

 <b>Eskom</b> National Transmission Company South Africa <sup>TM</sup>	<b>Stakeholder Requirements Definition</b>	<b>ENGINEERING</b>
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Title: **BASIC STAKEHOLDER  
REQUIREMENTS DEFINITION FOR  
DESIGN AND CONSTRUCTION OF  
SYSTEM OPERATING CONTROL  
(SOC) BUILDING AT EMKHIWENI.  
FOR OWNER'S ENGINEER  
PERUSAL ONLY.**

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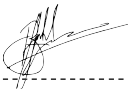

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## **1. INTRODUCTION**

There is an existing System Operating Control (SOC) building at Duvha Power Station, because of its age and location, there are several risks and issues with the building including not meeting requirements of the 32-894 NTCSA server room and data centre standards. This Stakeholder Requirements Definition (SRD) entails the design, construction, commissioning, and handover of the SOC building: the building will provide for operating facilities, space to house the Transmission Power System Control and Monitoring (TPSCM) equipment, office space, wellness centre and provide for the necessary telecommunications infrastructure in a suitable place as per the relevant standards.

This will be a NKP (National Key Point) site situated in Mpumalanga, site details: Rietfontein 314 JS, Portion 14.

For this turnkey project, the Employer intends issuing an open market enquiry to appoint an EPC Contractor to perform design, construction, construction monitoring, supply, fabrication, installation, commissioning, handover, and certification of the above-mentioned SOC building. The EPC Contractor holds full responsibility from design to construction and handover of a fully equipped & ready to use building.

## **2. SUPPORTING CLAUSES**

### **2.1 Scope**

This document serves to provide minimum information to the Contractor for the scope of works and technical specifications required for the multidisciplinary scope, as listed below:

- 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 provide Stakeholder requirements for the design and construction of the SOC building.

#### **2.1.2 Applicability**

This document is applicable to the project team involved in design and construction of the new SOC building project at Emkhiweni only.

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### **2.1.3 Effective date**

This document shall be effective from the authorization date.

## **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**

#### **GENERAL**

- [1] Occupational Health and Safety Act (Act 85 of 1993) with associated Regulations
- [2] 200-35208 - Environmental Management Plan
- [3] National Environmental Management Act, 1998 (Act 107 of 1998)
- [4] National Environmental Management Waste Act, 2008 (Act 59 of 2008)
- [5] National Water Act, 1998 (Act 36 of 1998)
- [6] Government Notice 704, National Water Act 1998
- [7] The Environmental Conservation Act (Act No 73 of 1989)
- [8] South African National Standards (SANS), relevant and applicable
- [9] National Building Regulations and Building Standards Act No. 103 Of 1977
- [10] 240-53113685 - Design review procedure
- [11] 240-114967625 Operating Regulations for High Voltage Systems
- [12] 240-606480018 Terms of reference for Design Review Teams Presiding over Transmission and Distribution Infrastructure Designs in NTCSA
- [13] 240-59083220 Substation DRT requirements additional to the DRT ToR applicable for 2021/22
- [14] 240-86056088 User Requirement Specification

#### **CIVIL & STRUCTURAL**

- [15] 240-56364545 Structural Design and Engineering Standard
- [16] 240-57127955 - Geotechnical and Foundation Engineering Standard
- [17] 240-57127951 – Standard for the Execution of Site Investigations
- [18] 240-57127953 – Execution of Site Preparation and Earthworks Standard
- [19] 200-16817 - Excavation permit Application Procedure
- [20] 240-85549846- Standard for Design of Drainage and Sewerage Infrastructure
- [21] SANS 1200 complete series
- [22] SANS 2001 CC1 complete series

- [23] 240-52599753 Workplace space and furniture standard for commercial properties
- [24] SANS 10400 – The application of the national Building Regulations
- [25] SANS 204:2011 Energy efficiency in buildings.
- [26] SANS 10400-XA:2011 Energy usage in buildings.
- [27] 240-56177186 Standard for Battery rooms
- [28] 240-57127953, Execution of Site Preparation and Earthworks Standard
- [29] SANS 10161, The design of foundation for buildings.
- [30] SANS 10100-1, The structural use of concrete (specifically Part 1: Design)
- [31] SANS 10162, The structural use of steel
- [32] 240-94743192, Standard for Fabrication Steelwork used in NTCSA Transmission Substations
- [33] SANS 10163, The structural use of timber
- [34] SANS 10164, The structural use of masonry
- [35] 240-85067224, Substation Platform and Access Road Design Standard
- [36] South African Pavement Engineering Manual (SAPEM) ISBN 978-1-920611-00-2
- [37] 240-84418186, Roads Specification Manual
- [38] 240-153000199, Substation Drainage
- [39] 240-102393009, Standard for Substation Flood Analysis Design
- [40] SANS 10252, Parts 1 and 2 Water supply and drainage for buildings

## **MECHANICAL**

- [41] 240-126468603 Operational Standard for Fire Management in Generation
- [42] 240-54937450 Fire Protection and Life Safety Design Standard
- [43] 240-56356376 On-Site Commissioning for Low Pressure Systems Standard
- [44] 240-105020315, Standard for Low Pressure Valves
- [45] 240-106628253, Standard for Welding Requirements on NTCSA Plant
- [46] 240-123801640, Standard for Low Pressure Pipelines
- [47] 240-61227631 Piping and Instrumentation Diagram (PID) Standard
- [48] 240-106680663 Lifts, Escalators, Lifting and Crane Design Guideline
- [49] 240-82172806 Air conditioning in transmission substation buildings and telecommunication sites
- [50] SANS 10252-part 1 Water supply and drainage for buildings Part 1: Water supply installations for buildings
- [51] SANS 10252-part 2 Water supply and drainage for buildings Part 2: Drainage installations for buildings.
- [52] SANS 10400 Part P, T, W & O

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- [53] SANS 10400–T The application of the National Building Regulations Part T: Fire protection.
- [54] SANS 10400–P The application of the National Building Regulations Part P: Drainage
- [55] SANS 10400–W The application of the National Building Regulations Part W: Fire installation
- [56] SANS 10400–O The application of the National Building Regulations Part O: Lighting and ventilation
- [57] SANS 10400–N The application of the National Building Regulations Part N: Glazing
- [58] SANS 10400–XA The application of the National Building Regulations Part X: Environmental sustainability Part XA: Energy usage in buildings

### **FIRE DETECTION SYSTEM**

- [59] 240-56737448 – Fire Detection and Life Safety Design Standard
- [60] 240-54937439 Fire Protection/Detection Assessment Standard
- [61] 240-54937450 Fire Protection and Life Safety Design Standard
- [62] SANS 10139 – Fire System Design
- [63] 240-56355466 – Alarm Management System Guideline
- [64] 240-54937454 Inspection Testing and Maintenance of Fire Protection Systems Standard
- [65] 240-56737654 Inspection Testing and Maintenance of Fire Protection Systems Standard
- [66] 240-156552996 Generic Technical Specification for NTCSA Real Estate Project for Fire Protection and Fire Detection

### **ELECTRICAL**

- [67] 240-56227516 - LV Switchgear Control Gear Assembly Associated Equipment for Voltage 1000V AC and 1500V Standard
- [68] 240-56227443 - Requirements for Control and Power Cables for Power Station Standard
- [69] 240-56356396 - Earthing and Lightning Protection Standard
- [70] 240-56176852 - Essential Power Supplies for Power Stations Standard
- [71] 240-56355815 - Junction Boxes and Cable Termination Standard
- [72] SANS 10142-1 - The wiring for premises Part 1: low-voltage installations.
- [73] SANS 10114-1 - Interior lighting Part 1: Artificial lighting of interiors
- [74] SANS 10114-2 - Interior lighting Part 2: Emergency lighting
- [75] SANS 475, Luminaires for interior lighting, streetlighting and floodlighting – Performance requirements
- [76] SANS 60598-1 Luminaires Part 1: General requirements and tests
- [77] 240-83382122 – Emergency lighting

- [78] 240-139282493 - Security Lighting for NTCSA Applications
- [79] 240-62772907 – Standard For Stationary Diesel Generator Systems
- [80] 240-112691204 - Specification For Mobile Diesel Generator Systems
- [81] 240-118870219 - Standard Power Systems Topology and Autonomy for NTCSA Sites
- [82] 240-55714363 - NTCSA Generation Power Station Lighting and Small Power Installation Standard

## **SECURITY AND ACCESS CONTROL**

- [83] 240-102220945 Specification for Integrated Access Control System for NTCSA sites
- [84] 240-91190304 Specification for CCTV Surveillance with Intruder Detection
- [85] 240-86738968 Specification for Integrated Security Alarm System for Protection of NTCSA Installations and its subsidiaries
- [86] 240-170000098 Security Public Address Systems for Substations and Telecommunications high sites
- [87] 240-170000096 Physical security integration standard
- [88] 240-78980848 Specification for Non-Lethal Energized Perimeter Detection System (NLEPDS) for protection of NTCSA installations and its subsidiaries
- [89] DEM2412993 & 2425114 LAD (Logical Architecture Definition) PAC (Physical Application Component) for Physical Security Information Management System (PSIM)
- [90] Business Requirement Specification DEM\_2412993 & 2425114 Tx and ET Security Monitoring System
- [91] 240-170000723 Generic technical requirements for Physical Security Technologies Contracts
- [92] 240-170000691 Standard for Intrusion Pre-detection System used at NTCSA sites
- [93] 240-55410927 Cyber Security Standard for Operational Technology
- [94] 240-170001061 Transmission Cyber Security Standard for Operational Technology
- [95] 32-373 Information Security – IT/OT and Third-Party Remote Access Standard
- [96] 240-79669677 Demilitarised Zone (DMZ) designs for Operational Technology
- [97] 32-85 Information Security Policy
- [98] 240-180000 Security threat assessment (STA) report – SO Control Building Project 2023.04
- [99] 240-170001084 SOW for NLEPDS at Emkhiweni SOC facility
- [100] 240-170001087 Technical evaluation criteria for the integrated physical security system at Emkhiweni SOC facility

## **INTERNATIONAL AND REGIONAL STANDARDS**

Contractor shall source these standards and adhere:

[101] TIA-942 Telecommunications Infrastructure Standard for Data Centres

[102] ISO/IEC 27001 Information Security Management System

[103] Uptime Institute's Tier Standards

[104] ASHRAE Datacom Series

[105] Protection of Personal Information Act (POPIA)

### **2.2.2 Informative**

[106] ISO 9001 Quality Management Systems

[107] ISO 14001:2015 Environmental Management Systems

[108] Occupational Health and Safety Management Systems Requirements (OHSAS 18001)

[109] 200-46362 - Site Inspections Procedure

[110] 200-15406 - Issue Takeover Certificate

[111] 32-421 - NTCSA Life Saving Rules

[112] PWI 200 – 5664: Engineering Change Management Work Instruction

[113] 240-103414344 - Summary of corporate identity manual

[114] Policy ESK PB AAQ 3 - Interior Specifications for NTCSA

[115] 240-76666863 Telecommunications Network Architecture Standard

[116] 240-101578948 - Specification for CCTV Surveillance and Intruder Detection Systems

[117] 240-170001087 Technical evaluation criteria for an Integrated Physical Security System at Emkhiweni SOC facility

[118] 240-170001084 Scope of work for a NLEPDS at Emkhiweni SOC facility

[119] 240-170001085 Technical evaluation criteria for a NLEPDS at Emkhiweni SOC facility

[120] 32-894 NTCSA server room and data centre standards

[121] 202211\_OH&S Tender Returnable Documents for EPC & EPCM & Owner's Engineer\_TPDMAN-FM-204\_Rev2

[122] 202211\_ (Form A) Tender Contract SHEQS Requirements For EPCM & or Owner's Engineer\_TPDMAN-FM-197\_Rev2

## 2.3 Definitions

Definition	Description
Consultant	Employer who performs construction work.
Control Centre	A place from which an organization, activity, mechanism, system, etc., is centrally monitored, regulated, and directed, or in which operational devices and controls are housed.
Control Room	Core functional entity, and its associated physical structure, where operators are stationed to carry out centralized control, monitoring and administrative responsibilities.
Employer	National Transmission Company of South Africa, Simmerpan head office complex or representative
Operational Zone	The assigned areas in which an operator has an assigned function and can exercise authority.
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,
Contractor	Refer to Construction Regulations section 1 "Definitions" for technical definition.
Design	Refer to Construction Regulations section 1 "Definitions" for definition.
Designer	Refer to Construction Regulations section 1 "Definitions" for definition.

