

	User Requirement Specification (URS)	Unique Identifier	240-86056088
		Document Type	Form
		Revision	2
		Effective Date	01 August 2020

Project Name: System Operating Control (SOC) New Building Project _ Standby TSNC Emkhiweni
Substation Name: NA
Transmission Region/Grid: System Operator
Project No: C. TXS0203
Registered Property Co-ordinates : Near Emkhiweni SS
Originator (AIP): MM Palamootil

High level Scope (Give brief description of project requirements)- Standby Transmission Security Nerve Centre (TSNC) Emkhiweni

Add the facilities to accommodate a Standby Transmission Security Nerve Centre (TSNC) at Emkhiweni SOC building. The scope of work and technical Specification is as per the report "Standby TSNC Emkhiweni SOW Rev 1 UID 240-171000159 signed on 10/01/2024. This document is attached.

Design Type	New ☐	Refurbishment ☒	Extension ☐
Busbar Cross flow studies required	YES ☐	NO ☐	
Fault Levels (kA)		Existing 1Φ	Existing 3Φ
V1:			
V2:			
V3:			
Power Transformers	MVA N/A	Voltage N/A	Quantity N/A
Comments.....			
Scope Description			
VOLTAGE 1:			
DESCRIPTION	NEW	REFURB	DECOMM
Feeder Bays			
Busbar			
Bus Coupler			
Bus Section			
TRFR Bay			
ADDITIONAL REQUIREMENTS / COMMENTS			
Approval Documentation Attached			
	No. & Rev	Date	Comments
TP DOCUMENTS			
PLANNING REPORT	Standby TSNC Emkhiweni SOW Rev 1 UID 240-171000159	10/01/2024	
AUDIT REPORT /			

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INITIATING REPORT			
SYSTEM STUDIES & RESULTS			
Equipment Specialists			
Clearances requirements	OHS ACT		
Minimum Basic Insulation Level (BIL)	V1:	V2:	
	V3:		
Pollution Level	Heavy ☒	Extra Heavy ☐	
Insulator Type Preference	Porcelain ☒	Composite ☐	
Transformers condition monitoring requirements	Online Drying System ☒	☐	Online Oil Monitoring System ☒
Comments:			
Terrace Extension required		YES ☐	NO ☒
Comments / Special Requirements			

ADDITIONAL REQUIREMENTS / COMMENTS			
Secondary Plant Engineering			
Substation DC Voltage			
Bus-zone Ratios	V1:	V2:	V3:
Tele-Protection Requirements			
Protection Equipment to be replaced			

Revision Control			
Rev. No	Date	By	Comments
0	02 Feb 2024	MM Palamootil	SURS for Standby Security - TSNC requirement

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<u>Originator Representative</u> Tx AM- AIP	Mini Palamootil Name	 Signature	19 Apr 2024 Date
<u>Projects Execution Representative</u> Transmission TPD	Salamina Khanyile Name	 Signature	 Date
<u>Senior Manager Tx Special Projects</u>	Thomas Tshikalange Name	 Signature	 Date
<u>System Ops NCC</u> Tx SO (if applicable)	Gav Hurford Name	 Signature	 Date
<u>Senior Manager TRE</u> (if applicable)	Bronwyn Stolp Name	 Signature	 Date
<u>Instrument Transformers & Line Traps</u> PDE – HV Plant (if applicable)	N/A Name	 Signature	 Date
<u>Transformers and Reactors</u> PDE – HV Plant (if applicable)	N/A Name	 Signature	 Date



Eskom

Report

Transmission

Title: **STANDBY TSNC EMKHIWENI
SOW**

Unique Identifier: **240-171000159**

Alternative Reference Number: **N/A**

Area of Applicability: **Engineering**

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Disclosure**

Compiled by

Phelokazi Ndlovu

Physical and Cybersecurity
Engineer

Date: 03.01.2024

Functional Responsibility

Cornelius Naidoo

Middle Manager Telecoms
and Physical Security T&S

Date: 3/1/2023

Authorized by

Judith Malinga

Senior Manager PTM&C
Engineering

Date: 10/01/2024

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1. Introduction

This document is an augmentation of the Technical Specification for Design and Construction of the System Operating Control building at eMkhiweni (240-94136452). This specification entails the design, construction, commissioning, and handover of the Standby Transmission Security Nerve Centre (TSNC) which is to be co-locate with SOC (System Operating Control) at the site.

