

	Functional Specification	Eskom Real Estate
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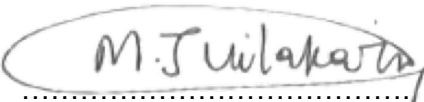
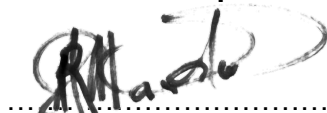
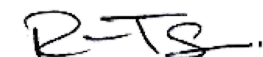
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1. INTRODUCTION

The rationale behind the compilation of the ERE multidisciplinary scope for minor *Works* is to set out standard technical requirements for all required construction project work and services to be carried out as and when required. This scope of work shall be utilized for both new and existing ERE properties.

- Engineering: (where applicable, such as clause 3.4.2) inclusive of detailed design, material supply, *Workshop*/construction/as-built drawings, and any additional, however, required design,
- Procurement: Using detailed design reports furnished of the *Employer*, manufacture/procure/fabricate all equipment and accessories necessary to carry out the *Works* and avail resources. This is inclusive of testing, delivery, and supply of type test certificates.
- Removal and/or Installation: installation of the designed equipment such as power supply cables, distribution boards, miniature circuit breakers, lighting, junction boxes, conduits, busbars, switchgear assemblies, ceiling, tiles, vinyl flooring, laminated timber flooring, HVAC and split units, fire detection and protection systems etc., to integrate, interface and commission all work related.
- Quality Control: The *Contractor* executes in accordance with an approved Method Statement and ensure the relevant persons are notified to conduct inspections as per the approved QCP.
- Commissioning: The *Contractor* provides a list of all commissioning requirements that need to be adhered to during the commissioning phase of the project. The *Contractor* shall have competent persons available to provide on-site advice and supervision during configuration and commissioning.
- Spares: Supply and provide a comprehensive list of spares, cost for a single unit replacement and the recommended minimum and maximum stock based on the acquisition lead time, manufacturing turnaround time and the failure rate of items.

2. SUPPORTING CLAUSES

2.1 SCOPE

This document covers the minimum functional specification for the scope of the *Works*. This document is to be inserted into the relevant NEC *Works* Information. It spans architectural, electrical, control and instrumentation, civil, and mechanical engineering requirements.

2.1.1 Purpose

The purpose of this document is to outline the minimum functional specifications for the *Works*. This document provides the Engineering input to a Contract document based on the NEC conditions of contract.

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2.1.2 Applicability

This document shall apply to Eskom Real Estate only.

2.2 NORMATIVE/INFORMATIVE REFERENCES

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

2.2.1 Normative

- [1] ISO 9001 Quality Management Systems.
- [2] Construction Regulations, 2014
- [3] 32-727 - Eskom Safety, Health, Environment and Quality (SHEQ) Policy
- [4] Occupational Health and Safety Act No. 95 of 1993,
- [5] 240-103414344: Corporate Identity Manual
- [6] 240-157602340: Universal Access Specifications
- [7] National Building Regulations And Building Standards Act No. 103 Of 1977
- [8] SANS 10400: The application of the National Building Regulations (All Parts)
- [9] 240-52599753: Workplace Space and Furniture Standard for Commercial Properties
- [10] SANS 9001- Quality systems
- [11] SANS 10142 -1- The wiring of premises Part 1: Low-voltage installations
- [12] SANS 10114-2- Interior lighting part 2: Emergency lighting
- [13] SANS 204- Energy Efficient Buildings
- [14] SANS 10389-1-Exterior lighting Part 1: Artificial lighting of exterior areas for work and safety
- [15] SANS 10389-2- Exterior Lighting Part 2: Exterior Security Lighting
- [16] SANS 10114-1- Interior lighting Part 1: Artificial lighting of interiors
- [17] 240-54937439- Fire Protection / Detection Assessment
- [18] 240-54937450- Fire Protection and Life Safety Design Standard
- [19] 240-54937454- Inspection, Testing and Maintenance of Fire Protection Systems
- [20] 240-56737654- Inspection, Testing and Maintenance of Fire Detection Systems
- [21] SANS 10139 - Fire Detection and Alarm Systems for Buildings – System Design, Installation and Servicing
- [22] SANS 50054 - Fire Detection and Fire Alarm Systems (Adopted from BS EN 54)
- [23] SANS 10287 Design, installation, and maintenance of automatic fire sprinkler systems

2.2.2 Informative

- [1] 240-53113685- Design Review Procedure

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- [2] 240-56227443- Generation Requirements for Control and Power Cables for Power Stations Standard
- [3] 240-56356396- Earthing and Lighting Protection Standard
- [4] 240-126210656- LED Street Lighting for Eskom Properties
- [5] 240-139282493- Security Lighting for Eskom Applications
- [6] 240-55714363- Generation PS Lighting and Small Power Installation Standard

2.2.3 Disclosure Classification

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

2.2.4 Definitions

Definition	Description
Acceptance	The Employer accept the condition or design but does not take responsibility from the <i>Contractor</i> .
Commissioning	Commissioning is defined as bringing into service all items of the <i>Works</i> as specified, meeting the requirements of the Functional Specification, plant and materials performance including all necessary testing and verification of the stated performance.
Equipment	Assemblies of components, sub-units or sub-assemblies usually contained in a suitable enclosure, and capable of performing an overall specified function.
Eskom Standards	Means all Eskom standard documents referred to, expressly or impliedly, in the Functional Specification.
HAZLOC	Hazardous location on account of explosive gas atmosphere: an area in which an explosive gas atmosphere is or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment. Hazardous location on account of dust: an area in which combustible dust, in a form of a cloud is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment.
Ingress Protection – IP Rating	(IP) ratings is an international standard (SANS/IEC 60529) used to rate the degree of protection or sealing effectiveness in electrical enclosures against intrusion of objects, water, dust, or accidental contact.
Luminaire	Apparatus which distributes, filters, or transforms the light transmitted from one or more lamps or LED modules and which includes all the parts necessary for supporting, fixing, and protecting the lamps modules, and where necessary circuit auxiliaries together with the means for connecting them to the supply.
Switchboard	A complete switchgear assembly consisting of number of switchgear panels (switchgear panels include incomer panels, feeder panels, bus-section panels, VT panels, etc.).

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Definition	Description
Switchgear	Refers to the switchgear and control gear assembly for LV or the metal enclosed switchgear; in cases where the term is used alone.
Type test	Test conducted before a type of cable covered by this standard is supplied on a general commercial basis, in order to demonstrate that the cable has the necessary performance characteristics for the intended application.

2.3 ABBREVIATIONS

Abbreviation	Description
A	Amperes
ACB	Air Circuit Breaker
BESS	Battery Energy Storage System
BMS	Building Management System
CCTV	Closed Circuit Television
CMBS	Central Building Management System
DB	Distribution Board
DC	Direct Current
EAL	Eskom Academy of Learning
ERIC	Eskom Research and Innovation Centre
ECM	Engineering Change Management
ECSA	Engineering Council of South Africa
ERE	Eskom Real Estate
ERIC	Eskom Research and Innovation Centre
est.	Estimate
FDIA	Fire Detection Installers Association
FDS	Fire Detection System
FACP	Fire Alarm Control Panels
HID	High Intensity Discharge
HMI	Human Machine Interface
HVAC	Heating, Ventilation, and Air Conditioning
kVA	Kilo Volt Ampere
LDC	Leadership Development Centre
LED	Light Emitting Diode
m	Meter
MCB	Miniature Circuit Breaker
MCCB	Moulded Case Circuit breaker
MDR	Multi-disciplinary Review

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Abbreviation	Description
A	Amperes
ACB	Air Circuit Breaker
BESS	Battery Energy Storage System
BMS	Building Management System
CCTV	Closed Circuit Television
CMBS	Central Building Management System
DB	Distribution Board
DC	Direct Current
EAL	Eskom Academy of Learning
ERIC	Eskom Research and Innovation Centre
mm	Millimetre
MWP	Megawatt Park
NEC	New Engineering Contract
OEM	Original Equipment Manufacturer
PA	Public Address
PV	Photovoltaic
PVC	Polyvinyl Chloride
RAC	Registered Asbestos <i>Contractor</i>
SABS	South African Bureau of Standards
SCPD	Short Circuit Protective Device
SANS	South African National Standards
SWA	Steel Wire Armoured
SANAS	South African National Accreditation System
SCADA	Supervisory Control and Data Acquisition
V	Volt
VMS	Video Management System
VVVF	Variable Voltage Variable Frequency
PSIM	Physical Security Information Management system

2.4 ROLES AND RESPONSIBILITIES

Roles and responsibilities shall be as follows:

Compiler:

Responsible for compilation of the Functional Specification document, merge contributions from all disciplines and to ensure that all the technical and operational requirements of the end user are adequately and effectively described.

Functional Responsibility:

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The Functional Responsible person reviews the functional specification report for correctness and approves its contents prior to submission of the document for authorisation.

Authoriser:

The functional specification document authoriser is accountable for ensuring that correct processes were followed in developing it and that the relevant stakeholders have been involved. The authoriser also reviews the document for alignment to Eskom business strategy, policy, objectives, imperatives, and requirements. The authoriser shall authorise the release and application of the document.

Contracts Manager:

The contracts manager is responsible to incorporate this Functional Specification into a contract based on the NEC conditions of contract.

Architectural Practitioner:

The Architectural Practitioners are responsible to review the completed contract to ensure that this Functional Specification has been incorporated correctly.

Project Manager:

The project manager is responsible for facilitating and ensuring continuous coordination and management of the requirements during the design development, execution phase and closing out of the project.

Facilities Manager:

The facilities manager is responsible for ensuring continuous sustainable performance of facilities. During construction phase he/she ensures that there are smooth interactions with tenants and stakeholders where required.

Contractor:

The *Contractor's* responsibility is to build the project according to the contract documentation within the required cost and time budgets and the specified standards.

The Contractor also plays the role of the design authority, as specified in clause 3.4.2, ensuring the following:

- The design satisfies the design requirements.
- All relevant Eskom design standards, procedures and guidelines have been adhered to.
- The design is suitable and correct calculations, philosophy, functionality, etc. have been applied.
- The design is integrated by identifying all interfaces with other packages/plant systems/assets and ensuring that these interfaces are catered for.

Eskom Engineering

Eskom Engineering/the Employer plays the role of the design authority, as set out in clause 3.4.1, ensuring the following:

- The design satisfies the design requirements.

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- All relevant Eskom design standards, procedures and guidelines have been adhered to.
- The design is suitable and correct calculations, philosophy, functionality, etc. have been applied.
- The design is integrated by identifying all interfaces with other packages/plant systems/assets and ensuring that these interfaces are catered for.
- The design satisfies the stakeholder requirements (i.e., validation of design deliverables against stakeholder requirements).
- The design is integrated by identifying all interfaces with other packages/plant systems/assets and ensuring that these interfaces are catered for.
- Foreseen technical risks are identified and addressed/challenged internally.
- General technical oversight is provided over execution.

2.5 PROCESS FOR MONITORING

The design will be monitored by conducting MDR reviews ensuring that all comments are incorporated and effected.

2.6 RELATED/SUPPORTING DOCUMENTS

All relevant documents are listed in the Normative and Informative referencing sections and all additional, but related, supporting documents are referenced directly and included in text.

3. ENGINEERING AND THE *CONTRACTOR'S* DESIGN

3.1 DESCRIPTION OF THE *WORKS*

3.1.1 Executive overview

This document provides technical requirements for, as per clause 1 introduction, engineering, procurement or fabrication or manufacture, construction which encompasses installation and commissioning, of:

a) Electrical system:

Inclusive of small power and lighting: power cables, conductors, luminaires/light fittings/ lamps, switchgear, earthing/bonding and all peripheral work to ensure ERE properties are fully functional electrically.

b) Control and instrumentation

Inclusive of all related instrumentation, wiring, wiring termination and controllers for Building Management systems such as PA system, Fire Detection System, Airconditioning controllers, Security, and access control, lift and escalators, energy monitoring and lighting controller for the work according to the requested work to be done.

c) Architectural

Architectural *Works* comprise supply and fit of all components that make up a functional building, this ranges from amending existing, new proposed additions, or repairing existing fabric entailing components like drywalling, brickwork, painting, plastering, tiling, ceiling work, flooring

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both internal and external and repairing and/or preparation, lighting, glazing and facades, doors and windows, ironmongery, sanding and sealing, roofing and cladding, waterproofing, plumbing and fixtures, rainwater goods.

d) Mechanical

The mechanical scope will cover HVAC, Fire Protection and Wet Services, supply of material construction testing balancing and commissioning of mechanical systems.

e) Civil

Incorporates trenching and earthworks (where applicable), equipment support structures/plinths installation/modification, demolition of existing structural components, timber Works (example roofing), masonry Works, steel Works, creation of openings, stormwater and drainage, waterproofing, road Works and structural repair Works.

