

 Eskom	Task Manual	Technology
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Title: **ROUTINE INSPECTION AND
MAINTENANCE OF
SUBTRANSMISSION
AND DISTRIBUTION LINES**

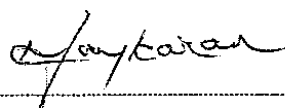
Unique Identifier: **240-138196972**

Alternative Reference Number: **34-1441**

Area of Applicability: **Engineering**

Next Review Date: **STABILISED**

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This document is **STABILISED**. The technical content in this document is not expected to change because the document covers: *(Tick applicable motivation)*

1	A specific plant, project or solution	
2	A mature and stable technical area/technology	x
3	Established and accepted practices.	x

This letter is for multiple documents:

PCM Reference: <XXXXXX>

SCOT Study Committee Number/Name: <Number or name>

 Eskom	Standard	Group Technology
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Title: **ROUTINE INSPECTION AND
MAINTENANCE OF SUB-
TRANSMISSION AND
DISTRIBUTION LINES**

Unique Identifier: **34-1441**

Part: **11 - Maintenance**

Area of Applicability: **Distribution Engineering
Transmission Engineering**

Documentation Type: **Standard**

Revision: **1**

Total Pages: **25**

Next Review Date: **February 2018**

Disclosure Classification: **Controlled Disclosure**

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Foreword

The document was compiled to conform or align with NRS 082 and Occupational Health and Safety Act (OHSA) requirements ([2] OHS Act No. 85) in ensuring that equipment in our network is maintained to maximize the lifespan of equipment, and maintenance and operating are done under safe conditions.

Revision history

This revision cancels and replaces all revisions of the following documents:

- BFN 002, Distribution and Reticulation Lines;
- BFN 032, Distribution and Reticulation Detailed Wooden Pole Line Inspection;
- BFN 0033, MTS and Distribution Lines;
- CEMS 0077, Routine Inspection and Maintenance of Distribution and Reticulation Lines;
- JHB, Power Line Inspection Report; and
- SCSASAAV2 and DST0030.

Date	Rev.	Compiled by	Clause	Remarks
Feb 2013	1	D M Ntombela	4.3.4	• Corrected text in column 1. • Changed 10 month to within 10 months. • Included Table 2 (Earth testing frequencies).
			4.3.7	• Reconstructed d) and added bullets for pole-mounted transformer maintenance. • Removed the references of SCSASAAX3.
			4.3.2	Reviewed the document to include late comments.
				Included 4.3.2.1 i), 4.3.2.2 f) and 4.3.2.3 c).
Jun 2011	0	D M Ntombela	-	• Format change. • The document number changed to DST_34-1441.
			1.1	Revised this section to include Fibre Optic Maintenance (DMN_34-2172).
			2.	Updated the references, removed 'SCSASABH5: Rev. 0, Maintenance Standard for Substation Primary Plant Equipment and Impact Assessment' and included: • DST_34-1342: Rev. 1, Standard for the Maintenance of Isolators; • DST_34-504: Rev. 1, Standard For The Maintenance of Insulators; • DST_34-1451: Rev. 0, Standard for the Maintenance of Circuit Breakers and Oil-immersed Isolators; • SCSASAAX3: Rev. 2, Maintenance of Power Transformer, Reactors, Auxiliaries, NEC's and NECR's; • DST_34-503: Rev. 1; Standard for Maintenance on Capacitor Banks and SVC's; • DMN_34-2172: Rev. 0, Fibre Optic Maintenance; and • 08 TB – 02: Rev. 0, Phasing Out of the Term 'Reticulation'.

Date	Rev.	Compiled by	Clause	Remarks
			4.3.4	Under Inspection Frequencies , removed: - Low voltage (380V/230V), Annually, 10 Years, 10 Month. - Note 2: In areas where the cost of doing LV line inspection is higher than the cost of corrective maintenance, only corrective maintenance shall be done.
			4.4.5.3	Updated the clause with the following statement: 'The insulator inspection, maintenance or replacement shall be as per DST-34-504 and local procedures and task manuals'.
Aug 2005	2	D M Ntombela	-	- Reference number changed to DST0030. - Format changed. - Normative references updated. - Renumbered all the titles and added more information. - Included related documents paragraph. - Included impact assessment form. - Changed annex sequence (A→B, B→C and C→A).
Apr 1999	1	N J Mavhungu	-	- Procedures removed. - Inspection checklists change to minimum requirements of MAXIMO. - Text updated.
Dec 1997	0	C D Smith	-	Original issue as SCSASAAV2.