## **2.4 Abbreviations**

<b>Abbreviation</b>	<b>Explanation</b>
DEC	Data & Energy Centre
EDWL	Engineering Design Work Lead
EPC	Engineering, Procurement and Construction
HVAC	Heating Ventilation and Air Conditioning
IT	Information Technology
LDE	Lead Design Engineer
NKP	National Key Point
OT	Operational Technology
SANS	South African National Standard
SOC	System Operating Control
STABNAC	Standby National Control Centre
TEMSE	Transmission Energy Management System Evolution
TPSCM	Transmission Power System Control and Monitoring
TSNC	Transmission Security Nerve Centre
TX/Tx	Transmission
UPS	Uninterruptible Power Supply
URS	User Requirement Specification
SRD	Stakeholder Requirements Definition
EPC	Engineering, Procurement and Construction
SHEQ	Safety, Health, Environment and Quality
TRE	Transmission Real Estate

## 2.5 Roles and Responsibilities

Person	Technical Responsibility
Contractor	The <i>Contractor</i> shall be responsible for the duties as defined in section 4 “overview of the Contractor’s design and construction scope” as well as section 7, “Duties of the <i>Contractor</i> ” of the Construction Regulations and all duties as defined by Contract data.
Engineering Design Work Lead (EDWL)	He/she co-ordinates the design work provided by the discipline Design Engineering roles and integrates this work into a final integrated design product. He/she is the custodian of the requirements set and the interface register between packages and part of his/her role is to maintain this information. He remains responsible for the integrity of the engineering product and is accountable for the overall management of interfaces and delivery of an integrated product.
Lead Discipline Engineer (LDE)	The role of the Lead Discipline Engineering role is to manage the technical integrity of the design and be accountable for the management of the interfaces within their specific engineering domain
Consultant’s Designer	Refer to Construction Regulations section 6 “Duties of the Designer”.  For Civil and Structural engineering and Electrical engineering applications the duties of the Designer, as defined in the Construction Regulations, shall be assigned to the Professional Engineer\Technologist.
Architect	The Architect is responsible for the conceptual and detailed design of the building, the specification of finishes and the submission of plans for acceptance to local council, ensuring compliance with <i>Employer’s</i> planning requirements and national building regulations.
Project Manager	The <i>Project Manager</i> is the delegated authority from the <i>Employer</i> representing the <i>Employer</i> to manage the defined scope of work. The <i>Project Manager</i> coordinates the execution of the Works to achieve the required cost, schedule, and quality objectives.

	The <i>Project Manager</i> is NTCSA's representative(s) that officially communicates with the <i>Consultant</i>
Quality Management	Quality ensures <i>Consultants</i> build plant according to contractual specifications, and user requirements and codes. Quality is the custodian of the Quality Management System and quality records and facilitates the work of the Approved Inspection Authority (AIA). The Quality Function's responsibility is to ensure <i>Consultants</i> have a sound quality system in place. Quality checks these systems on behalf of the <i>Employer</i> .

## **2.6 Process for Monitoring**

None

## **2.7 Related/Supporting Documents**

- a) 240-56177186 - Standard for Battery room design.
- b) 240-76368574 – Standard for security high risk fence



### **3. OVERVIEW OF THE CONTRACTOR'S DESIGN AND CONSTRUCTION SCOPE**

- a) The scope of work for the project entails engineering and architectural design, construction, supply and construction supervision, construction monitoring by design professionals, installation, commissioning, and certification of the SOC building.
- b) The Contractor shall consider green building principles (taking into consideration environment sustainability for the design and construction of the above-mentioned building).
- c) The building shall be ergonomically designed and supplied in accordance with this SRD.

#### **3.1 Location of the building**

The building will be located as depicted in figure below:



**Figure 1: Site aerial view**

#### **3.2 Overview of Contractor's design scope**

An overview of the design scope is provided below:

- a) Provision shall be made for upgrades to equipment while maintaining the operational functionality of the building.



- b) All civil and structural elements (architectural design, civil design, electrical design, mechanical design, geotechnical investigation, roads and paving, parking areas and paved walkway areas, stormwater and internal drainage).
- c) All areas including control rooms, server rooms, administrative/office areas, boardrooms, computer centre/rooms, locker rooms, workshops & storages, kitchens, ablutions facilities and, all other areas for supportive services and equipment as indicated in the **240-86056088** User Requirements Specification (URS).
- d) HVAC system complete with structural supports.
- e) Electrical supply and distribution (incl. earthing, lighting and small power)
- f) Potable water system.
- g) Active and passive fire protection.
- h) Fire detection.
- i) Access Control.
- j) Three tier fences.
- k) Blast protection building design.
- l) During the design and construction phase the *Contractor* shall make provision to perform a topographic survey before finalising detail design of the works.
- m) Design integration to ensure functionality of the building and services.

### **3.2.1 Procedure for submission and acceptance of Contractor's design**

- a) The design review process, as outlined in the Design review procedure - **240-53113685**, shall be followed for the review and acceptance of all the design documents submitted by the Contractor.
- b) Interim design reviews shall be performed on a regular basis, as and when required, to ensure End-of-Phase design objectives are achieved accurately and timeously. End-of-Phase design reviews shall be performed at key milestones during the project design life cycle. Key milestones, as defined by the Contractor, shall be agreed between the Project Manager and the Contractor's Designers, taking into consideration the stages of design reviews as per the Design review procedure.
- c) The Contractor shall account for 14 calendar days review period for design drawings and design reports for each submission. Each submission can be reviewed 3 times only if first and second submissions were rejected.
- d) For all design changes the Project Engineering Change Procedure – **240-53114026** shall be used for implementation of these changes.

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### **3.2.2 General design requirements – all works**

- a) All design work shall be compliant with, including but not limited to, the Employer's standards, specifications and other relevant codes listed under section 2.2 of this document.
- b) All design work shall be compliant with, including but not limited to, relevant and applicable standards, codes of practice, regulations, and legislative requirements.
- c) All design work shall be compliant with, including but not limited to, the Employer's standards, specifications and other relevant codes listed under section 2.2 of this document.
- d) All design work shall be compliant with, including but not limited to, relevant and applicable standards, codes of practice, regulations, and legislative requirements.

### **3.2.3 Design constraints due to limited available information**

The following information, that could influence the design of some structural elements, were not available at the time of finalising this document:

- a) Latest topographic survey. The Contractor shall make provision to perform a topographic survey before finalising detail design of the works.
- b) The weights of the heaviest components to be handled in the different rooms/areas have been specified, but the areas over which these loads are to be applied have not been specified. The Contractor must make provision to verify the weights prior to finalising the design.
- c) Requirements for the use of forklifts for operational activities. The Contractor must include provision to finalise the use of forklifts requirements with the Project Manager during concept and detailed design stages.
- d) In terms of blast protection, NTCSA does not currently have any standards or specifications dealing with the question of blast protection. The appointment of experienced blast and design engineers is recommended and engagements with the NKP Regulator must commence as soon as a concept design is in readiness.
- e) Considering above listed design constraints the Designer is advised to refer to SANS 10160-2 clause 9.3.2 that could assist the Designer in making reasonable assumption during tender stage.

### **3.3 Overview of the construction scope, but not limited to, is provided below:**

- a) Civil and structural elements (including architectural, mechanical, electrical, geotechnical works, roads and paving, parking and paved walkway areas and stormwater) for the building.
- b) All areas as stipulated in the User Requirements Specification.
- c) HVAC system
- d) Electrical supply and distribution (incl. earthing, lighting, and small power)
- e) All building finishes
- f) Biometric units, CBMS interface
- g) Fire Detection System
- h) Active and passive fire protection
- i) Telecommunications
- j) Security
- k) The Contractor shall be responsible for the supply of all materials. This includes - the complete building, HVAC systems, Fire protection systems (passive fire protection and active fire protection), fire detection, small power and lighting, ablution and kitchen facilities, storage/racking systems all as indicated in this document and in the URS (user requirement specification).
- l) The Works to be provided by the Contractor shall include, but is not limited to all scaffolding, site cranes, lifting equipment and construction vehicles and all required plant to execute the scope. All excavations, earthworks and terracing as required; all signage required; any modifications required for the use of existing infrastructure; and all materials, facilities and samples required to perform inspections, tests, and commissioning as per the relevant statutory and regulatory standards and as per this Technical Specification.
- m) The Contractor shall perform all its duties in accordance with the Construction Regulations, NTCSA procedures and specifications and including but not limited to, relevant SANS specifications, regulatory and legislative requirements.
- n) The Contractor shall include provision for all incidental works.

#### **3.3.1 Construction constraints**

- a) The building is going to be constructed on a remote site which is going to be a National Key Point.
- b) Access to site will only be granted upon obtaining the necessary permission to work.

- c) As this is going to be within eMkhiweni substation, permission to take pictures for any design work will have to be applied for from the substation security.
- d) There may be occasional encounters with wildlife such as snakes, etc. The *Contractor* shall remain observant and ensure that they manage the situation safely, whilst alerting the necessary personnel for assistance.
- e) Site weather conditions
- f) Underground and overhead services
- g) Permit to Work Procedure

### **3.3.2 Aboveground and underground services**

The Contractor is responsible for the scanning, surveying, and verification of all existing above and underground services that may interface with the new works.

Contractor shall provide copies of the above reports in 3 x sets of hardcopy format and soft copy format.

### **3.3.3 Survey control and setting out**

- a) The Contractor is responsible for the setting out of all the works.
- b) The official site layout and surveyor general diagram shall be shared with the Contractor to use and verify that all services are incorporated into the design and construction of the new works.

### **3.3.4 Excavation work, demolition work and water control**

- a) The Contractor is responsible for all excavation work.
- b) The Contractor is responsible for all demolition work (where required) as well as the control of water.
- c) All the above works shall be performed by the *Contractor* in accordance with the Construction Regulations.

### **3.3.5 Sequences of construction**

- a) The Contractor is responsible for sequencing of the works in accordance with the accepted program.
- b) Sequencing of the works shall be discussed and agreed between the Contractor and the Project Manager.

## **4. ENGINEERING REQUIREMENTS**

### **4.1 Codes and standards to be used in the works**

The Contractor is required to adhere to the latest editions of the normative and informative references within this document and all SANS standards and NTCSA specifications/standards mentioned throughout this document as well as other relevant and applicable standards, regulatory and legislative requirements.

### **4.2 Geotechnical investigation**

#### **4.2.1 Overview**

The geotechnical investigation will be required for the purpose of understanding the sites subsurface conditions and properties. A Contractor be required to carry out the following tests, which will be detailed in the geotechnical scope and specifications document:

- a) In-situ testing i.e. DPSH or DCP
- b) Soil resistivity
- c) Compaction i.e. CBR and maximum dry density
- d) Foundation testing such as Atterberg limits, triaxial, moisture content etc.
- e) Oedometer test (if required) such as swell pressure tests and settlement.
- f) Laboratory conductivity (ms/cm) as per TMH-1
- g) Stabilisation with calcium lime (only if necessary)
- h) Chemical testing i.e. Basson
- i) Core drilling (only if necessary)

The excavation of test pits will be required for the tests, which will be done using either a TLB or excavator.

- a) Geology

According to the 1:250 000 Geological Series Map 2528 PRETORIA, the area is underlain by sedimentary and volcanic rocks of the Dwyka Group belonging to the Karoo Sequence, Permian Era. The geology of the site consists of tillite and shale. The soil may contain expansive clay, engineering impact associated with tillite is that it may have a high erodibility, and pervious to semi-impervious while shale has high settlement, low shear strength, relatively impermeable and poor workability.

- b) Topographical Survey

The selected site is located at elevations above the mean sea level ranging between 1520m (in the north) and 1528m (in the south). The slope of the area is generally flat with a gradient of approximately 2%, which slopes down in the south-east to north-west direction. The natural water course and surface run-off will follow the gradient of the site, and for the purpose of drainage, the standard or ordinary channelling of water can be used as a measure.

#### c) Hydrological Characteristics

Flood line studies or other hydrological studies are needed as the site is not an existing one. As the site is not an existing one, all matters pertaining to the hydrological characteristic criteria are required to be sorted out when the site is established. The Mean Annual Precipitation (MAP) of the study area ranges between 570mm - 730mm; with an overall average MAP of 654mm [13]. According to [14] the depth to the groundwater is between 5-15m for the study area.

#### 4.2.2 Site Layout

The latitude and longitude coordinates for the proposed SOC building is indicated in the table below:

**Table 1: GPS Coordinates for the proposed SOC building**

	Latitude	Longitude
System Operating Control building	25°52'30"S	29°24'05"E

#### 4.2.3 Site clearance

The Contractor shall dispose of any excess materials in a dedicated laydown area.

#### 4.2.4 Earthworks

Detailed geotechnical studies shall be conducted to outline the full scope of the earthworks. The design of the earthworks shall be in accordance with SANS standard [21] and [22] as well as [16], [17] and [18].

### 4.3 Civil Engineering and structural works

#### 4.3.1 Reinforced Concrete Design

The design of the reinforced concrete elements shall be in accordance with SANS standard [29] and [30]. Important geotechnical aspects should be considered during design e.g., bearing capacity of the underlying soil must be determined or known and compared with the bearing pressure from the foundation, The minimum strength of concrete should be 25MPa.

#### **4.3.2 Retaining Walls**

The design and building of retaining walls is critical to ensure slope stability due to the variation in terrain where the substation is constructed. The retaining wall should be specified in such that it able to withstand the applied pressures and additionally it should be founded on layered engineering G material or stabilised soil to ensure that the underlying soil has adequate bearing capacity.

#### **4.3.3 Structural Steel Design**

The design of the steelwork shall be in accordance with [31]where applicable, and fabrication in accordance with [32].

#### **4.3.4 Structural Timber Design**

The design of the timber shall be in accordance with [33] where applicable.

#### **4.3.5 Structural Masonry Design**

The design of the masonry shall be in accordance with [34] where applicable.

#### **4.3.6 Roads**

All roads leading into and within the substation yard shall be designed to facilitate easy access and loading for transportation and offloading of all major plant and equipment. Access for mobile cranes during construction as well as maintenance and replacement thereof under all weather conditions.

The design of the road shall be in accordance with SANS standard [16], [35], [36] and [37].

#### **4.3.7 Drainage**

Storm water and subsoil drainage to be provided based on the finished terrace design and the overall catchment area that the substation falls in; this will include the design of cut off drains, water divergent channels and soil erosion control measures. The design of the drainage system shall be in accordance with [38], [40] SANS standard [21]and Standard for Substation Flood Analysis Design, [39].

#### **4.3.8 Layer works and Concrete Block Paving**

- a) Precast concrete kerbs, edgings and channels are required to comply to SANS 927.
- b) Road lime chemical stabilizing agents is required to comply with SANS 824
- c) Chemical stabilizing cement is required to comply with SANS 50197-1
- d) Concrete paving blocks shall comply with the requirements of SANS 1058.

