

	User Requirement Specification (URS)	Unique Identifier	240-86056088
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Project Name: System Operating Control (SOC) New Building Project

Substation Name: NA

Transmission Region/Grid: System Operator

Project No: C. TXS0203

Registered Property Co-ordinates : Near Emkhiweni SS

Originator (AIP): MM Palamootil

High level Scope (Give brief description of project requirements)

The Standby National Control, also known as System operating Control (SOC) is located within Generation's Duvha Power Station currently. Several risks and issues have been cited with this building as a result of its age, location and current ergonomic conditions. The building is also used as storage for disaster recovery servers for Eskom's critical systems like Metering systems, TEMSE Energy systems and Telecoms systems. Previous information Technology Disaster Recovery Audit also reported that the Tx server rooms at Duvha does not meet the requirements of the Eskom server room and data centre standard.

The high-level project scope is to develop and construct a new System Operating Control (SOC) building, making provision for adequate operating facilities, space to house the Transmission Power System Control and monitoring (TPSCM) equipment, and provide for the necessary telecommunications infrastructure in a suitable place as per the relevant standards. This will be a national key point and preferably situated near one of the Transmission substations in the Witbank area.

1.1 . CONTROL ROOM TEMSE WORKSTATIONS

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

- **8 X workstations** for Senior Controllers (including envisaged expansion).
- **4 X workstations** for NCC Senior Controllers
- **1 x workstation** for Outage Scheduling function
- **1 x workstation** for TEMSE support
- **1 x workstation** for Senior Advisor (Head of Shift)
- **1 x workstation** for Operations Support function
- **1 x workstation** for SOC Manager.
- **1 x workstation** for Simulation function.

Total of 18 workstations are required.

Each workstation shall have 3X 42-inch monitors and 2 network points for TEMSE.

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

Each console shall allow space for a TEMSE workstation with 3 monitors, a normal IT PC with a monitor, a trader board telephone with direct lines and hotlines, a normal Voice over IP (VoIP) telephone

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1.2 CONTROL ROOM SPECIFICATIONS

- The control room should be of operator focussed design.
- The control room shall be isolated from all external noise sources.
- Lighting shall be functional and suitable for control room operations.
- There shall be antistatic raised flooring with a floor void, minimum 400mm, all tile covering shall be limited to the tile size, and tile covering shall not hinder access to the floor void.
- There shall be dual redundant uninterruptible power supply for operational equipment in the control room.
- All critical services to the control room shall be dual redundant such that no single outage can render the control room unusable.
- There shall be a fire escape exit.

1.3 MAPBOARD WITH MODERN REAR PROJECTION TECHNOLOGY

The new Transmission Control Room must be a mirror-image of the Control Room at National Control (Simmerpan), because it will be a Standby National Control Centre (STABNAC). For this reason, it must have a map-board with rear-projection as per specification installed at National Control (Simmerpan). The design should allow for the doubling of the map board size should the need arise.

- The map board structure house 35 cubes in 7 x 5 matrix centrally located on the plinth.
- The gap on either side of the structure is covered with sound absorbing material that matches the Eskom Standard colour scheme.
- Each cube has a 70" diagonal and has 16:9 aspect ratio.
- The width, height and depth of each projector is 1,550 mm x 872 mm x 625 mm The total height and width of the map board structure is 10,85 m x 4,36m.
- Each cube should have as a minimum a pixilation of 1900 x 1080 pixels that can be upgraded.
- The structure starts approximately 1.14 meters above the plinth so that there is no gap between the ceiling and the top of the structure.
- The weight of each projector is < 73 kg.
- The horizontal screen gap is less than or equal to 2.3 mm. The vertical screen gap is less than or equal to 1.6 mm at 25°C.
- The angle between each projector is 6 degrees.
- Wall mounted Frequency meters X 4 in the control room to be installed next to the map-board.
- Each operator console should have speakers installed with personal volume control per desk.
- The shift supervisor and desk that can be used for loading to have desk mounted frequency meters.

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1.4 COOLING SYSTEM FOR THE MAP-BOARD

- As the LED lifetime drops by 50% if the LED junction temperature increases with 10°C, liquid cooling is applied directly at the junction of the LEDs in order to guarantee the advertised lifetime.
- The back of the map board cooling is of the same standard as any other Data Centre. In no circumstances shall the cooling system allow dust to enter the illumination or projection part of the optical engine.

The front of the map board will be in the control room where office type air-conditioning will be used

1.5 MAPBOARD ELECTRICAL REQUIREMENTS

- The supplier is to provide and install the connections needed to connect to the power supply at the base of each column of projectors.
- The supplier is to provide, install and test earthing straps at the bottom of each column and ensure that each projector is correctly earthed.
- Eskom to provide a 16/32 amp socket at the foot of each column of the map board.

