

 Eskom	Scope of Work	Kusile Power Station
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1. Introduction

The existing perimeter fence system at Kusile Power Station requires modification to enclose the main warehouse facility. The perimeter protection system comprises mechanical and electric fencing, perimeter lighting, Closed Circuit Television (CCTV), Public Address (PA) systems and associated road infrastructure. The scope of the project works includes the engineering design, procurement, construction, installation, testing and commissioning of the required perimeter protection infrastructure.

2. Supporting Clauses

2.1 Scope

2.1.1 Purpose

The purpose of this document is to outline the project specifications for the intended works at Kusile Power Station.

2.1.2 Applicability

This document shall to Kusile power Station

2.1.3 Effective date

This document shall be effective from the date of its authorization.

2.2 Normative/Informative References

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

2.2.1 Normative

Table 1: Employer Standards

Code	Description
Applicable Standards	
240-4332798	Engineering policy
240-5311685	Design Review Procedure
240-53114026	Engineering Change Management Procedure

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Code	Description
Applicable Standards	
240-71432150	Plant Labelling Standard
240-93576498	Coding Standard
240-76992014	Project/Plant Specific Technical Document and Records Management Work Instruction
240-65459834	Gx Projects Documentation Deliverable Requirements Specification
240-57127953	Execution of Site Preparation and Earthworks Standard
240-57127955	Geotechnical and Foundation Engineering Standard
240-107981296	Constructability Assessment Guideline Standard
240-56364545	Structural Design and Engineering Standard
203-770	Kusile Specification for Structural Concrete
240-86973501	Engineering drawing Standard
240-66920003	Documentation Management Review and Handover Procedure for Gx Coal Projects
203-103437	Technical Document Submission and Review Work Instruction
203-770	Kusile Power station specification for structural concrete
240-55714363	Coal Fired Power Stations Lighting and small power installation standard
240-93576498	KKS Coding Standard
240-56227443	Requirements for Control and Power Cables for Power Stations Standard
240-56356396	Earthing and Lightning Protection Standard

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240-55714363	Coal Fired Power Stations Lighting and small power installation standard
BS EN 62676-4	Video Surveillance Systems for use in Security Applications
240-91190304 -	Specification for CCTV Surveillance with Intruder Detection
SANS 10222-5	Electrical Security Installations Part 5: CCTV installations
240-102220945	Specification for Integrated Access Control System (IACS) for Eskom sites
240-86738968	Specification for Integrated Security Alarm System for Protection of Eskom Install and Subsidiaries
240-55410927	Cyber Security Standard for Operational Technology
240-78980848	Specification for Non-Lethal Energized Perimeter Detection System (NLEPDS) for Protection of Eskom Installations and its Subsidiaries
240-64720986	Emergency Preparedness Public Address System – For Large Area Deployment
240-131050729	Hybrid Coding Standard
240-109607732	Eskom Plant labelling Abbreviation Standard
240-106365693	Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings

2.2.2 Informative

[33] 36-681: Eskom Plant Safety Regulations

[34] 474-58 (Rev1): Document and Records Management

[35] 240-105658000: Supplier Quality Management Specification

3. Description of the works

3.1 Executive Overview

A robust perimeter protection solution is required for the main warehouse (ex-GE Store) facility at Kusile Power Station to ensure continuous monitoring, detection and alarming of the area. The facility, covering an area of approximately 66 000 m², including peripheral infrastructure (refer to Figure 1), shall be enclosed within the National Key Point (NKP) fence boundary to maintain an acceptable level of security.

This contract covers the Design and Construction of the ex-GE Store Perimeter Protection works at Kusile Power Station. The objective of the works is to deliver a fully integrated, compliant and resilient perimeter protection system.

The appointed Contractor shall provide multidisciplinary engineering services, including construction supervision and commissioning, in accordance with the Engineering Profession Act (No. 46 of 2000), applicable codes of practice and the latest standards in effect at the contract award date.

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The Contractor shall review existing design data prepared by others that interfaces with or impacts the works and shall assess existing designs for completeness, constructability and compliance. Where necessary, the Contractor shall propose value-adding design improvements and assume full design responsibility for all designs prepared or amended under the contract. All designs and construction activities shall be professionally executed and signed off by ECSA-registered professionals.

The works comprise civil, structural, electrical, mechanical and C&I disciplines and include perimeter and electric fencing, CCTV surveillance and public address systems, security lighting, patrol road, stormwater drainage, earthing systems, conduits, manholes, plant labelling and associated infrastructure.

The Contractor shall provide technical oversight during construction and commissioning to ensure compliance with approved designs and standards and shall issue the required Certificates of Compliance for the works.

The Contractor shall further provide testing, commissioning, training, spares, special tools, complete documentation, and accurate as-built records to support safe operation and long-term maintenance. Upon completion, the Contractor shall deliver a fully functional, certified, and operational perimeter protection system, ready for use at Kusile Power Station.

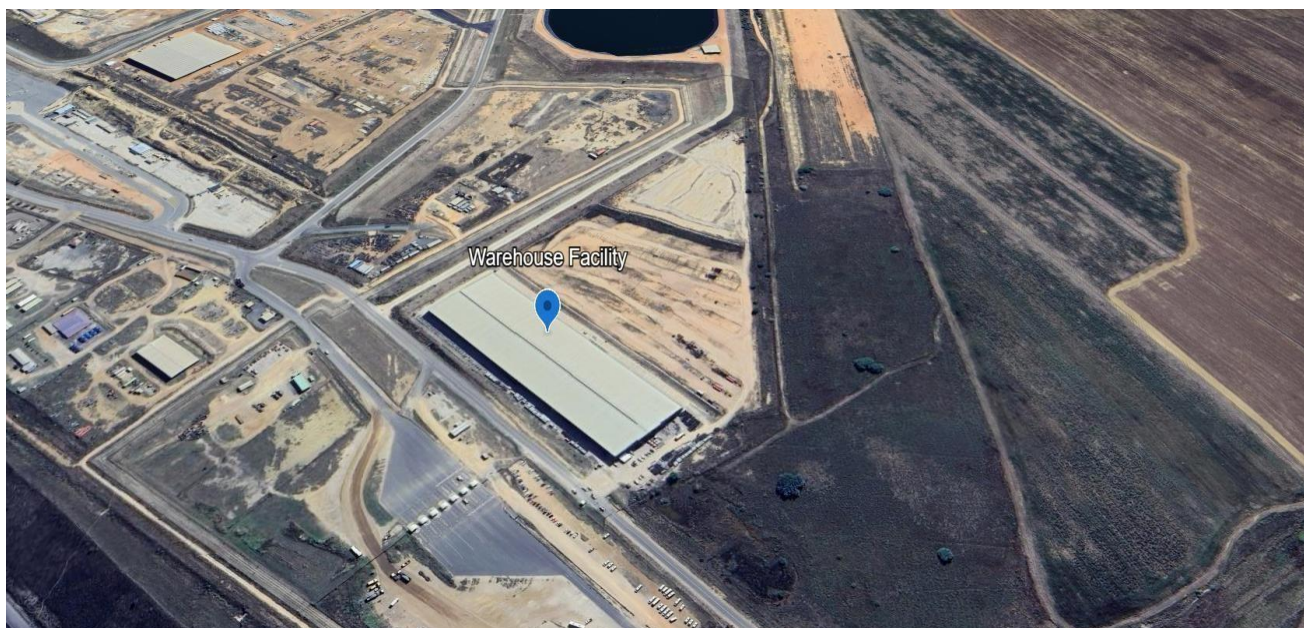


Figure 1: Warehouse Aerial View

3.2 Employer's objectives and purpose of the works

The proposed perimeter protection works will act to safeguard the restricted area.

