Eskom	Standard	Technology

Title: **COMPLIANCE OF LV AUXILIARY SUPPLY NETWORKS IN SUBSTATIONS**

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Low voltage AC supply is required at substations in order to supply battery chargers, lighting, air conditioning, fans, motors, panel AC, etc. Eskom Substations must comply with the Electrical Machinery Regulations (EMR) whereas Telecommunication sites and offices must comply with the Electrical Installation Regulations (EIR).

This document covers the necessary certificates required at Eskom Substations and Telecommunication sites in order to comply with the Electrical Installation Regulations and the Electrical Machinery Regulations.

1. Introduction

Low voltage AC supply is required at substations in order to supply battery chargers, lighting, air conditioning, fans, motors, panel AC, etc. Eskom Substations must comply with the Electrical Machinery Regulations (EMR) whereas Telecommunication sites and offices must comply with the Electrical Installation Regulations (EIR).

2. Supporting clauses

2.1 Scope

2.1.1 Purpose

This document covers the necessary certificates required at Eskom Substations and Telecommunication sites in order to comply with the Electrical Installation Regulations and the Electrical Machinery Regulations.

Load equipment are not part of this document and its requirements.

2.1.2 Applicability

This document shall apply throughout Distribution, Transmission and Telecommunication with in 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] SANS 10142-1, Wiring of Premises.

[3] No. R. 250, Occupational Health and Safety Act, 1993 Electrical Machinery Regulations. Government Gazette No. 34154

[4] No. R. 242, Occupational Health and Safety Act, 1993 Electrical Installation Regulations. Government Gazette No. 31975

[5] 240-55151908, AC Reticulation Application Design Guideline for Substations

2.2.2 Informative

[6] 32-9, Definition of Eskom documents

[7] 32-644, Eskom documentation management standard

[8] 474-65, Operating manual of the Steering Committee of Technologies (SCOT)

2.3 Definitions

2.3.1 General

Definition	Description
Accredited Eskom Employee	An accredited Eskom employee is a person who has passed the AC/DC board testing course and has submitted his or her POE to ESETA and has received credits.

Definition	Description
Accredited person	Means a person registered in terms of regulation 9 (EIR) as an electrical tester for single phase, an installation electrician, or a master electrician, as the case may be.
Certificate of Compliance	Means a certificate in the form of the EIR Annexure 1 issued by an accredited person in respect of an electrical installation or part of an electrical installation.
Electric fence	Means an electrified barrier consisting of one or more bare conductors erected against the trespass of persons or animals
Electric fence energiser	Means electrical machinery arranged so as to deliver a periodic non-lethal amount of electrical energy to an electric fence connected to it.
Electric fence system	Means an electric fence and an electric fence energiser
Electrical contractor	Means a person who undertakes to perform electrical installation work on behalf of any other person, but excludes an employee of such first-mention person.
Electrical Installation	Means any machinery, in or on any premises, used for the transmission of electricity from a point of control to a point of consumption anywhere on the premises, including any article forming part of such an electrical installation irrespective of whether or not it is part of the electrical circuit, but excluding:- a) any machinery of the supplier related to the supply of electricity on the premises; b) any machinery which transmits electrical energy in communication, control circuits, television or radio circuits; c) an electrical installation on a vehicle, vessel, train or aircraft; and d) control circuits of 50V or less between different parts of machinery or system components, forming a unit that are separately installed and derived from an independent source or an isolating transformer.
Electrical Installation Regulations, 1992	Means the Electrical Installation Regulations, 1992, promulgated by Government Notice No. R. 2920 of 23 October 1992.
General control	In relation to electrical installation work that is being carried out, includes instructions, guidance and supervision in respect of that work
Installation electrician	Means a person who has been registered as an installation electrician in terms of regulation 11 (2) of the EIR for the verification and certification of the construction, testing and inspection of any electrical installation, excluding specialised electrical installations.
Load Equipment	Any equipment connected to the AC/DC panels and Auxiliary AC distribution system.
Registered person	Means a person registered in terms of:- a) regulation 11 of the EIR b) regulation 9 of the EIR, 1992 as an electrical tester for single phase, an installation electrician or a master installation electrician, as the case may be.
Suitably trained	Means attended and passed the AC/DC Distribution course.
User	In relation to plant or machinery, means the person who uses plant or machinery for his own benefit or who has the right of control over the use of plant or machinery, but does not include the lessor of, or any person employed in connection with, that plant or machinery.