1.6 SERVER ROOM BEHIND MAPBOARD

- The area behind the map board shall serve as a computer room for the control centre.
- This area must have the same cooling as a computer room.
- This area must be sealed from the control rooms for both noise and air conditioning.
- This area will house racks for telecoms systems used inside the control centre, TEMSE switches used inside the control.
- An air-conditioning equipment room required for this area.
- A mobile scaffold with platforms to access the rear of the map board for maintenance purposes shall be required.
- The door to this area must allow the movement of the scaffolding to be used inside the control room when required.
- The flooring should be antistatic, raised flooring, 1500kg/m², 800mm floor void.
- The size of the room shall be the length and of the map board and a depth of 7.2 metres.

1.7 FULLY EQUIPPED TEMSE SIMAULTOR FACILTIY (DTS ROOM)

- The new Transmission Control Room must have a separate TEMSE Training Room with fully equipped simulator servers and workstations that can accommodate the whole SOC shift at a one time (9 workstations, fully equipped with TEMSE hardware and software).
- There shall be a separate lockable instructor's office within the DTS room. This office shall also have a TEMSE Terminal.
- Each workstation to have 2 * 30" monitors. The size shall be 86m², an area the length of 7m, 1.8m high and 45mm deep shall be kitted with built in cupboards for file storage.

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- The DTS room shall be equipped with 2 projectors.

1.8 OFFICES FOR BACK-OFFICE SERVICES

The new SOC Control Room must have the following offices (Five in total):

- **One office** for SOC Manager
- **One office** for Senior Advisor Operations
- **One office** for Senior Advisor Simulations
- **One office** for Outage Scheduling Officer
- **One office** that can house 2 x Operating Officers

Each of the offices to be equipped with an additional TEMSE workstation, with one 24inch monitor, one network point for TEMSE, co-operate points to be included.

1.9 27 X OPEN PLAN OFFICES FOR SYSTEM OPERATOR STAFF

Open plan offices available for installation of TEMSE workstation on demand.

1.10 STORAGE AND WORKSHOP FOR TEMSE SUPPORT

- The new SOC building must be equipped with a storage and workshop area 5x5m.
- The workshop must have 2 x two tier work bench 2m in length, 2 x Lockable steel cupboards, 3 x highchairs and 2 x telephones line (normal UC).

1.11 MEETING ROOMS

- The new SOC Control Room must have two own dedicated boardrooms.
- **One boardroom** is dedicated to the shift on duty (critical discussions, one-on-engagements, etc).
- **One boardroom** for management meetings known as the **Gallery** and it is to also be used for visitors.
- Boardrooms must be fully furnished and must be big enough for a seating of at least 10 people (management team plus average of 3 visitors).

1.12 AIR-CONDITIONING SYSTEM

- There must be separate dual redundant **air-conditioning system** for human areas and equipment / computer systems.
- The HVAC system must be in line with the size of the working space required, as well as computer equipment requirements.
- HVAC shall ensure that all systems can maintain cooling independently to the equipment room blocks. Thus, each equipment room block shall have a dual redundant air-conditioning system.

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- Access control for maintenance and support of the supply shall be limited to authorised personnel only. Future upgrades to the HVAC shall have no negative impact on the operational systems in the equipment rooms and / or people in the control centres.

1.13 POWER SUPPLY REQUIREMENTS

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

1.14 COMPUTER CENTRE

- Duvha SOC building currently houses multidisciplinary areas Tx SCADA, Tx DR Site, Dx SCADA, IT/Metering DR site closely supported by Telecommunications for connectivity. Tx SCADA includes the SOC operation centre which is responsible for switching operations for most of the country. This operations centre started out as an ad-hoc switching centre and largely as a DR site and therefore the configuration has been that of a single system with no redundancy. The responsibilities of this site have steadily increased over the years such that the discussions are on-going about the criticality of this site.
- The Computer Centre shall be designed to house diverse critical equipment from different areas and as such the computer centre should be designed so that each area is given its own computer room/s within the Computer Centre. Dual redundancy shall be employed throughout such that no single contingency shall adversely affect operations. Therefore, critical infrastructure like telecommunications, water, power (raw and UPS), air-conditioning, cable routes shall be diverse and segregated as much as possible to aid in isolation during operations and or upgrade periods such that outages in one area should not affect other areas. Care shall be taken to ensure that environmental conditions are properly mitigated for e.g., lightning spike suppression methods are designed for, water ingress containment from areas below ground level are catered for.
- The server room space for Tx SCADA servers should be no less than what is currently provided for in the computer rooms in the present National Control Data and Energy Centre (DEC). The same configuration as, it is in the DEC shall be retained. The configuration shall be designed in blocks and each block will consist of two compartments as shown in Figure 1, one compartment shall house the production equipment and a spare compartment adjacent to this for upgrade

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purposes. Since a dual redundant system is required then four of these blocks will be required. The physical access control to the production and upgrade compartments shall be independent of each other.