3.2 EMPLOYER'S OBJECTIVES AND PURPOSE OF THE WORKS

The requirement for Eskom Real Estates is to have in place a *Contractor(s)* for engineering (where required), construction Works who will carry out all project requirements as set out in this scope work. The *Employer* provides the following documentation to the *Contractor* for use as baseline for the Works:

- Relevant Eskom design base documentation, specifications, and standards.
- Construction drawings and layouts regarding the Works the Employer is to design which will yield *As-built* drawings.
- Detailed design reports, also under the Works the Employer is to design.

All *Employer* information and property made available to the *Contractor*, including the Works done by the *Contractor* for the *Employer*, is confidential and may not be disclosed to external parties without the *Employer's* consent. If there is any further information the *Contractor* requires for the Works, it is the *Contractor's* responsibility to inform the *Employer* timeously and ensure that the overall project schedule is not affected negatively.

3.2.1.1 General requirements

- a. The *Contractor* shall adhere to the requirements of the Occupational Health and Safety Act 85 of 1993, (OHS Act) and all subsequent amendments and regulations during construction, commissioning, and operation of the equipment installed.
- b. A portion of detailed design Works, case in point: see clause 3.4.1, shall be carried out by the *Employer's* resources in full compliance with the performance specifications and standards.
- c. The *Contractor* also develops the detailed design, where required, in full compliance with the requirements and performance specifications as set out in this document and takes liability for that design.

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- d. The *Contractor* ensures that all designs he develops are signed off by a respective Engineering Council of South Africa (ECSA) registered Professional Engineer or an engineer registered with an equivalent professional body.
- e. The *Contractor* submits his detailed designs to the *Project Manager* for review and commentary prior procurement and construction of equipment required for the execution of the project.
- f. The *Contractor* utilises the Employer's detailed designs for procurement, fabrication and construction of equipment required for the execution of the project.
- g. The *Contractor* labels all plant apparatus using the Kraftwerk Kennzeichen System (KKS) coding standard; 240-93576498, 240-71432150, Plant Labelling Standard and 240-109607332, and Eskom Plant Labelling Abbreviation Standard provided by the *Employer*.
- h. If there is a conflict of method or approach, the *Contractor* adopts the specification, recommendation, or regulation with the most accurate conditions. The *Contractor* submits details of any such conflicts and the provisions adopted to the Employer prior adoption.
- i. With respect to any surveys or analysis of existing infrastructure relevant to the installation, the *Employer* does not assume responsibility for the completeness or accuracy of such surveys and analysis.
- j. The *Employer's* review and commentary on all documentation developed by the *Contractor* e.g. detail design *Works*, temporary *Works*, commissioning procedure etc, does not absolve the *Contractor* of his liability and accountability for the *Works*.
- k. The *Contractor* reviews, validates and subsequently assumes responsibility for the scope and accuracy of any such data relevant to completion of the *Works* provided by the *Employer*.
- l. The *Contractor* shall be responsible for planning, specifying and executing any additional site investigations required in order to satisfy itself that the required level of scope and accuracy of data and analysis has been obtained, so as to not in any way affect the performance of its obligation.
- m. Should there be discrepancies between the documentation provided by the *Employer*, as perceived by the *Contractor*, or misalignments or ambiguities in the designs furnished, the *Contractor* shall notify and liaise with the *Employer* for clarification and resolution.

3.2.2 Existing System

3.2.2.1 Electrical

The currently existing ERE electrical infrastructure encompassed in operational properties such as ERIC, EAL, and MWP, comprises, with a commonality:

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- a. Point of supply: low voltage system rated at 400V tapping power from an LV power supply system such as the LV side of a Mini-Substation, and low voltage electrical board. This is typified by the LV substation at ERIC housing the main LV switchboard equipped with a 100A 3-pole ACB and a 500kVA, 6.6kV/380V Mini-Substation supplied from T&R main substation, respectively. These plants are, in certain instances, interfaced with BESS and PV plants. A division by root 3 is carried out by effectively connecting neutral and a phase conductor and thus creating 220 - 250V for single phase domestic circuits.
- b. Point of control: the SCPDs used are typically MCBs, MCCBs, ACBs for single and three phase systems.
- c. Power transmitting medium: These are copper cables, conductors/busbars, 3-pole with earth and/or neutral in three phase systems, and 2-pole (phase and neutral) with earth in single phase systems.
- d. And load: These are resistive, capacitive, and inductive loads, e.g., LED luminaires, HID light fittings, socket outlets, small power, and lighting. This is typified by the ERIC North-West – 230V DB supplying lights and plugs through a 63A breaker.

3.2.2.2 Control and Instrumentation

The ERE buildings are equipped with various integrated systems, including fire detection and suppression system, Public Address (PA) system, HVAC monitoring and control, Access Control, lighting Control and power consumption monitoring systems managed via the Building Management System (BMS).

A consolidated building management system is a centralized, integrated platform that controls and monitors various systems within a building, including HVAC, lighting, security, fire safety, and energy management. It allows building owners and managers to remotely monitor and adjust these systems for optimal efficiency, occupant comfort, and safety. The system typically includes sensors, controllers, and software that collect and analyse data to make informed decisions about building operations. By providing real-time information and automation capabilities, a comprehensive building management system helps streamline operations, reduce energy consumption leading to cost savings on utility bills and increased overall building safety and performance.

Signals from field instruments are hardwired directly to the control panels. The system is monitored and managed through existing servers and operator terminals, which are located at a separate site. These servers are also used for software updates, configuration changes, and program loading as required. The communication medium used in these systems is Fibre cables, coaxial cables, etc.

3.2.2.2.1 Public Address (PA) System

The PA system comprises:

- Input Equipment: Microphones, audio sources, and other signal input devices.
- Processing & Control Equipment: Audio mixers, amplifiers, and signal processors.

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- Output Equipment: Loudspeakers strategically installed across the buildings.
- Cabling & Accessories: All necessary wiring and connectors for signal transmission throughout the system.

3.2.2.2.2 Fire Detection & Suppression System

The fire system includes:

- Control Equipment: Fire Alarm Control Panels (FACP) for managing signals and alerts.
- Initiating Devices: Smoke detectors, heat detectors, and manual call points.
- Notification Devices: Sirens, horns and strobes.
- Power Supply: Both primary and backup power sources to ensure uninterrupted operation.

3.2.2.2.3 HVAC monitoring and control

The following components are responsible for measuring, controlling, automating, and optimizing the Heating, Ventilation, and Air Conditioning (HVAC) system:

- Controllers and Panels, e.g., PLCs and zone controllers
- Sensors (Monitoring Components), e.g., temperature, airflow, etc.
- Actuators and Final Control Devices, e.g., dampers
- Networking and Communication Components, e.g., servers' gateways, network switches, etc.
- User Interface and Monitoring, e.g., SCADA Workstation, HMI, etc.

3.2.2.2.4 Access control and security control

Card Reader

- Accepts employee or visitor access cards.
- Sends identification data to the DDC (Direct Digital Controller) for authentication.
- *Works* in conjunction with door locks and security alarms.

Access Reader

- Similar to the card reader but may include biometric or PIN authentication.
- Communicates with the DDC to grant or deny access.

DDC (Direct Digital Controller)

- Acts as the central brain for the access control system.
- Receives inputs from card readers, keypads, sensors, and cameras.
- Sends control signals to door locks, alarms, CCTV cameras, and the security monitor.

Door Lock

- An electronically controlled locking mechanism.
- Engages or disengages based on access permissions provided by the DDC.
- Ensures only authorized personnel can enter restricted areas.

Security Alarm

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- Activates when there's unauthorized access or a security breach.
- Sends real-time alerts to the security monitor and potentially to the central BMS.

CCTV Camera

- Provides real-time video surveillance.
- Streams directly to the security monitor and records footage for security audits.
- Can be triggered automatically by motion sensors or alarms.

X-ray Machines and Turnstiles

- Walk-through metal detector and X-Ray machine at main entrances.
- Card operated turnstile access control systems.

Below is the basic CBMS layout with all its subsystems:

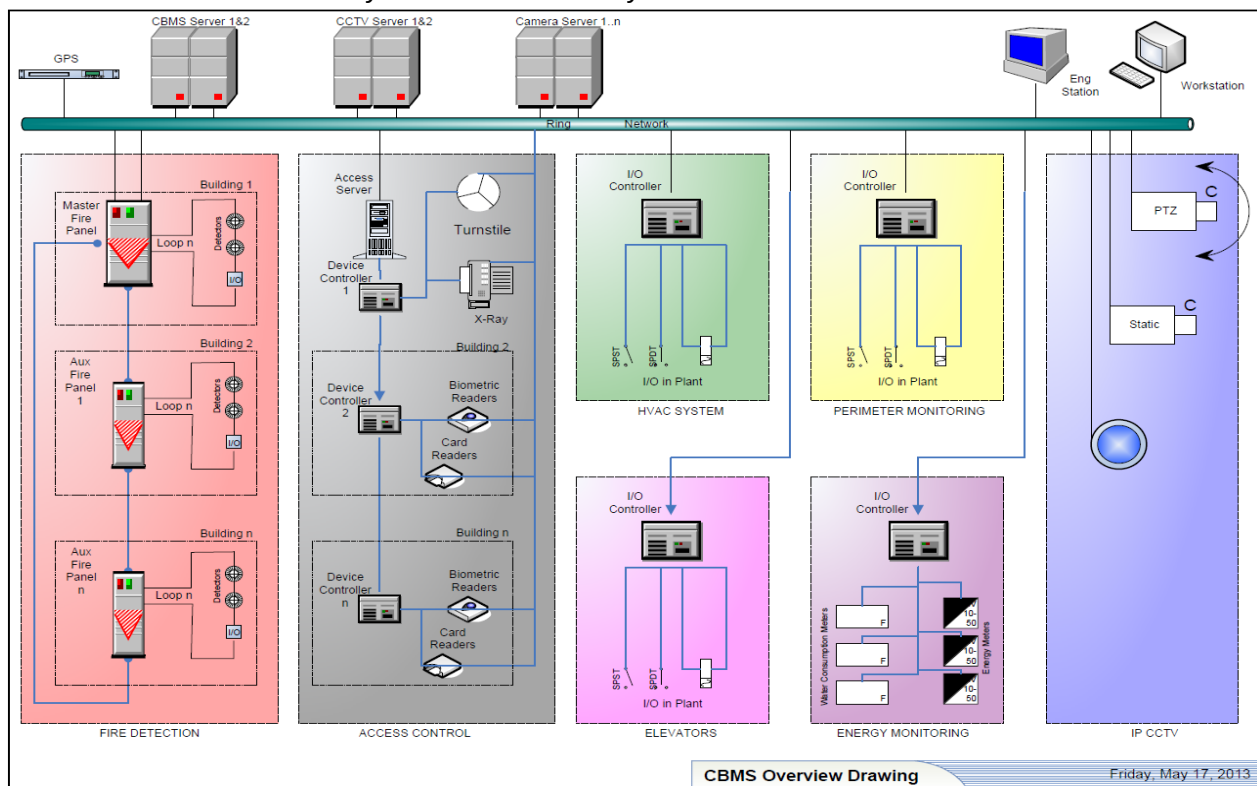


Figure 1: basic CBMS layout with all its subsystems

3.2.2.3 Mechanical

The building HVAC system comprises various HVAC systems which include centralised units, packaged units and split type units, the units cooling either chilled units or Dx type units, and the heating either via boilers or Dx unit.

Building is using various fire protection strategies including, sprinklers, fire hydrants, hose reel, gas systems, and fire extinguishers.

Potable water supply is typically via municipal supply to the premises and supplied to the premises potable water tanks which is then fed to the building services.

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3.2.2.4 Architectural

The buildings comprise various composite structures and range from single to multistorey building typologies, with interconnecting walkways be it suspended or ground level with outdoor interlinking areas. The existing external structural fabric consists of general brick and mortar and areas with re-enforced concrete columns, beams and walls some areas with brick infill generally with concealed roof sheeting and/or concrete slabs, concrete “coffer”, rib and block designs protected with conventional waterproofing methods.

Where glazing is concerned the buildings have areas with skylights above the atriums. Facades are in the form of aluminium supported curtain walling between floor slabs or frameless glass from single to multi-storey for entrances and others with conventional ‘residential styled’ window openings and at times shared with cladding, be it sheeting or admixture surfaced, or precast units. Internally buildings have skimmed ceilings to ‘commercially’ tiled, all suspended and housing all building services components either on or above.

Floors range from power floated finish (utility areas) to carpet, tiles and at times laminated flooring, specialised areas with synthetic flooring and walling like our sporting/recreational areas. Heritage sites possibly have timber floors and steel pressed ceilings. Internal walls are either brickwork or drywalling, some video walls need extensive support etc as the function of room calls for.

Therefore, architectural *Works* to be either on par with existing and or current building materials and products that could comprise proposed/additions/amendments: drywalls, brickwork, skim/plaster painted to finish, and glazing shopfronts/frameless glazing or aluminium beaded with appropriate ventilation grids/diffusers, subfloor structure/base preparation, flooring and baseboards, ceilings and consideration of building services, doorways, doors, window and its ironmongery. Facades, roofs/roofing and its structure, rainwater goods and waterproofing, cladding be it wallpaper, vinyl or panels for privacy.