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3.3 Interpretation and terminology

Abbreviations

Abbreviation	Description
CBMS	Consolidated Building Management System
CCTV	Closed Circuit Television
CoC	Certificate of Completion
C&I	Control and Instrumentation
ECSA	Engineering Council of South Africa
HVAC	Heating, Ventilation and Air-conditioning
ITP	Inspection and Test Plan
NKP	National Key Point
OHS Act	Occupational Health and Safety Act
O&M	Operating and Maintenance
PEC	Professional Engineering Certificate
QA	Quality Assurance
QC	Quality Control
QCP	Quality Control Plan
uPVC	Unplasticized Poly Vinyl Chloride
SANS	South African National Standards

3.4 Roles and Responsibilities

Contractor

The Contractor shall be responsible for the following:

1. Execution of the Works
 - Execute the defined works in accordance with the provided scope
 - Provide all necessary material, plant, equipment and labour to deliver the required service
 - Ensure that current and correct site drawings are obtained, understood and communicated to all personnel undertaking the works
2. Competence and Resourcing
 - Ensure that all appointed personnel possess the required competencies, qualifications and experience to perform the works safely and effectively.
 - Ensure that all employees or agents are medically, physically and psychologically fit to carry out the works
 - Ensure all employees hold a valid medical certificate of fitness specific to the work to be performed.
 - Ensure all personnel undergo safety induction prior to commencing work at the power station site.
3. Health, Safety and Environmental Compliance
 - Ensure full compliance with the Occupational Health and Safety Act (OHS Act) No. 85 of 1993 and all associated regulations.
 - Ensure compliance with Eskom's SHE policies, procedures, standards, guidelines, specifications and site regulations.
 - Conduct risk assessments for the required works and implement appropriate control measures.
 - Ensure all safety and health related incidents and hazards that pose a danger to life or health are

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reported immediately.

- Ensure all prescribed PPE for the specific works is provided (Consultant's responsibility) and worn at all times.
- Ensure that all power tools, equipment and plant are inspected and certified as required.

4. Employer

- Provide support, technical information and documentation relevant to the required Service.
- Review and accept the Consultant's method statement, Quality Control Plan (QCP)/Inspection and Test Plan (ITP).
- Attend all applicable inspection intervention points, as defined in the ITP, where applicable.

4.1 Site Description

The Kusile Power Station site is located approximately 37km northwest of eMalahleni in the Mpumalanga Province. The site is accessed from the R686 road between highways, N4 and N12. The site has approximate coordinates 25° 55' 07.34"S and 28° 54' 43.30"E.

The location of the warehouse facility is given in Figure 1. The facility serves as the main storage area for material stock at the site.



Figure 2: Warehouse Location

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4.2 General Scope of the works

The scope of the Works includes the design, procurement, manufacture, fabrication, factory testing, supply, storage, delivery to site, construction, installation, erection, quality assurance, site testing and commissioning of the elements listed below.

The works are based on the Employer's basic design. All design documents and drawings provided by the Employer are issued for information purposes only. The Contractor shall be fully responsible for the review, verification and development of the design and for all system interfaces forming part of the works, including the identification, coordination and integration of all project interfaces.

The detailed technical project requirements are specified in Section 3.6.

The scope of the works includes, but is not limited to, the following:

- Design review, assessment and optimisation of existing perimeter protection designs.
- Civil, structural, electrical, mechanical and control and instrumentation (C&I) works associated with the perimeter security infrastructure.
- Construction of security fencing, electric fencing, CCTV surveillance systems, lighting, patrol roads, stormwater structures and all associated foundations.
- Installation of precast concrete CCTV camera poles, perimeter public address (PA) systems, lighting poles, manholes, conduit sleeves and earthing systems.
- Installation, testing and commissioning of all electrical, C&I, CCTV, lighting, and security systems.
- Provision of plant labelling in accordance with Eskom KKS standards.
- Provision of spares, special tools, documentation, training and complete handover of the works.
- Compliance with all applicable South African National (SANS) and regulatory standards including corporate Eskom standards.

The Contractor shall be fully responsible for delivering a complete, compliant, fully functional and integrated perimeter protection solution suitable for long-term operation at Kusile Power Station.

4.2.1 PERIMETER PROTECTION DESIGN & WORKS

The boundaries of the Scope of Works are defined herein. The Contractor's duties shall include, but not be limited to, the following activities:

a. Planning and Investigations

- Site feasibility and layout planning including route optimization for infrastructure and utilities

The Contractor shall undertake site feasibility assessments and layout planning, including route optimisation for the related perimeter protection infrastructure.

The proposed routing for the perimeter protection infrastructure is indicated in Figure 3. The Contractor shall evaluate the suitability of the proposed route. Where the proposed route is deemed unsuitable, the Contractor shall identify and propose alternative routing solutions for approval by the Employer or Project Manager.

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Figure 3: Proposed Routing for Perimeter Security Infrastructure

- Subsurface utility mapping

The Contractor shall perform utility detection and mapping to identify all existing underground infrastructure within the site, including but not limited to stormwater drains, electrical cables, water mains, sewer lines, communication ducts etc. Appropriate detection methods (e.g., Ground Penetrating Radar) shall be proposed by the Contractor and implemented subject to approval. All detected utilities shall be clearly marked on site prior to construction, recorded and incorporated into detailed utility layout drawings and considered during design development and construction planning.

- Topographical surveying

The Contractor is responsible for the complete surveying and setting out of the works. This shall include but not be limited to:

- Conducting a topographical survey to establish base mapping for design development.
- Establishing, verifying and safeguarding all control points, benchmarks and reference markers required to execute the works.
- Provide complete setting-out data based on approved design drawings
- Verifying all survey data prior to commencement of construction activities

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- Geotechnical investigations

The Contractor shall conduct geotechnical investigations to assess ground and subsurface conditions relevant to the perimeter protection infrastructure. Investigations may include but are not limited to:

- Field investigations i.e. Dynamic Probe Super Heavy (DPSH), Dynamic Cone Penetrometer (DCP) tests including test pit excavations, soil sampling and profiling etc.
- Laboratory testing of soil samples, as required etc.

A comprehensive Geotechnical Report shall be prepared and submitted, including:

- Site geology and subsurface conditions
- Borehole logs and/or test profiles.
- Field and laboratory test results
- Groundwater conditions
- Foundation and earthworks recommendations
- Assessment of soil suitability
- Identification of geotechnical risks
- Recommendations for foundations, earthworks, dewatering and soil stabilization measures.

