Eskom	Procedure	Technology

Title: **SECONDARY PLANT SECURITY SYSTEMS MAINTENANCE PROCEDURE**

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Content

1. Introduction

The purpose of this document is to describe the step-by-step guideline process for maintenance of security systems for the Eskom Telecoms and Transmission Division.

2. Supporting clauses

2.1 Scope

This Maintenance Procedure is applicable to secondary plant physical security systems. All minimum maintenance activities are stipulated along with the triggers for recommended maintenance activities and the associated logistics requirements.

This procedure covers the following:

- Maintenance of Non-Lethal Energized Perimeter Systems (NLEPDS),
- Maintenance of CCTV Surveillance systems,
- Maintenance of Access Control systems,
- Maintenance of Intrusion Pre-Detection systems,
- Maintenance of Public Address (PA) systems,
- Maintenance of security alarm systems,
- Physical Security Information Management System (PSIM).

2.1.1 Purpose

The purpose of this document is to stipulate the procedure for maintenance of secondary plant physical security systems within the Eskom Telecoms and Transmission Group, to ensure optimal performance to contribute to the quality of supply to customers by ensuring that all personnel and assets are protected in an effective and safe manner.

2.1.2 Applicability

This procedure shall apply throughout National Transmission Company.

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] Occupational Health and Safety Act, (Act No.85 1993)

[2] 240-61182486 Maintenance standard for Substation facilities

[3] 240-91190304 - Specification for CCTV Surveillance with Intruder Detection.

[4] 240-86738968 - Standard for Security Alarm Systems for Protection of Eskom Installations and its Subsidiaries

[5] 240-170000096 Physical Security Integration Standard

[6] ISO 9001:2015 Quality management systems - Requirements

[7] 32-391 Guide to Integrated Risk Management, Eskom Ltd, 2009

[8] 240-91252455: Technical Specification, Lighting for Perimeter Security at Eskom Installations.

[9] DEM2412993 & 2425114: LAD PAC for Physical Security Information Management System (PSIM).

[10] 240-102220945: Specification for Integrated Access Control System (IACS) for Eskom Sites.

[11] 240-170000098: Security public address systems for substations and telecoms high sites.

[12] 240-170000691: Standard for Intrusion Pre-detection Systems used at Eskom sites.

2.2.2 Informative

2.3 Definitions

2.3.1 General

Definition	Description
CCTV surveillance system	A system that consists of camera equipment as well as any monitoring and associated equipment for transmission and controlling purposes that is necessary for surveillance of a defined security zone.
Non-Lethal	A pulsed energy supply to the fence in accordance with the Government Gazette.
Sector	Portion of electric fence from feed to return of energy supply.
Zone	Subdivision of sector.
Gate Sector	A Fence section that is dedicated to the Access area.
Control Centre	The Centre that monitors the Alarms.
Zero Control	Transmission's Security monitoring control Centre
Unit	Refers to an energizer/electrified sector.

2.3.2 Disclosure classification

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

2.4 Abbreviations

Abbreviation	Description
CCTV	Closed Circuit Television
GUI	Graphical User Interface
IDF	Intermediate Distribution Frame
ERTU	Enhanced Remote Terminal Unit
PA	Public Address
SCADA	Supervisory, Control and Data Acquisition

2.5 Roles and responsibilities

- Transmission Secondary Plant Managers shall ensure that this procedure is applied for maintenance of secondary plant physical security systems.

- Personnel using this procedure shall comply with requirements stipulated and use it in conjunction with documents listed in 2.2.

2.6 Process for monitoring

- The Design base Operating Unit, Standards Implementation section is responsible to ensure that the correct change control and awareness takes place.
- Regions and Operating Units shall ensure that the document is dispersed and understood.
- Maintenance and Operations departments in the respective Regions and Operating Units shall ensure that there is adherence to the maintenance requirements outlined in this document.

2.7 Related/supporting documents

TPC41-245 Superseded by this document.