All to suit occupancy be it offices, meeting rooms, ablutions, atriums, kitchens, dining, utility rooms or areas and recreational spaces. As will be noted, universal access is key factor in the existing buildings. Where reasonably possible the above components are required to be in unison with the objective to build/design passively before any mechanical intervention.

3.2.2.5 Civil

The current buildings within the ERE portfolio comprise structures which have been constructed from the early 1970’s till present. These structures are typically constructed from elements of reinforced concrete, structural steel, brick and block, timber. These elements make up components of the complete structure such as the foundations, plinths, columns, beams, walls, floors and roofs (accessible and inaccessible).

Non-structural and finishing elements include doors, windows, stairs for vertical transport, and various building finishes like cladding and parapets.

Due to the age of many buildings the minor *Works* are commonly refurbishment work that is required along with replacement or repair of components that make up the structures. Addition of new structural elements such as plinths are commonly required as supporting *Works* to the main scope (such as mechanical or electrical equipment).

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3.2.2.6 Security

Security systems are deployed at Eskom facilities/sites to safeguard critical infrastructure, protect personnel, and ensure business continuity. Given the strategic importance of Eskom's operations to South Africa's energy supply, robust security measures are required to mitigate threats, risks, and vulnerabilities that could disrupt operations or endanger people.

All ERE campuses, namely the Eskom Academy of Learning (EAL), Eskom Research and Innovation Centre (ERIC), and Megawatt Park (MWP), are equipped with a comprehensive range of baseline physical security systems designed to safeguard people, infrastructure, and information. These systems include Access Control Systems (ACS) using a combination of biometric readers and card readers, pedestrian turnstiles, Closed Circuit Television (CCTV) surveillance, Intruder Detection Systems (NLEPDS), outer perimeter fences (concrete and welded mesh), centralized control rooms with video walls and operator workstations, as well as X-ray machines and metal detectors at MWP.

All these systems provide a layered defence strategy that combines deterrence, detection, control, and response measures. While all three campuses share common security infrastructures, Megawatt Park is equipped with additional screening systems due to its strategic significance and higher visitor volumes.

a) Access Control System (Biometrics and Card Readers)

- Used to limit and prevent unauthorised access to Eskom sites.
- Use to regulate entry and exit into secured areas.
- Biometrics ensure accurate identity verification, while card readers offer flexible access management for employees, *Contractors*, and visitors.

b) Turnstiles for Pedestrians:

- Provide controlled entry points that prevent tailgating and unauthorized access.
- Ensure only one person enters per authorization.

c) CCTV Surveillance

- Installed inside and outside buildings to provide real-time monitoring, event recording, and investigative support.
- Enhances situational awareness and assists in incident response.

d) Intruder Detection System (NLEPDS)

- Detects and deters unauthorized attempts to breach the perimeter.
- Provides early warning alerts to control rooms for rapid response.

e) High Security Fences (Concrete Palisade and Welded Mesh)

- Serve as the first line of physical defence.
- Different fence types (Welded Mesh and concrete palisades) are deployed, offering high-security barriers.

f) Security Perimeter Lighting

- Enhances visibility around the perimeter during low-light conditions.

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- Deters potential intruders by removing concealment opportunities and supports CCTV effectiveness.
- Contributes to safety for authorized personnel conducting patrols or inspections at night.

g) Control Rooms (Video Walls and workstations)

- Central hubs for monitoring of all systems alarms and video feeds on monitoring screens.
- Operators coordinate responses, review video feeds, and maintain situational oversight of the campus.

h) X-ray Machines and Metal Detectors (MWP only)

- Provide advanced screening of persons and belongings at access points.
- Detect concealed items such as weapons or contraband, thereby strengthening campus protection.

3.3 MANAGEMENT AND START UP.

3.3.1 *Management meetings*

The intention is that the Parties and their agents use the techniques of partnering to manage the contract by holding meetings designed to pro-actively and jointly manage the administration of the contract with the objective of minimising the adverse effects of risks and surprises for both Parties.

Weekly progress meetings are convened by the Project Manager and/or Supervisors to discuss the following:

- Risk Reduction
- Progress / Programming & Scheduling
- Project meetings Finances and

The following meetings are convened as and when necessary:

- Technical & Design Co-ordination
- Specialist Meeting
- Special purpose meetings

The *Contractor* notes that attendees have the necessary delegated authority to make decisions in respect of matters raised at such meetings.

Regular meetings of a general nature may be convened and chaired by the *Project Manager* as follows:

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Title and purpose	Approximate time & interval	Location	Attendance by:
Risk register and compensation events	Weekly	On Microsoft Teams/MWP.	<i>Employer's and Contractor's Project management staff</i>
Overall contract progress and feedback	Weekly	On Microsoft Teams/MWP.	<i>Employer's and Contractor's Project management staff</i>
Progress / Programming & Scheduling	Weekly	On Microsoft Teams/MWP.	<i>Employer's and Contractor's Project management staff</i>
Construction clarification meetings to evaluate resolutions to design related construction issues. This is inclusive of firming up construction drawings to being <i>As-Built</i> drawings	Ad-hoc	On construction site	<i>Employer's design engineering team and Project manager. Contractor's Construction management.</i>
Construction progress and schedule review.	Weekly	On Microsoft Teams/MWP/Mutually agreed site.	<i>Employer's and Contractor's Construction management, project management, and planners.</i>
Commissioning Meeting.	Daily (from commissioning start date to the end of commissioning period)	On Construction site	<i>Employer's and Contractors Commissioning Teams.</i>

Meetings are convened during working hours on Microsoft Teams/mutually agreed site.

Records of these meetings shall be submitted to the *Project Manager* by the person convening the meeting within five days of the meeting.

All meetings shall be recorded using minutes and circulated by the person who convened the meeting for review and approval.

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When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

3.3.2 Documentation control

All documents supplied by the *Contractor* are subject to Eskom's acceptance. The language of all documentation is English.

The *Contractor* includes the *Employer's* drawing number in the drawing title block. This requirement only applies to design drawings developed by the *Contractor* and *Sub-Contractors*.

Drawing numbers are assigned by the *Employer* as drawings are developed.

All review documentation is submitted with transmittals. Any review information submitted without transmittals are considered rejected automatically.

The *Contractor* compiles a Master Document List (MDL) which contains a list of all documents issued for review, document number, document title, transmittal number, date of submission, overall document review status. The MDL is a live document, the *Contractor* issues an updated MDL within the progress report to the *Project Manager*.

Documentation requirements:

- Manufacturing: Quality Control Plans (QCPs), Inspection and Test Plans (ITPs), Material Specification sheets, Manufacturing methods and plans, etc.
- Construction: Construction/installation methods and plans, etc.
- Commission: System commissioning procedures, safety clearance documentation, pre-commissioning inspection reports, etc.
- Testing: All pre-commissioning tests, performance tests, acceptance testing and non-destructive testing, reports. All test procedures and methods can also be included here.
- Operating: Operating manuals and procedures.
- Maintenance: Maintenance manuals and procedures.
- Handover: All documents pertaining to the *Works* which could include all Manufacturing, Construction, Commissioning Testing, Operating and Maintenance documents (As-Built, As-Commissioned Documentation Package).
- Decommissioning: Decommissioning manuals and procedures (where applicable).
- Health and Safety: All necessary and regulatory health and safety procedures required for conducting the *Works*.
- Quality: Quality Control Plans (QCPs), Inspection and Test Plans (ITPs) and all other Standards, Processes and Procedures that are required to ensure technical integrity of Manufacturing, Construction, Commissioning Testing, Operating and Maintenance of the *Works*.
- Environmental: Environmental Impact Assessments (EIAs), Environmental Management Plans (EMPs) and all other regulatory Environmental documentation that are applicable when conducting the *Works*.

3.3.3 Health and *safety* risk management

In addition to the requirements of the laws governing health and safety, Eskom may have some additional requirements particular to the *Works* and the Working Areas for this contract.

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The supplier/*Contractor*/tenderer is expected to comply to the following documents when working at/rendering a service to Eskom:

- a. Occupational Health and Safety Act 85 of 1993 and its Regulations (OHS Act)
- b. Disaster Management Act, no 57 of 2002.
- c. Safety, Health and Environmental requirements contained in the SHE Specification for *Contractors*.
- d. Eskom SHEQ Policy, Standards, Procedures, Guidelines, Specifications and Regulations as listed below:
 - i. Eskom Safety, Health, Environmental and Quality Policy: 32-727
 - ii. Eskom Lifesaving Rules, Directive: 32-421
 - iii. Eskom Procedure on Smoking: 32-36
 - iv. Eskom Incident Management Procedure 32-95
 - v. Implementation of Occupational Hygiene management programme, Standard 240-42262670
 - vi. Eskom Life Saving Rules, Directive: 240- 62196227
 - vii. Eskom vehicle and driver safety management 32-93
 - viii. Eskom vehicle specification 32-345
 - ix. Eskom *Contractor* Health and Safety requirements standards 32-136
 - x. Employees' right of refusal to work in an unsafe situation 240-43848327
 - xi. Eskom Waste Management Standard 32-245
 - xii. Annexure B: Acknowledgement Form for Eskom SHE Rules and other Requirements

The *Contractor* requests all applicable Eskom procedures & requirements. The *Contractor* ensures safety awareness at all times through continuous training. The *Contractor*, at all times is responsible for the supervision of his employees, agents, Sub-*Contractors* and takes full responsibility and accountability for ensuring they are competent, compliant and aware of the legal requirements and other requirements and execute the *Works* accordingly.

The *Contractor* ensures that all statutory appointments and appointments required by any Eskom Regulations are made in writing and that all appointees fully understand their responsibilities and are trained and competent to execute their duties.

The Divisional/Regional Safety Risk Manager or his representative having jurisdiction over the *Works* must provide the relevant safety, health and environmental (SHE) criteria for incorporation into this *Works* Information. The SHE specification / scope must be signed off by the Divisional/Regional Safety Risk Manager or his representative confirming that the applicable safety criteria have been considered.

3.3.4 Environmental *constraints* and management

All waste introduced and/or produced on the Employer's premises by the *Contractor* for this contract is handled in accordance with the minimum requirements for the Handling and Disposal

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of Hazardous Waste in terms of Government Legislation as proclaimed by the Department of Water Affairs and Forestry and Employer's environmental requirements.

All environmental incidents are reported to the Employer within 24 hours of such occurrence. All environmental incidents occurring on the Project Site (or on any other places, if any, as may be specified under the Contract as forming part of the Site) are recorded, detailing how each incident was dealt with in an Environmental Incident register.

The *Contractor* shall construct and/or implement all the necessary environmental protection measures in each area before any production work will be allowed to proceed. The Employer may suspend the *Works* at any time in terms the Conditions of Contract should the *Contractor*, in the Employer's opinion, fail to implement, operate or maintain any of the environmental protection measures adequately.

The *Contractor* ensures that all goods, services or *Works* supplied in terms of the Contract comply with all applicable environmental legislations (National Environmental Management Act, 1998 [Act No 107 of 1998]). The *Contractor* is responsible for keeping the work area clean of any environmental waste.

The *Contractor* shall comply with all relevant applicable laws, environmental legislation and regulations, conditions of environmental approvals, environmental management plans, and Employers Policies and Procedures. The *Contractor* must submit an Environmental Policy demonstrating commitment to protection of the environment. The Environmental Policy shall form part of the SHE file submission. Upon the Employer's approval, the *Contractor* shall immediately implement the policy and any amendments and keep it in operation for the full duration of the Contract. The policy shall be communicated to all personnel and copies of the policy shall be prominently displayed at all places of work.

The *Contractor* shall determine and develop the aspects and impacts register related to the scope of work. All aspects of the planning, manufacturing, pre-construction, construction and operational phases shall be considered.

3.3.5 Quality assurance requirements

The *Contractor* complies to the following documents when working at/rendering a service to Eskom:

- a. 240-12248652 - List of Tender Returnable/Quality Requirement Document
- b. 240-68099512 - FORM A: Tender & Contract Quality Requirements for QM 58 and Quality Requirements for ISO 9001 Standard
- c. 240-105658000 (QM 58) - Supplier Quality Management: Specification
- d. 240-109253698 - Contract Quality Plan (CQP)
- e. 240-109253302 - Quality Control Plan (QCP)/ Inspection and Test Plan (ITP)

After the acceptance of the construction drawings the *Contractor* submits the associated construction Method Statements and relevant QCP/ITP for acceptance and determination of intervention points prior to construction.

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Failure to comply with an accepted Method Statement/QCP or ITP may result the issuing of a NCR, rejection of the *Works* as well as the withholding of payment until the appropriate remedial actions have occurred.

3.3.6 Programming constraints

The *Contractor* submits a single Project Implementation Plan (PIP) that incorporates the scope of work in its entirety.