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Introduction

This standard is the revision of the document that was initially compiled and titled 'Routine Inspection and Maintenance of Sub-transmission and Distribution Lines' with reference number DST_34-1441 to formalize the inspections and maintenance on Sub-transmission and Distribution lines.

Keywords

Standard, maintenance, document, inspection, line, distribution, routine, transmission, optic, fibre

1. Scope

The purpose of this document is to standardize the requirements for routine inspection and maintenance of sub-transmission and distribution lines where Reliability-centred Maintenance (RCM) is not being practised. The implementation of this document on sub-transmission and distribution lines with fibre-optic cables installed on them shall be complemented by the Fibre Optic Maintenance document ([21] DMN_34-2172).

2. References

Parties using this document shall apply the most recent edition of the following documents:

2.1 Normative references

2.1.1 International document(s)

Document number	Document title	Preparer/author	Revision or date of issue
[1] IEC 60050	International Electro technical Vocabulary (IEV)	IEC	Latest

2.1.2 South African national document(s)

Document number	Document title	Preparer/author	Revision or date of issue
[2] OHS Act No. 85	Occupational health and safety act and regulations	-	1993

2.1.3 Eskom national document(s)

Document number	Document title	Preparer/author	Revision or date of issue
[3] EPC 32-247	Environmental Procedure: Bush clearing	Eskom	1
[4] EPC 32-846	Operating Regulations for High Voltage Systems (ORHVS)	Eskom	0
[5] EST_32-332	First aid standard	Eskom	1
[6] DISASAAN0	Standard for the labelling of substations and networks	Eskom	2
[7] NRS 000	NRS definitions	Eskom	Latest

2.1.4 Eskom divisional document(s)

Document number	Document title	Preparer/author	Revision or date of issue
[8] DPL_32-727	Safety, health, environment, and quality (SHEQ) policy	Eskom	0
[9] DST_34-1454	Clearing and maintenance of servitude routes	Eskom	0
[10] DST_34-1456	Routine inspection of electrical equipment	Eskom	0
[11] DST_34-1985	MV and LV earthing	Eskom	2
[12] DST_34-334	Inspection and supplemental treatment of treated wood utility poles	Eskom	2

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Document number	Document title	Preparer/author	Revision or date of issue
[13] DST_34-1191	Part 4: Medium voltage distribution. Section 0: General information and requirements for overhead lines up to 33kV with conductors up to Hare/Oak	Eskom	0
[14] DST_34-1342	Standard for the maintenance of isolators	Eskom	1
[15] DST_34-504	Standard for the maintenance of insulators	Eskom	1
[16] DST_34-1451	Standard for the maintenance of circuit breakers and oil- immersed isolators	Eskom	0
[17] DST 34-453	Distribution standard Part 4: medium voltage reticulation section 4: SWER particular requirements for 19kV single wire earth return (SWER) overhead reticulation	Eskom	Latest
[18] DST_34-503	Standard for maintenance on capacitor banks and SVC's	Eskom	1
[19] DST_34-1205	Substation earthing	Eskom	0
[20] DISAGABF5 (DGL_34-555)	Guideline for the routine inspection and consequential maintenance of high, medium and low voltage power lines	Eskom	0
[21] DMN_34-2172	Fibre optic maintenance	Eskom	0
-	Manufacturers manuals	Manufacturers	-

2.2 Informative references

Document number	Document title	Preparer/author	Revision or date of issue
[22] 32-9	Definition of Eskom documents	Eskom Document Centre	Latest
[23] 32-644	Eskom documentation management standard	Eskom Document Centre	Latest
[24] 474-65	Operating manual of the Steering Committee of Technologies (SCOT)	Vinod Singh	Latest
[25] DST_34-4	Procedure for the preparation and administration of distribution standards	Eskom	0
[26] DST_34-1710	Provision and use of personal protective equipment	Eskom	0
[27] DPC_34-227	Pre-task planning and feedback process	Eskom	0
[28] 08 TB – 02	Phasing out of the term 'reticulation'	Eskom	0

3. Definitions and abbreviations

3.1 Definitions

The following definitions are used in this document. Also refer to the definitions listed in [4] EPC 32-846, [2] OHS Act No. 85 or recognized industry glossaries such as [1] IEC 60050 and [7] NRS 000, and use these wherever appropriate.