3. Document Contents

This document outlines the procedure for maintenance of electronic physical security systems at Eskom substations and Telecoms sites. The Security systems covered in this document include CCTV System, Access Control System, Electric fence System, alarm system, Intrusion pre-detection system, Public Address (PA) System, intercom system and Physical security information management (PSIM) system. The tests stipulated shall be undertaken to ensure that the installed Security Systems still meet the installation and functional requirements and to identify and correct non-conformances. This will ensure that the installed systems can still operate optimally throughout their lifespan. All results and measurements shall be recorded as per the Annexures.

Note: The terms Electrified fence system and Non-Lethal Energized Perimeter Detection System (NLEPDS) will be used interchangeably in this document and shall refer to the same system.

3.1 Electrified Fence System (ANNUXURE A)

3.1.1 Visual inspections

Physical conditions of the main components of the installed NLEPDS shall be checked including the following at minimum:

i. Energizers / earth units
ii. Surge arrestors
iii. All cables inside/outside (labelling)
iv. I.D.F (condition and labelling)
v. Earthing
vi. Graphical User Interface
vii. Updated records and drawings availability

3.1.2 Operational checks

Functional tests shall be performed for correct operation of the system both onsite (through local GUI) and through to the remote security monitoring centre (Zero Control).

a) Apply a physical fault to the fence for each sector / zone and verify correct alarming. Where more than one gate indication is monitored then each gate must be tested. The following are the standard minimum alarms and indications to be monitored:

i. Fence Alarm

ii. System Off
iii. Equip fail
iv. Gate Open
v. Panic alarm

b) Where the Gate Sector is energized separately, test if the sector automatically switches off when the gate opens. This is particularly important as a safety feature for personnel and becomes critical when the gate has to be manually overridden.

c) To test manual and automatic operation of the security lights and siren, apply a physical fault to the fence for each and every sector/zone, check if correct light sectors siren / audible alarm are activated.

d) To test remote monitoring, check that all alarms are sent through to remote security control centre (Zero Control). Record results and person from control centre with whom the alarms were tested with. Test for system auto reset.

3.1.3 Measurements.

a) Use a Fence Impulse Analyser to measure the Non-Lethal Voltage and Energy for all energizers to establish condition of energisers, cables, and the fence (cable leakage, deterioration and looping connection points). Measure energy for each energizer for the following conditions at:

i. No load (energizer not connected to the fence)

ii. unit with fence normal load at start, midpoint and return of fence

Measure and record all battery voltage results for all units. These measurements must be done at start of and after a minimum of 20 minutes of battery backup mode operation. Calculate if battery will deliver the minimum hours backup required. In simple terms, initial V – $V_{(20min)}$ = 20min then calculate how long battery will last until preset cut off level is reached.

There are however many factors that can influence the battery and thus accurate calculation is considerately more complex. It is thus highly recommended that the batteries be replaced when necessary.

3.2 Maintenance on Access Control Systems (Annexure B)

3.2.1 Physical Visual inspection of installed access control systems equipment

- Access control systems electronic modules
- Gate Motor controllers and motors and limit switches
- Magnetic locks
- All cables inside/outside (labelling)
- I.D.F (condition and labelling)
- Earthing
- Updated records and drawings available

3.2.2 Test operation of Access Control for both:

- Normal Conditions (Annexure B). Test for correctness of operation and of all gates. Adjust and realign all limit switches and magnetic locks.
- Abnormal Conditions (Annexure B). Test for correctness and ease of operation of manual override switches and crank stations to enable emergency entrance.

3.2.3 Check for access control configuration integrity and correctness (Annexure B).

Check for correctness of details for all badges (cards) and remotes, delete all unallocated badges. Adjust for the correct time and date. Check that all public holidays are valid and correctly configured. Test that all access transactions are being correctly logged. Test if printer port is operational by printing latest badge listing. Test if the remote communication to access control system is functional (modem).

3.2.4 Measure all associated batteries for each unit and determine for the required 8 hours backup (Annexure B).

In simple terms, initial V – $V_{(20min)}$ = 20min then calculate how long battery will last until pre-set cut off level is reached.