The project key dates shall be incorporated into the program.

The *Contractor* ensures the project does not slip but rather invariably adheres to the stipulated completion timelines.

3.3.7 *Contractor's* management, supervision and key people

The *Contractor* submits a detailed project-specific organogram. It shall be inclusive of the construction workforce, showing the staff complement, with telephone numbers and E-mail addresses of all key project personnel. Reporting structure of internal divisions as well external Sub-*Contractors* are also indicated on the organogram.

3.3.8 Invoicing and *payment*

The Z clauses refer to invoicing procedures stated here in this Service Information. Also include a list of information which is to be shown on an invoice.

Within one week of receiving a payment certificate from the *Project Manager* in terms of core clause 51.1, the *Contractor* provides the *Employer* with a tax invoice showing the amount due for payment equal to that stated in the *Project Manager's* payment certificate.

The *Contractor* shall address the tax invoice to Eskom Holdings SOC Ltd and include on each invoice the following information:

- Name and address of the *Contractor* and the *Project Manager*;
- The contract number and title;
- *Contractor's* VAT registration number;
- The *Employer's* VAT registration number 4740101508;
- Description of service provided for each item invoiced based on the Price List;
- Total amount invoiced excluding VAT, the VAT and the invoiced amount including VAT;
- (add other as required)

Add procedures for invoice submission and payment (e. g. electronic payment instructions)

3.3.9 Insurance *provided by the Employer*

Refer to the relevant clauses of the Contract. For all Employer Insurance related queries, contact:

- Cluster Manager
- Eskom Insurance Management Services
- Eskom Holdings SOC Ltd

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- Megawatt Park
- 011 800 2714

3.3.10 Provision of *bonds* and guarantees

The form in which a bond or guarantee required by the *conditions of contract* (if any) is to be provided by the *Contractor*. It is given in Part 1 Agreements and Contract Data, document C1.3, Sureties.

The *Employer* may withhold payment of amounts due to the *Contractor* until the bond or guarantee required in terms of this contract has been received and accepted by the person notified to the *Contractor* by the *Project Manager* to receive and accept such bond or guarantee. Such withholding of payment due to the *Contractor* does not affect the *Employer's* right to termination stated in this contract.

3.3.11 Records of *Defined Cost*, payments & assessments of compensation events to be kept by the *Contractor*

The *Contractor* shall maintain accurate records of all cost related documents, in the event that the Project Manager may request such records.

3.3.12 Training *Workshops* and technology transfer

Not applicable.

3.4 ENGINEERING AND THE CONTRACTOR'S DESIGN

3.4.1 *Employer's* design

3.4.1.1 Electrical Equipment, Systems Design and requirements

The *Contractor* ascertains to obtain an Electrical Detailed Design report, and all its outputs, i.e. technical construction drawings encompassing wiring diagrams, cable routes (where required), and cable trench layouts prelude to the *Works*. Manufacture, factory testing, supply, delivery to site, installation, commissioning, testing, handing over in complete working order, a new equipment according to clauses 3.4.1.1.1 - 3.4.1.1.8 of this report and the detailed. The *Contractor* shall ensure that all peripheral work, necessary to fulfil electrical scope such as cable splicing, cable termination etc, is carried out to ensure the completeness of the *Works*.

3.4.1.1.1 Power Cables and Conductors

Neutral busbars shall be at least 50% of the cross-section of the phase busbar, whereas the earth busbar shall be as per table 6.25 of SANS-10142-1 standard.

The clearance between the phases and phase to earth busbars shall be more than 8mm whereas the creepage distance shall be more than 16mm.

Wiring encompassed in the distribution board shall be installed as per the Employer's designs and shall be as per the wiring diagrams on lighting distribution board assemblies' sheet 2 of 2 drawing number: 0.66/837.

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Jumper cables' cross-sectional areas, where used, shall be commensurate with current carrying capacities as set out on SANS 10142-1 Tables 6.2.

The selected power cable extending from source (external power from distribution) to load (ERE property) shall either be terminated on a mini-substation or low-voltage board or equivalent to the property DB(s) and its specification is as follows: Copper 3 and 4 core PVC Insulated PVC bedded SWA PVC sheathed 600/1000 V cable, it shall be as designed and installed as per the Employer's preferred installation method. Its cross-sectional area/size and length is provided in the electrical design.

Low Voltage power cabling Employed by *Contractor* shall comply to the following requirements: The requirements of SANS 10142-1, SANS 1507, SANS 1339, and SANS 10198-1 shall be observed and adhered to.

All power supply cables offered shall carry valid product type tests in accordance with the relevant SANS standard.

A copy of all relevant type test reports and the required tender returnable documentation shall be submitted at the time of tender enquiry submissions. Where applicable for local type tested cables, the SANAS accredited product certification body mark scheme.

The power cable types are designated in accordance with Eskom standard cable codes detailed on the following drawing: 0.00/1310.

Power supply cable sheath shall be black with the appropriate cable trace colour reflecting on the cable sheath.

Cables outer sheath shall be legibly marked in accordance with respective cable standards (SANS 97, SANS 1339, SANS 1507, and SANS 1574).

Additional information to appear on the outer sheath: voltage level, cross-sectional area in mm^2 , name of cable manufacturer and SABS specification to which the cable is manufactured, even if some portions of cable make-up deviate from the specification such as SANS 1507.

Regarding the fire performance requirements of cable, a provision is granted by the *Employer* to assess the applicable cable trace colour selection in the event of cable buried underground and the other part goes into an open-air environment. Should a greater chunk of power cable be buried and a smaller portion surfaces, the prevailing cable trace colour remains that of a one possessing a greater chunk. See electrical design.

The power supply cable shall be steel wire armoured for underground application, and portions surfacing above ground shall be supported in cable racks, trunking and supports where applicable. This is to provide mechanical support to electrical power cables.

Further low voltage power cable requirements, markings, cable layout, racking, laying, sleeve pipes, termination of cables and cores, cable route markers, transportation, storage, testing and commissioning, shall be according to **240-56227443 Generation Requirements for Control and Power Cables for Power Station Standard**.

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3.4.1.1.2 Lighting

The following standards shall be applicable to the emergency lighting installation: SANS 10114-2, SANS 1186-3, SANS 1464-22, SANS 10114-1, SANS 10400, SANS 10142-1 and OHS Act 85 of 1993.

Emergency lighting shall be provided to enable people to exit safely from an area by providing visual information on the direction and exit points and safety equipment.

High risk task area lighting shall be provided to enable people to safely shut down potentially dangerous equipment or processes during a failure of the main power supply.

Light fittings to be employed on ERE properties shall be as per lighting design and prior bulk installations, the *Contractor* shall submit a sample on all types for laboratory testing. Should the sample meet the minimum photometric requirements as set forth in the small power and lighting standard (240-55714363), the luminaires will be accepted for installation, however, should they flunk the standard, they will be rejected as failed.

The *Contractor* shall conduct, appointing a competent person, a post installation illumination survey according to SANS 10114 part 1 and 2 - Interior lighting - Artificial lighting of interiors and Emergency lighting, SANS 10098 part 1 and 2 - Public lighting - The lighting of public thoroughfares and the lighting of certain specific areas of streets and highways, and SANS 10389 part 1 and 2 - Exterior lighting - Artificial lighting of exterior areas for work and safety and Exterior security lighting. The minimum Illuminance levels measured in each respective area shall be presented in a tabulated format.

The *Contractor* to perform this survey as per the standard post project execution, compile a comprehensive illumination survey formal report as part of work execution and submit it to engineering and/or project management for review and acceptance.

The balance of the lighting requirements, interior lighting, exterior/security lighting, including photometric control units for lighting, switches, conduits etc, shall be as per **240-55714363 Eskom Generation Power Station Lighting and Small Power Installation Standard**.

3.4.1.1.3 Socket outlets

Only 16A three pin sockets (two pole and earthing contact type) shall be used, unless otherwise specified by the *Employer* on the design drawing.

Earth leakage protection on socket outlets is compulsory except where specified otherwise.

The anticipated load of a circuit that feeds socket outlet shall not be in excess of 5kW.

The balance of the requirements with regards to socket outlets for single phase systems including dimensions, ratings, positioning, form of power, shall be as per SANS 10142-1, and relevant parts of SANS 164.

3.4.1.1.4 Distribution boards

All Distribution Board assemblies:

- Shall comply with SANS 61439-4.

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- Shall be in accordance with the types as specified, be constructed according to the detail design and DB standard drawings: 22.66/837 sheet 3 of 3, approved Eskom drawing.
- Shall have labels with KKS coding mounted on the main cabinet.
- Shall have centrally fitted door locks.
- Hinges shall be bolted internally.
- Doors shall have rubber seal around inside edge for water proofing.
- DBs shall be manufactured from steel and equipped with IP55 and IP65 ingress protection ratings for indoor and outdoor applications, respectively.
- For locations classified as hazardous (HAZLOC), DBs shall conform to SANS 10108.
- Metal work shall be protected against oxidation, corrosion and damage anticipated under site conditions, the final finish shall be "light orange" as per SANS 10142-1 and "signal red" for essential 230/400V Distribution Boards.
- Shall be equipped with front access.
- They shall be glanded from the bottom only i.e. cable entries are only from the bottom.
- DB's width is contingent on the number of circuits, this will be furnished in the detailed design.
- DB circuits loading shall be (as in the case of their design) evenly distributed across the three phases, the difference shall be, at most, 10%.

Any construction or standard of a distribution board proposed, as an alternative to the specified, shall have prior approval from the Employer.

All incomer breakers on three phase distribution boards shall be rated a minimum of 32A with a minimum fault current level of 10kA.

The distribution boards shall be appropriately IK rated, IK 05 for indoor use and IK 07 for outdoor use, as per IEC 62262, and shall be constructed to withstand electrical and thermal stresses.

The minimum thickness for the plate steel shall be 1.6mm. Cubicle doors shall be positively drawn closed onto seals by means of padlock-lockable lever operated catches. Perforated foam type seals shall not be provided. The distribution board shall be provided with an internal equipment cover plate in accordance with SANS 10142-1. The cover plates shall not be used to keep components in position. The cover plates shall be provided with hinges for opening/closing and shall be provided with a square key lock.

All busbars, wiring, terminals etc, shall be insulated adequately and supported to withstand maximum current stresses.

Clearly engraved labels shall be mounted on or below every device. The wording of the labels shall be in English. Flush mounted boards shall be installed with the top of the board 2,0m above the finished floor level.

3.4.1.1.5 Switchgear

The circuit breakers shall be mounted within the distribution boards to give a flush front panel.

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A circuit-breaker rated in accordance with the anticipated diverse load, and with a symmetrical short-circuit breaking capacity commensurate with the prospective symmetrical fault current shall be installed at the source end. See exact values on electrical design on *other*.

MCCB requirements:

- MCCB shall comply with SANS 556-1 and SANS 60947-2. The former SANS Standard takes precedence over the latter.
- MCCB shall be triple pole, with or without neutral air-break devices, assembled as an integral unit, mounted in a supporting and enclosing moulded case of insulation material.
- MCCB shall be fitted with flash barriers on the line side.
- Where neutral links are specified, these shall be of the bolted or withdrawable type, accessible from the front of the unit.
- The breaking capacity of the MCCB shall be at least 10 % greater than the prospective fault current at its point of installation of the supply system (reiterated with detail).
- MCCB's shall be provided with independent manual closing and tripping devices in accordance with SANS 60947-2.
- MCCB shall meet the specified safety integrity level (SIL) requirements as a minimum. A confirmation that safety requirement is met must be provided with tender submissions in the form of certification, datasheet, specification.
- Further MCCB requirements, including indication devices, MCBs, isolation, ratings, auxiliary contacts etc, shall be according to **240-56227516 LV switchgear and control gear assemblies and associated equipment for voltage up to and including 1000V AC and 1500V DC standard.**

3.4.1.1.6 Trenching

Trench depth or depth for cable burial, in the case of Low Voltage (LV) power cables, (where applicable) shall be 500 mm as selected from SANS 10142-1 installation method. The width shall be 450 mm. This is extremely crucial as it has a bearing on the derating factor(s) affecting the current load and eventually the electrical design.

3.4.1.1.7 Earthing

The Employer's system earthing of preference is TN-S system and therefore enforced.

All earthing *Works* for electrical installations shall comply to SANS 10142-1, earth rods SANS 1063 4.2.1, 240-56356396 Earthing and Lightning Protection Standard and 0.54/393.

3.4.1.1.8 Certificate of Compliance

Upon completion of the *Works*, full verification testing shall be carried out on the installation(s) and the Employer's representatives shall be invited to witness at the testing phase. At least 12 types, according to the installation rules, of tests shall be performed and recorded on the recording sheets.

Inspection and Testing of electrical installations are dealt with in the Electrical Installation Regulation (EIR) Regulation 7 *"Certificate of Compliance (CoC) – every installation shall, during erection and/or on completion and before being put into service, be inspected and tested to*

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verify, as far as is reasonably practicable, that the requirements of the Regulations / Standards have been met”.