#### **4.3.9 Road Markings and signage**

- a) Road marking paint shall comply with the requirements of SANS 731-1.
- b) Signage shall be as per the NTCSA Summary of Corporate Identity Manual 240-103414344 rev5.

#### **4.4 Mechanical work - HVAC**

- a) The HVAC system must be in line with the size of the working space required, toilets odour in toilets and kitchens for possible smoke from making food (not the same as smoke extraction during a fire as well as computer equipment requirements.
- b) There must be separate dual redundant air-conditioning system for human areas and equipment / computer systems.
- c) HVAC shall ensure that all systems can maintain cooling independently to the equipment room blocks. Thus, each equipment room block shall have a dual redundant air-conditioning system.
- d) Access control for maintenance and support of the supply shall be limited to authorised 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 centres.
- e) The ventilation for the battery room shall be in accordance with the battery room standard. Extraction of gasses by means of forced ventilation. Wall mounted extractor fans to be used.
- f) 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 authorised 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 centres.
- g) Smoke extraction to be provided in the building, the Designer to determine if it should be provided in the entire building.

#### **4.5 Lighting and small power**

- a) All lighting to be used shall be LED luminaires and shall comply to the SANS 60598, SANS 475 and the SANS 55015. All the LED luminaires used shall be tested by the NTCSA lighting Laboratory for compliance to the above standards.
- b) Emergency lighting shall be provided.
- c) The lighting and power points for each room shall be divided into two separate circuits and supplied from different distribution boards.
- d) Each lighting circuit shall supply the correct illumination for the room.
- e) Each lighting circuit shall be separately switched.
- f) Lighting for hazardous locations shall comply to the SANS 10108. The hazardous location shall be zoned and equipment used shall be according to the zone classification.
- g) The power supply shall be 400 Volt and 230 Volt 50Hz.



- h) Use of dual-technology occupancy sensors are required for common areas, offices, boardrooms and storage rooms.

#### **4.6 Potable water**

- a) Potable water will be required for the irrigation system, kitchens, toilets and ablution facilities in the building which will tie into the eMkhiweni substation services.
- b) Installation shall comply with SANS 10252 part 1 – Water supply installations for buildings.
- c) The Contractor shall make provision for water storage tanks to supply water into the building should there be an unfortunate event of unavailability of water, there shall be able to supply water for a period of 7 days, Contractor's Designer shall advise on the best solution possible to keep the water always clean for consumption.

#### **4.7 Electrical works**

Electrical design should be an intrinsically safe design especially where there are systems and working equipment which could cause fire, intrinsically safe design should be considered to prevent fires that could occur because of sparks, heat sources or wire being cut. It is advisable that the Contractor gets a master electrician to perform this task.

##### **Power supply requirements:**

- a) The building must have diverse, adequate & reliable AC power supply as the Control Room may not be switched out at any given time.
- b) There must be dual redundant UPS systems with adequate capacity.
- c) There must be dual redundant back-up diesel generators to power the building should there be AC power interruptions.
- d) The redundancy of supply shall be maintained from source to all the computers and/or equipment required for the operating and control of the power system. The redundancy shall be attained through both physical and configuration such as to ensure that no single event will reduce the reliability of the supply regardless of the voltage level required.
- e) Access control for maintenance and support of the supply shall be limited to authorised personnel only. An emergency control shall be available to isolate the supply from within the equipment rooms for employees not authorised for maintenance access to the infrastructure.
- f) Redundancy of supply shall be designed to include back-up diesel storage and batteries.

#### **4.8 Security lighting**

- a) Security lighting on the perimeter of the boundary security fence is required with the purpose of ensuring even, sufficient light between the inner and outer fences.
- b) A minimum of 10 lux average is required between the inner and outer fence with a minimum of 4 lux.
- c) The lighting system must be energy efficient in its design with minimal maintenance requirements LED luminaires shall be used. and day/night switches must be incorporated per luminaire.
- d) The illumination level required at the vehicle entrances is 20 lux average.
- e) The security lighting design must be compliant to the requirements of the Standard for Lighting for perimeter security at NTCSA installations (290-91252455).

## **5. ARCHITECTURAL REQUIREMENTS**

- a) The building shall be compliant with the following, but not limited to, Employer's specification/standards and national standard requirements:
  - i. **240-103414344**– Summary of corporate identity manual
  - ii. **SANS 10400** – all parts
  - iii. Occupational Health and Safety Act (**Act 85 of 1993**) with associated Regulations
- b) All electrical and lighting supply and cable tunnelling/trenches, terracing around the building and access to the existing road, offloading area; drive in bay and necessary concrete ramps.

### **5.1 ENERGY EFFICIENCY DESIGN**

- a) The building and related services shall be designed to be energy efficient.
- b) The Contractor shall provide an energy efficiency report that complies with the SANS 10400 and SANS 204:2011.
- c) The Contractor shall provide a fenestration calculation diagram. The aggregate conductance and solar heat gain of the glazing in the lobby area.
- d) No windows to the building.

### **5.2 CONSULTATION WITH LOCAL AUTHORITY**

It is the responsibility of the Contractor to contact the Local Authority (Steve Tshwete local municipality) to clarify any statutory town planning regulations, zoning, building lines, height restrictions, coverage, floor space ratios, safety, fire management and other requirements and approvals.

The site is currently zoned as agricultural, the Contractor shall apply for rezoning of the site if it is required by the local council.

You must and should consult the Local Authority and NTCSA in respect of service connections, such as water, electrical power, stormwater and comply with their requirements.

### **5.3 STATUTORY REQUIREMENTS**

#### **5.3.1 Submission of plans to Local Authority**

The Contractor shall submit the sketch plans to the Local Authority for information and comments. A copy of the submission letter shall be sent to the NTCSA representative.

#### **5.3.2 Architectural services to be performed by appointed architects**

- a) Stage 1 - Inception
- b) Stage 2 - Concept and viability

- c) Stage 3 – Design development
- d) Stage 4 – Documentation
- e) Stage 5 – Contract administration and inspection
- f) Stage 6 – Close out

### **5.3.3 The National Building Regulations**

The Contractor shall comply with all the National Building Regulations.

### **5.3.4 Occupational Health and Safety Act**

You must ensure that the finished building complies with the Act in all respects. If on inspection by the Department of Labour the building is found not to comply you may be held responsible.

## **5.4 BUILDING ECONOMY**

### **5.4.1 Preference to South African Materials**

Imported products may only be used with the prior approval by NTCSA. Applications for such approval shall be submitted in writing. The Contractor shall then provide written proof to NTCSA that no South African product or alternative local material/product is available.

### **5.4.2 Economy in design**

The Contractor is required to devote special attention to economy of design in respect of planning, simplicity of form and regularity of structure.

### **5.4.3 Height of rooms**

For economy, room height should be as specified or kept to the practical minimum. This will depend on the shape, size and use of the room, due allowance being made for necessary clearance below lighting, other ceiling fittings and lintels.

Height of rooms to accommodate tallest possible computer and telecommunications cabinet and to allow for overhead cable trays and to allow for cables to be maintained in cable trays.

### **5.4.4 Sourcing of equipment**

Equipment shall be sourced in South Africa (SA) and must be equipment that can be maintained locally, sourcing from abroad should be the Contractor's last resort and written proof of unavailability in the country shall be provided to NTCSA.

## **5.5 Architectural finishes**

### **5.5.1 Standard architectural finishes**

- a) Refer to document - Policy ESK PB AAQ 3 - Interior Specifications for NTCSA for all paint and floor finishes colours.
- b) All paving and road finishes to be as per the designer's specification but the paving shall be a Cementous finish with a grey colour.
- c) All exterior walls to be of a specified blast proof material but the exterior wall finish should be designed such that it does not expose the blast proof material used as a core of the external walls.
- d) Floor finishes to be as specified by designer, tiles to be beige or grey in colour, power float/grano to be grey in colour and vinyl to be grey or beige.
- e) Ceramic wall tiles to be laid on wall above kitchen countertop, height of splash back to be 600mm above countertop, colour of tiles to be crisp white.
- f) Ceramic wall tiles to be laid from floor to ceiling in women and men's ablutions, tiles colour to be crisp white.
- g) Ceiling to be crisp white in colour and have a 2-hour fire rating or be a non-combustible material.
- h) Roofing to be as specified by the designer.
- i) All dry walls, if there are any, to have a firestop rhino board and have a 2-hour fire rating.
- j) The fence is to have unobstructive clear view aesthetics, it must be an unclimbable fence with a minimum height of 1.8 meters, finish to be powder coat and PVC. The colour finish shall be black and the fence it so be installed according to manufacturer's instructions.
- k) All carports to be dome shaped shade-port system with 4 steel columns, shade net cloth/net to be high density knitted polyethylene light weight and lock stitched with 90-95% UV sun block out, to be installed according to manufacturer's instructions. Steel colour - crisp white. Net colour - royal blue

### **5.5.2 Standard furniture**

- a) The Contractor shall request for a visual inspection of typical furniture that's currently at NTCSA Megawatt Park offices and Simmerpan national control centre prior to procurement of furniture. The Contractor shall submit furniture prototypes to the Project Manager for acceptance before procurement of required furniture.

### **5.5.3 New furniture**

All new furniture is to comply to **240-52599753** Workplace space and furniture standard for commercial properties.

a) Kitchen layout details



**Figure 2 - Kitchen (Image for indicative purposes only)**

- a) Countertop – 600 wide and 32mm thick moss granite with 25mmØ bullnose with exposed edges 22mm thick re-engineered stone in shade of white, the designer is to consider counter space for appliances.
- b) Cabinetry – kitchen cupboard carcass and doors made from 18mm thick melamine 32mm thick high-density particleboard, finish to be low glare continuous decorative laminate in a Vancouver Maple with matching edging.
- c) Ironmongery – all doors to have 1 pair of spring loaded self-closing hinges and one 128mm steel hollow bar handle per door, handle to have a brushed finish.
- d) Sink – 1200x500mm double drop-in sink or 750x400mm stainless steel single drop-in sink with polished finish, colour – silver.
- e) Tap – chrome plated brass pillar type sink mixer tap that can swivel from side to side.
- f) Table - 1200mmØ, 4-seater table with white laminate top with 4-way stainless steel base; legs to be fitted with an adjuster that can cope with uneven floor surfaces.
- g) Chairs - Polypropylene moulded chairs (refer to NTCSA Corporate Identity Manual for colours).

b) Kitchen appliances details

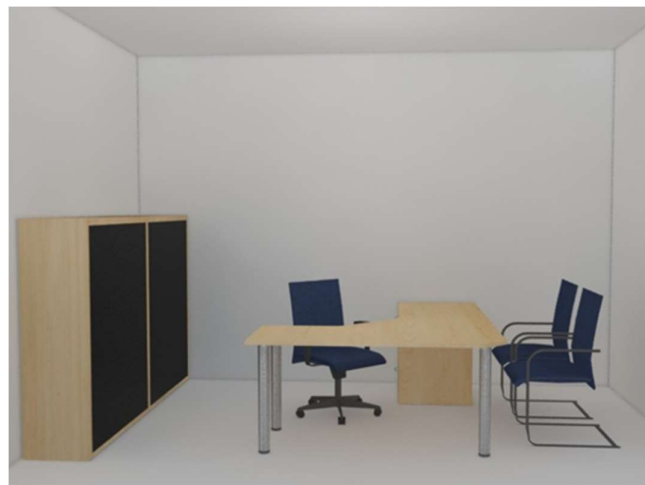
- a) Water boiler – wall mounted 10 litres hydroboil, colour – white.
- b) Microwave oven – stainless steel satin, 34 litres electronic grill, 1150W, to be placed on top of the counter.
- c) Fridge – 300 litres fridge with freezer, stainless steel satin finish, colour – grey
- d) Floor standing cold water dispenser.
- e) 80lt portable refuse bin

c) Office details

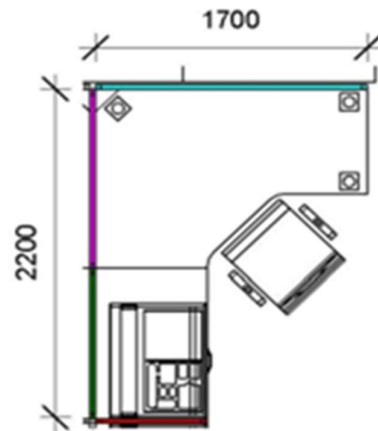


**Figure 3 - Typical meeting table (Image is for indicative purposes only)**

- a) Meeting table – 10-seater rectangular table made of 32mm thick high-density particleboard with a minimum of 0.5mm low glare continuous decorative laminate in a Vancouver Maple finish, work surfaces to have a 3mm thick extruded PVC or ABS edging with all corners profiled and leaving no sharp edges. Edging to have a wood grain surface that matches the top, and to be of such a nature that it will not wear or wipe off. All edging to be applied using high-grade hot-melt adhesive, top to be supported on 75mm diameter steel tubing with a minimum wall thickness of 1.6mm.
- b) Chairs - Single shell, sleigh base armchairs in black; upholstered in NTCSA Inspiration Fabric - Code Blue; to be constructed in round steel tubing with minimum of 25.4mm x 2.5mm wall thickness consistent throughout tubing.