Definition	Explanation
Close inspection	Inspection which encompasses those aspects covered by a visual inspection and, in addition, identifies those defects, such as loose bolts, which will be apparent only by the use of access equipment, for example steps, (where necessary), and tools. [IEC]
Damper	A device attached to a conductor or an earth wire in order to suppress or minimize vibration caused by wind.
Detailed inspection	Inspection which encompasses those aspects covered by a close inspection and, in addition, identifies those defects, such as loose terminations, which will only be apparent by opening the enclosure, and/or using, where necessary, tools and test equipment. [IEC]
Intrusive maintenance	This is the execution of specialist maintenance where special knowledge and skills is needed.
Routine inspection	Details line inspections conducted frequently as operational and environmental factors require the specification and scheduling of Preventative Maintenance (PM) in order to assess the condition of the line and establish the consequential maintenance.
Spacer	A device that keeps the sub-conductors of a bundle in a given geometrical configuration.
Visual inspection	Inspection which identifies, without the use of access equipment or tools, those defects, such as missing bolts, which will be apparent to the eye. [IEC]

3.2 Abbreviations

Abbreviation	Explanation
CAP	Committee for Accepted Products
DBM	DESIGN BASE MAINTENANCE
ENS	Electrical Network Schematics
GM	General Manager
PD	POWER DELIVERY
IEC	International Electrotechnical Commission
IEV	International Electrotechnical Vocabulary
LAP	List of Accepted Products
n/a	not applicable
NEC	Neutral Earthing Compensator
NECR	Neutral Earthing Coupling Resistor
OHSA	Occupational Health and Safety Act
PM	Preventative Maintenance
RCM	Reliability-centred Maintenance
SCOT	Steering Committee of Technologies
SHE	Safety, Health and Environment
SWER	Single Wire Earth Return

4. Requirements

4.1 Responsibilities

The authorized person or his delegate shall ensure that all requirements including inspections, follow-ups to maintenance as stipulated in this standard are adhered to.

4.2 Safety

4.2.1 Operating and earthing

When a line has to be taken out of service for maintenance or repairs, it shall be made safe to work on in accordance with [4] EPC 32-846.

4.2.2 Risks and hazards

- a) Risk assessment shall be carried out in accordance with [27] DPC_34-227 before commencing with all the tasks.
- b) Any dangerous situation discovered during an inspection, for example steel down, stay insulator broken, conductor on cross-arm, shall be reported and repaired immediately.
- c) All personal protective equipment shall be in accordance with [26] DST_34-1710.

4.3 Inspections

Inspection planning shall be carried out in accordance with [10] DST_34-1456.

4.3.1 Visual inspections

Routine visual inspections shall be carried out at the minimum frequencies stipulated in 4.3.4 and in accordance with the minimum requirements set out in the Maintenance Management System works order, an example of which is given in Annex C.

These inspections shall be done to identify any defects such as, but not limited to:

- a) Broken insulators and arresters
- b) Pollution
 - The different types of pollution shall be recorded, e.g.:
 - Industrial
 - Marine
 - Sand
 - Bird
- c) Dampers and spacers adrift or faulty
- d) Erosion
- e) Discolouration/corrosion of conductors and steel towers
- f) Damaged conductors
- g) Incorrect clearance from ground or trees

- h) Incorrect clearance on shared structures
- i) Incorrect clearance from Telkom line crossings
- j) Activities under power lines, e.g. buildings
- k) Worn hardware and damaged structures
- l) Oil/SF6 leaks on recloser/sectionalizers or transformers etc.
- m) Correspondence of the single line diagrams (i.e. Electrical Network Schematics (ENS)) with the physical installation (check and ensure that they are the same)

4.3.2 Detailed line inspections

4.3.2.1 Towers

Detailed hands-on inspections shall be carried out at the frequency specified in 4.3.4 using a Maintenance Management System generated checklist similar to the example in Annex B and covering at least the following:

- a) Inspection of all hardware.
- b) A corrosion inspection (especially at the coast or in pollution areas).
- c) Inspection of paintwork and foundation conditions.
- d) A pole numbering inspection.
- e) An inspection of all bolts, dampers, connectors, etc.
- f) When the line has more than 100 structures, at least the following shall be performed:
 - One suspension unit (hardware and clamps assemblies) every 100 structures shall be removed, dismantled and inspected for damage or non-conformance.
 - One damper and spacer every 50 structures shall be removed and inspected for damages or non-conformance.
 - The conductor shall be inspected for damage.
- g) If the line has less than 100 structures, at least the following shall be performed:
 - At least one suspension unit (hardware and clamps assemblies) shall be removed, dismantled and inspected for damage or non-conformance.
 - One damper and one spacer shall be removed and inspected for damage or nonconformance.
 - The conductor shall be inspected for damage.
- h) Where any problems are found, further checks/analysis shall be carried out on those items.
- i) A pole top inspection shall be conducted and shall cover at least the following (refer to [20] DISAGABF5 (DGL_34-555)):
 - Inspection of hardware for defects.
 - Inspection of dampers, insulators, preforms products, conductor, cross-arm, etc. for damage.

4.3.2.2 Steel and concrete pole lines

Detailed, hands-on inspections shall be carried out at the frequency specified in 4.3.4 using a Maintenance Management System works order similar to the example in Annex B and, as a minimum, shall cover at least the following:

- a) Inspection of all hardware
- b) A corrosion inspection (especially at the coast or in pollution areas)
- c) Inspection of paintwork and foundation conditions.
- d) A pole numbering inspection.
- e) An inspection of all bolts, dampers, connectors, etc.
- f) A pole top inspection shall be conducted and shall cover at least the following (refer to [20] DISAGABF5 (DGL_34-555)):
 - Inspection of hardware for defects.
- g) Inspection of dampers, insulators, preform products, conductor, cross-arm, etc. for damage

4.3.2.3 Wooden-pole lines

A detailed hands-on line inspection shall be carried out at the frequency specified in 4.3.4, and shall cover at least the following:

- a) A pole-by-pole check of the condition of each pole (including partial excavation and a check for degradation at each pole in suspected areas, otherwise every tenth pole).
- b) A visual inspection of all wooden-pole lines in accordance with [12] DST_34-334.
- c) A pole top inspection, which shall cover at least the following (refer to [20] DISAGABF5 (DGL_34-555)):
 - Inspection of hardware for defects.
 - Inspection of earth bonding.
 - Inspection of dampers, insulators, preform products, conductor, cross-arm etc. for damage

4.3.3 After handover inspections

- a) An inspection shall be carried out within 10 months after handover to ensure that:
 - all problems identified on the handing-over certificate have been addressed; and
 - any construction defects are identified.
- b) The inspector can then submit these defects in writing to the contractor, within the guarantee period, for rectification within the period specified in the contract.
- c) Only trained/competent/authorized personnel shall carry out these inspections.

4.3.4 Inspection and earth test frequencies

- a) Frequency of inspections shall be determined by Reliability-centred Maintenance (RCM) techniques.
- b) Where RCM studies/analysis has not been conducted, the minimum requirements specified in Table 1 will apply:

Table 1: Inspection frequencies

Line Type	Inspection frequency (minimum)		
	Visual (4.3.1)	Detailed (4.3.2)	After handover (4.3.3)
1. Sub-transmission	Annually *	10 years	Within 10 months
2. Distribution	Annually *	10 years	Within 10 months
NOTE: The asterisk (*) used in the table means the duration mentioned or following a close succession of faults with unidentified causes.			

Table 2: Earth testing frequencies

Equipment Type	Test type	Frequency
3. Pole-mounted transformer	Earth resistance (1985)	5 years
4. Pole-mounted recloser	Earth resistance	5 years
5. Tower	Tower footing resistance	5 years
6. SWER isolation transformer	Earth resistance ([17] DST 34-453)	5 years

4.4 Planned maintenance

4.4.1 Planning

- a) Planned maintenance shall generally be classified into the following three types:
- 1) Routine: The maintenance/inspection necessary to ensure the satisfactory operations of lines and equipment and planned on a regular basis.
 - 2) Minor: The third line intrusive preventative maintenance.
 - 3) Major: The comprehensive block maintenance of distribution lines and equipment or refurbishment.
- b) Inspections and performance reports will largely determine what maintenance is to be done and when it shall be carried out, and the maintenance shall be carefully planned to reduce costs.

4.4.2 Transport and servitudes

4.4.2.1 Transport

- a) The condition of the terrain and natural vegetation will generally prescribe the method of transport and careful consideration shall be given to environmental conservation.
- b) Transport shall not cause undue damage to roads, vegetation, crops or fields prepared for planting, etc. and, where possible, servitude roads shall be used unless otherwise arranged with the landowner.
- c) The inspection team shall repair any damage caused by vehicles.