SANS 10142-1 Clause 8 has the detailed methods of testing required. The tests shall be carried out in the sequence indicated. All measurements and test results shall be recorded on the Inspection and Test Report (ITR). Additional test recording sheets may be appended on the ITR where required.

A certificate of compliance shall then be tendered to the Employer’s representative prior or during commissioning for review and submitted for acceptance as part of the handover packages at the completion of the *Works*.

3.4.1.2 Control and Instrumentation

3.4.1.2.1 General Requirements

The *Contractor* shall be responsible for procurement/manufacture, supply, installation, testing, commissioning, of all equipment, instrumentation, controllers, wiring, and associated terminations for the following systems:

- Public Address (PA) System
- Fire Detection and Alarm System
- HVAC system Controllers
- Security and Access Control System
- Lifts and Escalators Control Interfaces
- Energy Monitoring system

All *Works* shall be executed in accordance with the approved project specifications, relevant SANS standards, and applicable Eskom standards as referenced in section 2.2.1.

3.4.1.2.2 Installation and Integration

The *Contractor* shall:

- Install all instrumentation, controllers, wiring, and cabling, including terminations
- Integrate subsystems with the BMS and existing site infrastructure
- Ensure all interface points are implemented as per the approved design
- Coordinate with other *Contractors* and stakeholders to avoid conflicts in system integration

All installation work shall be carried out following industry best practices and shall comply with relevant safety, environmental, and quality standards.

3.4.1.3 Mechanical

a. HVAC

The *Contractor* to supply material as per design, the selected material shall be submitted to the employer for acceptance, the *Contractor* shall construct the HVAC equipment as per the design, the *Contractor* shall test balance and commission the HVAC equipment, the contractor shall meet all the requirement as outlined in Eskom document General Technical Specification for HVAC 240-102547991.

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The scope will involve minor HVAC Works such as:

- Replacement of existing diffuser to new diffuser
- Repositioning of the diffusers
- Provision of compact/ single space HVAC equipment
- Adding controller or removing controllers
- Fresh air supply to single space
- Smoke extraction
- Fire damper
- Heat pumps
- Hot water boiler

b. Applicable standards, specifications and guidelines to HVAC Works

Number	Title
ASHRAE 15	Safety Codes for mechanical refrigeration
ASHRAE 62	American Society of Heating Refrigeration and Air Conditioning Engineers. Ventilation for acceptable indoor air quality
ASHRAE 55	Thermal environmental condition for human occupancy
ASHRAE 52/76	Standard test method for filters
ASHRAE G1	Guideline for commissioning of air conditioning system
240-102547991	Eskom General Technical Specification for HVAC Systems
240-143112846	Heating Ventilation and Air Conditioning (HVAC) System Work Instruction

c. Fire Protection

The *Contractor* to supply material as per design, the selected material shall be submitted to the employer for acceptance, the *Contractor* shall construct the fire protection equipment as per the design, the *Contractor* shall test balance and commission the fire protection equipment.

The scope will involve minor fire protection Works such as:

- Adjusting/moving of sprinkler within a space
- Providing of fire protection within a space such as gas system

d. Applicable standards, specifications and guidelines to Fire Protection System

Number	Title
240-54937450	Fire Protection & Life Safety Design Standard
240-56737448	Fire Detection and Life Safety Design Standard
240-56737439	Fire Protection/Detection Assessment Standard
ASIB 12th Edition	Twelfth edition rules for automatic sprinkler installations
SANS 10287	Design, installation, and maintenance of automatic fire sprinkler systems

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e. Wet Services

The *Contractor* to supply material as per design, the selected material shall be submitted to the employer for acceptance, the *Contractor* shall construct the protection equipment as per the design, the *Contractor* shall test balance and commission the fire protection equipment.

The scope will involve minor wet services *Works* such as:

- Provision of potable water to a space
- Replacement of piping
- Replacement of valves
- Replacement of pipe accessories (flow meter, pressure gauges, NRV, and CRV)
- Replacement of pumps

f. Applicable standards, specifications and guidelines to Wet Services System

Number	Title
240-56030558	Centrifugal Pumps Specification
240-56356376	On-Site Commissioning for Low Pressure Systems Standard
240-101712128	Standard for the internal corrosion protection of water systems Chemical Tanks and Vessels and Associated Piping with Linings
240-105020315	Standard for Low Pressure Valves
240-123801640	Standard for Low Pressure Pipelines

g. Performance and testing of equipment

The contractor shall conduct performance and testing of mechanical equipment using mostly non-destructive testing methods and produce reports for test, testing shall include:

- Flow measurement (Air and Water)
- Temperature measurement
- Wall thickness measurement
- Pressure measurements
- Power Measurements
- Overall, AHU, CRAC unit, Pumps, Fan, Chiller, Colling Tower performance

Testing and report should be compliant to ISO 9000 & 9001 requirement

- Ducting conditional assessment by using NDT techniques such as endoscope / drone inspection

3.4.1.4 Architectural Design Requirements

The *Contractor* to supply material, components and fixtures to construct and as per the design, best practices and manufacturer specifications. In certain instances, the supplier may lead the design component to ensure quality and material limitations are within bounds of what is to be achieved. The *Contractor* may be requested to supply 2 to 3 samples that meet the requirements together with this the *Contractor* to supply data sheets supporting mentioned item, the selected material shall be submitted to the employer for acceptance.

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The *Contractor* is required to provide, install, construct all components from designs and according to best practices and standards in the built environment together with specific Eskom standards. The *Contractor* to note that in certain instances key directives will advance over the below specifications when certain material specification and degree thereof and or combination of materials to ensure compliance of design is in adherence to Part T: Fire protection and or as per Local Authority Approval. The result of the *Works* and/or objective is to be compliant with all legislation and to ensure successful certificate of occupancy furnished by the local authority.

▪ **Drywalls:**

To be built up as non-loadbearing only, members to be galvanized steel framing consisting of 63.5mmx0.8mm studs with minimum 400mm or 600mm as maximum studs spacing together with top and bottom tracks, or as per manufacturer recommendation.

Boards to be classed for a privacy layer or where the need arises, this to be Higher density aerated gypsum core that is silicone impregnated and encased and firmly bonded with strong paper liners, these boards are to be "1 piece structured " and not layered by the *Contractor*, *Contractor* to source this directly from the manufacturer. The board thickness to be 12.5mm or 15mm in thickness. These boards to be specified as non-combustible. The *Contractor* to ensure full boards are used to ensure noise transfer is minimal thus min 3000mm and 3600mm height boards to be used.

Bathroom boards to be moist specified. Certain manufacturers provide a surface that only needs a primer and paint to finish, with prepped/tapered joints or edges using joint tape, filler and fixing screws. *Contractor* to ensure smooth finish between joints as per manufacturer installation.

Final drywall composition to be built up to be 12.5mm+63.5mm+12.5mm OR 15mm+63.5+15mm. Cavities to be filled with non-combustible self-supporting tested to SANS 10177 Glass wool cavity bat with thickness of 1200mmx600mmx63mm. Furthermore, the glass wool cavity bat needs to ensure that the bat is SANS 428 Fire classification - A/A1/1 and EN 13501 - A1-S1, D0 certified.

Fitment of batting needs to be snug fitted between studs with no gaps and needs to be floor to ceiling height in continuous lengths.

For "extension" or additions the drywalling needs to match existing and if they are layered with gypsum boards to be minimum of 9mm thickness, if no tapered boards are used with the same studs and spacing with bottom and top tracks this to ensure uniformity. The same specification for batting to be installed as above.

Routing needs to be internal and to be in minimum 20mm or 25mm conduits to ensure future cable work. The selection size will depend on run needs of spaces.

▪ **Brickwork:**

Bricks to be selected based on existing to match in size and colour to ensure uniformity when amending or for proposed new work as well as specified according to the exposure zone and or directive of design and in the absence of alternative, approach brickwork with;

- NFP for general masonry work above damp-proof level to be plastered.
- NFX for masonry exposed to damp or in contact with the ground like foundation walls, or manholes and/or for "fair" face work

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- Burnt clay masonry units: SANS 227
- To be standard, imperial size is 222mm long x 106mm wide x 73~76mm high with a mass of between 3.0kg ~ 3.5kg but as first preference to match in size when additions occur
- Concrete masonry units: SANS 1215

Masonry walls to be as per SANS 10400-K and B, where any cutting or demolishing to be carried out, clear method statement and assessment to be provided for to ensure structural integrity and safety. Supporting floor elements are of cavity construction or have a nominal thickness of not less than 140 mm; the storey height measured from floor to soffit of the floor above does not exceed 3,3m and design to ensure lateral support is sufficient. In accordance with SANS 10400-b, the imposed load in the following occupancy classes and zones as per section (d) offices for general use and offices with data-processing and similar equipment; does not exceed 3,0 kN/m² and other. Lintels shall be provided above all window and door openings in accordance with the requirements of 4.2.9.

Prior approval to be gained from the Employer before any work commences. All mortar should be class 'ii' that complies with the requirements of SANS 2001-CM1. The compliance to SANS is not limited to this specification only but to it as complete adherence to best practices and legislation.

- **General re-enforcement within brickwork:**

Brick force selection to be 2.8mm diameter wire in widths of 75mm, 150mm or 230mm for brickwork respectively, the brick widths to consider brick force width selection and to ensure no brick force is exposed outside of the mortar joints ensuring at least 15mm of cover is provided. Brick force to be continuous and to be rolled and free of any corrosion.

Where cavity walls are selected, ties to be specified according to the exposure zone, spacing to be according to SANS 10164 (2,5/m² or 600 mm vertical, 660 mm horizontal, staggered) and spacing around openings and construction joints to be <300 mm vertical

- **Doors – Timber:**

Application to be for commercial use and to be semi-solid/medium duty they ought to be double wood veneered (each side of door) door and mounted to natural anodised aluminium frame. For Fire Doors the appropriate class doors to be selected according to the fire rating, position and function.

Light Maple - Full veneer – or veneer to match and/or as per the client specification

Door heights and style to match that of existing to ensure uniformity

Single Leaf;

- 813mm Wide x 2032mm Height with 44mm thickness option or.
- 813mm Wide x 2400~2600mm Height with 44mm thickness option

Double Leaf;

- 1630mm Wide x 2032mm Height with 44mm thickness option or.
- 1630mm Wide x 2400~2600mm Height with 44mm thickness option

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For exterior doors the appropriate exposure class to be selected and to be solid timber doors, where fire doors are selected this to be classed for the correct minute rating and position/location

▪ **Ceilings:**

Ceilings to adhere to fire resistance in minutes, tested to SANS 10177, for Airborne sound insulation rating to conform to SANS 717/10218, any deflection requirements as per South African Building Interior Systems Association (SABISA). Ceilings to have structural performance requirements to ensure the design and selection can safely support all anticipated loads, such as luminaires, smoke detectors, air grilles, wind loads, point loads, audio speakers, microphones, acoustic baffles and possible wayfinding and signage.

For existing work Ceiling tiles to match existing Lay-in style exposed grid suspended ceilings or gypsum board skimmed ceilings in commercial buildings.

For proposed work options of 600mmx600mm or 600mmx1200mm with all suspension, Cross and Tee fittings with 25mmx25mm shadow line/plaster trim cornice

Or,

Gypsum 9.4mm boards skimmed with shadow line 12.5mm minimum and maximum of 25mm x 25mm cornice as per below also known as plaster-trim

▪ **Cornices:**

25mmx25mm shadow line/plaster trim or 25x60~75mm High density polystyrene cornice cove cornices only for infill amendments that match or 25mmx75mm Gypsum cove cornices only for infill amendments that match.

▪ **Surface/Subfloor:**

25mm granolithic screed and or depending on application need of self-levelling screed with surface hardener of 3mm to 10mm to be applied with occupancy class traffic in mind.

▪ **Flooring:**

Floor surface integrity to be assessed, provision to be made for removal of loose substrate, surface prepped and filled with appropriate filling admixture, bonding agent followed by self-levelling screed that includes a surface hardener where necessary. *Contractor* to provide a surface free tripping hazard and to allow for any uneven surface to be smoothed and flattened to allow for appropriate laying of commercial grade flooring and adhesives,

▪ **Carpet Tiles:**

Flooring finish to match existing carpet tiles or in lack of, *Contractor* to provide 500mmx500mm with thickness of ± 7 mm to 8.5mm, classed as: heavy commercial carpet tiles, to be made from stain-proof miracle fibre (polypropylene) with Resinbac/Nexbac backing with a Fire index 2 and 3 as per SANS 10177-4 respectively. Tiles to be laid in accordance with SANS 10186 fitting code of practice. To be installed in tessellated format. Tiles to be laid with adhesives as that, that are in accordance with the manufacturer's recommendations.

▪ **Tiles:**

Large format 1200x600 Vitrified tiles to be laid in accordance with a) ceramic wall and floor tiles: SANS 1449 b) porcelain tiles, fully vitrified: SANS 13006, all to be laid in accordance with SANS 10107

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- **Linoleum:**

2.5mm thickness for commercial use, with appropriate adhesive, seams to be welded accordingly as per manufacturers details.