**Figure 4 - Typical NTCSA workstation (Image is for indicative purposes only)**



**Figure 5 - Typical NTCSA D2 workstation (Image is for indicative purposes only)**

- a) Office chair - Synchronous office chairs on 5-star castor base; Upholstered in NTCSA Inspiration Fabric - Code Blue.
- b) Office desk – NTCSA D2 workstation, work surface to be made of 32mm thick high-density particleboard with a minimum of 0.5mm low glare continuous decorative laminate in a Vancouver Maple finish, top to rest on 75mm diameter steel tubing with a minimum wall thickness of 1.6mm and a pedestal with three drawers.
- c) Office cabinet - 16mm thick particleboard finished with a hard-wearing melamine surface, all components to have a 2mm thick extruded PVC edging, profiled and leaving no sharp corners. Colour to be a matching wood grain. All edges are applied using a high-grade hot-melt adhesive,
- d) Cabinet construction: is of a nature that will provide rigidity when moved and strong enough to carry loaded internal fittings, such as shelves or pull-out cradles. Centre shelf to be fixed to prevent “bowing” of side panels. Tops and bottoms of systems cabinets are 22mm thick CDL to provide loading strength. The base of the cabinet provides at least four ferrules that can be adjusted from the inside of the unit. Systems cabinets are capable of taking internal fittings easily in pre-determined positions. Shelves are made from epoxy powder coated mild steel. Colour to be black.
- e) Doors: roller-shutter doors are of extruded inter-locking slots in PVC or ABS and self-coloured in a Graphite colour. The handle is to be fitted with a multi-Point locking mechanism, with two locking rods and two bar guides per bar. The lock, a "Multi Point lock 'called FURNLOCK" to have a removable barrel and master keyed to match all other locks. The handle on the roller shutter door is epoxy powder coated steel in a Graphite colour and inter-lock with the roller door section.



d) Non-standard desks



**Figure 6 - Typical non-standard workstation in control room (Image is for indicative purposes only)**

The desk shall be used in the control rooms, the desk should be big enough to accommodate 3 x 42" monitors + 1 x 42" monitors for IT, a trader board telephone, normal telephone, have plug points, side drawers. The desk plan area shall not be less than 5m<sup>2</sup>.

Contractor's design shall be submitted to NTCSA for approval prior to manufacturing.

e) Waiting area furniture details

- a) Coffee table 1 - 1200mm x 1200mm x 305mm with chromed steel base; colour lacquered glass in NTCSA accent colour (refer to NTCSA Corporate Identity Manual) or
- b) Coffee table 2 - 800mm x 800mm x 305mm with chromed steel base; colour lacquered glass in NTCSA accent colour (refer to NTCSA Corporate Identity Manual)
- c) Sofa – double sofa fully upholstered using contract grade fabric, cold moulded polyurethane foam; Accent NTCSA colours can be used for upholstery (refer to refer to NTCSA Corporate Identity Manual)

f) Other furniture

- a) Lockers – 6 door lockers to be epoxy coated and oven baked for superior finish, colour – grey. Total number of lockers for each building to accommodate the total number of employees per building.
- b) Benches - Single sided floor standing bench of 900mm length minimum, manufactured in angle iron, square tubing and meranti slats.

g) Passive Fire protection

- a) Roof ceiling to have a 2-hour fire rating or be a non-combustible material.
- b) Emergency fire doors to have a fire rating of 2 hours in stability as well as 2 hours in insulation and integrity.
- c) Drywalls to have a fire rating of 2 hours.
- d) Finishes – paint finish in all rooms and ceramic tiles finish in all ablutions, all ceramic tiles to be fire resistant and the paint finish to be able to delays the expansion of fires.
- e) Flooring – vinyl sheet flooring, concrete floated and ceramic tiles flooring in different rooms as indicated in the Architect's conceptual drawings, all these types shall be fire resistant.
- f) All penetrations into the buildings and/or rooms in the building to be fire sealed with a 2-hour rated fire seal as per the requirements of the NTCSA Fire Protection and Life Safety Design Standard.
- g) Emergency route and signage in the whole building.

The Contractor is to provide separate emergency escape and fire drawings for NTCSA to review and approve. The fire emergency/escape route shall be designed in accordance with and SANS 10400.

h) Facilities for disabled persons

Minimum provision – The building shall be an accessible building therefore provision for disabled persons shall be made in accordance with Part S of the National Building Regulations.

i) Accommodation schedule

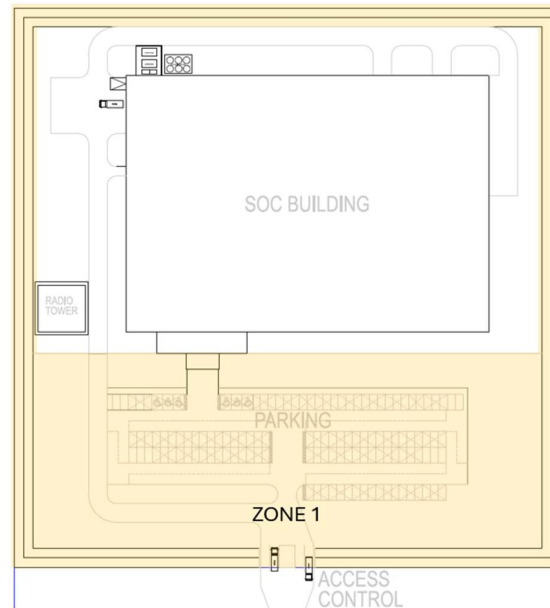
The Contractor will be required to produce a detailed accommodation schedule for every room, this information must include but not limited to:

- Total floor area of each room.
- Number of people to be accommodated in the room.
- Type of furniture or systems to be accommodated in the room.
- Function of the room.
- Tag indicating the name of the department the room belongs to, this schedule must be accompanied by a floor plan also indicating this information.

## **6. BUILDING FUNCTIONAL REQUIREMENTS**

- a) All areas/rooms with data equipment shall have access raised floor, with a minimum floor void of 1200mm and a bearing capacity of 1500kg per square meter, areas like the ablutions, kitchens, office areas etc. shall not have raised flooring.
- b) The Contractor shall design a ceiling void deep enough to accommodate air vents, pipes for carbon dioxide (CO2) fire suppression system (only in rooms with data equipment), sprinkler system, this void shall not be less than 900mm deep.  
Gas nozzles to be computer equipment safe.
- c) Contractor's Designer shall take into consideration the fire detection system requirement for floor and ceiling voids where needed as per SANS 10139.
- d) 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.
- e) All meeting rooms shall have more than one emergency exits.
- f) All rooms with equipment which make sounds/noise when operated shall have sound dampeners to keep the sound/noise in the room.
- g) The design shall be done in 5 zones:
  - i. Zone 1 – Public zone, perimeter fence, access control building and vehicle parking area
  - ii. Zone 2 – Main access points into the facility, both pedestrian and vehicle access points – Card +Biometric verification.
  - iii. Zone 3 – General access into the open areas within the facility – Card access.
  - iv. Zone 4 – Limited access areas such as the actual control room facility – Card + Biometric Access.
  - v. Zone 5 –Restricted zones such as guard room facilities, IT server rooms, equipment rooms etc. – Card + Biometric Access.

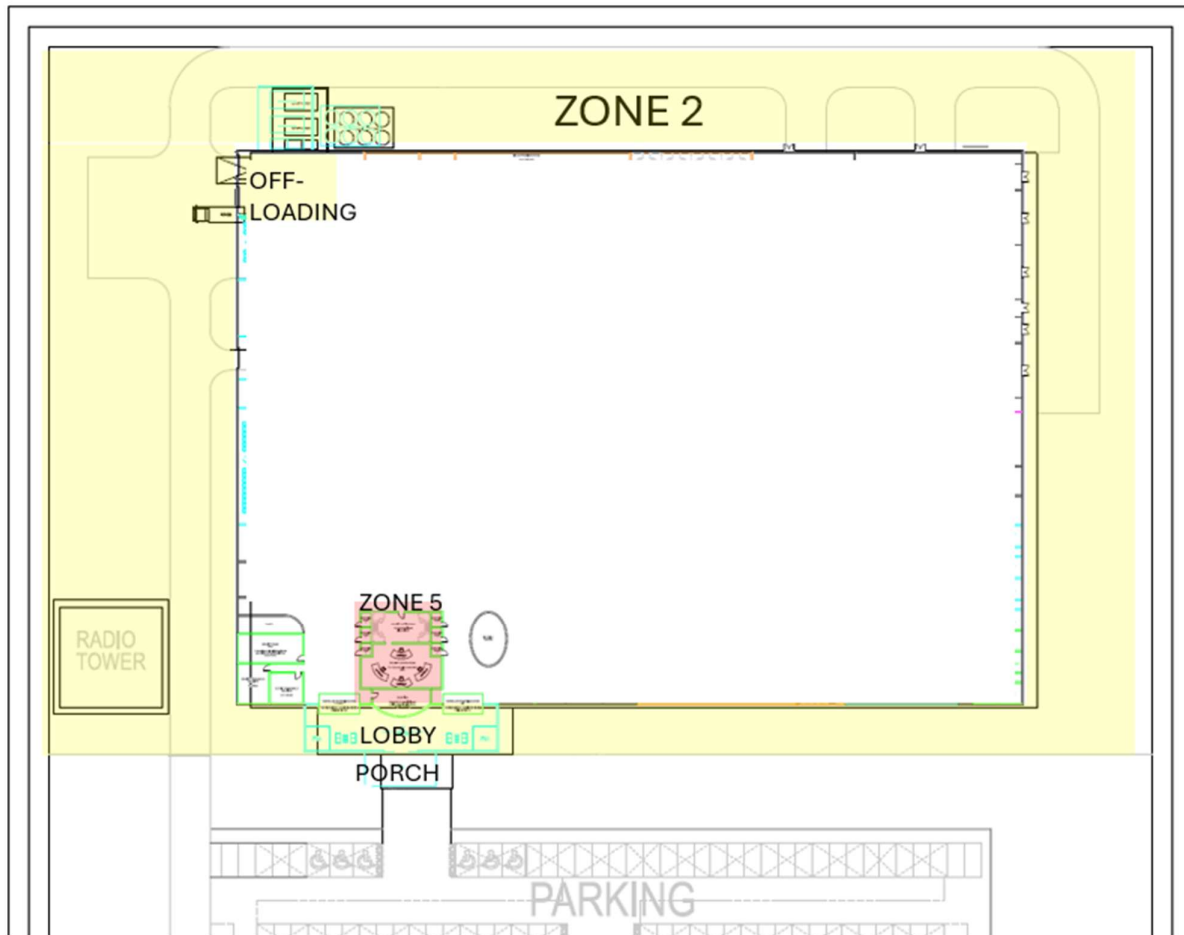
## **6.1 Zone 1 - Public zone**



**Figure 7 - Zone 1 layout**

- a) This site will be a National key Point (NKP) therefore a 2.4m high three-tier fence design is required around the facility consisting of an outer barrier security fence, an energized fence in the middle with an inner protection fence with 3m minimum distances between fences, 6m clear area outside of the outer fence, make provision for a patrol route for pedestrians internally and vehicles externally, The site shall have 1 (one) security controlled entrance gate with a 40 square meters standard access control building, the access control building design drawings will be shared with the consultant, vehicular access(for employees and visitors), large vehicular access for trucks(deliveries & collections) and pedestrian access, vehicle access to site must be limited as much as possible, this entrance shall lead to open plan parking with paved walkways, road width should allow for a 15 ton trucks to manoeuvre within the premises to the deliveries receiving area and exit the premises, a dedicated solution is required to ensure that only garbage and rubble is removed or collected from site and not any other assets in the process, paraplegic parking bays shall be in close proximity with the main entrance, this should be an open plan parking with shading, the Designer should make provision for trees and pedestrian walkways, the design should not allow for any cars to park beyond fence between the building and parking lot, cars to drive through the fence are delivery cars/trucks only.
- b) Outside the three-tier fence, a helipad is required with a minimum 20 x 25m landing to accommodate a 11m diameter roto, the helipad must be 22m away from the fence and accessible from the road leading to the SOC building.
- c) Parking - Open-plan parking with shaded carports (royal blue nets, white steel), paraplegic bays near entrance, and 6m clear patrol route around three-tier fence, the Designer shall determine the number of parking bays required based on the number of employees and visitors to be accommodated in the building.

## **6.2 Zone 2 – Building shell, access points into facility & general access within the facility**



**Figure 8 - Zone 2 Layout**

The Designer shall take into consideration the positioning of the building in respect to the boundaries, parking, proximity of offices, training facilities, sports facilities etc. the layout arrangement should be according to NKP requirements.

Envelope of the building shall be a blast proof design, the penetration points through these walls shall be kept at a minimum, however the Designer shall consider biophilic design approach (bring natural elements into the interior spaces), for an informed design the Designer is required to do research on blast proof buildings design, from the parking one should be directed to a -

### **6.2.1 Main entrance porch**

- with a roof shelter, this should be the most aesthetically pleasing portion of the building as it is the main entrance, porch should lead one to the -

#### **6.2.2 Main entrance lobby**

- area which can be exposed to natural light as much as possible, in the lobby area the Designer shall maximise usage of ceiling height to achieve a feeling of openness and provide exclusivity, there shall be a waiting area which can accommodate a minimum of 12 people at once, ablution facilities for visitors and a centralised reception desk, the only penetration areas through the blast proof wall in the lobby area should be openings for parcel scanners and man traps with security guards at both ends of the machines, a blast proof wall shall separate the lobby from the –

#### **6.2.3 Offloading and sorting area**

- (Deliveries/collection entrance) shall be away from the main entrance, have a pedestrian entrance, have an opening wide enough for hand operated forklifts to manoeuvre in the area, it shall have an opening wide enough and high enough to accommodate truck deliveries and the off-loading area shall be covered.

#### **6.2.4 Security checkpoint**

- Refuse check point in the offloading area.

