

Title: **EMERGENCY LIGHTING IN  
TRANSMISSION  
SUBSTATIONS**

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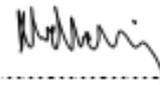


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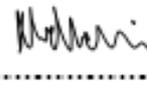


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## **1. Introduction**

Emergency lighting is essential in all buildings, for employees to safely exit the building in case of a power failure. The Emergency lighting must illuminate immediately in the event of a power failure.

This document is intended to standardise the Emergency lighting requirements for Transmission Substation buildings.

## **2. Supporting clauses**

### **2.1 Scope**

This document standardises the requirements for the Emergency lighting at Transmission Substation buildings.

#### **2.1.1 Purpose**

This document standardises the design requirements for the Emergency lighting used in Transmission Substations.

#### **2.1.2 Applicability**

This document shall apply only at Eskom holdings limited Transmission Substations.

## **2.2 Normative/informative references**

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

Suppliers are responsible for obtaining the latest copies of the South African national standards (SANS) and international standards referred to in this document. Copies of the latest revision of Eskom documents will be supplied by the purchaser and will form part of the enquiry documentation.

### **2.2.1 Normative**

- [1] SANS 10142-1: The wiring of premises – Part 1: Low-voltage installations.
- [2] SANS 10114-2: Interior Lighting part 2, Emergency Lighting
- [3] SANS 60598: Luminaires.
- [4] SANS 1464-22: Safety of luminaires - part 22: Luminaires for emergency lighting.
- [5] SANS 61347-2-7: Lamp control gear Part 2-7: Particular requirements for d.c. supplied electronic ballasts for emergency lighting.
- [6] SANS 10086-1, The installation, inspection and maintenance of equipment used in explosive atmospheres.
- [7] SANS 1574: Electrical cables – flexible cords and flexible cables
- [8] Occupational Health and Safety Act and Regulations

### **2.2.2 Informative**

None

## 2.3 Definitions

### 2.3.1 General

Definition	Description
<b>Ballast</b>	Unit inserted between the supply and one or more discharge lamps which by means of inductance, capacitance or resistance, single or in combination, serves mainly to limit the current of the lamp(s) to the required value.
<b>Centrally powered emergency lighting</b>	Emergency lighting for maintained or non-maintained operation that is energized from a central emergency power supply that is not contained within the luminaires. In this case the substation main DC system.
<b>Duration of operation</b>	The period of time that a luminaire can continuously provide the minimum illuminance required in a specific emergency condition
<b>Emergency Lighting</b>	Lighting provided for use when the supply to normal lighting fails. For the purpose of this standard, emergency lighting shall refer to standby lighting as defined in SANS 10114-2, <i>Interior lighting Part 2: Emergency lighting</i> , where the emergency lights are only powered when required and does not switch on automatically during a power failure.
<b>Equipment</b>	Assemblies of components, sub-units or sub-assemblies usually contained in a suitable enclosure, and capable of performing an overall specified function.
<b>Escape Route</b>	A route that is intended to be followed to arrive at the final exit.
<b>High risk task area lighting</b>	That part of emergency escape lighting that provides illumination for the safety of people involved in a potentially dangerous process or situation and that enables proper shut down procedures for ensuring the safety of the operator and other occupants of the premises.
<b>Horizontal illuminance</b>	The measure of brightness from a light source, usually measured in lux, which is taken through a light meter's sensor at a horizontal position on a horizontal surface.
<b>Illuminance</b>	(usually "E" in formulas) is the total amount of visible light illuminating (incident upon) a point on a surface from all directions above the surface. This "surface" can be a physical surface or an imaginary plane. Therefore illuminance is equivalent to <i>irradiance</i> weighted with the response curve of the human eye. Standard unit for illuminance is Lux (lx), which is lumen per square meter (lm/m <sup>2</sup> )
<b>Label</b>	An inscription on equipment or on a sub-unit, either integral therewith or on a separate piece of material affixed thereto.
<b>Luminaire</b>	Apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes all the parts necessary for supporting, fixing and protecting the lamps, but not the lamps themselves, and where necessary circuit auxiliaries together with the means for connecting them to the supply.
<b>Maintained Emergency Lighting</b>	A lighting system in which all emergency lighting lamps are in operation at all material time. In this case the emergency lights are automatically switched on with the normal lights.
<b>Non-maintained Emergency Lighting System</b>	A lighting system in which all emergency lighting lamps are in operation when the normal power supply fails. In this case the emergency lights are not automatically switched on with the normal lights. They have to be powered by manually operating a timer switch.