- The equipment room block shall have dual redundant services, such as cooling and power. Each equipment room block shall have an independent fire suppression system. Each equipment room block shall have the configuration as defined in Figure 1. The Data and Energy Centre shall have four (4) of these equipment room blocks resulting in a total of eight (8) compartments. The production system shall be deployed using the four (4) production compartments. The four (4) upgrade compartments shall be used during the system upgrade and hardware replacement cycle of TEMSE/TPSCM when the production and upgrade systems is in parallel operation. The requirements for the compartments are:
 - Two (2) equipment rooms shall be allocated for the System A and System B. The dimensions for the compartments in the System A and System B equipment rooms are 7,5m x 10m.
 - The compartments for the Cluster servers equipment room may be smaller at 7,5m x 5m.
 - The compartments for the Development servers equipment room may the same size at 7,5m x 5m.

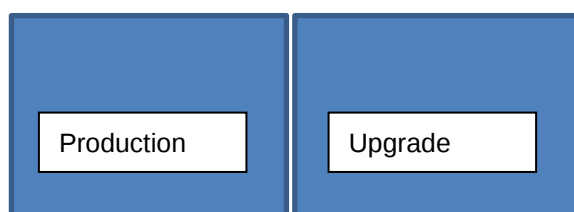


Figure1: Computer Room Configuration Single System:

- Tx/OT will require OT telecommunications cabinets to be housed in the same compartment for distance limitation considerations. Therefore, each area will be required to state the number of blocks they require for their operations.
- Each compartment in each block will have dual redundant power supplies, air-conditioning, fire suppression systems and exits. This configuration also allows most support maintenance teams to access critical equipment that requires frequent inspections from the perimeter of the blocks rather than within.
- Each room shall have two entry/exit points, one trap door for personnel and another door for emergency exit and equipment.
- The computer room floor shall be designed with antistatic, raised flooring with a minimum floor void of 800mm, the floor should with withstand about 1500kg/m² the ceiling shall have a minimum 600mm void. The cabinets should be top entry for data cabling and bottom entry for power cabling. Cabinets shall be arranged such that the most efficient heat extraction methods are possible. Lighting shall be adequate to allow easy reading of the sometimes-small font used

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in data cable labelling. There must be logged access control for all entry and exit points. The doors for equipment access into all areas in computer rooms should allow access for loads on hand operated pallet jacks where the load height excluding pallet jack is 2100mm.

- The door shall be aligned with the hot aisle in the computer room to maximise space within the computer rooms. Assuming cabinets of width 800mm and depth of 1000mm, the floor space required per compartment is 11400mm x 7200mm, which is 82m². The total space for 6 compartments then comes to 492m²
- Each computer room compartment requires 196 303 BTU/hour of cooling and 34 kVA of power.
- There should be non-generator power supply available in the control room and the computer room for reference frequency purposes over and above raw mains.
- Separation of staff access for the maintenance and support of the infrastructure (such as power and cooling) versus those required for computer equipment shall be maintained. The different access control levels shall conform to all cyber security standards.

1.15 TELECOMMUNICATIONS REQUIREMENTS FOR COMPUTER ROOMS

Communication links:

300 X.21 serial ports + 120 ports growth per room (40%)

Ethernet Capacity for 10Gb/s bandwidth which will include.

- NCC – SCC TPSCM connecting the respective DEC rooms (x2)
- NCC – SCC IMM network
- WAMS connection 10Mb/s per room
- ICCP connection 10Mb/s per room
- SAPP IPP 10Mb/s per room
- SCC to 6 respective Dx Control centre.
- Telephone
- Dealer board

Ethernet Capacity for 1 Gb/s bandwidth with the possibility of growth for Security.

Ethernet Capacity for 1 Gb/s bandwidth which will include Group IT connections (1 Gb/s)

Considering the initial System Operator communication requirement between Duvha and Emkhiweni , a dual route configuration with 40Gb/s bandwidth is required.

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1.16 LOCKER ROOMS FOR SHIFT STAFF

- The Transmission Control Room must have Locker Rooms for (7people on shift x 5 shifts) = 35 shift lockers.
- Such shift lockers must be adequately placed in a separate room, but not far from the Control Room itself. Each locker must be lockable.
- The size can be that of a normal compartment, approximately 500mm x 1000mm and about 400mm deep.
- They can be of wooden make affixed along the walls or can be standard steel lockers but still affixed around the walls.

1.17 CONTROL ROOM KITCHEN

There shall be in total four Kitchen areas to service the entire building.

- **One kitchen** inside the control room to only be used by controllers.
- **One kitchen** in surrounding arear to be used by supporting staff and visitors.
- **One kitchen** to be used by controllers during training.
- **One kitchen** to be used by Security personnel and other visitors

The kitchen/s must be fully equipped, as follows:

- running water and sinks
- hot water boiler
- micro-wave oven
- fridge
- lounge with chairs that can seat at least 6 people.

1.18 PARKING FOR EMPLOYEES

- Dedicated covered parking area, which should accommodate at least 18 vehicles at any given time (for controllers on shift, controllers on training week and office staff and 3 visitors).
- Parking area must outside of National Key Point (NKP) boundaries, reference to Security Division specification.