#### **6.2.5 Skip bin platform and water tanks**

- There shall be a skip bin platform outside the receiving area to accommodate at least 2 x skip bins and big enough for the skip bin truck to deliver and collect the bins without clashing with other vehicles within the area.
- Potable and fire water tanks to be located outside the building, the Designer determine the number of litres required for this building, this water shall be reserved for emergencies only.

#### **6.2.6 Ablution facilities and pause areas**

- All ablutions and pause areas accessible from the general passageway,
- ablutions shall have WC's, showers, wash hand basins and change rooms with lockers.
- All kitchens/kitchenettes must be fully equipped with running water, 1(one) drop-in sink, water boiler, micro-wave oven, fridge, lounge with chairs that can seat at least 12(twelve) people, counter space, water cooler and refuse bin.

### **6.3 Zone 3 – Limited access areas - Card**

This design should have a contemporary design approach which reflects simplicity in the branding of NTCSA (National Transmission Company of South Africa), an uncluttered look internally and externally, with clean lines enhancing the building's spatial use and achieve modernisation, journey from the main entrance to the core of the building should allow for a transparent feel vertically and horizontally even though the shell of the building shall be blast proof with no glazing as a source of natural light and natural air ventilation, lighting in the building should be on 24/7 and all rooms must be fitted with HVAC system to control room temperature.

After the reception desk and mantraps there shall be open area for traffic of personnel's entering and leaving the building, within that space there shall be a security area defined in Zone 5 description.

From the security area the building should open to the different zones within the building through one main passageway wide enough to accommodate personnel's traffic and forklift, maintaining the transparent feel and openness, required spaces are defined as follow:

### **6.3.1 Data centre computer rooms**

These equipment rooms shall be outside the System Operations control area/section but they should not be too far from it, the Contractor shall comply and use document (32-894 NTCSA Server Rooms and Data Centres Standard) as a guide to determine the location of the data centre within the building, sizes of the rooms, finishes and the amount of entrances, the configuration shall be designed in blocks and each block will consist of two compartments. Four of these equipment room blocks will be required resulting in a total of eight (8) compartments.

The computer room floor shall be designed with antistatic, raised flooring with a minimum floor void of 1200mm, the floor should with withstand about 1500kg/m<sup>2</sup>. The ceiling shall have a minimum 600mm void. The cabinets should be top entry for data cabling and bottom entry for power cabling. The cable trays design shall ensure exclusive use per discipline for cable routes for Telecommunication, IT, BMS, security and TEMSE/SCADA systems. Power systems cables shall be totally separated from the data cables.

Cabinets shall be arranged such that the most efficient heat extraction methods are possible, the doors for equipment access into all areas in computer rooms shall allow access for loads on hand operated pallet jacks where the load height excluding pallet jack is 2100mm. The door shall be aligned with the hot aisle in the equipment room to maximise space within the computer rooms. Assuming cabinets of width 800mm and depth of 1000mm, the floor space required per compartment is 11400mm x 7200mm, which is 82m<sup>2</sup>. The total space for eight (8) compartments then comes to 656m<sup>2</sup>, entry into the control rooms shall be one (1) mantrap drop and one (1) double door (maintenance door) per equipment room.

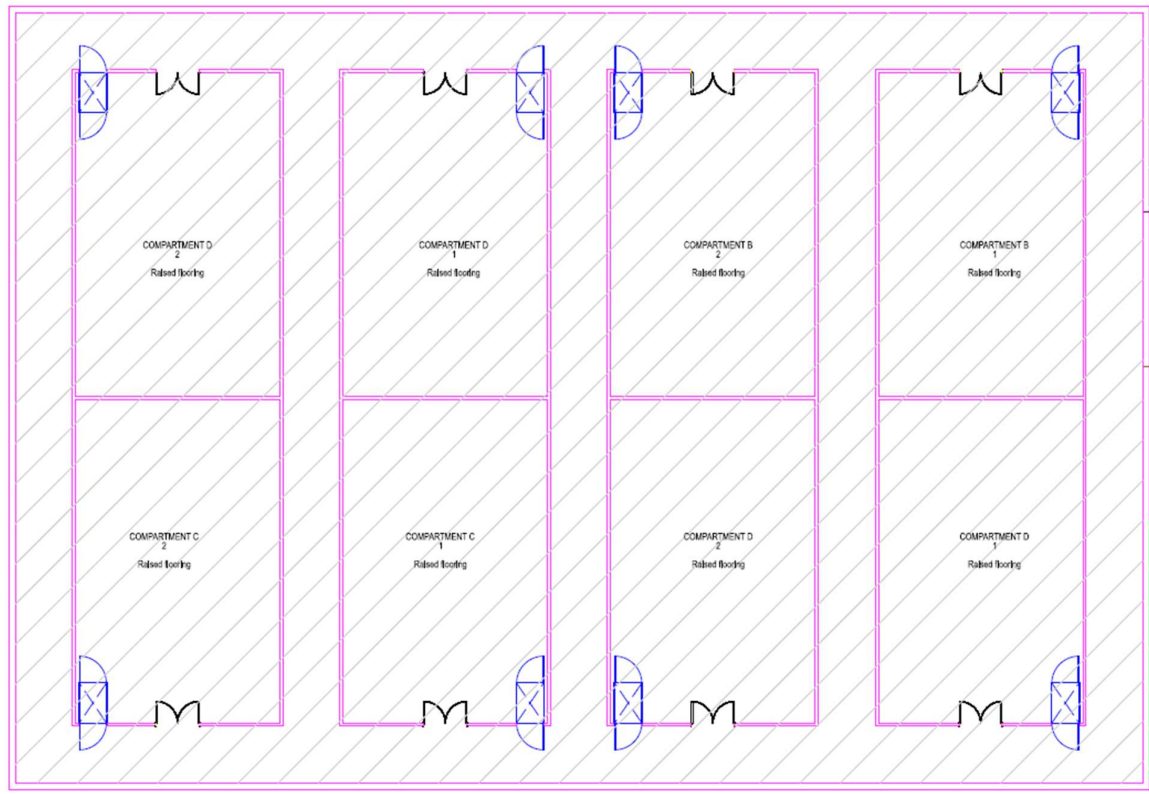
Each equipment room block shall have dual redundant services, such as cooling and power.

Each equipment room block shall have an independent fire suppression system. The production system shall be deployed using the four (4) production compartments. The four (4) upgrade compartments shall be used during the system upgrade and hardware replacement cycle of the operating and control system when the production and upgrade systems is in parallel operation. The minimum requirements for the compartments are:

- a) Two (2) equipment rooms shall be allocated for the system A and system B. The dimensions for the compartments in the system A and system B equipment rooms are 7,5m x 10m.
- b) The compartments for the cluster server's equipment room may be smaller at 7,5m x 5m.
- c) The compartments for the development server's equipment room may be the same size at 7,5m x 5m.

Critical infrastructure like telecommunications, water, power (raw and UPS), air-conditioning, cable routes shall be diverse and segregated as much as possible to aid in isolation during operations and or upgrade periods such that outages in one (1) area should not affect other areas. Care shall be taken to ensure that environmental conditions are properly mitigated for e.g., lightning spike suppression methods are designed for and water ingress containment from areas below ground level are catered for.





**Figure 9 - Operating and Control Equipment Rooms**

### 6.3.2 Common facilities

#### a) 2 x Air conditioning (HVAC) system rooms

##### I. Air handling units room/s.

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.

##### II. Thermal storage tanks room/s

III. Thermal storage system is preferred to be used in the building in case the HVAC system fails, there are different thermal storage systems in the market, the Contractor shall present the proposed system to the employer (NTCSA) for approval and then determine floor area and location of the approved system.

IV. Computer centre and air conditioning systems rooms are to be in proximity.

V. Air conditioning plant rooms are to be separated into two, one for areas with equipment/computer systems and one for areas occupied by humans.

#### b) 2 x UPS rooms

There must be dual redundant 50VDC and 220VAC UPS supply systems with adequate capacity, floor area and location of the rooms shall be determined by the Designer, the rooms

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shall have raised access flooring with a minimum height of 1200mm for cabling, see document 240-56227443 requirements for control and power cables.

TPSCM is on a separate dual redundant UPS to general purpose building UPS, Telecommunications require 50vdc supply.

If not decided different, these rooms can also be used to accommodate the UPS and DB and 50 V chargers but exclude the batteries.

c) 2 x UPS rooms for HVAC

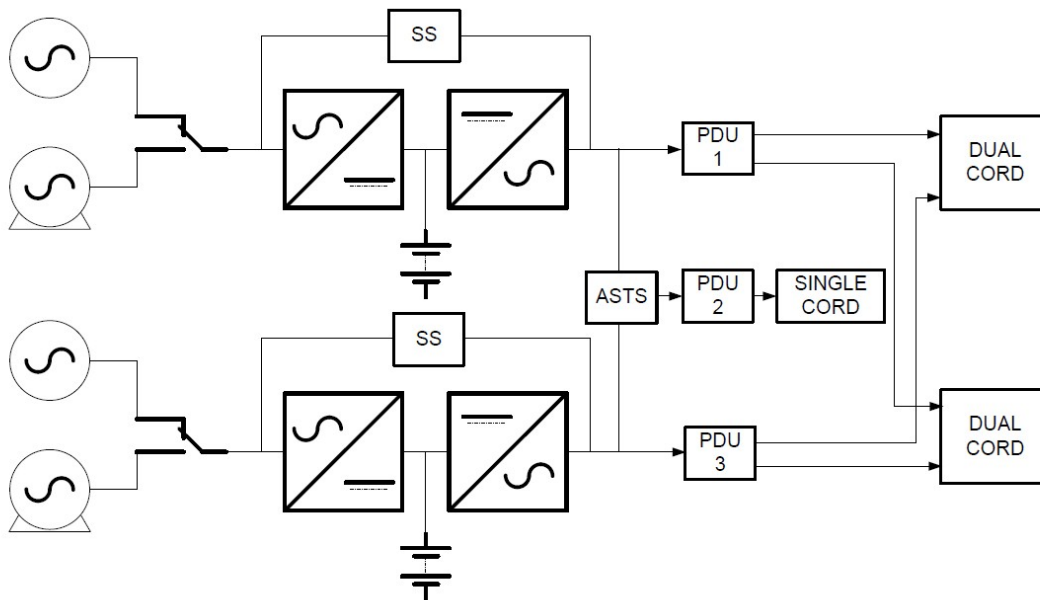
There must be 2 x UPS rooms specifically for HVAC system, these shall be close to the HVAC plant rooms.

d) 2 x Back-up diesel generator room/s

There must be at least 2 x dual redundant back-up diesel 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.

e) Bulk Diesel 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 diesel 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. Required back-up or standby times to be determined by the Designer in order to size the Storage tanks.



**Figure 10**

f) 2 x Battery rooms

There shall be battery rooms for batteries to support UPS's in the building, floor area and location of the rooms shall be determined by the Designer, redundancy of supply shall be designed to include back-up and batteries to align with dual UPS's, battery storage should align to UPS requirements and the rooms shall comply with the NTCSA standard for battery rooms, there shall be an extractor to remove toxins released from the batteries and 4 x battery banks are to be provided per room, extraction of H<sub>2</sub> shall be provided.

The Consultant 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.

g) 2 x Transformer rooms

Even though the building will be close to eMkhiweni substation, it shall have its own transformer, the Designer shall determine the floor area required for the rooms and the location, the requirement for redundant power, is to have 2 feeds from substation, each connected to separate bus bars, therefore 2 transformers will be required.

h) 2 x LV Switchgear rooms

Rooms to be in proximity with back-up diesel generators, switchgear to support dual redundancy.

i) 2 x MV Switchgear rooms Dx

Rooms to be in proximity with back-up diesel generators, switchgear to support dual redundancy.

j) Backup diesel generator

There must be dual redundant back-up diesel generators to power the building should there be AC power interruptions.

The redundancy of supply shall be maintained from source to all the computers and/or equipment required for the operating and control of the power system. The redundancy shall be attained through both physical and configuration such as to ensure that no single event will reduce the reliability of the supply regardless of the voltage level required.

k) 2 x Charger rooms

Requirements to be determined by the Designer.

### 6.3.3 BMS server room

Requirements to be determined by the Designer.

### 6.3.4 Demin plant room

Requirements to be determined by the Designer.

#### **6.3.5 Gym room and ablutions**

This facility is exclusively for Power system Control Operators, gym shall be accessed from a passageway, entrance door should open up to a reception area with a reception desk to accommodate 2 (two) receptionists, cabinetry for filing and waiting area equipped with two chairs and a coffee table, from the reception area access to the gym area should be controlled by use of access cards machines, gym area to be big enough to accommodate gym equipment and ablutions (water closets, wash hand basins, urinals, lockers, benches and showers), there shall be a dedicated kitchen to be used by gym staff only.

#### **6.3.6 Building management office**

There shall be a building management office within the building, location should not be too far from the deliveries receiving area, from the passageway there shall be a double door opening into the office area with 2 x D2 workstations for Building Manager and cleaners management, cleaning equipment storage and a kitchen with a sink, water boiler, microwave-oven, fridge, refuse bin, floor stand water dispenser, 2 x kitchen dining tables and 8 kitchen chairs.

#### **6.3.7 Telecommunications equipment room**

Refer to document **240-135101235** Specification report: New System Operating Control (SOC) Telecommunications network.

The EPC Contractor will design and present the relevant design. It is anticipated that the Telecommunications room size will be 210m<sup>2</sup>.

This room need to house the following equipment but not limited to:

- a) Telecommunication equipment.
- b) Security related servers and equipment.
- c) IT equipment.
- d) This room will provide related equipment labelled as Gate way B.