- **Vinyl:**

2.5mm thickness for commercial use, with appropriate adhesive, seams to be welded accordingly as per manufacturers details.

Where Linoleum or Vinyl flooring is selected, tiles may be opted for where the Employer specifies or where functional occupancy could dictate frequent replacement needs.

- **Specialised Areas:**

Gymnasiums

High impact areas to have heavy commercial type resistant and easy to clean flooring tiles to be 1000mmx1000mm and minimum thickness of 20mm, Flooring to be non-toxic, odour-free, anti-slip and stain resistant, possible floor hardener with leveller might be needed to repair and ensure level and hard surfaces. Other areas to have the same level of quality but to be 1000mmx1000mm with a thickness of 15mm high density rubber tiles with more compressibility for less impact needing areas. Rolled rubber flooring may be selected with the same level of specification but with minimum thickness of 10mm and to be in continuous roll length of minimum 5meters, ultimate selection to run length of space or area need.

Courts:

Flooring for courts to be sprung board design consisting either of Hevea rubber flooring or beech, all hardwood timbers to be machined to existing or new perimeters. For existing work, timbers to match. Repairs to the front playboard wall or "tin" might be needed, with correct plaster and finishing or composite panel or boarding and specialised coating for squash courts specifically. For plaster the faces to be plastered must be hard, strong, clean and free of dust and other loose material. They should be as plane as possible: within ± 3 mm of planeness and verticality.

Possible waterproofing might be needed for moist area or problematic areas. A polymer emulsion, based either on styrene butadiene rubber or acrylic, may be included in mixes for the bonding coat, undercoat and finishing coat to assist in workability, shrinkage, surface hardness, adhesion and to minimize tendencies to crack. Minimum plaster thickness to be 20mm for new work, generally consisting of your bonding coat and your final work coat, for existing work possibly 7mm to 25mm and to be carefully built-up to adhere to adhesion integrity.

Isolated repairs may be done as well with correct cutting out of areas, dedusting and bonding methods etc. For refurbishment approach areas allowance to be made for sanding and resealing of boards will be needed and isolated wood infill areas, repainting or taping of game lines. Should frameless glazing be required, the same minimum requirements as above however with additional criteria for courts. Generally, this is seen as specialised *Contractor* work with specialised materials.

Studio Type:

Not too low impact areas, such as Pilates, aerobics and wellness spaces such as physiotherapy and occupational areas to be 22mm thick solid wood timbers in springboard design for certain

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functional areas and others to be laid on underlay as per general timber flooring. Certain high sweat or occupational areas and other might need vinyl or linoleum approach as specified above

- **Frameless Glazing panels (interior):**

Frameless glazing facades 2025mm in width x 3240mm height (floor to ceiling cut to size) Glazing to be minimum 8.38mm laminated sheets with clear PVB interlayer, all panels to be installed and to be manufactured to SANS.

8.38mm PVB Clear Laminate panels as minimum and/or specialist to advise superior design, height of panels to be floor to ceiling of 3240mm, to be confirmed on site. Each panel to be supported by 2 sides (Floor & ceiling) as a minimum. The necessary support structure to be designed to ensure its integrity. All panes to be butt jointed with no silicon or fil, A glass fin may be necessary to provide the support. Specialist to advise.

The performance of safety glazing material shall be in accordance with the requirements of SANS as a whole and specifically 1263-1 and 10137. The individual panes of safety glazing material shall be permanently marked by the installer in such a manner that the markings are visible after installation.

- **Roofing:**

Concrete roof tiles:

420mmx332mm tile sizes and or 437mm x 257mm tile sizes with minimum 1.5mmx1500mm wide under tile membranes that conform to Part T and all tiling and fixing to comply with SANS 10062 and 10400L code of practice.

- **Clay tiles:**

420mm x 332mm with minimum 1.5mmx1500mm wide under tile membranes that conforms to Part T and all tiling and fixing to comply with SANS 10062 and 10400L code of practice.

- **Roof sheeting:**

Pierced fixing inverted Box Rib/IBR profile sheeting with rib height of 37mm and sheet widths of 686mm and minimum thickness of 0.5mm, 0.53mm and 0.58mm and to be Galvanised with a minimum micron of 200 and or aluminium and zinc coated with a minimum micron of 150, sheets to be factory colour coated on side as a minimum and to be fixed with class 2 roofing screws as per manufacturer.

For more concealed options, a non-pierced sheeting profile may be selected with the same minimum coatings as above with appropriate specialized fixing.

- **Sisalation and insulation:**

To be selected in unison with the complete roof built up and its surrounding structure with its occupancy class in mind ensure compliance with Part T and SANS XA calculations.

Mineral wool with minimum 63~100mm x 600mm batts to withhold its structure and not collapse to be classed as non-combustible or with minimum 1.5mm strainer wires fixed wire to be specified according to exposure class and to be fixed to purlins.

- **Barge Boards:**

200mmx80mm or 10mmx150mm or 10~12mmx225mm Fibre Cement boards or 32mmx 220mm Timber with S5 grading.

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▪ **Rainwater goods:**

75mmx110mm uPVC gutters with 75mmx75mm square uPVC downpipes or 75mm diameter downpipes and all its fixing, closing hardware. Certain areas where aluminium box gutters, downpipes are needed due to matching the same material specifications as per roof sheets above specified to be used. Generally, gutters to be 150mm and 75x100mm rectangular downpipes with same material hardware.

Both system types to be according to roof size and discharge rates calculations.

3.4.1.5 Civil and Structural Engineering Design

All Civil and Structural designs are in accordance with the following *Employer's* Design Standards:

- 240-56364535: Architectural Design and Green Building Compliance Manual
- 240-56364545: Structural Design and Engineering Standard
- 240-107981296: Constructability Assessment Guideline
- 240-85549846: Standard for Design of Drainage and Sewerage Infrastructure

The above standards include compliance with:

- SANS 10100-1: The structural use of concrete (specifically Part 1: Design)
- SANS 10160 (All Parts): General Procedures and Loadings to be Adopted in the Design of Structures
- SANS 10162: The structural use of steel
- SANS 10163: The structural use of timber
- SANS 10164: The structural use of masonry
- SANS 10400 (All Parts): The application of the National Building Regulations

3.4.2 Parts of the *Works* which the *Contractor* is to design

3.4.2.1 Civil and Structural

The *Contractors* design responsibilities, where applicable, are noted in Section 3.6.3.

3.4.2.2 Electrical

Lifts (where required and applicable):

- a) Design, manufacture/procure, install and commission passenger lift, where required, according to SANS 50081-20 safety rules for the construction and installation of lifts - lifts for the transport of persons and goods. The *Contractor* shall ensure the lift complies with the following safety requirements and protective measures coupled with verification of the safety requirements and protective measures:
 - Well, machinery spaces and pulley room.
 - Landing doors and car doors.
 - Car, counterweight and balancing weights.

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- Suspension means, compensation means, and related protection means.
 - Precaution against free fall, excessive speed, unintended car movement and creeping of car: inclusive of safety gear and its tripping means.
 - Guide rails.
 - Buffers.
 - Life machinery and associated equipment.
 - Electric installations and appliances.
 - Protection against electric faults, failure analysis, electric safety devices.
 - Controls – final limit switches – priorities.
 - Technical compliance and documentation.
 - Verification of design.
 - Examination and tests prior putting into service.
- b) Moreover, design rules, calculations, examinations and tests to lifts components shall conform to SANS 50081-50 safety rules for construction and installation of lifts – examination and tests.
- c) The general scope of *Works* will be for the *Contractor* to design, supply and install new equipment as follows: New gearless machine to be installed in the machine room, micro-processor controller, regenerative VVVF drive, shaft information equipment, VVVF car door operator, heavy duty car door, heavy duty landing door tracks and rails, electronic door protection, car operating panel, landing buttons and signalization, top of car inspection control unit, shaft and car lighting (existing lighting to conform to SANS1545), and electrical wiring;
- d) Furthermore: travelling cables, new energy efficient car lights and emergency lights, floor plate shall be non-slip diamond floor plate according to SANS, intercommunication system (5 way) to be installed, painting of surrounding areas upon request, safety and compliance reports: Annexure A and annexure B Compliance Certificates, Emergency Alarm System: heavy duty alarm siren for the top of the lift car and on all landing floors, Signals to be incorporated into landing button face plates on all landings: “Landing door left open”, “Car here signal”, “Car out of service”.

For the balance of the electrical requirements: The *Contractor* receives and accepts designs from the Employer and design output documentation such as SLDs for construction and then redlines the electrical schematics to yield *As-built* drawings

3.4.2.3 Controls and Instrumentation

For new installations where no BMS or related subsystems currently exist, the appointed and qualified BMS *Contractor* shall be responsible for providing comprehensive and detailed system designs for the employer's review and approval. The scope of work shall align with the requirements discussed during clarification meetings and site visits. All designs must comply with the standards and procedures outlined in Section 2.2.1.

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The *Contractor* further designs the required interfaces for the third-party systems where applicable.

For all the designs and new *Works*, the *Contractor* shall provide training to all relevant departments.

3.4.2.3.1 Design and Engineering requirements

The *Contractor* shall be fully responsible for the detailed design of all systems and components within the scope of work:

- Preparation of detailed system schematics and layouts
- Specification and selection of equipment and devices
- Integration of new systems with existing infrastructure
- Incorporation of all interfaces identified during site inspections, site walks, and clarification meetings

The design shall ensure:

- Full compliance with applicable regulatory and safety standards
- Seamless integration between subsystems and the overall Building Management System (BMS)
- Optimization of energy efficiency, reliability, and system performance
- Appropriate communication protocols are used during the execution of the work.

The *Contractor* shall submit design drawings, calculations, and specifications for review and approval prior to commencement of installation.

3.4.2.3.2 Power Supply Requirements

The *Contractor* shall be responsible for the design, provision, connection, and testing of all power supplies required for the operation of the BMS and associated subsystems.

▪ Power Source and Distribution

Each subsystem shall be connected to a dedicated, stable power source from the designated DB (Distribution Board).

Power distribution shall include dedicated circuit breakers and labeling for all BMS components.

All panels, controllers, and servers shall be connected via isolators to allow safe maintenance and shutdown.

▪ Uninterruptible Power Supply (UPS)

The *Contractor* shall ensure critical subsystems are powered by a UPS backup to maintain uninterrupted operation during power outages.

The following systems must have UPS-backed power:

- Fire Detection and Alarm System
- Security and Access Control System
- PA System
- BMS Servers, Network Switches, and SCADA Workstations

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UPS capacity shall provide a minimum of 30 minutes runtime at full load, unless otherwise specified.

▪ **Power Quality and Protection**

Install surge protection devices (SPDs) at critical panels and controllers.

Provide automatic changeover switches (ATS) where redundancy is required.

Ensure cable sizing and voltage drop calculations are performed according to SANS 10142 and Eskom specifications.

Sensitive electronics shall be protected with RCDs and voltage stabilizers if required.

▪ **Earthing and Bonding**

All controllers, panels, racks, and metallic enclosures shall be earthed and bonded per SANS standards.

Equipotential bonding between the BMS and power distribution shall be verified and documented.

▪ **Power Supply Labelling and Documentation**

All DBs, circuits, breakers, and panels powering BMS components shall be clearly labeled.

Submit power distribution drawings showing:

- Circuit IDs
- Cable sizes and lengths
- Protection ratings
- UPS connections
- Include these drawings in the final as-built documentation

3.4.2.3.3 Installation and Integration

The *Contractor* shall:

- Install all instrumentation, controllers, wiring, and cabling, including terminations
- Integrate subsystems with the BMS and existing site infrastructure
- Ensure all interface points are implemented as per the approved design
- Coordinate with other *Contractors* and stakeholders to avoid conflicts in system integration

All installation work shall be carried out following industry best practices and shall comply with relevant safety, environmental, and quality standards.

3.4.2.3.4 Documentation and As-Built Deliverables

The *Contractor* shall prepare, maintain, and submit the following updated documentation throughout the project lifecycle:

- Updated wiring diagrams and termination schedules
- Configuration and programming documentation
- Operation and maintenance (O&M) manuals
- Test reports and commissioning certificates

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- Submit a Decommissioning Report including:
 - List of all decommissioned equipment
 - Final routing of removed cabling and panels
 - Disposal certificates for hazardous and electronic waste
 - Update as-built documentation to reflect the final system configuration after decommissioning.

3.4.2.3.5 Decommissioning Requirements

Where existing equipment, controllers, cabling, or panels are rendered redundant by the new installation, the *Contractor* shall:

- Safely disconnect, remove, and dispose of all redundant equipment, devices, and cabling.
- Ensure all power supplies, circuits, and terminations are isolated and clearly labeled.
- Remove obsolete panels, junction boxes, and terminations from service.
- Ensure minimal disruption to operational systems during decommissioning activities.