The Contractor shall determine the extent and scope of the geotechnical investigations based on the scale and nature of the infrastructure and shall obtain approval from the Employer or Project Manager prior to commencement of fieldwork. All geotechnical reports shall be signed by a Professional Engineer registered with ECSA in the discipline of Geotechnical Engineering. The Contractor shall bear full responsibility for the accuracy, completeness and interpretation of all geotechnical and utility investigation data and shall immediately notify the Project Manager of any findings that may impact design, cost, programme, safety or constructability of the works etc.

b. Design Services

The Contractor shall provide full multi-disciplinary design services for the perimeter protection works. All designs shall be developed from the Employer's basic design, fully coordinated across disciplines, and compliant with all applicable SANS standards, Eskom specifications and statutory requirements.

i. Civil Engineering

The Contractor shall be responsible for the civil engineering design, including but not limited to:

- Design of fence system civil works and supporting structures
- Design of patrol road pavement
- Design of stormwater management systems
- Design of utility reticulation structures (trenches, ducts, tunnels, manholes etc.)

ii. Structural Engineering

The Contractor shall be responsible for the structural design of all permanent works, including but not limited to:

- Structures supporting lighting, CCTV and PA systems, electrical equipment and utilities
- Steel, reinforced concrete and masonry structures associated with the perimeter protection system

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iii. Electrical Engineering Design

The Contractor shall be responsible for the electrical engineering design, including but not limited to:

- Design of the electric fence system including power supplies, monitoring and fault detection etc.
- Design of roadway and perimeter lighting systems
- Design of earthing and lightning protection
- Design of cable routing and containment systems (i.e. cable trays, conduits, sleeves etc)
- Integration of generator and Uninterruptible Power Supply (UPS) systems to ensure continuity of operation

iv. Control and Instrumentation (C&I) & IT

The Contractor shall be responsible for the design of all C&I and IT systems associated with the perimeter protection Works, including but not limited to:

- Design security perimeter surveillance systems (CCTV)
- Design perimeter public address (PA) systems
- Design IT infrastructure

v. Construction Monitoring and Commissioning

The Contractor shall provide construction monitoring and commissioning support in accordance with ECSA Level 3 guidelines, including but not limited to:

- Part-time on-site supervision and quality assurance during construction
- Review and approval of construction methodologies, procedures and materials
- Response to technical queries, design clarifications and concession requests
- Management of multi-disciplinary interfaces and system integration
- Monitoring, witnessing and sign-off of testing and commissioning activities

vi. Statutory Compliance and Certification

The Contractor shall ensure full statutory compliance and certification of the works, including but not limited to:

- Engineering design reviews, approvals and sign-off by registered ECSA professionals for each discipline
- Compilation, certification and submission of complete as-built drawings documentation

4.2.1.1 Consultant's key persons

The Contractor shall submit a Personnel Schedule detailing the qualifications, relevant experience and professional registrations of all proposed key persons for the works. All key persons shall be suitably qualified, experienced and professionally registered with relevant statutory or professional bodies. The Contractor shall ensure that the key persons listed below are appointed prior to commencement of the works and remain available for the duration of the works, unless otherwise approved in writing by the Employer: Any proposed replacement of a key person shall have qualifications and experience equal to or greater than those of the individual being replaced and shall be subject to the Employer's prior written acceptance.

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- **Project Manager:**
 - Professional registration with the South African Council for Project and Construction Management Professions (SACPCMP)
 - Minimum 5 years' experience in contract administration within engineering and/or infrastructure projects with demonstrable experience in the administration and management of NEC contracts.
- **Civil Engineer or Technologist:**
 - Professionally Registered with the Engineering Council of South Africa (ECSA).
 - Minimum 5 years' experience in civil infrastructure works i.e. roads, earthworks, and drainage.
- **Structural Engineer or Technologist:**
 - Professionally registered with ECSA (Pr. Eng or Pr. Tech Eng)
 - Holds a formal qualification in Civil Engineering (BSc Eng/BEng/BTech/MEng or equivalent)
 - Minimum 5 years' demonstrable experience in structural design and construction supervision.
- **Geotechnical Engineer:**
 - Professionally registered with ECSA (Pr. Eng or Pr. Tech Eng)
 - Holds a formal qualification in Civil Engineering (BSc Eng/BEng/BTech/MEng or equivalent)
 - Minimum 5 years' experience in geotechnical investigations, foundation design and construction support etc.
- **Electrical Engineer or Technologist:**
 - Professionally registered with ECSA (Pr Eng or Pr Tech Eng).
 - Holds a formal qualification in Electrical Engineering (BSc Eng/BEng/BTech/MEng or equivalent)
 - Minimum 5 years' experience in electrical infrastructure and security related systems.
- **Control and Instrumentation Engineer or Technologist:**
 - Professionally registered with ECSA (Pr Eng or Pr Tech Eng)
 - Holds a formal qualification in Electrical or Electronics Engineering (BSc Eng/BEng/BTech/MEng or equivalent).
 - Minimum 5 years' experience in control, instrumentation, CCTV and security systems.
- **IT Engineer Resource:**
 - Holds a formal qualification in Information Technology, Computer Science, Information Systems, Software Engineering or a related field (BSc/BEng/BTech/MEng)
 - Minimum 5 years' post qualification experience in design, implementation, management and support of IT systems and infrastructure etc. The resource demonstrates knowledge in information security, network management, systems integration etc.
- **Construction superintendent or site agent**

Responsible for on-site management and coordination of the works, and shall meet the following minimum requirements:

 - Relevant qualification in Civil Engineering or Construction Management.
 - Minimum 5 years demonstrable experience in supervising civil engineering construction works of a similar nature and complexity.
- **Electrical Installation Electrician Resource:**
 - Holds a valid national certificate (NQF level 4 or high) in electrical Engineering or trade test certificate as an electrician

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-
- Has possession of a wireman's license
 - Registered by the Department of labour
 - Has at least 5 years' demonstrable experience in the construction and/or reticulation electrical sector
- Professional Land Surveyor:
 - Registered with the South African Geomatics Council (SAGC)(Professionally registered)
 - Minimum 3 years' experience in engineering and construction surveying.
 - Draughtsperson(s):
 - Minimum Grade 12 qualification or equivalent.
 - Minimum 5 years' experience in preparing civil, structural, C&I and electrical drawings.
 - Document Controller/Records officer
 - Minimum 3 years' experience managing project documentation.