The DEC room space required is for 7 cabinets located next to each other. The cabinet size is anticipated to 1000 mm (L) x 800 mm (W). The design needs to detail this and can be used to estimate the space required for Dec rooms.

#### **6.3.8 4 x Security computer rooms**

These rooms are for IT equipment, BMS, physical security computer systems and telecommunications equipment, size of the rooms to be determined by the Designer.

#### **6.3.9 Information Technology (IT) rooms**

- a) Server room

50m<sup>2</sup> server room for 26 IT cabinets, within this room 2 x 42U cabinets area must be accommodated, this room shall be close to SCADA data centre

- b) 1 x enclosed office

10m<sup>2</sup> enclosed office specifically for IT employees when they are on site, this office shall be close to IT server room.

c) Storeroom

28m<sup>2</sup> storeroom for IT equipment, Storage to be 7x4m in size, ceiling to be a solid concrete ceiling, solid walls with wall-to-wall shelving, controlled access and 1200mm floor void. This storage must be away from kitchens, ablutions or any plumbing cavity.

### **6.3.10 Telecommunications - NMC rooms**

a) Data centre

50m<sup>2</sup> (5 x 10m) data centre to house telecommunications equipment in a dedicated NMC area.

b) Office space

Open plan office space required for 6 employees, the workstations are to have D2 workstations, office area to also accommodate 1500 x 1200 storage cabinet.

### **6.3.11 Horticulture workshop & storage**

a) Location and size of these rooms to be determined by the Designer.

### **6.3.12 Open plan offices – Transmission real estate (TRE)**

a) Open plan D2 desks offices for 10 TRE employees.

b) 60m<sup>2</sup> min. 30-seater boardroom in the same vicinity as the offices.

c) Workshop and storeroom for repairs, this room shall be equipped with workbenches, the size and location of the room shall be Determined by the Designer.

### **6.3.13 Equipment rooms (TRE)**

a) 8 x equipment rooms, requirements to be Determined by the Designer.

## **6.4 zone 4 – limited access areas – card & biometric access**

### **6.4.1 Transmission System Operating and Control (SOC) area**

- a) Security checkpoint - from the main passageway to the transmission area/section you should pass through another security checkpoint with controlled access, this checkpoint shall have a reception desk to accommodate at least 2 (two) security guards, from this checkpoint the guards should be able to always have a view of the entrance/s to the control room and a view of the control room itself, access to the control room from the security checkpoint should be through mantraps, 1 (one) for entry, 1 (one) for exit and 1 double door for a wheelchair access. Card and biometric access for limited/restricted zones (Zones 4 and 5) shall be provided. There shall be a fire escape exit. The access control to the boardroom for the on-duty shift shall be from within the power system control room. The access control for the second boardroom shall have access from the local reception area to the control room such that visitors can access the boardroom without entering the power system control room
- b) System operating & control room - should be centrally located and isolated from all external noise sources (to be sound proofed) as it is the core of the building and lighting shall be functional and suitable for control room operations.

It should be of Operator focussed design with 13 operating workstations, further 5 enclosed offices must be in the vicinity with the view of the map board at all times. There shall be antistatic raised floor with a 1200mm void.

The total size of the control room will be determined by the orientation of the operator consoles.

Each console shall allow space for a TEMSE workstation with three (3) 42" monitors, a normal IT PC with a monitor, a trader board telephone with direct lines and hotlines, and a normal Voice over IP (VoIP) telephone and two (2) network points to connect to the operating and control system..

Each operator console workspace shall have speakers installed with personal volume control per workspace. The speakers shall be connected to the television output on the rear projection system with local audio control for each workspace. The shift supervisor and desk that can be used for loading shall have mounted frequency meters.

The control room shall be able to accommodate the listed number of TEMSE operating and control workstations as follows:

- 8 x workstations for Senior Controllers (including envisaged expansion).
- 4 x workstations for NCC Senior Controllers and
- 1 x workstation for the Shift Manager

A total of thirteen (13) workstations are required inside the control room.

- c) Map board equipment room - shall be located behind the map board with a depth of 7.2meters minimum and the length of the map board, it must be sealed (with a use of sound dampeners) from the control room for noise, it shall have its own air-conditioning equipment room, this area will house racks for telecommunications systems used inside the control centre, TEMSE switches used inside the control. the door to this area must allow for the movement of the scaffolding to be used inside the control room when required, the flooring should be antistatic, raised flooring, 1500kg/m<sup>2</sup>, with a minimum of 1200mm floor void, shape of the room should be rectangular or square only, no curved walls or angular walls will be accepted.
- d) TEMSE simulator facility (DTS room) – 180m<sup>2</sup> min. training room with fully equipped simulator servers and workstations that can accommodate the whole SOC shift at a time 12(twelve) workstations with 2\*30" monitors per workstation, workstations shall be similar to the Operator workstations in the control room fully equipped with TEMSE hardware and software, 2(two) projectors, built in cupboards for file storage, projector, drawing board, false flooring of at least 1200mm above floor slab and a separate lockable instructor's office, the office shall be within the room, it shall have a glass panel for the instructor to look into the training room, D2 desk, office chair and a cabinet. A cupboard, an approximate length of 7m, 1.8m high and 45mm deep, shall be installed on the side of the power system operator training room, for file storage. The minimum size shall be 86m<sup>2</sup>. A dedicated workstation with the capability to connect to four (4) projectors shall be allocated to drive the front projection system, all projectors shall provide ultra-short throw, each projector shall have a minimum pixilation of 1 900 x 1 080 pixels that can be upgraded. A sound system shall be provided for the training simulator room, to allow for the playing back of training videos.
- e) Offices – 5 x enclosed offices with view of the control room with map board, each office shall have a D2 workstation, chair and a file cabinet.
- One office for a System Operating Control Manager
  - One office for a Senior Advisor Operations
  - One office for a Senior Advisor Simulations
  - One office for an Outage Scheduling Officer
  - One office that can house 2 x Operating Officers

The engineering **support offices** shall be able to accommodate the listed number of workstations as follows:

- 1 x workstation for Outage Scheduling function
- 1 x workstation for TEMSE support
- 1 x workstation for Senior Advisor (Head of Shift)
- 1 x workstation for Operations Support function
- 1 x workstation for SOC Manager.
- 1 x workstation for Simulation function.

Each workstation shall have two (2) 30" monitors and two (2) network points for connection to the operating and control network.

- f) Storage and workshop – for TEMSE support there shall be a 25m<sup>2</sup> min. storage & workshop room, the workshop must have 2 x two tier work bench 2m in length, 2 x Lockable steel cupboards, 3 x highchairs and 2 x telephones line (normal UC). There shall be card and biometric access control at the same level as the SCADA/TEMSE data centre.
- g) Meeting rooms – Each room shall be equipped with a table and chairs for 10 people, both shall have a blast proof glass wall to look into the control room, have a projector, mobile drawing board, map board, board room can only be accessed from the control room and gallery room access should be from passage way in the control area. There shall be two (2) dedicated boardrooms for use by the power system control room operators. One (1) boardroom shall be dedicated to the shift on duty (critical discussions, one-on-engagements, etc). The second boardroom for management meetings is known as the gallery and it is to also be used for visitors. The gallery shall allow visitors to view the activity in the power system control room after receiving permission from the power system control room operators. Boardrooms must be fully furnished and must be big enough for a seating of at least ten (10) people, that is the management team plus and average of three (3) visitors.
- h) Support staff office area – There shall be twenty-seven (27) open plan offices for the System Operator staff. The open plan offices shall be available for installation of workstations on demand, for example during a disaster recovery switch over. The area shall have D2 desks and chairs.
- i) Ablutions - control room shall have ablutions with basins, water closets, urinals, showers and locker rooms for (9 people on shift x 5 shifts) = 45 shift lockers, such lockers shall be in a separate room but not far from the control room, each locker must be lockable, and be sized approximately 500mm x 1000mm and about 400mm deep and be fixed around the walls, the amount of all these items should be as per SANS 10400 part P requirements, within the control room area there shall also be 1 accessible toilet for men and women and a separate men's toilet, these shall accommodate water closets, basins and a urinal in the men's toilet.
- j) Kitchens – One kitchen in the control room to be used by controllers only, the kitchen must be fully equipped with running water, 1(one) drop-in sink, water boiler, micro-wave oven, fridge, lounge with chairs that can seat at least 6 people, counter space, water cooler and refuse bin.
- k) 1(one) kitchen in the transmission control area/section to be used by staff and controllers during training, the kitchen must be fully equipped with running water, 2(two) drop-in sink, water boiler, micro-wave oven, fridge, lounge with chairs that can seat at least 12(twelve) people, counter space, water cooler and refuse bin.

#### **6.4.2 Transmission security nerve centre (TSNC) area**

From the TSNC entrance door there shall be:

- a) A waiting area with a double sofa for guests when visiting the building,
- a) Access control area/reception desk to receive personnels entering the building



- b) From the reception there should be only one controlled access leading to the control room,
- c) Control room shall be centralised so that that all the other rooms are around it and the video wall can be viewed from the rooms,
- d) Rooms around the control room shall be Shift supervisor's office, Security Manager's office,
- e) Males, females and paraplegic ablutions,
- f) Kitchen with sink and a coffee station,
- g) Video wall,
- h) Conference room,
- i) Sever room, Battery room and HVAC room,
- j) Maintenance room and storage room,
- k) Walkway/passage in the building shall be not less than 1200mm
- l) 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.

a) Waiting/reception area requirements

This shall be an open plan area with security to receive visitors and enrolments - take note of ballistic requirements for counter/glass, reception desk shall be designed to take a minimum of 2 receptionists/security guards, this desk will be for enrolling personnels entering the TSNC area only and the waiting area must have a double sofa for visitors.

b) IT and telecommunications impact

It is envisioned that the standby eMkhiweni site shall require 1Gbps data circuit into the Telecommunications 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 Telecommunications 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 telecommunications infrastructure to be provisioned by the Contractor.

c) Control room requirements

It should be of operator focussed design with 6 x operating workstations. There shall be antistatic raised floor with a 1200mm void, each desk shall comprise of 2 standard 19" screens for each operator. There shall be a video wall made of 6 x 67" LCD screens.

d) Shift Supervisor's and Security Manager's offices requirements

2 offices are required, each office to accommodate a D2 size workstation, a chair, and a file cabinet and all offices shall have a glass wall to view the control room with map board.



e) Ablutions requirements

Control room shall have ablutions with basins, water closets, urinals, showers and locker rooms for (6 Operators on shift x 5 shifts) = 30 shift lockers, such lockers shall be in a separate room but not far from the control room, each locker must be lockable, and be sized approximately 500mm x 1000mm and about 400mm deep and be fixed around the walls, the amount of all these items should be as per SANS 10400 part P requirements, within the control room area there shall also be 1 accessible toilet for men and women and a separate men's toilet, these shall accommodate water closets, basins and a urinal in the men's toilet

f) Kitchen requirements

One kitchen in the control room, the kitchen must be fully equipped with running water, 1(one) drop-in sink, water boiler, micro-wave oven, fridge, lounge with chairs that can seat at least 6 people, counter space, water cooler and refuse bin.

g) Video wall room requirements

This room shall be behind the control room video wall with access only from the control room, it must be sealed (with a use of sound dampeners) from the control room for noise, the flooring should be antistatic, raised flooring, 1500kg/m<sup>2</sup>, with a minimum of 1200mm floor void, shape of the room should be rectangular or square only, no curved walls or angular walls will be accepted.

h) Conference room requirements

It must be fully furnished (chairs & table) and must be big enough for a seating of at least 12 people (management team plus average of 3 visitors), it shall have a blast proof glass wall to look into the control room, be easily accessible by a wheelchair, have a projector, a mobile drawing board and map board, access into the conference room should only be from the control room and be easily accessible by a wheel chair.

i) Server room requirements

This room shall be located behind the video wall room and accommodate 11x2 racks listed below:

- 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. There is a requirement for a Tier 2 data centre that demonstrates 99.741% availability. The Consultant 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 Consultant shall also make provision for a fire suppression system that is suitable for a computer data centre.

j) 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.

## **6.5 Zone 5 – Restricted areas**

### **6.5.1 Security control room**

- a) Provisioning of control room space for 4 (four) operators in terms of the NTCSA approved control room standard, room shall be big enough to accommodate all 4 non-standard desks and positioned at the main entrance with flow provisioned for pedestrian access either side of the control room, turnstiles, access control and CCTV to be implemented.

### **6.5.2 Security Disaster Recovery room**

- a) A provision shall be made for a Security Disaster Recovery (DR) room. This will serve as the disaster recover site for the Transmission Security Control Centre.

### **6.5.3 Security equipment room**

To house NLEPDS equipment and IPSS equipment with a false flooring with a minimum floor void of 1200mm, this room shall not be too far from the telecommunications equipment room and auxiliary supply.

- a) All CCTV must be linked back to the secure equipment room dedicated to the handling of security control devices.
- b) These will include routers, switches, PoE devices, servers and storage servers.
- c) Equipment room must be suitably sized to accommodate the identified equipment in rack format.
- d) The equipment room must be suitably cooled to ensure efficient temperature control within the room.
- e) The limitation of access points into the equipment room is required as far as functionally possible.
- f) False flooring with a void of minimum 1200mm is recommended to ease the routing of cables and other services required.
- g) A fire suppression system is required, which is suitable for the application within an electrical and electronic environment.
- h) PA system equipment to be operated from this room.
- i) The room shall have uninterrupted UPS supply.

#### **6.5.4 Searching rooms**

- a) At pedestrian access points, these search rooms shall have doors for privacy during the searching **and** each room's floor area shall be a minimum of 3m<sup>2</sup>, number of rooms to be determined by the Designer.