1.19 ABLUTION FACILITIES

- The construction of ablution facilities must be compliance to The National Building Regulations requirements. Shower facilities should be included in the building.

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1.20 GENERAL SUPPORT SERVICES

Department	Responsible	Equipment	Description
Group IT	IM	Basic Applications	Zenzele, Outlook, Phoenix, electronic Log, etc.
National Control Systems Support	TEMSE	TEMSE infrastructure	Energy management systems support
Securities	Safety of personnel and equipment	Security safety measures	Site security support services

1.21 BUILDING SAFETY REQUIREMENTS

- Security and fire systems need to be according to Eskom's requirements as the SCADA system is a zero-downtime system.
- This means adequate provision must be made in terms of fire protection, emergency power, and environmental control as well as for the safety of employees.

1.22 BUILDING DESIGN CONSIDERATIONS

General Considerations

- In design consideration attention must also be given to the blast resistant capability and positioning of the facility in respect to the boundaries of the proposed facility with respect to proximity of offices, sports facilities, training and housing facilities, etc.

Building Design

Fit for purpose' built access control space is required to ensure that all equipment required to fulfill the searching and access control functions is required.

- Due to the lack of information during the current planning stages, it is not possible to provide an exact space requirement.
- Vehicle access to the site must be limited as far as possible.
- No employee or company vehicles will be allowed to park inside the proposed NKP boundary.
- Limited access will be permitted to facilitate operational vehicle movement for deliveries of equipment, emergency, maintenance and rubble removal vehicles.
- The facility will have a dedicated entrance with suitable searching facilities, a vehicle sally port, and sufficient security procedures to manage the required access.
- Due consideration must be given to parking requirements for employees and visitors and larger vehicles.

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- It is proposed that the use of glass facades and windows is kept to a minimum due to the shrapnel it may create during an explosion.
- The building shall have Off-loading and Sorting Room respectively.
- Building shall also have a Refuse Check Room.
- Building shall also have a Gym.
- The Air condition room shall be located closer to the Transmission Scada Rooms
- The Services plant room shall be split into 4 rooms
- Confirmation of Battery room allocation is required

Security Facilities

- All security facilities on site must be designed in accordance with the requirements of the Standard for Bullet Resistant Guard Huts in terms of the protection capabilities of the facility. Manned facilities are required at the NKP access point to the facility.
- The facilities must cater for administrative and regulatory needs namely, office space, control facilities, string room, equipment rooms, ablution facilities, etc, adequate to meet the needs of the security complement at site.

1.23 BLAST PROTECTION

- In terms of blast protection, Eskom does not currently have any standards or specifications dealing with the question of blast protection.
- For this reason, the Engineering team is requested to research the methodology and provide a structure suitably constructed to provide sufficient protection in the event of an explosive event.
- The threats are to be identified by means of the information within the Design Base Threat (DBT) and site-specific Security Risk Assessment.
- Due to the lack of internal experience within Eskom.
- The appointment of experienced blast and design engineers is recommended and engagements with the NKP Regulator must commence as soon as a concept design is in readiness.

1.24 PERIMETER SECURITY

Fence Design

- A three-tier fence design is required around the facility.
- The fence design must consist of an outer barrier high security fence, an energized fence in the middle with an inner protection fence.
- In the design application a clear area is required on the outside of the outer barrier fence of at least 6m.
- The distances available between the fences must be cleared and covered with a suitable ground cover material to enable ease of maintenance.
- The minimum distances required between the fences is 3m.

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- A patrol route is required both on the inside, pedestrian patrols route, and external, a vehicle road, to enable unobstructed patrolling of the perimeter fence structure.
- The fence design must be compliant with the Standard for High Security Mesh Fencing (240-76368574).

Vehicle Gates

- All vehicle gates must be designed in conjunction with the blast protection requirements which is to be determined.
- All gates are to be linked to the access control system from where control will be executed with the required emergency bypass features incorporated in terms of emergency and safety procedures.
- Functionally the gates must form a sally port in which vehicles can be searched on access and egress.
- This function is to be achieved through logic control, which must be exercised through the access control system.

1.25 ENERGISED FENCE

- A 24-strand free standing energized fence with detection capabilities is required around the perimeter.
- The fence must be continued across all gate entrances.
- When closed, the gate(s) must complete the energized fence protection method without exception.
- It is required that the fence be divided into zones as short as possible, in line with the capabilities of the selected energizer to enable the pinpointing of alarms on the fence system.
- Integration between the CCTV and energized fence systems is required.
- This requirement entails video footage being recorded pre and post the alarm event for a particular zone on the energized fence by the appropriate camera corresponding to that specific zone.
- The energized fence design and application must be compliant to the requirements of the Specification for Non-Lethal Energized Perimeter Detection Systems (240-78980848).