4.2.1.2 Security Fencing

Mechanical Fence

- a. The Contractor provides the design development, supply, installation and construction of a double-tier mechanical security fence system enclosing the facility
- b. The *Contractor* reviews the Employer's fence design information and notifies the Project Manager of any inconsistencies or omissions. Any proposed changes or additions required to achieve a complete and functional fence system are submitted for acceptance before implementation.
- c. The fence layout covers an estimated 955m of perimeter fencing. The Contractor verifies the fence coordinates and alignment on site with the Employer before installation. The Contractor notes that verification does not change the Contractor's responsibility to provide the works in accordance with the scope.
- d. The mechanical fence design and installation complies with the following Employer's drawings unless amended by an accepted change:
 - 0.90/707 - P146838-0UYX-S3916A Rev. 2 – Security Fence – Post Concrete Bases and Gate Details
 - 0.90/708 - P146838-0UYX-S3916B – Security Fence
 - 0.90/709 - P146838-0UYX-S3916C – Security Fence
 - 0.90/710 - P146838-0UYX-S3916D – Security Fence
 - 0.90/711 - P146838-0UYX-S3916E – Security Fence
 - 0.90/712 - P146838-0UYX-S3916F – Security Fence
 - 0.90/59093 – P146838-0UYX-S3916G – Security Fence, Single Swing Access Gate, Plan, Elevations and Details
 - 0.90/59094 - P146838-0UYX-S3916H – Security Fence
 - 0.90/59093 – P146838-0UYX-S3916G – Security Fence, Single Swing Gate Keep Details

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- e. The general arrangement of the mechanical fencing is shown in Figure 5.

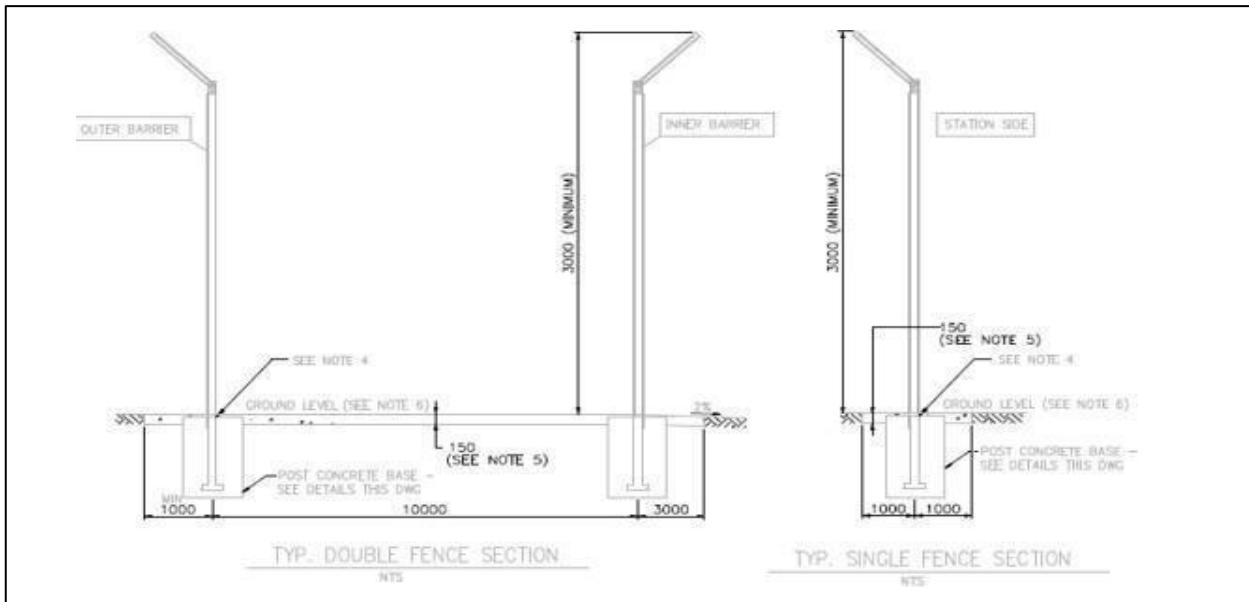


Figure 5: General Arrangement – Mechanical Fencing

Mechanical Gates

- a. The Contractor provides the design development, supply, installation and commissioning of all mechanical security gates
- b. The Contractor installs eight (8) single swing gates at Positions 4 and 5 as shown in Figure 3, including interfaces between new and existing fencing and the road crossing location. The Contractor ensures that the interfaces between new and existing fencing and gates form a continuous and secure barrier without gaps, misalignment or loss of security performance
- c. The gate configuration complies with Table 2 and the arrangements shown in Figure 6.
- d. Mechanical gate designs and installation comply with the following Employer drawings unless amended by an accepted change:
 - 0.90/59093 – 146838 – 0UYX – S3916G – Security Fence Single Swing Access Gate Plan, Elevations and Details
 - 0.90/59094 – 146838 – 0UYX – S3916H – Security Fence Gate Post Foundations
 - 0.90/59095 – 146838 – 0UYX – S3916J – Security Fence Single Swing Gate Keep Details

Table 2: Gate Details (Refer to drawing: 0.90/59093)

A (mm)	B (mm)	Foundation type (P146838-0UYX-S3916H)	T.O.C Foundation
4950	4630	1A/1B/1C/1D	100 mm above ground level (max)

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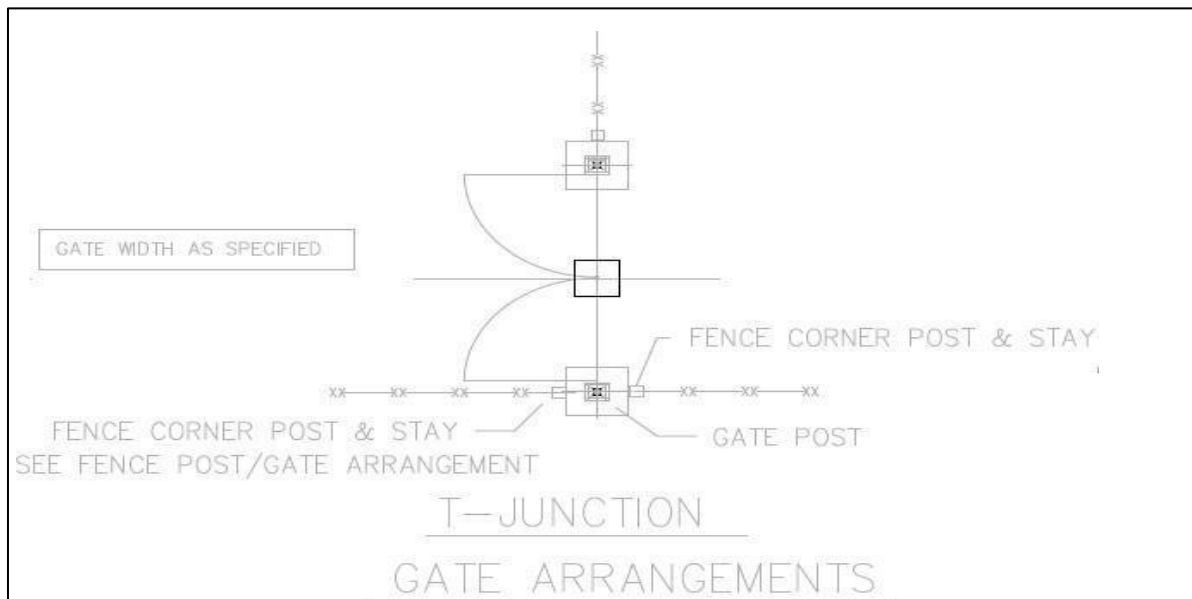