#### **6.5.5 Reception desk**

- a) Big enough to accommodate 2 x receptionists, with a counter, 2 x office chairs and filing cabinets, for interaction with site visitors and enrolments there shall be bullet resistant glass between lobby and the reception area.
- b) Building must comply with technical specifications for bullet resistant guard huts in terms of the ballistic specifications.

#### **6.5.6 Security office space**

For Security Manager & 3 (three) additional standard D2 workstations in the office area.

### **6.6 High level design**

The Specification Report details a graphical representation and the following:

- a) Upgrade of the microwave radio link between eMkhiweni Substation and NTCSA Park
- b) Construction of a microwave radio tower and provides a microwave radio link between the eMkhiweni and Gloria Radio tower.
- c) Installation of a 5 km fibre cable and "T" in this fibre with an existing fibre at Arnot Power Station.
- d) Provides the Telecommunication equipment at for the System operation control room. This includes the Telecommunication equipment at connecting sites up to exists telecommunication infrastructure.

## **7. SYSTEMS**

### **7.1 Access control**

#### **7.1.1 Access control system in the entire building**

- a) The access control at the site needs to be align and comply with the access control standard, Specification for Integrated Access Control System for NTCSA Sites: Unique Identifier: 240-12220945
- b) Additional Security Measures needs to install:

**Table 2: Additional Security Measures**

	<b>Security Measures Type</b>	<b>Recommendations</b>
1	Non-lethal electrical fence	To be installed
2	Electrified gates with special locks	To be installed
3	Audible alarm when triggered	To be installed
4	Electrified gates with special locks	To be installed
5	Perimeter lighting	To be installed
6	CCTV cameras inclusive of PTZ	To be installed
7	Remote alarm going through to Zero control and NMC	To be installed
8	PA systems	To be installed
9	The outer barrier to be fitted with an intrusion detection system	To be installed
10	On site recording of storage of video and local viewing and recording	To be installed
11	Security alarm system in control room	To be installed

- c) The lights installed needs to comply with the NTCSA Standard: **240-139282493** Security Lighting for NTCSA Applications.
- d) The building needs to have a bomb resistant wall and glasses(glazing in reception desks).

#### **7.1.2 Access control system in the SCADA/TEMSE data centre**

- a) These methodologies determine the need for the deployment of biometric and card-based access verification for employees depending on the zoning requirements of the site.

- b) Zone 5 – Restricted zones such as guard room facilities, IT server rooms, equipment rooms etc. – Card + Biometric Access.
- c) The movement of people shall be controlled by means of full height turnstiles and interlocking cubicles as required for access in terms of the specific zones. The determination on the implementation of these devices will be made during the concept design phase of the facility in consultation with engineering.
- d) The doors for equipment access into all areas in computer rooms shall allow access for loads on hand operated pallet jacks where the load height excluding pallet jack is 2100mm. The door shall be aligned with the hot aisle in the equipment room to maximise space within the computer rooms.

## **7.2 Telecommunication links from the data centre**

The following telecommunications are required from the production equipment rooms to various remote sites:

- a) Communication to the substations:
  - System A equipment room – substations 300 X 9600 baud serial communication links with expansion capacity of 40%;
  - System B equipment room – substation 300 X 9600 baud serial communication links with expansion capacity of 40%.
- b) Communication to the regional control centres
  - Six (6) 10 Mb/s telecommunication circuit to the remote workstations in the Distribution control rooms for operating and control.
- c) Inter-Control Centre communication to the National Control Centre
  - System A equipment room – 100Mb/s WAN link (upgradable) routed by independent paths to the system B equipment room link, for high availability and redundancy for operating and control network;
  - System B equipment room – 100Mb/s WAN link (upgradable) routed by independent paths to the system A equipment room link, for high availability and redundancy.
  - Cluster server's equipment room – 100 Mb/s WAN link (upgradable) routed by independent paths for the out-of-band maintenance network.
- d) Dedicated telecommunication IP segments for operating and control
  - One (1) 100 Mb/s interface to the telecommunications IP network for the power system wide area monitoring system from both the system A equipment room and system B equipment room. This is an interface requirement the actual bandwidth used is currently 10 Mb/s.
  - One (1) 100 Mb/s interface to the telecommunications IP network for the inter-control centre protocol communication from both the system A equipment room and system B equipment room. This is an interface requirement the actual bandwidth used is currently 10 Mb/s.
- e) Telecommunication to the Southern African Power Pool countries

- Two (2) 100 Mb/sec interfaces to the telecommunications IP network for SAPP and SAPP members' systems from both the system A equipment room and system B equipment room. This is an interface requirement the actual bandwidth used is 5 Mb/s.
- f) Operating and control network connection to the IT network
- One (1) 100 Mb/s interface to the telecommunications IP network for connect to the IT network from both the system A equipment room and system B equipment room. This is an interface requirement the actual bandwidth used is currently 50 Mb/s.
- One (1) IP phone on the IT network in both the system A equipment room and system B equipment room.
- g) Independent redundant telecommunication routes to the site shall be available.

### **7.3 Fire detection system**

- a) The Contractor shall design, supply, install and commission a fire detection system for the whole building.
- b) Fire detection system will be supplied by the Contractor based on the fire rational design in accordance with SANS 10400 and SANS 10139 as supplied by the Contractor. The biometric access systems shall be integrated with the system.
- c) The Contractor is required to cooperate with Others to integrate requirements and provide a fully functional system.
- d) The fire detection system shall be capable of detecting any fire threats and notifying personnel in the vicinity of the building about the threat, and it should be interfaced with the eMkhiweni substation fire detection system for the notification to be repeated at permanently manned locations (fire station, access control room).
- e) In the event of a fire threat the Fire Detection System shall shut down HVAC system to reduce the spreading of fires. It shall also disengage the access control system to provide personnel in the building means to exit the building.
- f) A Fire smoke extraction system shall form part of the fire rational design, this system must be able to extract smoke in the event of a fire.
- g) Specified fire detection system shall comply to all standards listed in fire detection system section under section 2.2.1.

### **7.4 Fire 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 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 NTCSA 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.

## **7.5 Quality management system**

The building activities and processes shall be implemented and comply in accordance with:

- a) ISO 9001:2015 Quality Management System,
- b) ISO 10005:2005 Guidelines for Quality Plans,
- c) ISO 10006:2003 Guidelines for Quality Management Systems in Projects &
- d) 240-105658000 NTCSA's Supplier Quality Management Specification latest revision (QM58)

## **7.6 DC**

- a) The DC system shall be designed using the Standby Power System Topology and Autonomy for NTCSA Sites document, 240-118870219. There is a high demand for reliability, and it has then to be built redundant with dual DC systems. The design is such that each section in a dual system shall be able to take the full continuous load for stated standby time after loss of the charger. In case of a double contingency when both sections are being paralleled and feed from one battery, the total battery operating time will be half of the individual battery standby time.
- b) In accordance with the document National control Centres are regarded as Priority 1 sites.
- c) The DC system shall Comprise of the following:

**Table 3: DC System Requirements**

System	Topology	Standby Time (Hours)	
		System	Total
48 V DC	2N OR 2(2N + 1)	4	168
UPS	2N OR 2(2N + 1)	4	
Generators	2N OR 2(2N + 1)	TEB	

- d) The Table above shows the required system topologies for priority 1 sites and the different system voltages needed to power the different critical load equipment. Telecommunications – and SCADA equipment uses 48Vdc. UPS Systems are required where equipment that operate from AC power, usually information technology equipment, are used e.g., workstations or datacentres.
- i. 48 DC system - Dual Batteries (Specification 240-56360034)
    - Dual chargers. (Specification, 240-53114248)
  - ii. UPS
    - Dual UPS (Specification, 240-53114248)
    - Dual UPS Batteries (Specification, 240-56360034)
  - iii. Generators – Dual Generators
- e) Essential loads include the protection schemes, telecommunications equipment, SCADA equipment, emergency lights and security systems.
- f) Essential loads in Office buildings include HVAC, lighting, server rooms / data centres, security systems, fire detection systems, emergency preparedness systems, teleconference facilities, telecommunications systems and SCADA systems located in essential areas.
- g) Essential areas in office buildings include inter alia Network Management Centres, Contact Centres, Resource Management Centres, Command Centres, etc.
- h) All these essential loads / areas shall be powered from standby power systems.
- i) The design engineer, in consultation with the customers / site stakeholders shall identify which of the essential loads are interruptible and which are not.
- j) Interruptible – and uninterruptible essential loads shall be powered from the generator DB and UPS system (AC loads) or DC system (DC loads) DB, respectively.
- k) It is important to note that in order to maintain the required system reliability and availability the stated standby times apply per system e.g. in the case of a dual redundant system with a battery bank per system; each battery bank needs to provide the stated standby time.



- l) The total required standby time ( $T_{total}$ ) is a combination of the energy storage standby time (TES) normally provided by battery banks and the extended backup standby time (TEB) normally provided by a diesel generator, as indicated in Equation 1.

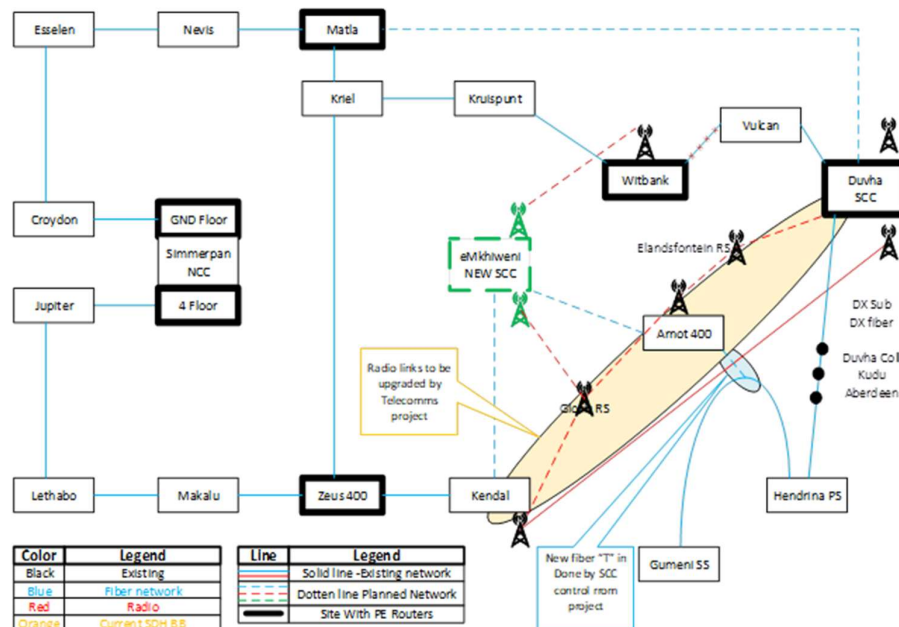
m)  $T_{total} = TES + TEB$

## 7.7 Telecommunications

The high-level project scope is to develop and construct a new SOC building, making provision for adequate operating facilities, space to house the Transmission Power System Control and monitoring (TPSCM) equipment, Future TEMSE / TPSCM equipment from the mid-cycle hardware refresh and beyond and provide for the necessary telecommunications infrastructure in a suitable place as per the relevant standards.

The design specification will be incorporated or attached in the User Requirements given to the EPC Contractor from the Transmission project Team. This design specification highlights the telecommunication specification for the control room builds.

Refer to document **240-135101235** Specification Report: New System Operating Control (SOC) Telecommunications network.



**Figure 11 - Telecommunications**

## 7.8 HVAC system

- There must be separate dual redundant air-conditioning system for human areas and equipment / computer systems.
- The HVAC system must be in line with the size of the working space required, as well as map board equipment requirements.

- c) HVAC shall ensure that all systems can maintain cooling independently to the equipment room blocks. Thus, each equipment room block shall have a dual redundant air-conditioning system.
- d) Access control for maintenance and support of the supply shall be limited to authorised 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 centres.
- e) Dedicated dual redundant HVAC with precision cooling (18-22°C), integrated with thermal storage tanks for the map board equipment rooms.
- f) Cooling for equipment rooms shall be dedicated dual redundant HVAC with precision cooling (18-22°C), integrated with thermal storage tanks.
- g) TSNC area shall have precision cooling (18-24°C) with redundant fans, integrated with fire suppression.
- h) IT equipment rooms cooling system shall be liquid cooling for high-density racks, with dual redundant HVAC and thermal storage. Each computer room compartment requires 196 303 BTU/hour of cooling and 34 kVA of power.
- i) Telecommunications equipment rooms cooling system shall be supplemental air handlers (18-24°C), with fire suppression.
- j) Operational technology equipment rooms cooling - each equipment room compartment requires 196 303 BTU/hour of cooling.

## **7.9 Smoke risk**

- a) 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).

## **7.10 Building Management System**

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

## **7.11 Information Technology (IT) systems**

### **7.11.1 IT room**

- a) The IT requirements are based on the current Stabnac at Duvha Power Station. Below are the IT requirements for the new Stabnac:
- b) Wide Area Network (WAN)
- c) Besides the corporate network for the new sites, there is a requirement for a 100 MB/s Telecoms line between Simmerpan Data & Energy Centre (DEC) and the new Stabnac data centre.
- d) This line will be dedicated for the hourly replication of the Transmission servers between the DEC and the new Stabnac data centre.