2. Supporting clauses

2.1 Scope

This serves to provide information to the Contractor for the scope of works and technical specifications required for the multidisciplinary scope as listed below, of System Operating Control building:

- a) Design
- b) Construction
- c) Construction Monitoring
- d) Supply
- e) Fabrication
- f) Installation and testing
- g) Professional certification
- h) Commissioning and handover

The Contractor is to deliver fully functional and compliant structure as defined in this technical specification.

2.1.1 Purpose

The purpose of this document is to outline the technical specification for the TSNC standby site to be developed at eMkhiweni.

2.1.2 Applicability

This document is applicable to the project team in designing and construction of the TSNC

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] 240-84323647 Network Management Centre Redundancy Standard.
- [3] 240-94136452 Technical Specification for Design and Construction of System Operating Control building at eMkhiweni.
- [4] 240-60725641 Specification for standard (19 inch) Equipment Cabinets.

-
- [5] EN-50174-1 Information technology - Data centre facilities and infrastructures - Part 1: General concepts.
 - [6] EN-50174-2 Information technology - Data centre facilities and infrastructures - Part 2-2: Power supply and distribution.
 - [7] 240-89797258 The Safe Handling, Transportation and Disposal of Cells, Batteries and Electrolyte.
 - [8] IEC 60529 Degrees of Protection Provided by Enclosures (IP Code).
 - [9] 240-52599753 Workplace Space and Furniture Standard for Commercial Properties.
 - [10] 240-156552996 Generic Technical Specification for Eskom Real Estate (ERE) type Projects for Fire Protection Systems and Fire Detection Systems.

2.2.2 Informative

- [11] 32-894 Eskom Server Rooms and Data Centre Standard.
- [12] 32-1203 Eskom Telecommunications User Requirements.

2.3 Definitions

2.3.1 General

Definition	Description
Contractor	Employer who performs construction work.
Employer	Eskom, or eMkhiweni substation or representative
PSIM	A category of software that is designed to integrate multiple unconnected security applications, enable automation of workflows and processes, and to provide control over devices through a unified user experience
System	An integrated set of constituent pieces that are combined in an operational or support environment to accomplish a defined objective. These pieces include people, hardware, software, firmware, information, procedures, facilities, services, and other support facets.

2.3.2 Disclosure classification

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

2.4 Abbreviations

Abbreviation	Description
BMS	Building Management System
HVAC	Heating Ventilation and Air Conditioning

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NKP	National Key Point
PSIM	Physical Security Information Management
SANS	South African National Standard
SOC	System Operating Control
TSNC	Transmission Security Nerve Centre
UPS	Uninterruptible Power Supply

2.5 Roles and responsibilities

The parties responsible are Asset Management (Transmission Real Estate) and TX Security.

2.6 Process for monitoring

N/A

2.7 Related/supporting documents

240-56177186 - Standard for Battery room design.

240-76368574 – Standard for security high risk fence

3. Technical Specification

Below is the technical specification the contractor needs to adhere to for the construction of the standby site for the TSNC.

3.1 General Requirements

- a) Control room and data centre shall have access raised floor, with a minimum floor void of 1200mm and a bearing capacity of 1500kg per square meter.
- b) The contractor shall design a ceiling void deep enough to accommodate sprinklers and air vents, this void shall not be less than 900mm deep.
- c) The contractor shall design roofing with blast proof, roof to be accessible from the ground storey for maintenance and it shall be designed to drain away rainwater with ease.
- d) All meeting rooms shall have more than one emergency exits.
- e) All rooms with equipment which make sounds/noise when operated shall have sound dampeners to keep the sound/noise in the room.