1.26 SECURITY LIGHTING

- Security lighting on the perimeter of the boundary security fence is required with the purpose of ensuring even, sufficient light along the perimeter.
- A minimum of 0.5fc is required measured at 6 m outside the outer barrier fence.
- The lighting system must be energy efficient in its design with minimal maintenance requirements.
- The illumination level required at the vehicle entrances and sally ports is a minimum of 10fc even.

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- The security lighting design must be compliant to the requirements of the Standard for Lighting for perimeter security at Eskom installations (290-91252455).

2. PERIMETER DETECTION SYSTEM

- A perimeter pre-detection system(s) is required along the perimeter fence. The intentions of these systems are to enable early warning in the event of breaching events / attempts at the security boundary.
- The deployment of different systems must be investigated but the selected system must be able to detect subterranean activity, digging and tampering through cutting, climbing or any other form of breach attempt at the outer boundary fence.
- The system must be zoned in accordance with the energized fence zoning and similarly integrated with the CCTV system to record events in recording the pre-, actual and post event activities.
- The perimeter pre-detection system must be designed in compliance with the Specification for CCTV Surveillance and Intruder Detection Systems 240-101578948.

3. ACCESS CONTROL SYSTEMS

- The application of access control is required at the facility. There will be two points of access (main entrance and the NKP entrance to the Control facility. The system must integrate the approach as prescribed by the Integrated Access Control project determinations.
- These methodologies determine the need for the deployment of biometric and card-based access verification for employees depending on the zoning requirements of the site.
- Depending on the layout of the site and subsequent zoning requirements, the design team will be guided by the Security Division on the exact requirements per zone.
- As a guideline the following zones are set out as possible zones within the facility:
- Zone 1 – Public zone (area outside the facility);
- Zone 2 – Main access points into the facility, both pedestrian and vehicle access points – Card +Biometric verification.
- Zone 3 – General access into the open areas within the facility – Card access.
- Zone 4 – Limited access areas such as the actual control room facility – Card + Biometric Access.
- Zone 5 –Restricted zones such as guard room facilities, IT server rooms, equipment rooms etc. – Card + Biometric Access.
- The movement of people shall be controlled by means of full height turnstiles and interlocking cubicles as required for access in terms of the specific zones. The determination on the implementation of these devices will be made during the concept design phase of the facility in consultation with engineering.

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- Integration between the access control system and other security systems such as the CCTV system and gate control system is required to ensure the delivery of the required functionalities.
- The implementation of the access control system must be executed in compliance with the following standards:
 - IAC Technical Standard – (IT00118)
 - Specification for Integrated Access Control System (IACS) for Eskom sites – (240-102220945)
 - IAC Security System Integration Standard – (IT00118_ERA 1)

4. SEARCHING

- Dedicated searching points are required at all vehicle access points and pedestrian access points. Searching will be conducted by security personnel with technological aids such as walk-through metal detectors and X-Ray scanners.
- It is to be determined which technologies, if any, will be applied at vehicle searching points and whether dogs might be used or not.
- These variables shall be addressed from an operational need's perspective.
- Dedicated search areas are required large enough to accommodate the scanning equipment, turnstiles, interlocking cubicles and a private searching room where individuals can be searched by hand or mobile metal detector in private.
- The X-Ray units required must be compliant with the Standard for X-Ray Machines - **Error! Unknown document property name.**91252375. Please refer to the Access Control Policy – (32-1134) for guidelines on the requirement for the searching of people, vehicles and goods entering the facility.

5. CCTV SURVEILLANCE

Perimeter CCTV

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

CCTV at Access Points

- A higher concentration of CCTV is required at vehicle and pedestrian access points and must be designed as such.

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- The objective of CCTV cameras at pedestrian access points is twofold, firstly to positively identify an unknown person entering the premises and secondly to provide an overview of the access point in totality without any blind spots being created.

CCTV in critical areas

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

Equipment room(s)

- All CCTV must be linked back to a secure equipment room dedicated to the handling of security control devices.
- These will include routers, switches, PoE devices, servers and storage servers.
- Equipment rooms must be suitably sized to accommodate the identified equipment in rack format.
- The equipment rooms must be suitably cooled to ensure efficient temperature control within the room.
- The limitation of access points into the equipment room is required as far as functionally possible.
- False flooring is recommended to ease the routing of cables and other services required.
- A fire suppression system is required, which is suitable for the application within an electrical and electronic environment.

System Design

- The CCTV system shall comprise of IP cameras, both static and PTZ, installed as per the functional requirements of the facility.
- Local storage of CCTV images and video footage is required.
- The system design and application must be compliant with the Specification for CCTV Surveillance and Intruder Detection Systems – (240-101578948).

6. CONTROL ROOM REQUIREMENTS

- A local security control room is required with the functional responsibility of providing a facility from where all CCTV feeds, alarm events and other security related activities can be managed.
- The control room must be equipped with the cellular, landline and radio communication capabilities and a network link to the RSCC and NSCC.
- The determination on the exact size and layout of this facility is to be determined pending a concept design being completed of the facility.
- Monitoring capability is required at the guard house from where basic functions can be accessed to enable guards have views of the relevant alarms and CCTV footage as required.