There are however many factors that can influence the battery and thus accurate calculation is considerately more complex. It is highly recommended that the batteries be replaced when required.

3.3 Maintenance on CCTV (Annexure C)

Maintenance of the CCTV System shall include adjusting all necessary settings to ensure that the installed CCTV meets functional requirements as per the technical specifications. This shall include testing of the system including simulation of security bridge incidents and testing of communication between the system on site and the security control room (off site and on site).

3.3.1 Non PTZ cameras Test procedure

a) Each camera shall be tested against its intended purpose

b) The test shall be performed by crossing the protected zone/virtual fence at multiple points.

c) The test shall be done by walking upright, hunched, and crawling through the protected zone.

d) The distance at which the test shall start is from just before the detector's anticipated blind spot (if any).

e) Cross the area covered by the detection system, increasing in intervals of 10m from the detector's location.

f) Cross the area where there are distinct depressions and elevations.

g) If the footage is to be recorded and viewed from a security control room, the tests shall be done based on control room footage and then repeated for recorded footage.

h) The target shall be placed at the furthest point to be covered and the percentage height of the screen taken up by the target shall be determined.

i) The resolution achieved shall be tested using a rating of 'poor/sufficient/excellent'.

j) The frame rate achieved shall be tested using a rating of 'poor/sufficient/excellent'.

k) The depth of focus achieved shall be tested using a rating of 'poor/sufficient/excellent'.

l) The colour quality achieved shall be tested using a scale of 1-10.

m) Cameras intended for recognition or identification: The ability of a viewer to recognise/identify a human or number plate shall be tested using a human or number plate.

3.3.2 PTZ cameras Test procedure

a) The control of the PTZ cameras shall be tested from within the equipment room, as well as from the security control room.

b) Pan the PTZ camera 360º clockwise, as well as counterclockwise.

c) Tilt the PTZ camera over the camera's full range.

d) The PTZ camera shall also be tested to verify that it can be effectively used to enable the security control room to gather real-time information about incidents on site, and co-ordinate the response to any intrusions.

e) A person of average height (about 1.6m) shall be used as the target for the tests.

f) if the footage is to be recorded, and viewed from a security control room, then the tests must be done based on live control room footage, and then repeated for recorded footage.

g) The target shall be placed at each of the areas to be covered by the PTZ pre-set positions and the effectiveness of the PTZ footage at that pre-set will be evaluated.

h) If PTZ tracking is available, it shall be tested by a person walking and running between various positions on the site.

i) Cameras intended for recognition or identification: The ability of a viewer to recognise/identify a human or number plate shall be tested using a human/number plate.

j) A walk test shall be used to determine and sketch the horizontal field of view and area of focus of each pre-set position. A measuring tool shall be used to determine exact dimensions of the field of view achieved. Figure below shows an example sketch:

3.3.3 NVR Test procedure

An incident on site shall be simulated and the following verified:

a) NVR Records for 5s second before the event, the time of the actual event and 15s second after motion stops.

b) A short video clip / series of still pictures from the camera covering the zone where the alarm triggered is sent to the security control room.

c) The quality of the clip received at the security control room is such that the controller can clearly identify whether the intruder detection was triggered by a human.

3.4 Intrusion detection and Alarm systems (Annexure D)

3.4.1. Test procedure

3.4.1.1 Indoor Intruder Detection Tests

a) The test shall be performed by entering/simulating entrance into the protected area.

b) The test shall be done by walking upright, hunched, and crawling through/just in front of the potential point of entry.

c) Verify detection for each potential entry point.

3.4.1.2 Outdoor Intruder Detection Tests

a) The test shall be performed by crossing the protected zone/virtual fence at multiple points.

b) The test shall be done by walking upright, hunched, and crawling through the protected zone.

c) The distance at which the test shall start is from just before the detector's anticipated blind spot (if any).

d) Cross the area covered by the detection system, increasing in intervals of 10m from the detector's location.

e) Cross the area where there are distinct depressions and elevations.

f) Verify detection for each crossing of the protected zone.