3.2 Operational Requirements

3.2.1 Accessibility

The standby centre shall be located at eMkhiweni and have the onsite security capability extended to the centre for access control and safety. The entrance/exit to the DC will be covered by a digitally recorded closed circuit television (CCTV) camera, monitored by security personnel located at the TSNC, in Simmerpan.

3.2.2 Redundancy

Based on the Security Resilience Assessment, as defined in table 1, the preferred implementation option for the standby centre will be classified as a Tier 2 data centre classification. This would mean:

- a) Acceptable downtime of 22 hours a year with availability of 99.741%.
- b) Allowance is made for operators to drive from TSNC (Simmerpan) to standby site and be operational within 2 hours.

The process delay, the disaster recovery, business impact, risk operations and the risk mitigation were all considered.

Table 1: Typical data centre tier requirements

PARAMETERS	TIER 1	TIER 2	TIER 3	TIER 4
Uptime guarantee	99.671%	99.741%	99.982%	99.995%
Downtime per year	<28.8 hours	<22 hours	<1.6 hours	<26.3 minutes
Component redundancy	None	Partial power and cooling redundancy (partial N+1)	Full N+1	Fault tolerant (2N or 2N+1)

3.2.3 Redundancy

Maintainability refers to the ease with which a system or facility can be maintained, repaired, and updated over its lifespan. The equipment used at the standby centre shall be carefully curated to ensure durability, optimum performance and without any faults causing unexpected failures which will result in a system that complies with Tier 2 requirements.

The main TSNC will be manned on a 24/7 basis whereas, the standby centre will have monthly maintenance check-in by operational/technical resources to verify system is operational and ready for switchover. The layout of the control centre shall make provision for a data centre and a staging/maintenance room for the systems administrator to ensure that systems are operational. All as-build documentation and training material will be maintained on ProjectWise and follow the engineering change control process.

The project shall ensure that the appropriate contracts are established for the necessary OEM support. This will include 5-year service level agreements for the TSNC standby facilities.

3.2.4 Reliability

Reliability failures shall be regarded as failures that reduce the accuracy, efficiency and speed of the Nerve Centre and standby platform. Any failure, that requires human intervention to recover the system to full operational status, shall be regarded as a failure of availability. The standby centre, on Tier 2 standards, is expected to be reliable 99.741% of the time.

3.2.5 Availability

According to Tier 2 requirements, the standby centre shall be permitted a downtime, of less than 22 hours per year.

3.2.6 Upgradeability

Particular attention shall be given to ensure that the design considers future hardware and software platform evolution. The design should ensure that mechanisms are in place to achieve future compatibility with new hardware and software platforms as previous platforms become unavailable.

3.2.7 Life expectancy

The communication and IT hardware shall have a design life of a minimum of 5 years, while the facilities of the Nerve Centre shall have an expected design life on 20 years.

3.2.8 Disaster recovery

A process for automatic backup of configuration to the standby location shall be activated, with a maximum period between backups of not more than a week. This backup shall be of such a format that a standard hardware platform can be reconfigured to resume operation within 2 hours after a failure.

3.2.9 IT and telecommunications impact

It is envisioned that the standby eMkhiweni site shall require 1Gbps data circuit into the Telecoms core data network at least 2 PE routers. These routes shall require to be geographically redundant fibre routes to be provisioned as an extension of the Transmission Telecoms network.

Provide infrastructure for operational voice for the 6 operator phones, 2 office phones and a security front desk phone, one phone for conference emergency preparedness room and video conferencing requirements. This is an add-on to the Transmission telecoms infrastructure to be provisioned by the contractor.