3.4.2.3.6 Environmental and Regulatory Compliance

All decommissioning work shall comply with:

- SANS environmental standards
- Eskom waste management policies
- National environmental regulations on electronic waste and hazardous materials disposal
- A Disposal Certificate shall be provided for any equipment containing hazardous materials.

3.4.2.3.7 Testing and Commissioning

The *Contractor* shall perform full system testing and commissioning in accordance with approved procedures. This includes:

- Verification of correct installation and configuration
- Functional testing of each subsystem and integrated interfaces
- System performance validation and reliability tests
- Final acceptance testing witnessed by the Employer or its representative

3.4.2.3.8 Training and Handover

Upon completion, the *Contractor* hands over the completed work which shall include all certificates, software licenses and warranties.

3.4.2.4 Architectural

Specialized components like fire doors, frameless glazing, curtain walling and roof truss designs will be according to the designs of said supplier and or manufacturer or specialised fitter who will receive 'base' designs from the employer.

3.4.2.5 Mechanical

Allowance of design of mechanical system HVAC, Water and Fire Protection on and as required bases, based on the concept design received from the employer, design shall meet requirement

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of the employer, as well as local and international standards as documented on section 3.4.1.3 of this document.

3.4.2.6 Security requirements

The project includes requirements for an Integrated Physical Security System comprising a perimeter fence, non-lethal fence on top, Access Control Systems, CCTV System, Intrusion Pre-detection System, Alarm System, public address (PA) and interface to the PSIM System and IT infrastructure.

The *Contractor* shall design, supply, develop user documentation, perform testing, and deliver, install, and commission the Physical Security System and associated equipment (hardware/software etc.) at ERE campuses according to the associated technical specifications/standards.

The appointed *Contractor* for any Security System will be responsible for the following:

- a. Produce designs for the Integrated Security System. The designs must include details for the Access Control System, CCTV System, Intruder Detection System, Alarm System, Public Address System and PSIM System (including IT Infrastructure). The design must also cover the integration of these different systems into an Integrated Security System.
- b. Present the proposed designs to the ERE Security Team for acceptance.
- c. Installation and configuration of security LAN Infrastructure (Involving Eskom IT).
- d. Installation, configuration and commissioning of the CCTV System in totality on site as per Eskom Standard (240-91190304).
- e. Installation, configuration and commissioning of the Integrated Access Control System (IACS) in totality on site as per Eskom Standard (240-102220945).
- f. Installation, configuration and commissioning of an Intruder Detection System in totality on site as per Eskom Standard (240-91190304, 240-86738968 & 240-170000096).
- g. Installation, configuration and commissioning of an alarm system on site as per Eskom Standard (240-86738968).
- h. Installation, configuration and commissioning of Public Address System in totality on site as per Eskom Standard (240-170000098).
- i. Installation, configuration and commissioning of intrusion pre-detection system in totality on site as per Eskom Standard (240-170000691).
- j. Integration of newly installed systems/components such as Access Control System (ACS), CCTV System, Intruder Detection System, Alarm System, and Public Address System into an Integrated Security System (240-170000096) to interface with the PSIM system.
- k. Provide services as per Generic Technical Requirements for Physical Security Technologies Contracts 240-170000723.
- l. Installation and or upgrades as per Standard for Non-Lethal Energised Perimeter Detection System (NLEPDS) Electrical Components 240-78980848.

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- m. Installation, configuration and commissioning of interfaces to the Physical Security Information Management (PSIM), including firewall configuration and Telecoms circuit commissioning, for data collection, incidents management, data correlation, controlling functionality (CCTVs, IACS systems, PA Systems, etc.) and provision of real-time dashboards and reports (refer to DEM2412993 & 2425114).
- n. Conduct FAT and SAT tests before commissioning the complete integrated system.
- o. Compile or update site as-built drawings with electrical and engineering details showing cable, fibre and network tracing.

3.4.3 Procedure for submission and acceptance of *Contractor's* design

The *Contractor* submits all designs as per the requirements in Section 3.4.2 of this Functional Specification. The designs submitted are complete packages with all elements (drawings, calculations) included in order for the Employer to review as a whole. The Employer distributes the designs to his review teams. The Contractor receives a response from the Project Manager indicating either acceptance or rejection, with detailed comments. When a design is rejected, the Contractor engages with the *Employer* regarding the reasons for rejection, corrects the design and resubmits it.

The *Contractor* considers this review process in his planning. All designs must be reviewed, accepted and frozen before manufacturing and construction of the relevant plant item starts.

3.4.4 Other requirements of the *Contractor's* design

Not applicable.

3.4.5 Use of *Contractor's* design

Not applicable.

3.4.6 Design of Equipment

During the construction phase the *Contractor* shall provide access and general area lighting to ensure that the *Contractor's* personnel can reach their place of employment/work safely.

Each *Contractor* shall provide his own construction lighting with lighting levels in accordance with the OHS Act No. 85 of 1993. The luminaire installation and lighting level measurements shall be part of the routine safety inspections.

3.4.7 Equipment required to be included in the *Works*

All equipment stipulated in detail designs and their outputs (Bill of quantities, drawings: layouts, schematics) of all disciplines, and all information in clause 3.4.1 *Employer's design*.

3.4.8 As-built drawings, operating manuals and maintenance schedules

The *Contractor* will be required to submit for approval, redlined construction drawings (where required) as these will yield as-built drawings of the completed *Works*, on which details are provided in respect of as-built information, operating manuals & maintenance schedules, and equipment spares lists. This Section must be read with requirements of clause 3.2 Document control and 3.3.2 *Employer's objective and purpose of the Works*.

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3.5 CONSTRUCTION

3.5.1 Temporary Works, Site services & construction constraints

The *Contractor* shall be responsible for the planning and arrangement of the site to ensure safe, secure and efficient progress of the *Works* throughout the entire project period.

3.5.1.1 Employer's Site entry and security control, permits, and Site regulations

Permits to enter the site are a requirement and the *Contractor* shall comply with the Site entry and permit requirements, prior to commencement of construction.

The *Contractor* shall be responsible to implement a secure site access control system for the entire site, laydown areas and *Contractor's* yards, to comply with the *Employer's* requirements.

3.5.1.2 Restrictions to access on Site, roads, walkways and barricades

The *Contractor* shall comply with the *Employer's* zero tolerance policy, to alcohol and substance abuse, and the *Contractor* shall be subjected to screening upon entry to the *Employer's* premises and Project Site.

3.5.1.3 People restrictions on Site; hours of work, conduct and records

It is paramount that the *Contractor* maintains records of his people on Site, including those of his Sub-Contractors which the Project Manager or Supervisor have access to at any time.

3.5.1.4 Health and safety facilities on Site

See clause 3.3.3.

3.5.1.5 Environmental controls, fauna & flora, dealing with objects of historical interest

See clause 3.3.4.

3.5.1.6 Title to materials from demolition and excavation

The Employer has ownership of property or asset rights to all materials from demolition and excavation. The Employer will decide on materials that are due for disposal, and materials that will be re-used including those that the Employer will decide to keep as spare items. However, excess rubble and materials from excavation the Employer will decide to dispose of, shall be disposed of according to Eskom Waste management standard in section 3.3.3 d) xi.

3.5.1.7 Contractor's Equipment

The *Contractor's* equipment and its inventory is his sole responsibility. The *Contractor* is responsible to maintain accurate records of all plant and equipment, including scaffolding, rigging equipment including slings (ensure test reports are readily available for Employer's review), cranes etc., which are brought on to the working areas. The *Contractor* controls and manages the access of such plant and equipment to the working areas.

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3.5.1.8 Equipment *provided by the Employer*

None.

3.5.1.9 Site services and facilities

The *Employer* will provide power and water connection points. The *Contractor* shall then provide everything else necessary to ensure completeness of the *Works*.

3.5.1.10 Facilities provided by the *Contractor*

The *Contractor* shall provide everything necessary for his own use and to see the *Works* through.

3.5.1.11 Underground services, *other* existing services, cable and pipe trenches and covers

Prior to the commencement of *Works*, the *Contractor* is required to detect and identify the presence of any underground services in the area where the *Works* will be performed. The *Contractor* will provide the employer with evidence in a form of a report signed by competent personnel who performed or was part of the underground service detection for acceptance and approval to commence with the *Works*.

The *Contractor* shall note that although the drawings maybe prepared using available information for detailed designs, they show only the approximate positions of existing services where applicable.

The information is supplied in good faith but shall be used as a guide only and does not relieve the *Contractor* of his responsibility to exercise due caution when working in areas where existing services can reasonably be expected, nor his obligation to liaise with the authorities in this regard and the obtaining of the necessary work permits and wayleaves.

The *Contractor* shall be responsible for immediately notifying the *Employer* and the authorities concerned regarding any damage caused to public services and existing *Works*.

Should underground services be located, the *Contractor* shall be responsible to locate and safeguard any existing service he may encounter during construction. The *Contractor* shall be responsible for any damage to such existing services and *Works* in the execution of this contract and shall reimburse the Employer, authority or the owner concerned for any repairs required following damages due to the *Contractor's* negligence.

The *Contractor* will be required to map and provide a drawing with exact locations or positions of the service, the type of service that has been detected and the depth of burial of the service. This includes in service and out of commission services. This shall be presented to the employer preceding *Works* commencement.

The decision will be based on:

- Safety : Ensure that there is no danger posed by trenching in the area where there are services located.

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- Type of Service : Check if the type of service requires ease of accessibility should there be a requirement to access the service and if the electrical cables installed will cause interference to the functioning of the service and vice-versa.
- Depth of Burial : If the service is buried deep enough to allow cables to be installed above it without significant risk.

The employer will communicate all decisions with the *Contractor* through the established communication channels.

3.5.1.12 Control of noise, dust, water and waste

The *Contractor* shall keep noise levels within reasonable norms (liaising with occupational hygienist for applicable dB levels), considering the context of the site location.

The *Contractor* shall control dust over the site of the *Works* having in place the necessary equipment available on site to control dust.

The *Contractor* shall provide receptacles at the work sites and shall be responsible for disposal of refuse and waste generated by his staff.

3.5.2 Completion, testing, commissioning and correction of Defects

3.5.2.1 Work to be done by the Completion Date

On or before the Completion Date the *Contractor* shall have done everything required to provide the *Works* except for the work listed below which may be done after the Completion Date but in any case, before the dates stated. The *Project Manager* cannot certify Completion until all the work except that listed below has been done and is also free of defects which would have, in his opinion, prevented the *Employer* from using the *Works* and Others from doing their work.

	Item of work	To be completed by
	None	None

3.5.2.2 Materials facilities and samples for tests and inspections

The *Contractor* is to provide all the material samples, facilities, transportation and testing as specified. Where the *Employer* prefers to handle its sample testing, as in the case of lighting, see clause 3.3.1.12 regarding lighting samples, the *Contractor* shall avail the samples and also provide transportation for the samples to be tested.

3.5.2.3 Commissioning

Conformity of the installation to the design documentation shall be assessed and adjudicated upon completion of the commissioning phase. All necessary test and calibration certificates to form part of the Operational Acceptance Testing document file.

The *Contractor* develops a commissioning procedure and submit it to the *Employer* for acceptance.

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A PIP (Project Implementation Plan) is developed stating exact dates/timelines for the project from inception to completion.

The *Contractor* provides sufficient personnel for the satisfactory and timely commissioning of the equipment.

Before plant and materials are placed in service, the *Contractor* submits completion certificates that confirm the equipment and installation functions in a suitable and safe condition.

Testing and commissioning requirements

Testing of electrical equipment.

All power cables type tests and sample tests shall be in accordance with SANS 97, 1507, 1574 and 1339.

- All required test reports shall be submitted to the Employer together with Appendix B of 240-56227443 Generation Requirements for Control and Power Cables for Power Station Standard for approval.
- All routine tests shall be indicated on Appendix B and test certificates provided at delivery of cables.
- Site tests shall include, at minimum, insulation resistance, and conductor resistance for acceptance.
- Testing of switchgear shall be consistent with 240-56227516 LV switchgear and control gear assemblies and associated equipment for voltage up to and including 1000V AC and 1500V DC standard.

Commissioning of electrical equipment

- The *Contractor* develops a commissioning procedure and submit to the Employer for review and acceptance.
- Electrical cable schedule template (240-56176097) and electrical termination schedule template (240-77302094) shall be used to capture cable installation information.
- A certificate of compliance shall be submitted after completion of the *Works*, as per 3.4.1.1.8.

3.5.2.4 Take over procedures

The *Employer* shall take over the facility after completion and only then shall normal operations commence.

3.6 PLANT AND MATERIALS STANDARDS AND WORKMANSHIP

3.6.1 Investigation, survey and Site clearance

With regards to implementing a design solution, the *Contractor* is required to take the actual measurements onsite before proceeding with design & manufacture of the *Works* as dimension accuracy remains the responsibility of the *Contractor*.

The *Contractor* shall check the condition and accuracy of all reference points and level beacons (where available) and satisfy himself that they have not been disturbed and are true with regard to position and level.