Figure 6: Gate Arrangement at Fence Junction

Stormwater Crossing Works

- a. The Contractor designs, supplies, constructs and completes three (3) bridge/culvert crossings at all stormwater drainage interface points with the perimeter fence at Positions 1, 2 and 3 as shown on Figure 3.
- b. The crossings provide continuous and secure support to the perimeter fence while maintaining uninterrupted stormwater flow
- c. Ditches 1 and 2 are each approximately 20m wide and 3m deep. Typical details of the existing station bridge crossings are shown in Figure 7.
- d. The Contractor secures all stormwater drainage points that interface with the perimeter fence using security grids, forming a continuous security barrier. Security grids comply with the typical details shown on drawing 0.90/25015 and Figure 5.
- e. All steel components including bridge members, grids and fixings are galvanized for corrosion protection.
- f. The Contractor supplies and installs guardrail systems along all stormwater crossings located on the fence line to restrain and guide vehicle. The total length of guardrail systems is approximately 22m. The guardrails comply with the requirements of SANS 1350 and are installed in accordance with the typical details shown on drawing 0.90/71779.
- g. The stormwater crossings and guardrail systems comply with the following Employer drawings unless amended by an accepted change:
 - 0.90/23491 – 146838-0UZJ-S5882 – Fence Bridge – Foundations Plans, Sections & Details, Fence Bridge 1
 - 0.90/24999 - 146838-0UZJ – S55884 – Fence Bridge – Foundations Plans, Sections & Details, Fence Bridge 2
 - 0.90/25015 – 146838-0UZJ-S5885 – Fence Bridge – Foundations Plans, Sections & Details, Fence Bridge 2

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- 0.90/71779 – 146838 – 0GUA – S3573 – Site Finishing – Site Guardrail Details



Figure 7: Security Grid Arrangement (Culvert/Bridge Crossing)

Electric Fence Design

- a. The Contractor provides the design development, supply, installation, testing and completion of an electric perimeter fence system
- b. The Contractor reviews the employer's fence design information and notifies the Project manager of any inconsistencies or omissions. Any proposed design changes or additions required to achieve a complete and functional system are submitted for acceptance before implementation.
- c. The Contractor installs approximately 955m of electric fencing located between the mechanical fence lines. The electric fence is free-standing and erected at a minimum distance of 5m from the mechanical fence.
- d. The electric fence system complies with SANS 10222-3:2003, Occupational Health and Safety Act (85 of 1993) and Standard - 240-78980848 [Specification for Non-Lethal Energized Perimeter Detection System (NLEPDS) for Protection of Eskom Installations and its Subsidiaries]

Strain Posts (In-line and Corner)

- e. Strain posts are provided at all in-line and corner location to maintain structural integrity and wire tension of the electric fence system.
- f. Strain posts are manufactured from 100mm x 100mm x 3mm square tubing, approximately 3000mm in height and fitted with welded strut brackets to accommodate strut fixings.
- g. Strain posts are configured to accommodate multiple fence wires using strain insulators at regular vertical spacing and non-metallic tensioning devices for controlled wire tensioning

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- h. Strain posts are supported by two (2) steel struts, installed in opposing directions to ensure stability of the fence system.
- i. All strain posts, struts and associated fixings are galvanized for corrosion protection and are supplied complete with all necessary insulators, tensioners, bolts, nuts and washers etc. to form a fully functional installation
- j. Foundations are provided as follows:

Strain posts: 500 mm x 500 mm x 600 mm deep, 20 MPa concrete

Struts: 500 mm x 500 mm x 300 mm deep, 20 MPa concrete

- k. The maximum spacing between two consecutive strain posts does not exceed 80m.

Intermediate posts

- l. Intermediate posts are provided to support and maintain alignment of electric fence conductors between strain posts
- m. Intermediate posts are manufactured from galvanised 40 mm x 40 mm x 3 mm hot-rolled steel angles, 3000mm in height suitable for accepting intermediate insulators at regular spacing
- n. Posts are installed in 300 mm x 300 mm x 300 mm deep, 20 MPa reinforced concrete foundations.
- o. The spacing between consecutive intermediate posts does not exceed 3m
- p. All posts are sealed to prevent water ingress and corrosion.

Gate Specifications (Electric Fence)

- q. The Contractor reviews the Employer's electric gate designs [PGE- 0000-0000-SAG1-GA-001] and notifies the Project manager of any inconsistencies or omissions. Any proposed design changes or additions required to achieve a complete and functional system are submitted for acceptance before implementation.
- r. The Contractor supplies and installs two (2) double - leaf electric fence gates at the interfaces between new and existing fencing and at the road crossings at Positions 1 & 3. Each gate has an approximate clear opening of 10 m and is mounted on wheel tracks.

Gates are of comparable quality and provide a comparable level of security to the adjacent fencing, have an overall height not less than the adjacent fence and align top and bottom rails with the adjacent fence rails.

- s. Gate frames are constructed from rectangular hollow sections, with continuous welds at all joints.

Gates are provided with locking devices. Double-leaf gates are fitted with a sliding horizontal locking bar, secured to a locking plate welded to the gate frame at approximately mid-height and not exceeding 1.5 m above ground level. The locking bar passes through both meeting stiles to secure the gate leaves in the closed position and is drilled to receive a padlock.

Concrete Anti-tunnelling Beam

- t. The Contractor constructs a 20Mpa reinforced concrete anti-tunnelling T beam, 100mm wide x

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500mm deep, beneath the full length of the electric fence to prevent unauthorised access by under – burrowing. The anti-tunnelling beam is continuously beneath gate openings, gate posts etc.

- u. The beam complies with Figure 8a and drawing: KUS000-09 – Kusile NLPEF Post and Concrete Slab Installation.

Vegetation Control Concrete Slab

- v. The Contractor provides a vegetation control concrete slab beneath the electric fence to prevent vegetation overgrowth and false alarms activation.
- w. The control slab is constructed of minimum of 20Mpa concrete, consists of panels, 800mm wide x 5000mm long x 75mm thick, laid at 150mm centers and has joints butted. Soft board expansion joints, 800mm x 50mm x 10mm, are provided at a maximum spacing of 5 m centres.
- x. The slab installation complies with Figure 8b and drawing: KUS000-09 – Kusile NLPEF Post and Concrete Slab Installation.