3.4.2. Intrusion and Alarm systems conformance and test qualification

a) The intrusion and alarm systems shall be tested for conformance to the technical specifications below:

i. 240-86738969: Specification for Integrated Security Alarm System for Protection of Eskom installations and its subsidiaries.

ii. 240-170000691: Standard for Intrusion Pre-detection Systems used at Eskom sites

b) Compliance check sheet(s) in Annex D shall be completed.

3.5 Public Address (PA) System (Annexure E)

3.5.1 Test procedure

a) Public Address system shall be tested to confirm required functionality and good workmanship.

b) The PA system shall be tested from within the site security equipment room, as well as from the remote security control room.

c) An employee shall speak over the PA system in the guard house while another employee shall stand next to the wall to listen and determine the clarity of the PA system.

d) A sentence shall be said over the system while an employee is positioned at each corner of the site, on all corners of the site and at any identified critical positions where there may be obstacles or obstructions that may buffer, distort, or echo the audio coming from the speakers.

e) The employee shall confirm whether the sentences heard were the same as what was said. This shall be done by writing down what was heard and correlating on completion of the test.

f) Verify whether the clarity and volume of the audio is acceptable and can be well distinguished from any surrounding noise that may exist in the area such as transformer hum and corona noise.

g) The test shall be repeated with the person speaking from offsite at the remote security control room.

3.5.2 Public Address system conformance and test qualification

a) Public Address shall be tested for conformance to technical specification 240-170000098: Security public address systems for substations and telecoms high sites

b) Compliance check sheets in Annex E shall be completed.

3.6 Intercom System (Annexure F)

3.4.3. Test procedure

a) Intercom system shall be tested for connectivity to the site security control room as well as the remote security control centre.

3.4.4. Intercom system conformance and test qualification

a) Intercom system shall be tested for conformance to technical document 240-102220945: Specification for Integrated Access Control System (IACS) for Eskom Sites.

b) Compliance check sheets in Annex G shall be completed.

3.7 Physical security information management system (PSIM) (Annexure G)

3.7.1 Test procedure

a) Connectivity between site level subsystems and the PSIM system (both locally and remotely) shall be tested.

3.7.2 PSIM conformance and test qualification

a) PSIM shall be tested for conformance to technical document DEM2412993 & 2425114: LAD PAC for Physical Security Information Management System (PSIM)

b) Compliance check sheets in Annex G shall be completed.

4. Authorization

This document has been seen and accepted by:

Name and surname	Designation
Ellan Phaahla	Northern Grid Secondary Plant Manager
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5. Revisions

Date	Rev.	Compiler	Remarks
April 2023	1	Matsobane Phosa	• Added new security systems. • Updated Document number.
January 2007	0	Joe Verissimo	New document compiled

6. Development Team

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

- Fanie Pretorius
- Donald Moshoeshoe
- Jan Baartman
- Busi Green
- Joe Verissimo

7. Acknowledgements

Not applicable.

Annexure A

Maintenance Check sheets for Electrified Fence Systems

A0. NLEPDS Installation Details

Station/Site:	
Energizer OEM:	
IP Address (where applicable):	
Worksorder number:	
Name of tester:	
Signature:	
Date:	

A1. Visual Inspection For Physical Condition Of The Installed Security Fence System.

	GOOD	FAIR	POOR
Fence posts			
Conductors			
Safety Signs			
General condition of Fence Area			
Fence/Loop connections			
Cabinets			
Isolators/earthing box units			
Surge Arrestors			
All cables (internal/external)			
Cable labelling			
IDF (condition and Labelling)			
All Earthing			
Mimic/Graphical User Interface			
Updated records and Drawings			
Comments:			