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- The Security Control Room shall have two TEMSE workstations for monitoring substation related alarms, like at Simmerpan.

7. ELECTRICAL RETICULATION

- Dedicated electrical supply is required to all security equipment without exception.
- The electrical supply must be housed in separate distribution boards and feed of a separate supply.
- All security devices must be connected to a UPS system capable of sustaining the load factor of the systems for a suitable period to enable a dedicated generator to supply backup supply.

8. SITE SPECIFICATION LAYOUT FOR SECURITY SERVICES

Main security Building:

- To be positioned at the main entrance with flow provisioned for pedestrian access either side of the control room, turnstiles, access control and CCTV to be implemented.
- Provisioning of control room space for four operators in terms of the ESKOM approved Control room standard.
- Building must comply with technical specifications for bullet resistant guard huts in term of the ballistic specifications.
- Provision for men's and ladies change rooms and ablution facilities (Staff compliment to be advised on);
- Provision for office space for a security manager + one admin assistant.
- Office space for a Crime Risk Officer and investigator (TBC);
- Reception desk for interaction with site visitors and enrolments – take note of ballistic requirements for counter/glass.
- Provision for X-Ray and metal detector screening.
- Provision for vehicle access point with vehicle booms, sally port, access control, CCTV.
- Provision for reinforced, automated sliding gate(s)
- Provision for equipment room with desiccated HVAC control according to server room spec.
- Provision of electrical backup supply to building.
- Provision for core hardening of structure – core consisting of control room, armoury, equipment room and critical electrical infrastructure (as designed)
- Provisioning for search room at pedestrian access points.

Control Centre Building:

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- Provisioning for turnstile facilities within foyer equipped with full-height turnstiles, access control, CCTV.
- Provisioning of access control elements, CCTV throughout building – TBD with concept design detail.
- Provisioning of Intrusion detection system, Panic system, PA system for security use of perimeter.
- Security lighting, CCTV, hardening of perimeter structure(s);
- Zoning of areas within the building is integral from a design perspective, ensuring minimal cross movement of technical operator staff in areas and zoning out of rubbish removal facilities and deliveries is critical.
- Due to the limited details available, input will be provided into the detailed designs as they are developed from a security perspective.

9. STANDBY POWER REQUIREMENTS

GENERAL

- From an operational perspective, the following functional requirements need to be fulfilled:
 - The site needs to be operational 24/7/365.
 - Complete redundancy from the utility service entrance all the way to the critical loads.
 - The elimination of all single points of failure as far as possible.
 - The configuration shall be fault tolerant.
 - Planned maintenance shall be possible on system components / sub-systems without affecting the connected load or without transferring the load to bypass mode, which would expose the load to unconditioned power.
 - The HVAC systems shall also be dual redundant to ensure that the critical load equipment operates within their designed temperature range and to ensure that the environment in essential service areas remains comfortable for staff to continue.
 - A SCADA monitor display shall be available at the system controller to show the status of all supplies (utility, generator, UPS systems and DC systems) and the positions of all applicable switches.
 - The placement of the standby power systems shall eliminate the impact of natural disasters and other potential incidents as far as practically possible.

10. SYSTEM TOPOLOGY

The standby power systems at these sites shall comply with the following requirements (see Figure):