4.4.2.2 Servitudes

- a) Reference [9] DST_34-1454 sets out Eskom's rights with regard to servitudes, and the approach to the control and cutting of trees and bushes within these servitudes.
- b) Where Eskom has Access Road rights for roads necessary for patrols and maintenance of lines, the road shall be maintained so that they are usable at all times (refer to [9] DST_34-1454).

- c) All servitude gates shall be kept locked unless otherwise agreed with the landowner who shall indemnify Eskom. Gates shall only be installed with the permission of the landowner and Eskom shall maintain them in good order. This specifically includes any earth straps bonding the gate and posts.
- d) The encroachment into Eskom's servitudes of new buildings, extensions, tennis courts, swimming pools and barns shall be reported immediately, especially if they are underneath the lines or inside the stipulated safety clearance.

4.4.3 Foundations (towers)

The following shall be inspected or checked:

- a) Foundations capping (clear off the soil and repair them if found to be damaged).
- b) Erosion at tower legs (damage shall be repaired to prevent recurrence).

4.4.4 Structures

- a) No tower or pole shall be climbed if it is mechanically or electrically unsafe to do so. Damaged anti-climb devices shall be repaired. All loose bolts and nuts shall be re-tightened, punched and painted.
- b) Damaged and faded warning labels shall be replaced.
- c) Where structure tower legs (mounting onto the foundation) are buried in the ground, the soil around the structure legs shall be cleared, and the footing/legs inspected for corrosion and repaired.

4.4.5 Hardware

4.4.5.1 Split pins

- a) All split pins shall be checked/inspected to ensure that they are in place, the correct type, undamaged and correctly fitted. They shall be replaced, as required, by a stainless steel split pin.
- b) There shall be a check for missing nuts and also for loose nuts that can chafe/wear off through split pins, ultimately resulting in the line coming adrift from the support structure.

4.4.5.2 Conductors

- a) Armouring and ferrules
 - 1) Armouring and ferrules shall be checked and replaced with approved types where damage has been caused to the conductor. Discolouring, flash marks and any other damage shall be recorded and repaired where applicable (refer to Annex C).
 - 2) Only approved joints to be applied (Preform/Compression/Auto joints).
- b) Spacers and dampers
 - 1) Spacers shall be checked and replaced if necessary.
 - 2) Loose or shifted dampers shall be repositioned and re-tightened if the conductor is not damaged.
 - 3) Damaged conductors shall be repaired.
 - 4) Damaged dampers shall be replaced with new ones, and of the correct conductor diameter.
- c) Hardware in general

All other items of hardware shall be checked for wear and tear and replaced where necessary.

4.4.5.3 Insulators

a) Inspection, maintenance or replacement

The inspection, maintenance or replacement of insulators shall be as per [15] DST_34-504 and local procedures and task manuals.

b) Damaged insulators

Damaged or flashed-over insulators shall be replaced. If a glass insulator has to be replaced, the remaining glass insulators on the string shall be cleaned to the same degree of cleanliness as the 'new' disc inserted, or the whole string shall be replaced. The reason for this is to prevent flashovers on the new disc inserted in the string due to old insulators having been polluted.

c) Live replacement of insulators

The replacement of insulators by live-work methods shall be the first option.

d) Earth wire insulators

The gap between the arcing horns shall be 6,5 cm.

4.4.6 Bird nests (refer to EPC 32-247)

a) Bird nests shall not be removed from structures unless the possibility exists that a flashover can occur.

b) All structures where bird nests are found shall be identified and reported.

c) A photograph of the nest shall be taken, if possible, to identify the type of bird.

d) The trees shall be trimmed back without damage to the nest if possible.

4.4.7 Distribution line equipment

a) Spark-gap protection on transformers or systems where surge arresters are installed is NOT recommended ([13] DST_34-1191), but if gap setting is required, refer to Table 3.

Table 3: Spark-gap settings

Nominal system voltage (kV)	Recommended gap		Negative lightning impulse flashover voltage at sea level (kV)	AC (peak) flashover voltage at 2 000 m	
	Single gap (mm)	Duplex total gap (mm)		Single gap (kV)	Duplex gap (kV)
2,2	21	*	34	22	-
3,3	26	*	38	26	-
6,6	52	40	64	45	42
11	74	56	81	56	56
22	*	104	128	-	90
33	*	160	170	-	117

NOTE: The asterisk (*) used in the table means not recommended.

b) All isolators shall be inspected and maintained in accordance with [14] DST_34-1342.