2.3.2 Disclosure classification

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

2.4 Abbreviations

Abbreviation	Description
AC	Alternating current
CoC	Certificate of Compliance
DB	Distribution Board
DC	Direct Current
DoL	Department of Labour
EAL	Eskom Academy of Learning
EIR	Electrical Installation Regulations
EMR	Electrical Machinery Regulations
ESETA	Energy Sector Education and Training Authority
GMR	General Machinery Regulations
ITC	Inspection and test certificate
LV	Low Voltage
OHAS Act	Occupational Health and Safety Act
PoE	Portfolio of Evidence

2.5 Roles and responsibilities

DX Plant Management are responsible to ensure that the ITC or CoC are available for all AC/DC boards at substations.

DX Control Plant Maintenance Management are responsible to ensure that the DC technicians are trained and equipped to perform the ITC as per this document.

DX Control Plant Maintenance (CPM) are responsible for doing the Inspection and Test Certificate (ITC).

Should the staff in the DX CPM section not be authorised as stated in this document a registered Installation Electrician should do the CoC.

Project Execution are responsible for ensuring that an ITC or CoC is issued for all new AC/DC panels/boards before handing the site over the CNC for commercial operation.

In Transmission the Engineering Assistant is responsible for the AC boards and the doing the ITC.

2.6 Process for monitoring

ITC/CoC to be adapted/amended to remain current.

2.7 Related/supporting documents

ITC course material.

3. Compliance to the Electrical Machinery Regulations and Electrical Installation Regulations

According to the definition of an electrical installation, substations are not part of an electrical installation. Therefore a substation does not need to comply with the Electrical Installation Regulations. Consequently a Certificate of Compliance (CoC) is not required for substations. Substations however must comply with the Electrical Machinery Regulations (EMR). EMR 8 (2) states the following:-

The employer or user shall ensure that all switchboards are selected, designed, manufactured, installed and maintained in accordance with sound engineering practice.

The sound engineering practices stated in the EMR 8 (2) are the relevant SANS standard namely SANS 10142-1.

Dedicated Telecommunication sites and offices must comply with the Electrical Installation Regulations (EIR), because they are not part of a substation. The purpose of the EIR is to ensure the safety of person's in so far as electrical installations and the performance of installation work is concerned. The EIR is part of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)

3.1 EIR Regulation 5 – Design and construction

Regulation 5.1 "No person may authorise , design, install or permit or require the installation of an electrical installation, other than that in accordance with a health and safety standard incorporated into these Regulations under section 44 of the Act."

The incorporated health and safety standard referred to in Regulation 5.1 of the EIR is the SANS 10142-1 code of practise for the wiring of premises as published in Government Notice No. R.243 of 6 March 2009 or any updated revision of the standard. Regulation 5.2 states that no component shall be used within an electrical installation unless it complies with SANS10142-1 and to the National Regulators compulsory specifications. The EMR 8(2) compels Eskom to design, install and maintain switchboards according to good engineering practice. Therefore all 400V AC auxiliary and DC supply drawings for substations must be designed according to SANS 10142 code of practice and all components used in the installation such as cables, LV switchgear, etc. must comply with the compulsory standards and SANS standard.

The contractor installing and commissioning the electric fence needs to be a registered person. Every electric fence system requires an electric fence Certificate of Compliance (CoC). This form is shown in Annexure 1 of the Electrical Machinery Regulations. All contractors performing LV work at Eskom sites need to be registered persons. Eskom employees performing work within substations do not have to be registered; however they have to be suitably trained.

3.2 Certificate of Compliance (CoC) and Inspection and Test Certificate (ITC)

A substation's LV AC auxiliary network does not require a CoC. The control room wall mounted Distribution Board that supply lights and electrical sockets for the building does require a CoC. This is normally issued by the contractor that constructs the building. Should any alterations be done on the DB a new/amended CoC needs to be issued. Telecommunication sites must have a CoC for the wall mounted DB and the AC/DC distribution board and panel.

All indoor and outdoor AC/DC Boards must have an Inspection and Test Certificate (ITC) or a CoC. However where an accredited Eskom employee is unavailable to issues an ITC then a CoC must be issued by an Installation Electrician. The ITC or a CoC would be proof that the installation complies with SANS 10142-1. For existing sites an ITC must be issued for all AC/DC Boards. This can be done during scheduled maintenance for Battery Chargers and will be performed by DC staff.