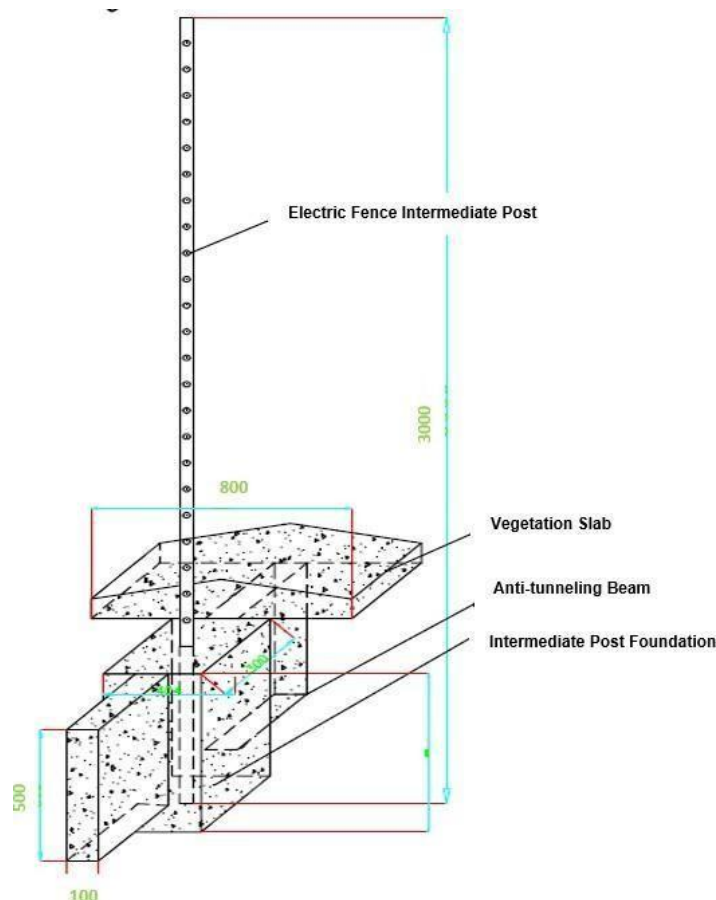


Figure 8a: Vegetation Slab and Anti-tunnelling Beam General Arrangement

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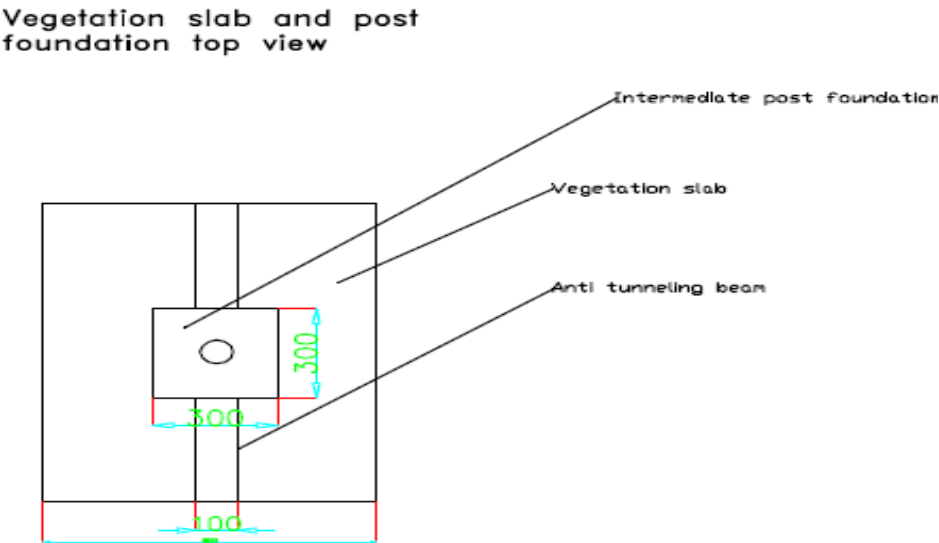


Figure 8b: Vegetation Slab and Anti-tunnelling Beam Plan Layout

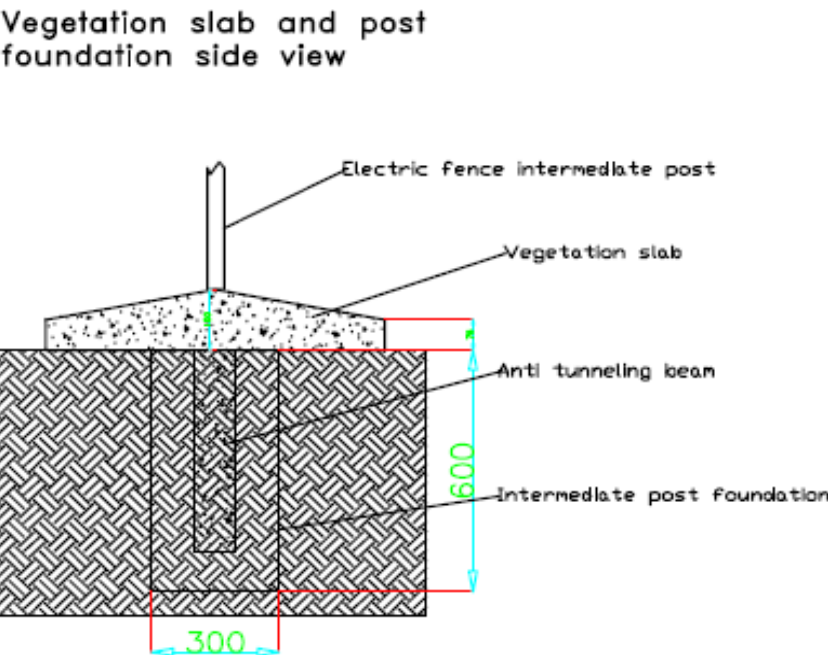


Figure 8c: Vegetation Slab and Anti-tunnelling Beam Elevation Detail

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Warning signage

The Contractor shall provide warning signage displayed conspicuously along the length of the electric fence, on fence posts and at all access points. Each warning sign shall have minimum dimensions of 200 mm × 100 mm. The lettering, symbols, colours and layout of the warning signage shall comply with SANS 60335-2-76.

4.2.1.3 Patrol Road

The Contractor shall design and construct a continuous patrol route along the full length of the perimeter fence. The patrol route shall be located on the inside boundary of the site perimeter fence system. The Contractor shall design and construct all associated stormwater drainage works required for the patrol route. The patrol route pavement shall be designed in accordance with the existing pavement layer design shown in Figure 9. The approximate length of the patrol route is 550m.

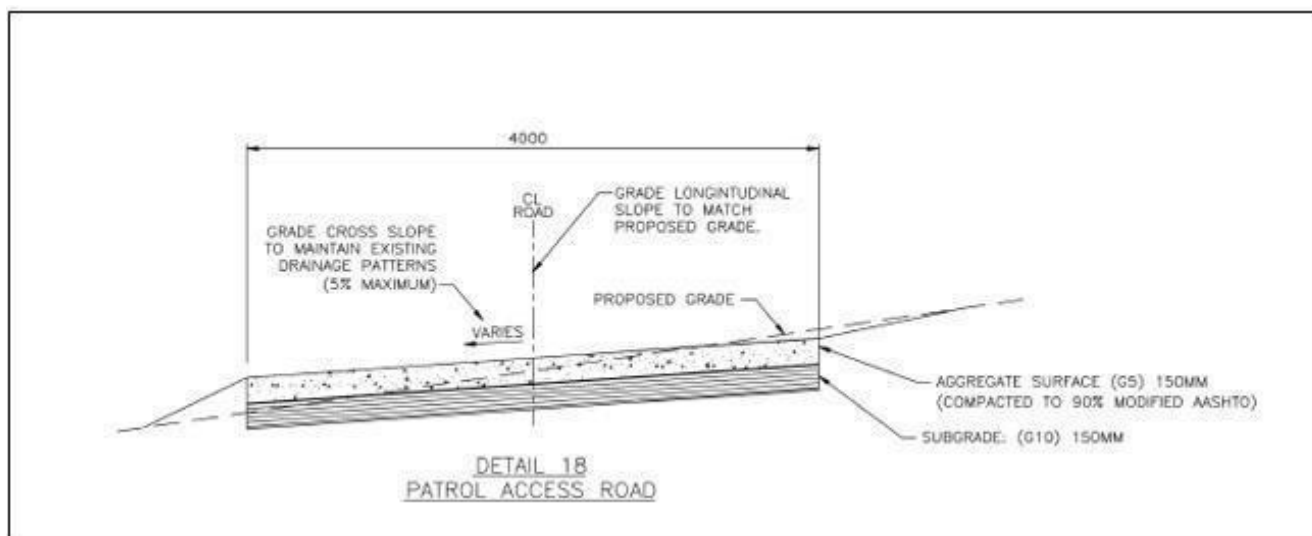


Figure 9: Typical Road Section

4.2.1.4 Perimeter CCTV Civil Infrastructure

Precast Concrete Poles (Security & Monitoring Application)