- c) Pole-mounted reclosers and sectionalizers shall be inspected and maintained in accordance with [16] DST_34-1451.
- d) There shall be a five-yearly programme for earth resistance testing of pole-mounted switchgears and comparisons with the 'handover' test results shall be made.
- e) Pole-mounted transformers shall be inspected and maintained in conjunction with the overhead lines where the equipment is installed and the following maintenance shall be the minimum:
 - There shall be a five-yearly programme for earth resistance testing (refer to [11] DST_34-1985) of pole-mounted transformers and comparisons with the 'handover' test results shall be made.
 - Check all insulators for chips, cracks or broken sheds. A maximum of 20% of chipped, cracked or broken sheds is permitted on an insulator.
 - Check pollution levels on insulators.
 - Check for any insulating oil leaks.
 - Check all surge arresters to be correctly mounted on the transformers as per approved drawings.
 - Check surge arresters for cracked or broken porcelain, signs of flashover (e.g. check surge arrester document).
 - Listen for any audible discharges.
 - Check that the earth wires are in good condition and effectively connected.
- f) Line capacitor banks shall be inspected and maintained in accordance with [18] DST_34-503.
- g) Regulators and boosters assemblies shall also be inspected and maintained as per the manufacturer's manual or area/regional standards and procedures.

4.4.8 Earthing

4.4.8.1 Sub-transmission line

- a) The following shall be inspected or checked on the tower:
 - 1) check and ensured that earth straps are in place and firmly connected;
 - 2) examine the earth straps for damage;
 - 3) where the tower earth enters the ground, excavate/dig to a depth of 150 mm and check for corrosion; rectify the fault where necessary.
- b) The tower footing earth resistance of every tenth tower shall be measured after every five years and recorded using an approved system or procedures (refer to [19] DST_34-1205).
- c) The results shall be compared with those of 'handover' test results and more extensive investigations shall be carried out if significant variations or deterioration are found (refer to [19] DST_34-1205).

4.4.8.2 Single Wire Earth Return (SWER) line system

Refer to [17] DST 34-453.

4.4.9 Housekeeping

- a) After maintenance work is complete, the terrain shall be cleared of all debris and materials, and any required repairs or maintenance to roads, trees, etc. shall be carried out.

- b) Environmental hazards shall be removed in accordance with [5] EST_32-332 and [8] DPL_3.

4.4.10 Labelling of overhead lines

All line labelling shall be in accordance with [6] DISASAAN0.

5. Forms and records

- a) A work order with the applicable job plan and task manual will be issued for any work to be carried out. The feedback required for each specific task will be stipulated on the job plan/work order.
- b) The inspection and maintenance reports shall form the record of work done.
- c) The completed inspection and maintenance report/feedback shall be returned to Plant Department and Work Management Centre together with the work order, and a copy shall be sent to the Technical Services Centre.

Annex A – Impact assessment

(Normative – for Eskom internal use only)

A.1 Guidelines

- All comments must be completed.
- Motivate why items are not applicable (n/a).
- Indicate actions to be taken, persons or organizations responsible for actions and deadline for action.
- Change control committees to discuss the impact assessment and, if necessary, give feedback to the compiler regarding any omissions or errors.

A.2 Critical points

A.2.1 Importance of this document, e.g. is implementation required due to safety deficiencies, statutory requirements, technology changes, document revisions, improved service quality, improved service performance, optimized costs.

Comment: Document revision, statutory requirements, improved service/product quality and improved service/plant performance.

A.2.2 If the document to be released impacts on statutory or legal compliance, this needs to be very clearly stated and so highlighted.

Comment: The OHSA requires that work places shall be made safe and this document sets the parameters for maintenance procedures and task manuals.

A.2.3 Impact on stock holding and depletion of existing stock prior to switch over.

Comment: n/a

A.2.4 When will new stock be available?

Comment: n/a

A.2.5 Has the interchangeability of the product or item been verified, i.e. when it fails, is a straight swap possible with a competitor's product?

Comment: n/a

A.2.6 Identify and provide details of other critical (items required for the successful implementation of this document) points to be considered in the implementation of this document.

Comment: Other maintenance documents must in synchronism when implementing this document.

A.2.7 Provide details of any comments made by the Regions regarding the implementation of this document.

Comment: (n/a during commenting phase).

A.3 Implementation time frame

A.3.1 Time period for implementation of requirements.

