables with new cable. Depending on the environment the following methods may be used (also refer to 240-70732888 Fibre Optic Cable Systems Acceptance testing):

- Installation of ADSS on the existing HV line structure when below the minimum clearance.
- Installing ADSS on a pole route
- Lay Heavy Duty Duct (HDD) cable on the ground
- Any other method that will not compromise Eskom's Safety and environmental policies.
- A mix of the above

All work shall be carried out as specified in the Eskom accepted/approved procedures as listed in section 2.2.2 of this document. Transmission Telecommunications or its contractor will conduct end to end optical tests using an Optical Time Domain Reflectometer and a Power Meter and Light Source for all repairs and maintenance interventions.

4. Acceptance

This document has been seen and accepted by:

Name	Designation
A Maseko	Manager: Transmission Telecommunications
U Dyantyi	Manager Network Management Centre
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M Hina	Manager: Engineering Services
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5. Revisions

Date	Rev.	Compiler	Remarks
May 2022	3	RR Morgan	Removed ADLash component to create a separate document for Sole Source application and/or tender purposes.
March 2017	2	RR Morgan	Changed 3.3 Earthing process to include a safe work area Included Contractors into the document
April 2013	1	RR Morgan	Changed cardinal rules to life saving rules
April 2013	1	RR Morgan	Removed ETFM 0663

6. Development Team

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

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