The *Contractor* shall employ a capable surveyor to set out the *Works* to the required lines and levels. The *Employer* shall be informed immediately should any discrepancy be discovered between the levels or dimensions obtained by the *Contractor* and those shown on the drawings.

The *Contractor* shall submit the method of setting out he proposes to employ to the *Employer*. Accurate control of line and level shall be provided by the *Contractor* at all stages of construction.

The *Contractor's* survey instruments and survey equipment shall be suitable for the accurate setting out of the *Works* and shall be subject to the approval of the *Employer*.

3.6.2 Building Works

See clause 3.4.1.4.

3.6.3 Civil engineering and structural Works

3.6.3.1 General

- a) Engineering, manufacture, quality control, procurement, handling, shipment and transport to/from site, storage, offloading, construction and erection, finishing, installation, commissioning, testing, optimisation and handover of equipment, tools and materials for the *Works*.
- b) The *Contractor* carries out the civil, structural and building portion of the *Works* in accordance with the Occupational Health and Safety Act (85/1993): Construction Regulations, 2014 and the National Building Regulations.
- c) All *Works* are designed for constructability, reliability, and maintainability.
- d) The *Contractor* procures all construction material and equipment required to perform the *Works*.
- e) The *Contractor* identifies and includes all items required to form a complete, reliable, fit for purpose operating *Works*, which complies with the requirements as stipulated in this specification and as per the project specific designs.
- f) The *Contractor* provides all drawings (hard and soft copy), models, inspection/quality reports, construction records, commissioning test reports, and other documentation as required by the scope of *Works*.
- g) The *Contractor* submits all inspection and assessment reports required as per the Civil Inspection Manual, 240-99527377.
- h) The *Contractor* obtains from the Employer, dimensioned general arrangement drawings of the designed *Works* and detailed drawings of all components of the *Works*, sufficiently detailed for the preparation of maintenance and operating procedures.
- i) The *Contractor* obtains from the Employer, drawings and documentation as specified in the project specific scopes of work. Where applicable, based on the level and nature of the project, the *Contractor* will produce fabrication drawings, construction drawings, as built

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drawings, maintenance and operating manuals for the fabrication and installation of the *Works*.

- j) Other Plant and Materials or items associated with this *Works* is utilised with prior approval from the *Project Manager*.
- k) The *Contractor* provides all the test equipment for testing, the sub-assemblies and the functional groups for site testing, commissioning and performance testing. The *Contractor* performs Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT) of the Plant and Materials where required.
- l) The *Contractor* designs and provides all falsework and formwork and any other necessary temporary *Works* for the safe execution of the *Works*.
- m) The *Contractor* takes all necessary precautions to ensure that none of the existing structures and services that are not in the scope of *Works* is damaged during any demolition required. In the event that structures and services which are not in the scope of work is damaged, the *Contractor* is liable to repair or replace the damaged items at their own cost.

3.6.3.2 Standards

The *Contractor* constructs and erects the civil and structural *Works* in accordance with the accepted design/proposal and takes cognisance of SANS 2001 and SANS 1200. In general, the following standards will be adhered to:

SANS 1200	Title
A	General
C	Site Clearance
D	Earthworks
DB	Earthworks (Pipe Trenches)
DM	Earthworks (Roads Subgrade)
GA	Concrete (Small <i>Works</i>)
L	Medium Pressure Pipelines
LB	Bedding (Pipes)
LC	Cable Ducts
LD	Sewers
LE	Stormwater Drainage
M	Roads (General)
ME	Subbase
MH	Asphalt Base and Surfacing
MF	Base
MJ	Segmented Paving
MK	Kerbing and Channelling
MM	Ancillary Road <i>Works</i>
SANS 2001	Title
CC1	Concrete <i>Works</i> (structural)
CC2	Construction <i>Works</i> (minor <i>Works</i>)
CM1	Masonry walling
CT1	Structural timberwork (flooring)
CT2	Structural timberwork (roofing)
CEM1	Cement plaster

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CS1	Structural steelwork
Other	Title
SANS 10400	The application of the National Building Regulations
SANS 10252. Part 2	Drainage installations for buildings
SANS 121	Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods
SANS 10064	The preparation of steel surfaces for coating
SANS 10160	Basis of structural design and actions for buildings and industrial structures
SANS 10162-1	The structural use of steel Part 1: Limit-states design of hot- rolled steelwork
SANS 10162-2	The structural use of steel Part 2: Cold-formed steel structures
SANS 50025 series	Hot rolled products of structural steels Parts 1-6
SANS 10145	Concrete masonry construction

3.6.3.3 Works Related to Existing Infrastructure

Minor *Works* for other engineering disciplines (such as electrical and mechanical equipment) generally require civil support services or amendments to existing infrastructure. For such implementation the following is applicable:

- a) Floor mounted equipment is to be mounted onto concrete plinths, which protrudes at least 50mm (unless otherwise stated) above finished floor level. Vibration elimination rubbers are to be provided between mechanical equipment and the concrete plinth.
- b) All piping and cabling are to be mounted onto cantilever brackets or equivalent means with vibration elimination rubbers provided between any mechanical equipment and the brackets.
- c) Piping and cable trenches will be in accordance with SANS 1200 DB, LB and LC
- d) When utilising existing concrete plinths and equipment supports, a structural integrity assessment is to be carried out by the *Contractor* to verify that the existing structures are capable of supporting the intended replacement equipment prior to any installation *Works* commencing.
- e) The *Contractor* ensures that all openings created in the walls to accommodate pipe work and cabling are adequately sealed to ensure that the existing fire rating of the building is maintained.
- f) The *Contractor* ensures that all openings created on load bearing walls do not compromise the structural integrity of the aforementioned walls. The *Contractor* ensures that all openings created do not compromise or impact any steel reinforcement existing in the structural walls.
- g) With regards to hoisting and rigging of any equipment, the *Contractor* designs and provides the following in order to complete the *Works*:
 - All scaffolding required.
 - Any equipment necessary to complete the *Works*.

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- Lifting facilities.

The *Contractor* ensures that a complete QCP, risk assessment, method statement, ITP and temporary *Works* calculations accompanied by a rigging study, where applicable are submitted to the *Project Manager* for review and acceptance before the *Works* can commence.

- h) The *Contractor* supplies, installs, maintains and removes all temporary construction facilities and utilities necessary to provide the *Works*.
- i) Where space planning or architectural design requires changes to the vertical elements of a structure, assessment will be performed to ensure there are no load bearing elements prior to removal or demolition. The same is applicable to creation of new openings in walls (such as doors or windows) or slabs where an approved design verification and solution will be required prior to the commencement of any *Works*.

3.6.3.4 Concrete Repairs

Reinforced concrete work shall be in accordance with SANS 2001-CC1:2007; Concrete *Works* (structural).

Where existing structural concrete or newly placed concrete require repairs, a Method statement is to be prepared illustrating the extent of the repairs that would be required, procedure, materials and equipment which will be adopted and used to repair the defects identified in all structural concrete elements.

The following types of concrete defects should be covered by this method statement:

- Honeycombs, spalling and voids
- Cracks

3.6.3.5 Steelwork

Steelwork shall be in accordance with SANS 2001-CSI: 2005, Structural Steelwork.

The following parts of SANS 2001 and associated specification data have been amended or have had options selected:

4.1.1 The grade of structural steel if required shall be S355JR to SANS 50025 / EN10025-2

4.1.5 Structural fasteners are to be ordinary bolts and nuts of grade 8.8.

4.2.4.2/4.4.4.5 Attachments to facilitate erections may not remain part of the permanent structure.

A suitable corrosion protection system is to be provided. Furthermore components/substrates/fasteners of dissimilar materials are to be isolated using washers/sleeves or other suitable means to separate the materials to avoid corrosion and or staining.

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3.6.3.6 Sporting Facilities

In addition to the Eskom engineering standards and SANS standards, the *Contractor* is cognisant of the materials required for specialised sporting facilities such as (but not limited to) soccer, padel, tennis, squash, volleyball, netball and basketball courts.

In general:

- Designed foundation's, slabs and surface beds are placed on prepared compacted ground or material that is as per the approved geotechnical design and report.
- Compaction of said ground or materials is in accordance with the specified Mod AASHTO and requirements of the approved geotechnical design and report.
- Drainage is catered for surface, sub-surface and perimeter boundaries of sporting courts and facilities. Drainage is in accordance with the specific court installation guidelines.
- Concrete *Works* are in accordance with the approved designs, SANS 1200 GA Concrete (Small *Works*) and SANS 2001-CC1: 2012.
- Glass panels, where required, are in accordance with SANS 1263-1 is Safety and security glazing materials for buildings – Part 1: Safety performance of glazing materials under human impact.
- Artificial turf, where required, is in accordance the requirements to meet the warranty certification of AGSA (Artificial Grass Southern Africa) or similar. All AGSA profiles are UV coated and have a 12 Year warranty against colour change. (There is no detectable trace of lead in AGSA profiles according to California's Prop 65, which is the strictest standard for lead content of the world. Except for lead, other hazardous elements, and heavy metals, such as Cd, Hg and Cr can also cause health problems. AGSA profiles are free of all these hazardous substances and passed the tests for 73 substances of high concern, 8 kinds of heavy metals).
- All fencing, poles and steel *Works* are galvanised and suitable for outdoor use.
- SBR Rubber and Silica Sand Infill used in sports fields/courts are in accordance with international safety standards, OHSA and sports federation standards, like those from FIFA.

3.6.4 Electrical Engineering *Works*

See clauses 3.4.1.1.1 - 3.4.1.1.8 and electrical section under clause 3.4.2.

3.6.5 Mechanical engineering *Works*

See cluses 3.4.1.3

3.6.6 Process control and IT *Works*

See clause 3.4.2.6.

3.6.7 Operational Requirements

None.

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3.6.8 Maintenance Requirements

None.

3.6.9 Handover Requirements

The Handover Certificate is issued by the Project Manager, if:

- The complete O&M manuals are provided by the *Contractor* and accepted by the Project Manager.
- Punch List is reviewed and accepted by the Project Manager.
- All Guarantees and Warranties are successfully transferred to the Project Manager and the plant is fully handed over to the Employer.
- The site is free from any wastes, residues from site establishment and construction
- If applicable, any delay damage payable to the Employer by the *Contractor* is completed.

3.6.10 Decommissioning Requirements

In the event where the *Works* require safe retirement of existing Electrical, C&I, Civil, Mechanical and Architectural equipment, the *Contractor* shall:

- Safely test (for live items), disconnect, test (health verification), label and remove from service position.
- The Contractor engages the Employer after health verification of equipment for determination of items due for disposal.
- Remove obsolete equipment from service.
- Ensure minimal disruption to operational systems during decommissioning activities.

Environmental and Regulatory Compliance:

All decommissioning work shall comply with:

- SANS environmental standards
- Eskom waste management policies
- National environmental regulations on electronic waste and hazardous materials disposal
- A Disposal Certificate shall be provided for any equipment containing hazardous materials.

3.6.11 Other [as required]

- a) Load verifications of equipment – supporting services for other disciplines.

3.7 LIST OF DRAWINGS

3.7.1 Documentation issued by the *Employer*

This is the list of documents issued by the *Employer* at or before the Contract Date and which apply to this contract.

Note: Some documents may contain both *Works* Information and Site Information.

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Document number	Revision	Title

3.8 ADDITIONAL REQUIREMENTS AND PREREQUISITES

3.8.1 General

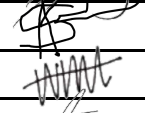
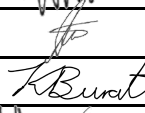
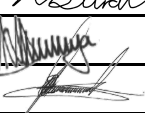
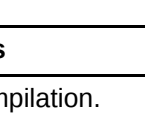
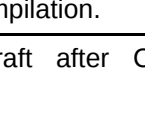
- a) None.

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4. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation	Signature	
Andre Van Der Berg	Snr Engineer C&I		2025/09/11
Andrew Koenane	Snr Engineer Electrical		2025/09/12
Burton Witbooi	Snr Advisor Architecture		2025/09/12
Emmanuel Manganye	Snr Engineer Mechanical		2025/09/12
Kameel Burath	Civil and Structural Engineer		2025/09/12
Nompilo Miya	Engineer C & I		2025/09/12
Sifiso Gwala	Manager Space Planning		2025-09-12

5. REVISIONS

Date	Rev.	Compiler	Remarks
August 2025	0.1	Mdu Vilakazi	First Compilation.
September 2025	0.2	Mdu Vilakazi	Final Draft after Comments Review Process
September 2025	1	Mdu Vilakazi	Final Document for approval, Authorisation and Publication

6. DEVELOPMENT TEAM

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

Name & Surname	Section developed
Burton Witbooi	Architectural scope
Emmanuel Manganye	Mechanical scope
Kameel Burath	Civil scope
Mdu Vilakazi	Electrical scope and integration
Nompilo Miya	Control and instrumentation scope

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