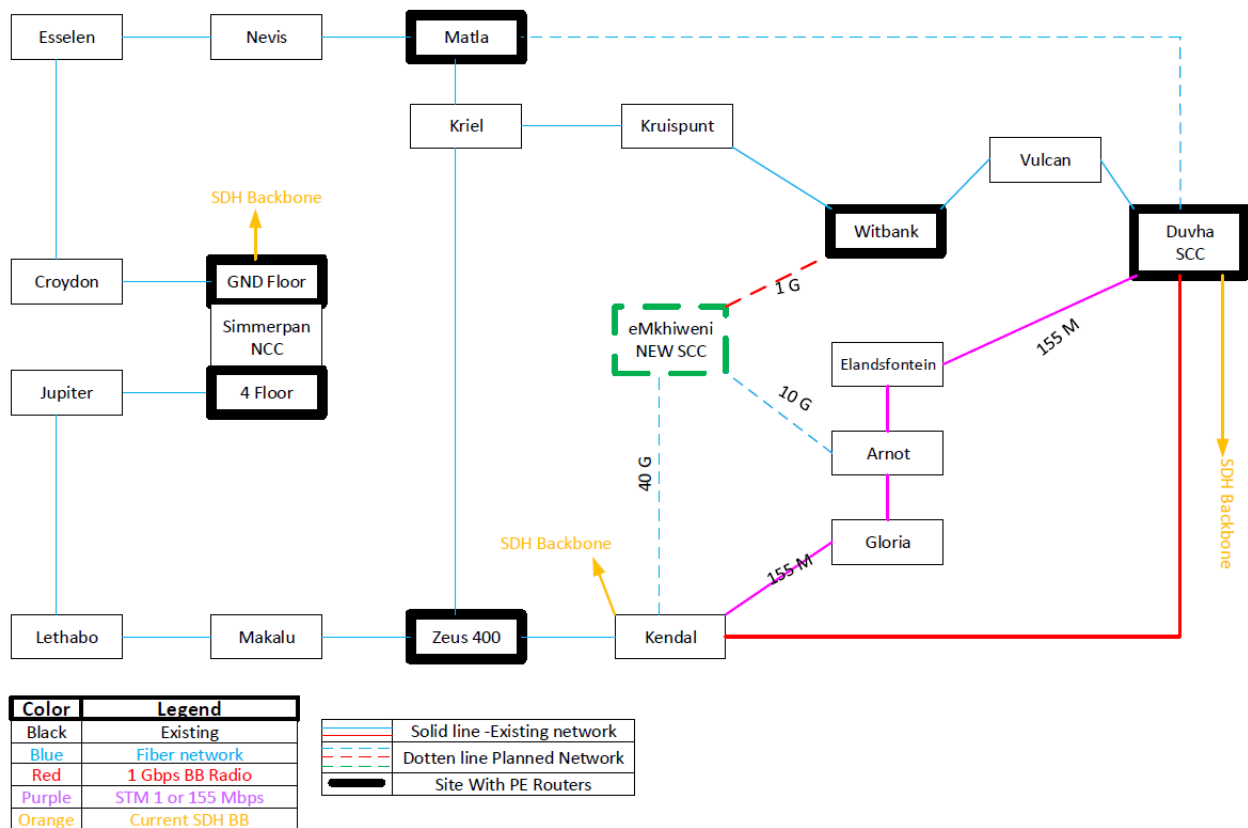


Figure 1: Planned fibre route connecting Simmerpan to eMkhiweni

3.3 TSNC Facilities

The standby centre requires the following rooms, offices, and areas for operations.

Table 2: Room requirements

	Floor Area Requirement	Reference	Square Meters Required
1	HVAC Room	ISO 11064 Air Quality	12
2	Server Room		72
3	Battery Room		16
4	Maintenance/Staging Room		32
5	Shift Supervisor Office		20
6	Security Manager Office		20
7	Waiting Area		32

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8	Storage Room		20
9	Video Wall (Rear) Room		30
10	Control Room	Reference [7] - ISO 11064 - Ergonomic design of control centres standards	150
11	EP / Conference Room	ISO 7730 [8] Thermal Environmental Considerations ISO 7730 Ergonomics ISO 11064 and SANS 10114-1, Interior Lighting,	32
12	Ablutions		36
13	Generator Room	(TBD at design phase)	5.1m x 3m
14	Fuel Storage Room	(Confirm adequacy of the SOC)	3m x 1.2m x 0.28m
13	Kitchen		17
		Total:	205.308 sq. meters