Comment: The document is already being implemented as this is just a review.

A.3.2 Deadline for changeover to new item and personnel to be informed of DX wide changeover.

Comment: None required.

A.4 Buyer's guide and power office

A.4.1 Does the Buyer's Guide or Buyer's List need updating?

Comment: No.

A.4.2 What Buyer's Guides or items have been created?

Comment: None.

A.4.3 List all assembly drawing changes that have been revised in conjunction with this document.

Comment: None.

A.4.4 If the implementation of this document requires assessment by CAP, provide details under A.5.

A.4.5 Which Power Office packages have been created, modified or removed?

Comment: None.

A.5 CAP/LAP pre-qualification process-related impacts

A.5.1 Is an ad hoc re-evaluation of all currently accepted suppliers required as a result of implementation of this document?

Comment: No.

A.5.2 If NO, provide motivation for issuing this specification before Acceptance Cycle Expiry date.

Comment: This document specifies no equipment but maintenance and CAP/LAP process is not applicable.

A.5.3 Are ALL suppliers (currently accepted per LAP) aware of the nature of changes contained in this document?

Comment: Refer to A.5.2.

A.5.4 Is implementation of the provisions of this document required during the current supplier qualification period?

Comment: Refer to A.5.2.

A.5.5 If Yes to A.5.4, what date has been set for all currently accepted suppliers to comply fully?

Comment: Refer to A.5.2.

A.5.6 If Yes to A.5.4, have all currently accepted suppliers been sent a prior formal notification informing them of Eskom's expectations, including the implementation date deadline?

Comment: Refer to A.5.2.

A.5.7 Can the changes made, potentially impact upon the purchase price of the material/equipment?

Comment: No.

A.5.8 Material group(s) affected by specification (refer to Pre-qualification invitation schedule for list of material groups).

Comment: None.

A.6 Training or communication

A.6.1 Is training required?

Comment: Yes and maintenance training is already given as part of the portfolio of evidence.

A.6.2 State the level of training required to implement this document (e.g. awareness training, practical/on job, module).

Comment: Awareness training, practical/on job, module, etc.

A.6.3 State designations of personnel that will require training.

Comment: Principal Technical Official, Senior Technical Official, Technical Official and senior supervisor.

A.6.4 Is the training material available? Identify person responsible for the development of training material.

Comment: Most of training module is available.

A.6.5 If applicable, provide details of training that will take place (e.g. sponsor, costs, trainer, schedule of training, course material availability, training in erection/use of new equipment, maintenance training).

Comment: Maintenance training.

A.6.6 Was Technical Training Section consulted regarding module development process?

Comment: Yes.

A.6.7 State communications channels to be used to inform target audience.

Comment: Change Control Committees facilitate the implementation process.

A.7 Special tools, equipment, software

A.7.1 What special tools, equipment, software, etc. will need to be purchased by the Region to effectively implement?

Comment: None.

A.7.2 Are stock numbers available for the new equipment?

Comment: None required.

A.7.3 What will be the cost of these special tools, equipment, software?

Comment: n/a

A.8 Finances

A.8.1 What total costs would the Regions be required to incur in implementing this document? Identify all cost activities associated with implementation, e.g. labour, training, tooling, stock, obsolescence.

Comment: Region will incur training cost.

Impact assessment completed by:

Name: David M Ntombela

Designation: Consultant

Annex B – Example of line inspection sheet
(Informative)

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Annex C – Minimum requirements for a line inspection in a works order

Lattice Tower			TOWER NUMBER/Column						
INSPECTED BY:			SELF-SUPPORTING						
DATE:			GUYED TOWER						
			Remarks	No.					
A. Tower/Mast Structural Steel Corrosion • Tower/masts • Beams • Cross arms • Footings • Plates/bolts • Loose/damaged members	GALVANIZING: • Is there reddish/whitish discoloration? 1 • Are the whole members or only a portion showing rust? 2 • Does the metal appear to be corroded away? 3 • Is there rust streaking off the bolts? 4 • Does the galvanizing appear to be sandblasted? 5 FOUNDATIONS: • Is there any subsiding at the foundation? 7 • Is there any erosion at the footing? 8 • Is any erosion getting close to the tower? 9 • Is the concrete 150 mm above ground level? 10 • Is there sand/soil over the concrete foundation? 11 • Are there any hairline cracks on the footing/benching? 12	MEMBERS: • Look for loose members; if you see none, hit the structure with a rubber mallet or similar and listen for bolt ringing. 13 • Are there missing members? 14 • Is there any loose step bolts? 16 • Are the bottom members bent or damaged? 15 PAINT: • Is the paint blistering? 17 • Is the paint peeling? 18		1.					
				2.					
				3.					
				4					
				5					
				6					
				7					
				8					
				9					
				10					
				11					
				12					
				13					
				14					
				15					
				16					
				17					
				18					