The Contractor shall design, supply and install precast concrete poles suitable for mounting surveillance cameras, in accordance with Figure 11 (typical details). Each pole shall be designed to resist an ultimate load of not less than 2.5 kN. Each pole shall include a cable entry box, and an inspection box or opening. The cable entry and inspection boxes shall be manufactured from galvanised steel and shall have approximate dimensions of 465 mm × 145

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mm. The poles shall be installed in concrete mass fill foundations. Each pole shall be earthed for lightning protection using 50 × 3 mm earth tails or equivalent. Earth tails shall be buried and welded to the base of the fence in a manner that is not readily visible. All earthing joints shall be painted the same colour as the fence to deter theft. The earthing installation shall comply with the latest revision of the applicable Earthing and Lightning Protection Standards. All pole openings shall be sealed with a suitable weatherproof sealant. The precast concrete poles shall comply with SANS 470.

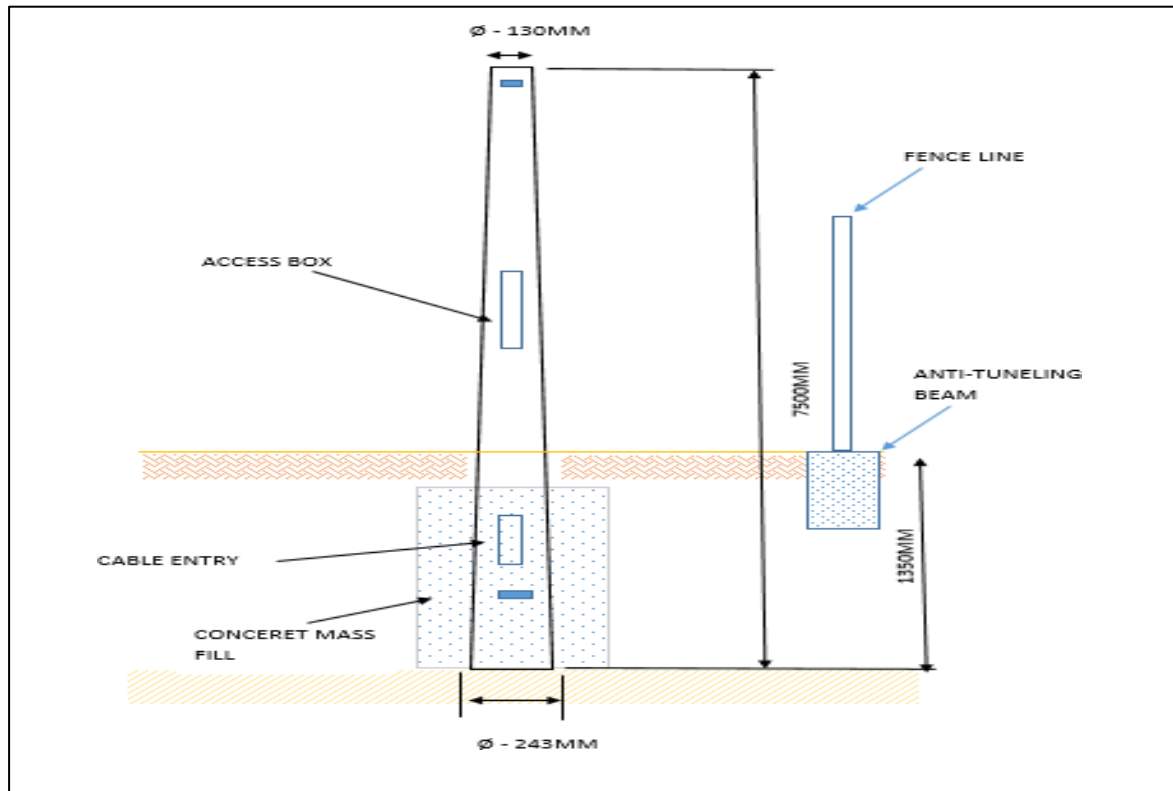


Figure 11: Schematic – CCTV Camera Pole Arrangement

Manholes

The Contractor shall design, supply and install manholes that are lockable and watertight to prevent unauthorized access and the ingress of water. Manhole covers shall be secured within their frames by a locking device or equivalent, designed to allow opening using standard tools. All manholes shall be of heavy-duty construction and suitable for the intended load conditions. Manhole tops shall comply with all relevant requirements of SANS 50124.

Conduit/Sleeve Pipes

The Contractor shall Provide, install, and test cable conduit sleeve pipes for the protection of electrical and

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communication cables. The conduit pipes shall have the following specifications

Total length: ~955m

Material: HDPE or other suitable

Nominal diameter: ~110mm

The conduit sleeves shall traverse a gravel or surface aggregate road section of approximately 48m. The Contractor shall allow for this condition in the design and installation (refer to Figure 11 for typical details).

The conduit pipes shall comply with SANS 61386-24 and installation shall be in accordance with the SANS 1200 series.

Conduit Mandrel Test

After installation is complete, the Contractor shall carry out a mandrel test on all installed conduit pipes to verify alignment, continuity, and freedom from obstruction.

4.2.1.5 Perimeter Lighting Infrastructure

The Contractor shall review the existing security fence lighting post and plinth foundation designs to ensure they are complete, safe, and fit for purpose. The Contractor shall propose any design changes or additions required to achieve a fully compliant and sound design.

The Contractor shall construct all lighting plinths and posts in accordance with the approved designs. All works shall reference and comply with the following drawings:

LB – Kusile – S3810 – ELE – 1001A (0.90/175198),
LB – Kusile – S3810 – ELE – 1001B (0.90/175199), and
0.90/173170 for the pole design.

All lighting infrastructure shall be designed and constructed to meet the applicable standards and requirements.

4.2.1.6 Electrical Design Scope

Perimeter Lighting

The current design of the NKP fence lighting system employs 140W HPS (High-Pressure Sodium) floodlights mounted on poles that are spaced 22 meters apart. Each pole holds two floodlights, which are angled to ensure optimal lighting coverage around the area. This setup has been effective in providing sufficient illumination along the fence, leveraging the high intensity and broad light spread characteristic of HPS lights.