3.3.1 Server room requirements

The contractor shall provide a server room that can fit 11x2 racks:

- 6x2 racks for equipment
- 1x2 rack for the cooling system
- 1x2 racks for UPS chargers
- 1 power selector

Each rack must be of standard 19" and up to 1.2m depth. The racks will be broken into two rows, each row containing 11 racks in total and enough space in between the two rows for a walkway. The server room design shall follow general requirements of rooms with data equipment mentioned in section 3.1. There is a requirement for a Tier 2 data center that demonstrates 99.741% availability. The contractor shall design a ceiling high enough to make provision for earthing racks on top of each rack in the room. The racks shall comply to the 240-60725641 standard. The contractor shall also make provision for a fire suppression system that is suitable for a computer data centre.

3.3.2 Control room requirements

The contractor shall also provide a second room for the operators (control room). The room should be enough to house 6 operator desks. Each desk shall comprise of 2 standard 19" screens for each operator. There shall be a video wall made of 6 67" LCD screens. There shall also be conference room/EP center overlooking the videowall. The contractor to also make provision for 6x2 lockers for the operators somewhere in data centre.

3.3.3 Maintenance/Staging and storage room requirements

There is a requirement for a staging room where the system administrator can make updates on the system and necessary changes for smooth operations. The staging room must be equipped with equipment's for base configurations and testing before installation. The staging room and storage rooms can be combined into one room but partitioned to separate the two.

3.3.4 Battery room

The contractor shall make provision for a battery room with specification according to "The safe handling, transportation and disposal of cells, batteries and electrolyte" 240-89797258 section 3.3.7.2. The space shall be enough to house 2x4 racks for the batteries for UPS. The battery room shall also be furnished with an extractor to remove the toxin released from the batteries.

3.3.5 Additional requirements

The contractor shall also make provision for the waiting area with a double sofa for guests when coming into the SOC. There is also a requirement for the shift supervisor and security manager offices in the standby centre. Their office requirements shall follow section 3.2 of 240-52599753. The contractor shall also make provision for standard ablutions for males and females. The space should also accommodate for disabled personnel. There is also a requirement for a kitchen that is equipped with a sink, coffee station that includes water a water dispensary system (boiling and cold water).

Please refer to figure below for the proposed layout.

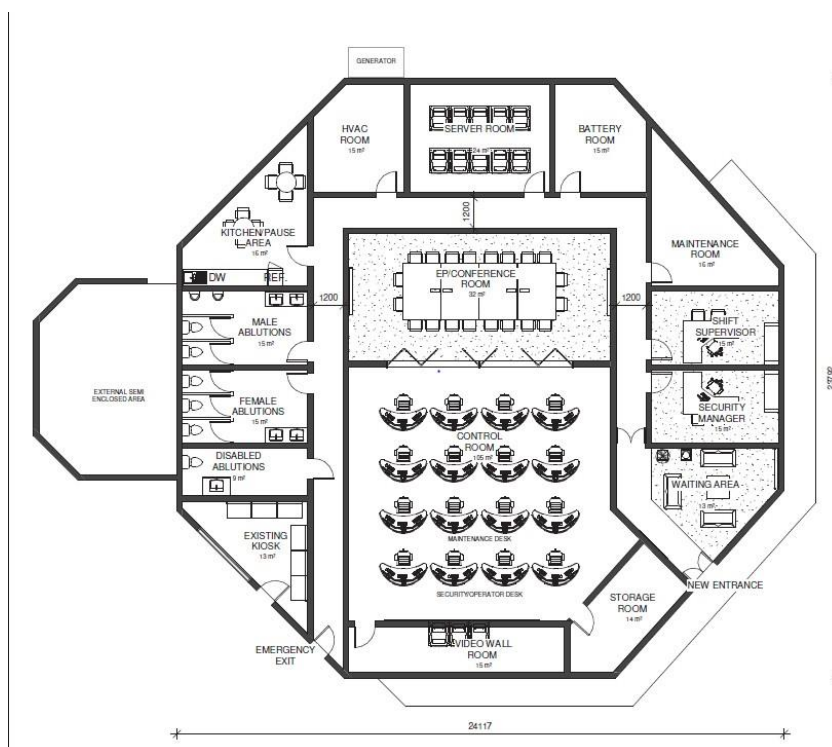


Figure 2: Proposed layout.