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Lattice Tower			TOWER NUMBER/Column						
INSPECTED BY:			SELF-SUPPORTING						
DATE:			GUYED TOWER						
			Remarks	No.					
B. Earthing: - Adequate - Test results	- Is it bolted tightly? 1 - Is the bolt rusting? 2	- Remove some soil where the earth strap enters. - The ground – is the metal corroding? 3		1					
				2					
				3					
C Stays/Guys - Corrosion - Tension - Grip - Strand	- Is the guy/cross head housing or U-bolt rusting? 1. - Is there visible slip between guy wire and preformed rods? 2 - Are the tamper guards in place? 3. - Examine cut guy end - are strands all the same lengths? 4. - Remove some soil around anchor link.	- Is bitumen still present? Is there rust? 5. - Does the guy wire appear to be slack? 6 (Note if wind is blowing as leeward slack.) NOTE: Tension on a wire dynamometer: 22 dia > 3,5 t; 24 dia > 4,3 t; 28 dia > 6 t; 32 dia > 7,5 t		1					
				2					
				3					
				4					
				5					
				6					
D. Insulators - Clean - Damaged - Clips missing	- Are the insulators dirty? 1 - Is it bird dirt? 2 - Is it pollution? 3 - Are insulators broken? 4 - Insert number of broken per string and position. 5 - Is there faulting on insulators? 6 - Are any security clips missing? 7	- Is there wasting/corrosion/pollution/erosion at pins/stems/rods? 8 - Is there discoloration of hardware? 9 - Insulator Type: 10 (insert letter in block 10) - Porcelain (A) - Glass (B) - Cycloaliphatic (C) - Composites (D)	Indicate Strain Towers to Self-supporting above		1				
					2				
					3				
					4				
					5				
					6				
					7				
					8				
					9				
					10				

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Lattice Tower			TOWER NUMBER/Column						
INSPECTED BY:			SELF-SUPPORTING						
DATE:			GUYED TOWER						
			Remarks	No.					
E. Conductors and Earth Wire - Condition - Spacers - Dampers - Jumpers - Joints	- Check suspension clamp for wear. 1 - Is the damper/spacer distorted? 2 - Are there any loose wires or bird-caging? 3 - Is there any bulging of the wire? 4 - Is there a white powder on the conductor? 5 - Does the conductor appear to be wearing? 6 - Are there burn marks on the conductor? 7 - Is the bundle twisted? 8 - Is the hardware wearing? 9 (Use binoculars)	- Is conductor pulling through the two halves of the AGS clamps? 10 - Look for heat discolouration on the ends of the mid-span joints and strain clamps dampers, etc. 11 - Is a railway line within ± 800 m? 12 - Is there insulation on the earth wires? 13 - Are there loose bolts on the clamps? 14 - Is the Crosby clamp in place on the jumper? 15 - Have the dampers moved along the span? 16 - Is there damage due to armour rods? 17		1					
				2					
				3					
				4					
				5					
				6					
				7					
				8					
				9					
				10					
				11					
				12					
				13					
				14					
				15					
				16					
				17					

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Lattice Tower			TOWER NUMBER/Column					
INSPECTED BY:			SELF-SUPPORTING					
DATE:			GUYED TOWER					
			Remarks	No.				
F. General • Identification • Anti-climbing • Servitude • Tree clearance • Gate locks • Access	• Is the tower numbered? 1 • Is the number peeling? 2 • Is the number clear? 3 • Is anti-climbing device damaged? 4 • Is anti-climbing device obstruction free? 5 • Is the service road obstruction free? 6	• Are there access road wash-aways? 7 • Is the retaining wall damaged? 8 • Could any trees that are growing towards the phases get too close to the line? 9 • Are all locks in place? 10 • Is there any damage to the gates? 11 • Is access difficult, is a helicopter required? Or new roads or quarries appearing? 12 (Use remarks column)		1				
				2				
				3				
				4				
				5				
				6				
				7				
				8				
				9				
				10				
				11				
				12				

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