For every AC/DC Board the owner must have a CoC or an ITC. DC staff within all grids (Transmission and Distribution) must file the COC's/ITC's for all DB's. Table 1 shows the certificates required for the various Eskom sites.

Table 1: Summary of certification required at Eskom Installations

Site	LV Electrical Installation	Base Design Standard/s	Inspector/Tester	Proof of Compliance 4)		Electric Fence CoC
				ITC 5)	CoC	
Transmission / Distribution Substations 1)	Control Room and Outside	SANS 10142-1	Accredited Eskom Employee	X		
			Installation electrician		X	
	Battery Room	SANS 10108, SANS 60079	Master Installation Electrician		X	
	Electric Fence	EMR	Installation Electrician			X
Telecommunications Sites / Office Blocks 3)	Control Room and Outside	SANS 10142-1	Installation electrician		X	
	Battery Room	SANS 10108, SANS 60079	Master Installation Electrician		X	
	Electric Fence	EMR	Installation Electrician			X

Notes:

1) Supplier sites / installations directly linked to the generation and supply of electricity.

2) This includes other electrical installations in hazardous areas.

3) Supplier sites / installations not directly linked to the generation and supply of electricity. Telecommunications high site or a Customer Network Centre.

4) ITC – Inspection and Test Certificate; CoC – Certificate of Compliance

5) ITR – Inspection and Test Report - to be issued for non-compliance of instillation in order to ensure corrections are made.

4. Current State & Recommendations

a) The Authorisation committee for Eskom Transmission and Distribution is the AC/DC Distribution Boards Care Group, which is under the SCOT mandated DC and Auxiliary Supply SC. The care group ensures through guideline and philosophy documents that AC Reticulation networks are designed safely and in accordance with SANS 10142-1. The Eskom AC Reticulation Application Design Guideline [4] must be used to design auxiliary supply networks.

b) The electric fence system requires an electric fence CoC.

c) For all new electric fence installations and where an existing electric fence have been modified an electric fence CoC is required for at least the modified part.

d) All AC/DC DB's shall have a CoC or an ITC.

e) For all new control room building DB's and where existing room DB's have been modified, a CoC or ITC is required, for at least the modified part.

f) The DB located in the control room of telecommunication sites shall have a CoC.

g) Testing and general installation work performed by Eskom employees, must be suitably trained.

The Inspection and test certificate (ITC) course for AC/DC Distribution Boards is been offered at Eskom Academy of Learning (EAL). Completion of this course will provide the learner with theoretical and practical knowledge with regards to performing inspections and testing on AC/DC Distribution Boards. The equipment used for testing is covered in the ITC course. Periodic earth leakage tests are required on all plug sockets. Plug sockets within Eskom substations are located in AC Boards, Protection Panels, Plug Boxes and in some outdoor JB's. The earth leakage tests can be performed during scheduled battery second line maintenance or to align with the building lighting inspection or repairs.

Annexure A shows the process for accreditation for personnel who are not in possession of an electrical trade certificate. The Installation Electrician must issue a CoC for every point of supply and test certificates for every sub DB that he/she has commissioned or modified.

5. Authorization

This document has been seen and accepted by:

Name and surname	Designation
R McCurrach	PTM&C Manager
T Jacobs	DC and Auxiliary Supplies Study Committee Chairperson
Anthea Solomon	Secondary Plant Managers in Transmission (Works Planning & Centralized Services (WP&CS))
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6. Revisions

Date	Rev	Compiler	Remarks
March 2021	2	C van Schalkwyk	Document placed on new template. Added 'Load equipment are not part of this document and its requirements.' to Purpose section. Load Equipment added to Definitions. Expanded on Roles and Responsibility section. Section 2.6 and 2.7 added. Section 3.2: changed that the building's DB are not exempt from a CoC and requires one. Removed ITR from table 1 and added it into the notes section of the table. Removed the sentence with regards to the interim measures in section 4. Amended Annex A to reflect the process for Eskom personnel to be acceded to do the ITC
Jan 2014	1	K Naicker	First Issue

7. Development team

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

- Christine van Schalkwyk
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8. Acknowledgements

Not applicable.

Annex A – Process for Accreditation