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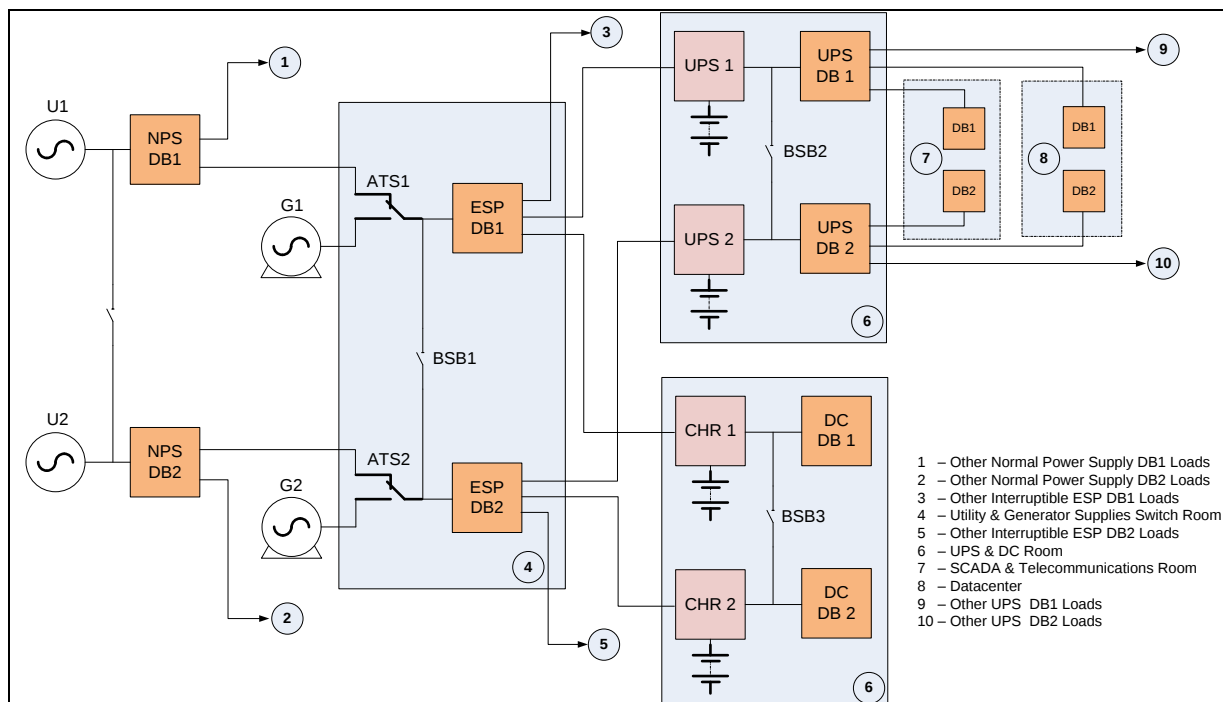
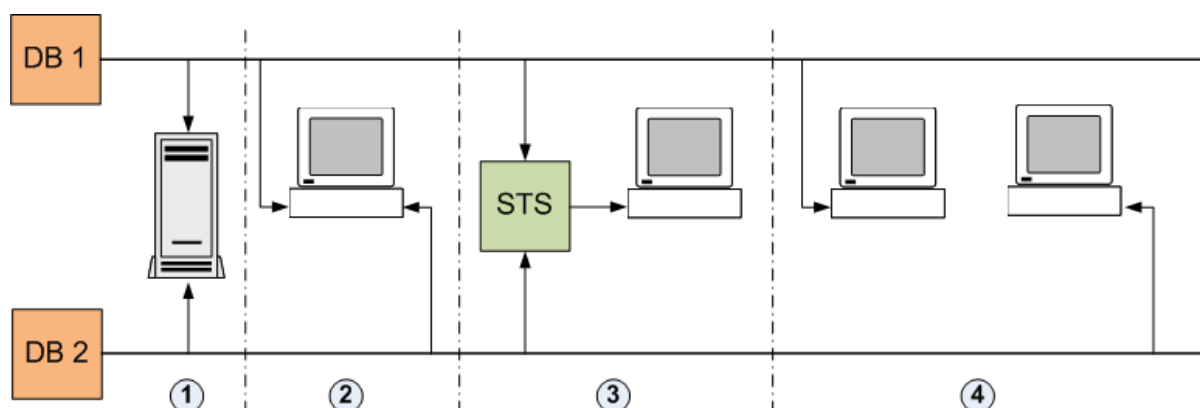


Figure 2: Emergency Standby Power Systems single line block diagram for a Priority 1 site

- All critical services shall be identified and connected to the standby power systems reticulation network.
- The standby power systems topology shall be as a minimum dual redundant (2N or 2(N+1) topology) with two independent power supply paths feeding all critical loads. Each path shall be rated to carry the full critical load of the facility.
- The two independent power supply paths shall be physically separated to prevent a common physical incident from affecting both paths.
- The utility supplies shall be from two independent network locations e.g. it shall if practically possible and if the budget allows not be two feeders from the same substation.
- The utility supplies shall terminate on normal power supply DBs (NPS DB) from where the power shall be reticulated to the normal power supply loads and critical loads.
- Automatic transfer switches (ATS) shall be used to switch between normal utility supply and the alternate diesel generator supply. The ATS switch shall employ a break-before-make operation.
- Each diesel generator shall be rated to carry the critical loads fully. It shall be rated as mission critical diesel generators required run for extended periods of time at full load.
- The diesel generators shall comply with the requirements of [240-62772907](#), Standard for Stationary Diesel Generator Systems
- The output of the ATS shall be connected to the Emergency Power Supplies DB (EPS DB) from where power shall be reticulated to all critical loads that may be interrupted for the period needed for the diesel generator to start-up and be ready to accept load (~30 seconds).
- Each UPS System shall have wrap-around circuits to enable easy replacement, when necessary, without affecting the load equipment.
- The UPS Systems and DC Systems shall be connected to the EPS DB.

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- The UPS Systems and battery chargers shall comply with the requirements of 240-53114248, Thyristor and Switch Mode Chargers, AC/DC to DC/AC Converters and Inverter/Uninterruptible Power Supplies Standard.
- The UPS Systems and battery chargers shall be either standalone or modular systems.
- The UPS Systems and battery chargers in each power supply path shall be rated to carry the critical loads fully.
- Each UPS DB shall supply the various DBs in the critical service areas. Each critical area shall have a UPS 1 DB and UPS 2 DB from where the critical loads shall be supplied.
- Dual-corded load equipment (e.g. load equipment with dual power supplies) shall as far as possible be used in priority sites to make optimal use of the dual redundant power supply paths available. See Figure .
- Single-corded AC load equipment (e.g. workstations) shall be powered from automatic static transfer switches (ASTS) which accepts two independent inputs from the two UPS DBs and provides a secure (firm) output to the load equipment. See Figure .
- In the case of DC circuits, a diode combiner DB shall be installed to provide firm supply to single-corded DC load equipment.