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3.4 HVAC

3.4.1 Air conditioning system room

There must be separate dual redundant **air-conditioning system** for human areas and equipment/computer systems, the designer shall determine the location and size of the room based on the air-conditioning system to be used, access control for maintenance and support of the supply shall be limited to authorized personnel only. Future upgrades to the HVAC shall have no negative impact on the operational systems in the equipment rooms and/or people in the control centers. Computer center and air conditioning systems rooms are to be in proximity.

3.4.2 Air handling units' room

Should the proposed air-conditioning system require air handling units (AHU) the designer shall consider locating the units close to the computer rooms and not too far from the source of air, floor area needed to accommodate these units shall be determined by the designer.

3.5 Power and UPS

The contractor shall make provision for electrical system with enough capacity to power, inter-alai:

- Cooling system
- HVAC
- Provide redundant power supply configuration for critical loads for operations (critical equipment for operations in the server room)
- UPS Battery charging
- Lighting around the data centre
- Standard plug points of 230V AC 50Hz

3.5.1 UPS room

There must be dual redundant UPS systems with adequate capacity, floor area and location of the room shall be determined by the designer, the room/s shall have raised access flooring with a minimum height of 1200mm for cabling.

3.5.2 Back-up generator room

There must be at least 2 x dual redundant back-up generators to power the building should there be AC power interruptions, location and size of the room/s shall be determined by the designer based on the sizes of the generators and space size requirements from the manufacturer/supplier.

3.5.3 Fuel storage room

Room shall be big enough to accommodate a tank size required to supply for the whole building, there shall be a fuel/diesel management system to keep the fuel clean and running, the room shall be designed to have the floor level lower than the base of the entrance door, in that way creating a bund wall around the tank should

there be any leaks. The designer shall make provision for a fuel truck to be able to enter the premises and refill the diesel tank without disturbing any operations on site.