Definition	Description
<b>Normal Lighting</b>	All permanently installed electric lighting that operates from the normal supply which, in the absence of adequate daylight, is intended for use during the entire time that the premises are occupied by people.
<b>Normal Power Supply</b>	The source of electrical energy used to provide normal lighting
<b>Self-contained emergency luminaire</b>	A luminaire that provides maintained or non-maintained emergency lighting and in which all the elements, such as the battery, the lamp, the control unit and the test and monitoring facilities, where provided, are contained within the luminaire itself or located within 1m from the applicable luminaire.
<b>Standby Lighting</b>	The non-mandatory part of emergency lighting that is provided to ensure safe execution of tasks.

### 2.3.2 Disclosure classification

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

## 2.4 Abbreviations

Abbreviation	Description
<b>AC</b>	Alternating current
<b>COP</b>	Coefficient of Performance
<b>DC</b>	Direct Current
<b>V</b>	Volt
<b>W</b>	Watt

## 2.5 Roles and responsibilities

Substation designers and Project managers who are involved in the designing and installation of Emergency lighting and emergency lighting systems shall adhere to this standard when going out on tender.

## 2.6 Process for monitoring

Not applicable.

## 2.7 Related/supporting documents

Not applicable.

# 3. Requirements

## 3.1 Application

### 3.1.1 Emergency lighting systems

Emergency lighting is provided for use when normal lighting fails, and must therefore be powered by an alternative source, than that of normal lighting, there are three ways to achieve this alternative source.

- Central generator
- Central battery systems
- Self-contained luminaire

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The choice between the central system and the self-contained system is usually governed by the building. The Control building's emergency lighting will make use of the central battery system where available. Whereas an office block will make use of the Self-contained luminaire.

### **3.1.2 Modes of operation**

When making use of the provided central battery system in the Control Building, two types of operation may be used.

#### **3.1.2.1 Maintained mode**

Is a method whereby a lamp operating on the normal supply is automatically transferred to an emergency supply when the normal supply fails. The luminaire will have both normal and emergency supply connected to it. This mode is used within the control room and office of the control building.

#### **3.1.2.2 Non-maintained mode**

In this case the emergency luminaire is only energised when the normal power fails. The emergency luminaire is a standalone unit and does not form part of the normal AC supply. This mode is used in the battery room of the control building, where a separate luminaire is used in the flame/spark proof environment.

### **3.1.3 Positions of emergency luminaires**

Each exit door

Near stairs

Change in ground level

Where safety and exit signs are installed

Change in direction

Intersection of corridors

At each first aid post

At the control building DB

Near firefighting and call points

Between each of the Control Panels

## **3.2 Testing**

The emergency lighting system should be tested regularly, at least twice a year to ensure that the system is always in working condition and that the system is always in a ready state.

## **3.3 Technical requirements of the Emergency lighting installation**

### **3.3.1 Technical Requirements**

Nominal voltage : 120V DC or 220V DC according to Substation's DC voltage.

Type of cable : Insulated Cable in Control room and Office

: Armoured cable in the Battery room

Fault Current : 2,5 kA

## 4. Emergency lighting requirements

### 4.1 Illumination level

An even horizontal maintained illumination level with a minimum of 20 lux at floor level shall be provided. Illuminance level must be calculated at ground level.

The light source must reach its full brightness within 15 seconds after normal AC power has failed, and remain on for a minimum of 1 hour for a self-contained luminaire or 15 minutes for the central battery system.

### 4.2 Responsibilities

- a) All control buildings and office blocks in a Transmission Substation shall have emergency lighting.
- b) The installation shall be done by a certified electrical contractor/ certified electrician.

### 4.3 Battery Pack

In the case where the emergency lighting is self-contained, the battery pack shall be sealed nickel cadmium. The battery pack shall have a label indicating the battery type, battery manufacture date and commissioning date in accordance to SANS 1464-22, *Safety of luminaires-Part 22: Luminaires for emergency lighting*. Refer to figure 4 for an example. This information is important for maintenance and the monitoring of equipment performance. The battery pack shall be easily replaceable.