DB : Distribution Board

STS : Static Transfer Switch

1 – Dual corded loads in equipment rack

2 – Dual corded workstation

3 – Single corded workstation supplied by STS

4 – Single corded workstations alternately supplied from DB 1 and DB2

Figure 3: Arrangement of Dual redundant supplies to load equipment

- Each UPS DB shall supply the various DBs in the critical service areas. Each critical area shall have a UPS 1 DB and UPS 2 DB from where the critical loads shall be supplied.
- The requirement for continuous lighting in critical areas shall be met by supplying every alternate light fitting from a power supply path.

11. POWER MANAGEMENT SYSTEM

- A Power Management System (PMS) shall be employed at all the priority 1 sites related to management and operation of the electricity network. The purpose of the PMS is to ensure the

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optimal utilisation and safe operation of all power sources at the site. This may be implemented as part of the Building Management System (BMS) of the site.

- The PMS shall have the following features:
- Provides a holistic overview (single line diagram) of the electrical reticulation network of the site at the control centre.
- The diagram shall include all power sources, power conditioning equipment (utility supplies, diesel generators, UPS systems, DC systems) and the emergency standby power systems network.
- Display the real-time states of all switching equipment.
- Display the real-time state-of-health of all standby power systems equipment (Ready, Warning, Alarm).
- Display the real-time fuel of all diesel generator tanks.
- Display the real-time state-of-charge of all energy storage equipment.
- Date-time-stamped log all system events, alarms and operations.
- Display and record real power, reactive power, apparent power, power quality parameters, voltages and currents at critical distribution boards. This data shall be used to monitor and manage the power usage on the site.
- Implement a load shedding schedule to shed less critical loads when required.
- Implement automated system switching schemes under different power supply conditions to ensure continuous operation of critical loads.

12. BUILDING MANAGEMENT SYSTEM (BMS)

- The Building Management System shall comply with all cyber security requirements and shall enable 24x7 maintenance and support response.

Design Type		New ☐	Refurbishment ☒	Extension ☐	
Busbar Cross flow studies required		YES ☐	NO ☐		
Fault Levels (kA)		Existing 1Φ	Existing 3Φ	New 1Φ	New 3Φ
	V1:				
	V2:				
	V3:				
Power Transformers	MVA N/A	Voltage N/A	Quantity N/A	Comments.....	

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Scope Description						
VOLTAGE 1:						
DESCRIPTION	NEW	REFURB	DECOMM	RELOCATE	FUTURE	COMMENTS:
Feeder Bays						
Busbar						
Bus Coupler						
Bus Section						
TRFR Bay						
ADDITIONAL REQUIREMENTS / COMMENTS						
Approval Documentation Attached						
	No. & Rev			Date	Comments	
TP DOCUMENTS						
PLANNING REPORT	System Operating Control (SOC) New Building Project Initiation Report UID 240-165609301			22/09/2021		
AUDIT REPORT / INITIATING REPORT						
SYSTEM STUDIES & RESULTS						
Equipment Specialists						
Clearances requirements	OHS ACT					
Minimum Basic Insulation Level (BIL)	V1:	V2:				
	V3:					
Pollution Level	Heavy ☒		Extra Heavy ☐			
Insulator Type Preference	Porcelain ☒		Composite ☐			
Transformers condition monitoring requirements	Online Drying System ☒		☐		Online Oil Monitoring System ☒	
	Comments:					
Terrace Extension required			YES ☐		NO ☒	
Comments / Special Requirements						
.						

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

Revision Control			
Rev. No	Date	By	Comments
0	23 Mar 2023	MM Palamootil	
1	16 Nov 2023	MM Palamootil	Telecoms requirements were revised. Controllers monitor size increased to 42 inches.

<u>Originator Representative</u> Tx AM- AIP	Mini Palamootil Name	 Signature	16 Nov 2023 Date
<u>Projects Execution Representative</u> Transmission TPD	Salamina Khanyile Name	 Signature	30/11/2023 Date
<u>System Ops Technical Operations</u> Tx SO	Comfort Masike Name	 Signature	 Date
<u>System Ops NCC</u> Tx SO (if applicable)	Gav Hurford Name	 Signature	 Date
<u>System Ops SOC</u> Tx SO (if applicable)	Timothy Zulu Name	 Signature	 Date
<u>Instrument Transformers & Line Traps</u> PDE – HV Plant (if applicable)	N/A Name	 Signature	 Date
<u>Transformers and Reactors</u> PDE – HV Plant (if applicable)	N/A Name	 Signature	 Date