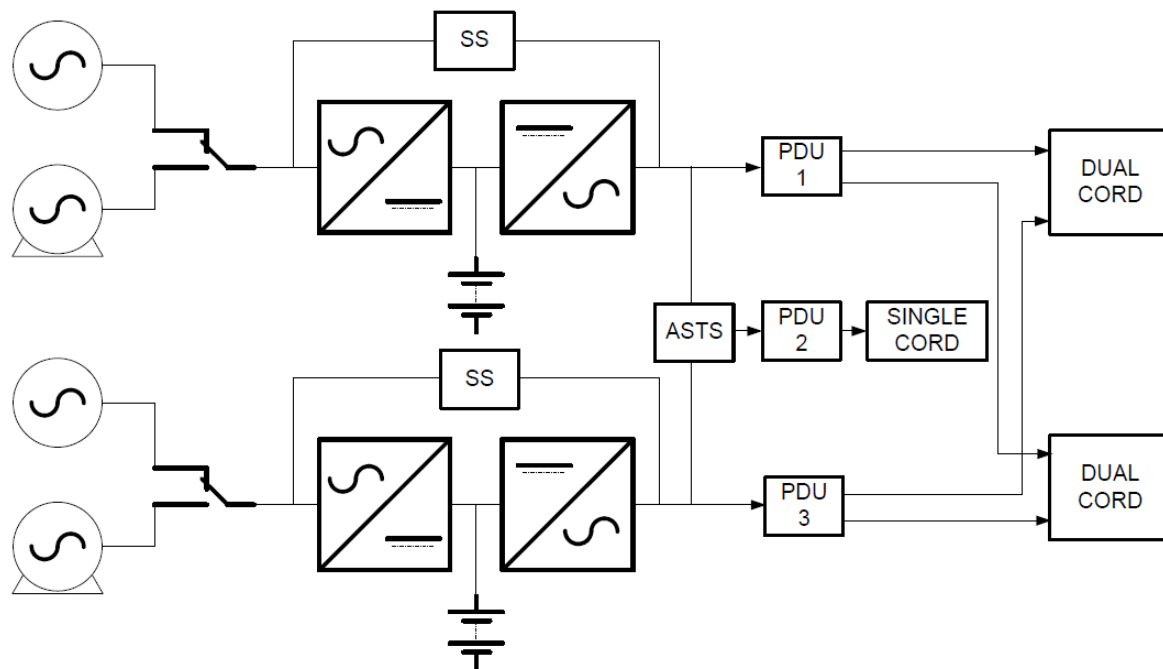


Figure 3: Dual redundant UPS system.

3.6 Fire detection and suppression systems

- a) An independent zoned fire detection and fire suppression system shall be installed complete with detectors, siren, bell and lock off unit in the data centre.
- b) One potential free contact for the shutdown of the air-conditioning system shall be supplied.
- c) The data centre shall have portable fire extinguishers mounted in key locations around.
- d) All firefighting equipment shall have an independent battery supply.
- e) All firefighting equipment shall be serviced and inspected as per local bylaws.
- f) An automatic detection and suppression system shall be installed opposite to where the electrical outlets are located. (If electrical outlets are above, the system shall be installed under the raised floor).
- g) The data centre shall use a gas extinguisher to prevent damage to the equipment. Comply with 240-156552996 section 3.3.8
- h) The extinguishing system shall be designed redundantly to prevent false alarms.
- i) The data centre shall shut down all electrical power before activating the fire suppression systems.
- j) Schematic diagram of all fire detectors and nozzles shall be available.
- k) All safety signs and colour-coding shall be done as per building regulations as well as local bylaws.
- l) The water supply for the fire detection and suppression system shall be according to 240-156552996

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section 3.3.1

- m) The battery room and the fuel storage room shall be equipped with sprinkle systems in accordance to 240-156552996 section 3.3.2
- n) The fire detection and suppression system shall comply with Generic Technical Specification for Eskom Real Estate (ERE) type Projects for Fire Protection Systems and Fire Detection Systems 240-156552996.
- o) The fire detection and suppression system shall be integrated with the BMS.

3.7 Smoke risk

Smoke with harmful particles, like burning plastics that release hydrochloric acid gas, can corrode equipment. Therefore, the data centre shall have a protection class of IP56 (Internal Protection Marking).

3.8 Building Management System

- a) The server room in the standby data centre shall have a temperature and humidification recorders.
- b) An alarm shall be raised if the temperature and humidification levels are out of ranges specified in section 3.4.
- c) All environmental alarm conditions shall be escalated to relevant stakeholders.
- d) The BMS shall be able to send remote alarm signals both the main and standby control room.
- e) It shall be possible to integrate the BMS to the PSIM.
- f) The BMS shall be able to assist service staff with relevant information. (Trends, graphs, etc.)
- g) The BMS shall monitor air-conditioners, cooling, power, generator, fire system, UPS, and doors at cabinet level.
- h) Under-floor water detection shall be installed at all Eskom data centres.

4. Authorization

This document has been seen and accepted by:

Name and surname	Designation
Dumi Nthongoa	Senior Manager – Central Grid
Melvin Murugen	Middle Manager TX security
Mihla Khumalo	Senior Manager – North East Grid

5. Revisions

Date	Rev.	Compiler	Remarks
May 2023	0	PP Ndlovu	First draft
Sept 2023	0.1	PP Ndlovu	Second draft

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6. Development team

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

- Phelokazi Ndlovu
- Bongani Shezi
- Cornelius Naidoo
- Vernon Dinkelman

7. Acknowledgements

N/A