The battery pack shall be sized to maintain the required standby time required as specified in section 4.1.

<b>BATTERY TYPE</b>	
<b>MANUFACTURE DATE</b>	
<b>COMMISSIONING DATE</b>	

### 4.4 Emergency Lighting Operation

A suitable control circuit shall be used to operate the emergency lighting in the event of the loss of normal power. The emergency lighting shall illuminate within 15 seconds of the power failure and shall remain on for 15 minutes, after which it will switch off, this is to prevent the standby batteries from draining if no personal is present in the building. By pressing the pushbutton at the entrance of the room the circuit will reset for 15 minutes. Refer to figure 2 for schematic diagram.

The contractor shall ensure that the emergency lighting system is operational before signing off, and handing over.

EMERGENCY LIGHTING IN TRANSMISSION SUBSTATIONS

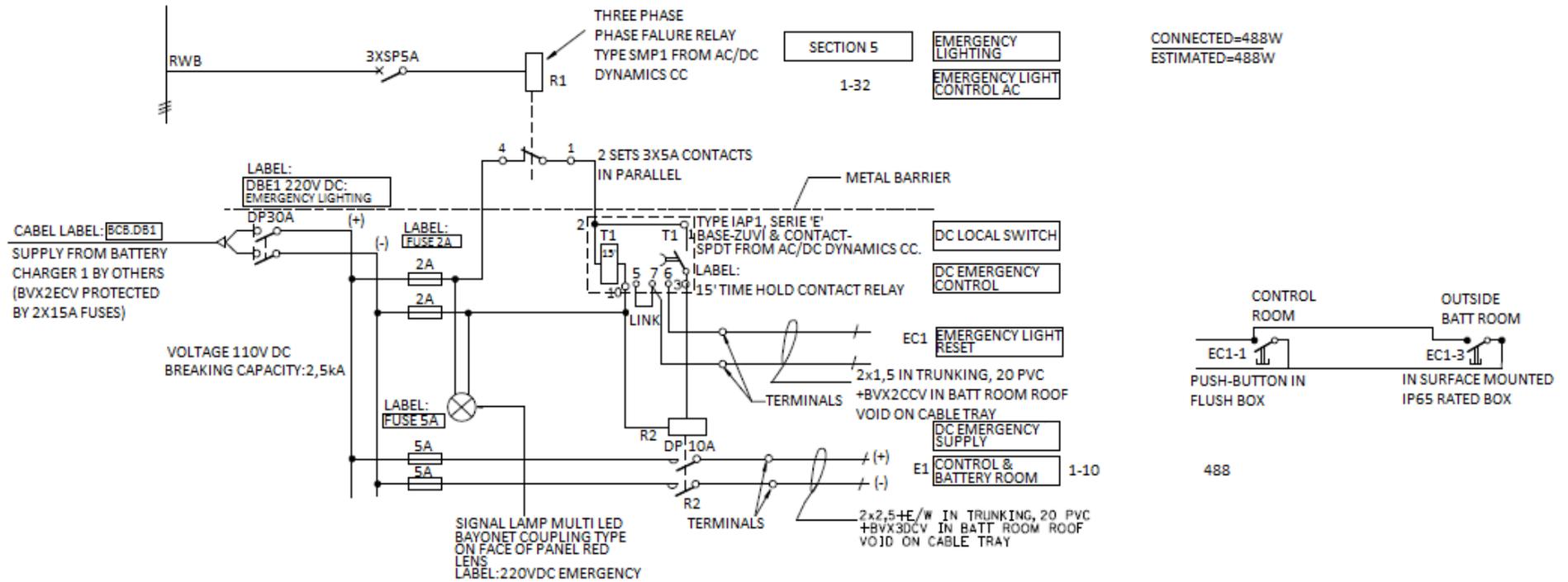


Figure 1: Emergency Lighting Control Circuit

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## 5. Authorization

This document has been seen and accepted by:

Name and surname	Designation
Subhas Maharaj	Senior Manager Substation Engineering
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## 6. Revisions

Date	Rev	Compiler	Remarks
April 2021	2	AR Naude	Document revised
June 2015	1	AR Naude	A standard was required for Emergency lighting

## 7. Development team

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

- Anton Naude

## 8. Acknowledgements

Lascon – A practical guide to Emergency Lighting

Let there be light by Brian Rowell