A2. OPERATION

A2.1. Testing alarms

	Normal				Normal		
Unit 1	**Energizer**	**MMI**	**Control Centre**	**Unit 2**	**Energizer**	**MMI**	**Control Centre**
Fence Alarm				**Fence Alarm**			
System On/Off				**System Off**			
Equip Fail				**Equip Fail**			
Gate Open				**Gate Open**			
	Normal				**Normal**		
Unit 3	**Energizer**	**MMI**	**Control Centre**	**Unit 4**	**Energizer**	**MMI**	**Control Centre**
Fence Alarm				**Fence Alarm**			
System Off				**System Off**			
Equip Fail				**Equip Fail**			
	Normal				**Normal**		
Unit 5	**Energizer**	**MMI**	**Control Centre**	**Unit 6**	**Energizer**	**MMI**	**Control Centre**
Fence Alarm				**Fence Alarm**			
System Off				**System Off**			
Equip Fail				**Equip Fail**			
	Normal				**Normal**		
Unit 7	**Energizer**	**MMI**	**Control Centre**	**Unit 8**	**Energizer**	**MMI**	**Control Centre**
Fence Alarm				**Fence Alarm**			
System Off				**System Off**			
Equip fail				**Equip Fail**			
	Normal				**Normal**		
Unit 9	**Energizer**	**MMI**	**Control Centre**	**Unit 10**	**Energizer**	**MMI**	**Control Centre**
Fence Alarm				**Fence Alarm**			
System Off				**System Off**			
Equip Fail				**Equip Fail**			
	Normal				**Normal**		
Unit 11	**Energizer**	**MMI**	**Control Centre**	**Unit 12**	**Energizer**	**MMI**	**Control Centre**
Fence Alarm				**Fence Alarm**			
System Off				**System Off**			
Equip Fail				**Equip Fail**			

A2.2. Other Operations

GATE SECTOR			
	YES	**NO**	**Comments**
Energized by separate unit:			
Switch Contacts operational:			
LIGHTS			
Lights operate manually:			
Correct zones operate:			
SIREN			
Siren Audible:			
Activated by each alarm			

A3. REMOTE MONITORING

Operator tested with: _____

A4. MEASUREMENTS:

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12
No Load Voltage												
Energy (J) Feed - no fence												
Voltage (V) start-mid-end point of fence	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:
Energy (J) start-mid-end point of fence	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:
Batt Charger Voltage												
Batt Volt No Load												
Batt Volt on Load(After 20 min)												
Battery replaced(Tick)												

Batt time calculation: Volt drop in 20min =_____ therefore Volt drop to cut off point = _____min.

Overall Comments: _____

_____

Annexure B

B1. Maintenance on Access Control Systems.

Station/Site:	
OEM Name:	
IP Address:	
Worksorder number:	
Name of tester:	
Signature:	
Date:	

B2. Physical Inspection of Installed Access Control Equipment

Task Description	Yes	No	Comments
Device Mounting Secure			
Device Position and Height Correct			
Device Triggered with Approved Access			
Device Triggered with Denied Access			
Battery Installed and Connected			
Gate Motors and controllers			
All cables inside/outside (labelling/condition)			
Infra-Red Beams			
Break Glass Unit Functionality Tested			
Labels Verified			
PSIM Functionality Tests			
Alarm Panel Integration Test			
Transactions loggings (correctly):			
Update / correct and print badge information			
Check Time Zones			
Download badges			

Overall remarks: _____

B3. Measurement Of Batteries

	Charging Voltage	Battery Voltage
Biometric/Card reader:		
Gates		
Magnetic Locks		

Were batteries replaced?

YES	NO

Overall Remarks: _____

Annexure C

C1. Maintenance on CCTV system

Station/Site:	
OEM Name:	
IP Address:	
Worksorder number:	
Name of tester:	
Signature:	
Date:	

C2. Physical Inspection of Installed CCTV Equipment

Task Description	Yes	No	Comments
Check Camera Mount Secure			
Equipment Cabinet (Door Seals/Rust)			
Camera Factory Lens Covers/Stickers Removed			
Camera Field of View Adjusted Accordingly			
Camera Lens and Housing Secure and Clean			
Confirm labelling Done			
Control and function tests of cameras in PSIM			
Device Trigger Tests			
Check for Viewing Risks, trees, obstructions etc.			
Camera Specific Zones			
Date & Time Correct			
Data Storage device space			
PTZ Control & Touring Tests (PTZ Cameras Only) both locally and remotely			
Camera Alignment and focus			
All cables (labelling/condition)			
I.D.F (condition and labelling)			
Earthing (Condition)			
Updated records and drawings available			

Overall remarks: _____

_____

C3. Intruder Detected?