### **7.11.2 Data centre**

- a) There is a requirement for a Tier 4 data centre that demonstrate a 99.99% availability or a Tier 3 data centre that demonstrate a 99.98% availability.
- b) Redundant power supply for IT infrastructure for maximum server availability.
- c) Uninterruptible power supply (UPS) to filter power spikes, sags and momentary outages to maximize the lifespan of IT equipment
- d) Access control system to control/monitor access to the server rooms.
- e) Cabling trunking in the data centre where IT cabling will be run
- f) Cabinet space that is zoned for networks, servers and storage equipment
  - i. Rack Space and power points and network ports required
  - ii. 12 x 2U Servers = 24U, 24 x Power points, 12x 1G Lan Points
  - iii. 6 x 4U Storage = 24U, 10 x Power Points, 6 x 1G Lan Points, 4 x 10GE Fiber Connections
  - iv. 4 x 1U Switches = 4U, 8 x Power Points, 4 x 1G Lan Points, 8 x 10GE fiber connections
  - v. 8 x 2U CommVault Storage = 16U, 12x Powerpoints, 2 x 1G Lan points, 4 x 10GE Fiber
- g) Once the server room is in place, a request will be submitted to Group IT for the move of the existing servers/storage and MV90 diallers from the old Stabnac to the new Stabnac.
- h) New IT cabinets 1, 2 & 3 to be accommodated in the Data Centre, these 26 cabinets will require a floor area of not less than 30 square meters, the Designer shall make sure all cabinets are accommodated and space for opening of cabinets doors and walking passages is considered.

### **7.11.3 IT network data cabling**

- a) IT network data cabling will be done by the cabling company contracted by Group IT (GIT), Cabling trunking in the ceiling where IT cabling will be run connecting all cabinets.
- b) Installation of new IT network infrastructure (network switches, Access Points, etc.) according to user requirements from the following detail:
  - An office layout to identify how many of LAN points and ultimately network switches will be required (space planning).

- A building plan to identify where the Access Points (AP's) should be installed for proper Wi-Fi coverage.
- c) Dedicated rooms for shared printers and network cabinets to service the office areas with cabling trunking to connect to the IT Room / Data Centre cabinets.
- d) Minimum floor area required - Space for 2 x 42U cabinets (panels) with a size of 800mm x 1000mm each in the IT room / Data Centre for the installation of the routers and core network switches with redundant cabling routes to all OT rooms, minimum area required shall be 10 square meters.

## **7.12 CCTV monitoring**

Surveillance points and 24 x 7 CCTV surveillance

### **a) Perimeter CCTV**

CCTV is required on the total perimeter of the site and shall be designed in such a manner that no blind spots are created at any given point. CCTV cameras shall be optimally spaced and so angled that the desired objective of monitoring is achieved. For an effective CCTV installation, the prevailing environmental conditions at the site shall be considered with regards to mist and fog in specific.

### **b) CCTV at Access Points**

A higher concentration of CCTV is required at vehicle and pedestrian access points and must be designed as such. The quality of the equipment shall enable the unique identification of the vehicles and persons. The objective of CCTV cameras at pedestrian access points is twofold, firstly to positively identify an unknown person entering the premises and secondly to provide an overview of the access point in totality without any blind spots being created.

### **c) CCTV in critical areas**

The application of CCTV in critical areas such as entrances to Zones 3 and higher security areas such as equipment and server rooms is required.

## **7.13 Solar PV systems**

- a) Solar PV system (PV panels and Inverter(s)), making use of Rooftop and parking structures, to be used for auxiliary power reduction in the building. Contractor to do the assessment and sizing.

## **8. GENERAL SHEQ REQUIREMENTS**

For SHEQ requirements refer to documentation:

- a) 1. 202211\_OH&S Tender Returnable Documents for EPC & EPCM & Owner's Engineer\_TPDMAN-FM-204\_Rev2
- b) 2. 202211\_ (Form A) Tender Contract SHEQS Requirements for EPCM & or Owner's Engineer\_TPDMAN-FM-197\_Rev2

## **9. DOCUMENTATION REQUIREMENTS**

### **9.1 Drawing requirements**

- a) The creation and control of all Engineering Drawings shall be in accordance with the latest revision of Engineering Drawing Standard 240-86973501.
- b) All required drawings shall be prepared in accordance with the requirements as specified in the Engineering Drawing Office and Engineering Drawing Standard 240-86973501.
- c) A drawing register which records the drawing's information shall be maintained by the Consultant.
- d) All Design change management shall be performed in accordance with the latest revision of the Transmission Engineering Change Management Procedure and the Project Manager shall ensure that Consultant is provided with latest revisions of this procedure.
- e) Documents and drawings shall indicate the Employer's drawing number as allocated by the Employer. The Consultant may have his own internal document or drawing number on the document or drawing, but where reference is made among documents or drawings, the Employer's number shall be used.
- f) All drawings shall indicate purpose for issuing (Issued for Information or Construction) as applicable and signed off by the professional registered Engineer/Architect.
- g) All design related documentation shall be dated and signed off by the professional registered Engineer/Architect.
- h) The Consultant shall supply NTCSA with 3x hard copies of the drawings and electronic copies for all revisions in the design phase, construction phase and as built.

### **9.2 General arrangement drawings**

General Arrangement drawings shall be completely dimensioned, showing as a minimum, the following:

- a) Arrangement of equipment offered.
- b) Plan, front view, and other elevation views.
- c) Required clearances for opening doors and for removing components.
- d) Conduit or cable entrance locations for bottom entrance.
- e) Cable racking layouts.

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- f) Incoming and Outgoing cable termination positions.
- g) Earthing connections.
- h) Floor layout/equipment layout
- i) Floor slot arrangement
- j) All structural arrangements drawing
- k) Fire layout drawing
- l) Furniture layout

## **10. CONTRACTOR'S DESIGN AND CONSTRUCTION PROGRAM**

The Contractor is to include but not limited to the following:

- a) A resource loaded design and construction program to comply and to meet the project duration specified. The Contractor's program shall make provision for Project manager's review, Eskom design review team (DRT) building occupancy certificate presentations, time risk allowances, critical path, float etc.
- b) An organogram indicating key construction and key design personnel correlated to the program.
- c) List of plant and construction equipment correlated to the program.
- d) Design and analysis software for civil and structural design and drawing processes.
- e) List of construction planning and programming software.
- f) List of other design software.

## **11. FURNITURE TO BE PROVIDED BY THE CONTRACTOR**

### **11.1 list of furniture and appliances**

Table in the next page lists the minimum furniture and appliances required in the building, the designer will determine the final amount based on the floor areas and amount of people to be accommodated in the building.

The list does not include cabinetry (kitchen cabinets, custom reception counter/desk etc.).

1 x filing cabinet per D2 workstation shall be supplied for enclosed and open plan offices

**BASIC STAKEHOLDER REQUIREMENTS  
DEFINITION FOR DESIGN AND CONSTRUCTION  
OF SYSTEM OPERATING CONTROL (SOC)  
BUILDING AT EMKHIWENI.**

**Unique Identifier: EMK24P02-SE-E50**

Revision: **0**

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Items	Building management	Security pause area	Security office	Security reception	Security control room	Control area kitchen	Control room kitchen	Office area	Boardroom	Gallery	Storage & workshop	5 x control offices	Control room	Control security checkpoint room	DTS room	Thermal storage tanks rooms	Gym	Diesel storeroom	Battery room	Backup diesel generator room	UPS system rooms	Air conditioning system room	Computer centre	Lobby	Guardhouse	TSNC section/area
Water boiler	1	1				1	1										1								1	1
Microwave	1	1				1	1										1								1	1
Fridge	1	1				1	1										1								1	1
Refuse bin	1	1				1	1										1								1	1
Floor stand water dispenser	1	1				1	1										2								1	1
Kitchen chair	8	6				12	6										4									6
Kitchen dining table	2	2				3	2										1									2
Lounge chair																								12		2
Coffee table																								3		1

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Office chair	6		4	2	4			27	10	10		14	18	2	12	1	2			1	1	1	8		2	22
Standard office desk	2		4					27				6			12	1				1	1	1	8			2
Non-standard office desk					4								18													6
Boardroom table									1	1																1
Bar chair																										

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## **12. HAND OVER REQUIREMENTS**

The *Contractor* will provide sufficient documentation at Handover of the complete scope of all the buildings and components indicated in this document to the *Project manager* for safe and sustainable maintenance and operation of the building and its contained systems. This will include but not be limited to Construction handover documentation, Design handover documentation and all statutory documentation in 3 x sets of hardcopy format and soft copy format.

Operating manuals, 4 training sessions, 3 sets of hard/soft copy documentation, and computer design models.

### **12.1 Construction handover documentation**

Construction handover documentation shall include but is not limited to the following:

As built and survey documentation in 3 x sets of hardcopy format and soft copy format.

### **12.2 Design handover documentation**

Design handover documentation shall include but is not limited to the following:

- a) Native/CAD drawing files and pdf
- b) Operating manuals on all the trades, arrange at least 4 training sessions
- c) Hard copies and soft copies
- d) Computer design models for all designs
- e) Fenestration calculation reports
- f) Architectural design reports
- g) Structural/building design calculation reports which shall include the following:
  - i. Design philosophy providing
  - ii. Evidence of 50-year design life consideration
  - iii. Evidence that value engineering was considered in the selection of structural system, elements, and materials
  - iv. Summary of structural analysis results
  - v. Summary of structural member design calculations
    - Civil design calculation reports.
    - Other technical/handover documents not listed above.

## **CONTROLLED DISCLOSURE**

- h) Full system commissioning (HVAC, fire, power, telecom) with compliance certificates (SANS, Eskom, NKP).
- i) Statutory approvals from Steve Tshwete Local Municipality, including rezoning from agricultural if required.
- j) 12-month warranty with 24/7 support

### **13. CIVIL AND STRUCTURAL DESIGN SKILLS TRANSFER**

- a) The *Contractor's* designer is required to provide skills transfer for at least 5 civil engineers from the *Employer's* team. The *Contractor's* designer makes available the design tools, and office space as required to include the *Employer's* engineers in their design activities. The Consultant's senior design engineer is required to provide supervision and guidance to the *Employer's* engineers for the duration of contract. The logistical aspects will be confirmed after appointment.
- b) The design engineer will be responsible to assist the Eskom civil engineers to meet ECSA outcomes for professional registration. The program for meeting the outcomes will be discussed and agreed upon between the parties (Design engineer and Eskom civil engineers) before contract award.  
Chris van Reenen
- c) Skills transfer for 5 Eskom civil engineers per ECSA outcomes.

### **14. CONTINUOUS OPERATION**

The relocation of all employees shall be done such that there is no interruption to the operating and control of the power system.

Where required equipment shall be duplicated as per the installed production systems.

The project shall provide for temporary infrastructure, such as telecommunication, to connect the production systems at the old location with the new infrastructure during the relocation.

**CONTROLLED DISCLOSURE**

## 15. ACCOMMODATION SCHEDULE

Accommodation schedule is attached on this document with minimum requirements, this document shall be read in conjunction with the accommodation schedule.



Accommodation  
schedule - Emkhiweni.

## 16. ACCEPTANCE

This document has been seen and accepted by:

Name & Surname	Designation	Signature
Lungi Mdletshe	Manager: Complex Projects	
Ernest Sikupela	Manager Real Estate	
Timothy Zulu	Timothy Zulu	
Chris van Reenen	PE- Physical Security Systems	
Moagaesi Motlhodi	Middle Manager: IM Operations	
Gerald Willemse	Planner NPAE Mpumalanga	
Phelokazi Ndlovu	OSS BSS Physical Security	
Unathi Dyantyi	Middle Manager Operations	

## 17. REVISIONS

Date	Rev.	Compiler	Remarks
31 October 2025	0	S. Sibiya	To be Issued for Owner's Engineer appointment who will compile the final and detailed scope of work for the Contractor.

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## **18. DEVELOPMENT TEAM**

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

<b>Name &amp; Surname</b>	<b>Designation</b>
Nkosenhle Mthiyane	Senior technologist: Engineering Integration
Sibonelo Sibiya	Snr Advisor: Civil
Boitumelo Modise	Snr Engineer: Electrical
Bilal Hajee	Chief Engineer: Civil
Sipho Sebose	Snr Technologist: Civil
Bilal Hajee	Chief Engineer: Civil
Akani Mabunda	Geotech: Civil
Chris van Reenen	Snr Technologist: PTM&C
Eric Mabotja	Snr Technologist: PTM&C
Bathathu Jonga	Chief Technologist: Electrical
Teboho Velaphe	Snr Technician: Electrical
Gerald Willemse	Snr Technologist: Engineering
Nosimilo Mbele	Snr Advisor: Quality assurance
Dineo Kotlolo	Snr Advisor: Safety Risk Management
Sherlley Mokone	Officer: Health & Safety
Bukelwa Masiza	Officer: Environmental Management
Delisiwe Sereme	Officer: Environmental Management
Phelokazi Nqwelo	Middle Manager: Facilities
Rosalette Botha	Corporate Specialist: System Ops
Ernest Mpshe	Middle Manager: National Control
Timothy Zulu	Manager: System Operations
Geoffrey Ive	Chief Engineer: Electrical
Japhta Maponyane	Manager: Security
Fishers Magowa	Snr Advisor: Security

### **CONTROLLED DISCLOSURE**

<b>Name &amp; Surname</b>	<b>Designation</b>
Ian Naicker	Chief Engineer: Electrical
Thendo Ramulondi	Chief Engineer: Electrical
Moagaesi Motlhodi	Middle Manager: IT
Chris Pillay	Snr Advisor: IT Application
Theunis Du Plessis	Snr Advisor: IT Infrastructure
Mookho Letlatsa	Snr advisor: IM Customer
Johann Nel	Snr Advisor: Information Systems
Francois Du Randt	Officer IT Network
Katlego Hungwane	Snr Advisor: Land & Rights
Jeffrey Khangale	Manager: Contracts Management

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