	Yes	No	N/A
Standing			
Walking			
Crawling			
Hunched			

Remarks: _____

_____

_____

Annexure D

Intrusion Detection and Alarm Systems

Station/Site:	
OEM Name:	
IP Address:	
Worksorder number:	
Name of tester:	
Signature:	
Date:	

D1 Intrusion Alarm Systems

Task Description	Yes	No	Comments
Panel & Devices Mounted Secure			
Alarm Panel Power Supply Operational			
Alarm Panel Battery			
Cable Labelling Confirmed			
Cabling Neatly Installed			
LCD Keypad Installed and Operational			
Arming/Disarming Tested			
PSIM Functionality Tested			
Test and map the detection range of all intrusion sensors.			
Test that zones are mapped and labelled correctly			
Test that there is an audible confirmation from the siren when the system is triggered			
Test that the alarm status (armed/disarmed) is visible at the security control room			
All cables (labelling/condition)			
I.D.F (condition and labelling)			
Earthing (Condition)			
Updated records and drawings available			

D2. Perimeter Intrusion Detection System (PIDS)

Task Description	Yes	No	Comments
Device Mounted Securely			
Battery operational			
PSIM function tested			
All cables (labelling/condition)			
Updated records and drawings available			

Annexure E

E1. Public Address (PA) System

Station/Site:	
OEM Name:	
IP Address:	
Worksorder number:	
Name of tester:	
Signature:	
Date:	

E2. Operations

Task Description	Yes	No	Comments
Speaker Mounted Securely			
Microphones Connected and Tested			
Audio Test Completed with no Distortions Detected			
Microphone Audio Tested with Clear Speech			
Volume Levels Checked & Adjusted where required			
PSIM Functionality Tested			
Live Announcement (both locally and remotely)			
Recorded Announcement			
Battery Charger Operational			
All cables (labelling/condition)			
Updated records and drawings available			

Overall remarks: _____

_____

Annexure F

F1. Intercom System

Station/Site:	
OEM Name:	
IP Address:	
Worksorder number:	
Name of tester:	
Signature:	
Date:	

F2. Operations

Task Description	Yes	No	Comments
Device Mounted Secure			
Intercom Call Test Confirmed and Audible			
Intercom Volume Correct			
Battery Charger Operational			
All cables (labelling/condition)			
Updated records and drawings available			

Overall remarks: _____

_____

Annexure G

G1. Physical Security Information Management System (PSIM)

Station/Site:	
OEM Name:	
IP Address:	
Worksorder number:	
Name of tester:	
Signature:	
Date:	

G2. PSIM Server Functions

Task Description	Yes	No	Comments
Server Mounted Securely			
Server Cables Connected and Neat			
Operating System Licence valid			
Supporting Software Licence valid			
Server Clean and Free of Dust			
User Administration / Right Management			
Event & Alarm Management			
Control and function tests of all datapoints interfaces and sub-systems in PSIM			
Graphics			
Archiving			
Video Handling			
Reporting			
Workflows			
Software Security			
Update Manager			

Overall remarks: _____

_____

G3. Workstation Functions

Task Description	Yes	No	Comments
PC Mounted Securely			
PC Cable Connected and Neat			
Operating System Installed & licenced			
Supporting Software Installed & licenced			
Workstation Clean and Free of Dust			
labelling Confirmed			

Overall remarks: _____

_____

G4. Network Functions

Task Description	Yes	No	Comments
Switch Mounted Securely			
Switch online			
Fibre Link online			
Switch Clean and Free of Dust			
labelling Confirmed			

Overall remarks: _____

_____