In contrast, the new design proposes the use of a single 60W LED light per pole. This new approach

aims to deliver an average illumination level of 10 lux or more along the fence, aligning with modern

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energy efficiency standards and sustainability goals. LEDs are known for their superior energy efficiency, longer lifespan, and better light quality compared to traditional HPS lights. The design adjustment involves optimizing the angle and placement of these LED lights to ensure consistent and adequate lighting.

To facilitate a thorough evaluation of the two designs, a 3D model of the new lighting system has been developed. This model illustrates the spatial arrangement and light distribution patterns of the 60W LED lights. Additionally, output light lux data has been generated to demonstrate the performance of the new lighting system. This data includes detailed measurements of lux levels at various points along the fence, providing a comprehensive view of the lighting coverage and intensity.

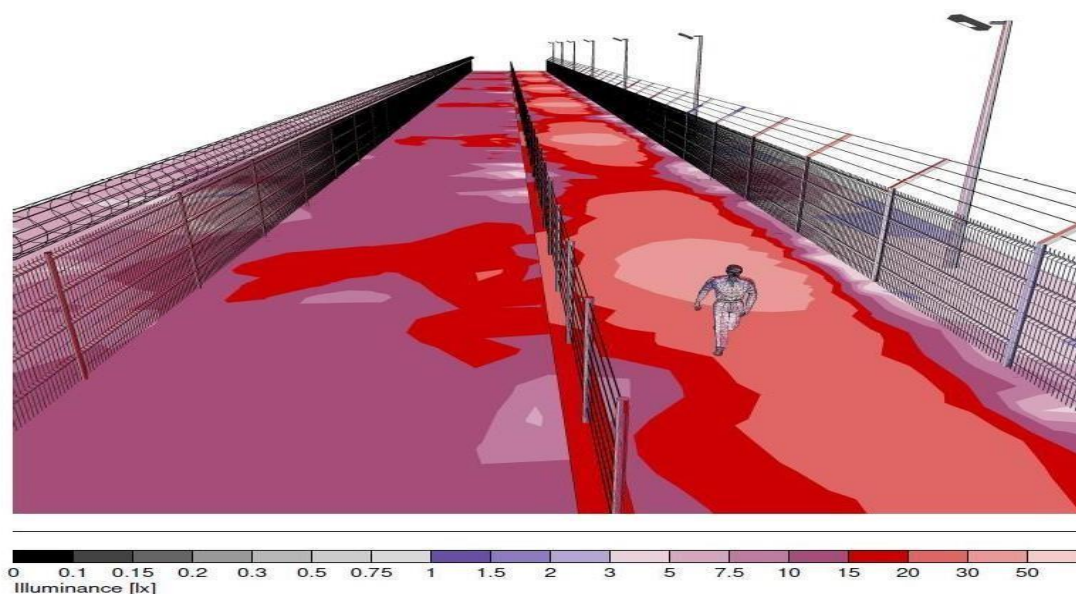


Figure 12: Lighting design for Electric Fence 3-D Model

colours shown in Figure 10 above show the average lux value produced from the lighting design also providing the average of 14lx around the area which is above the standard value of 10lx.

4.2.1.7 C&I Scope Design

The existing system is based on a digital video management (DVM) software for surveillance, real time monitoring and recording of events. The existing CCTV system consists of thermal network cameras for monitoring the perimeter fence, PTZ cameras for monitoring perimeter areas or tracking any intruders, bullet IR cameras for monitoring the perimeter areas, Honeywell enterprise building integrator (EBI) servers, DVM database and camera servers, storage devices, DVM software and license, and DVM operator workstations.

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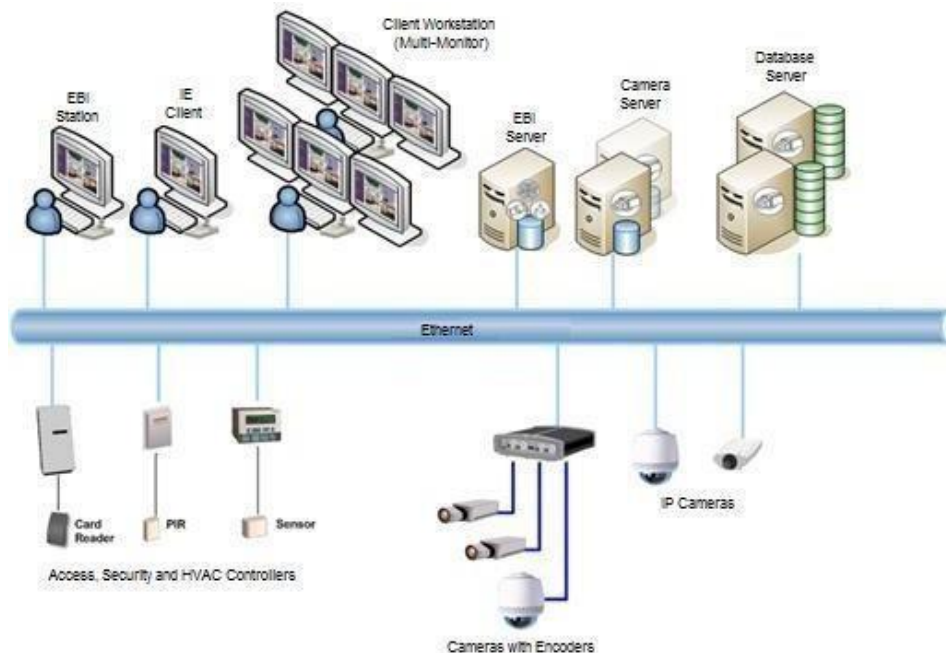


Figure 13: EBI Architecture

The proposed cameras shall be integrated into the existing site CCTV system and shall adopt the operational philosophy of the existing CCTV system. Suitable thermal CCTV technology for the low light conditions is to be utilized to enable no/low light pre-detection of attempted access into the area. The CCTV system must be linked to and monitored by the existing site security control room and must be integrated into the existing perimeter CCTV system. The design must cover the gate with a static camera where a gate exist. The *Contractor* shall adhere to standards and specifications supplied by Eskom. It is highly recommended to propose equipment similar to the existing equipment for spares management and maintainability purposes. In cases where the similar camera are obsolete, replacement model from Honeywell is recommended.

The existing perimeter CCTV consists of the following cameras:

1. Therman network camera (Honeywell Axis-Q1931/E)
2. Fixed network Bullet IR camera (Honeywell – HCD95534)
3. PTZ network camera (Honeywell – HDZ302LIW)

All equipment shall be designed and specified for a minimum realisable operational life 10 years under the prevailing environmental conditions. Visible notification shall be placed at entrances and on the outside of the perimeter fence of the premises to notify persons entering the premises, that they may be subjected to CCTV surveillance. The view of the camera shall be free of any hindering obstacles such as walls, trees or buildings. Perimeter cameras shall be arranged so that the dead spot of each camera is covered by the field of view of another camera. The use of microwave beam detection is strongly discouraged due to the prevalence of nuisance alarms. The perimeter

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detection system must generate an alarm when a human enters the monitored zone. It must be able to detect a person who is walking upright, walking hunched over, crawling or running.

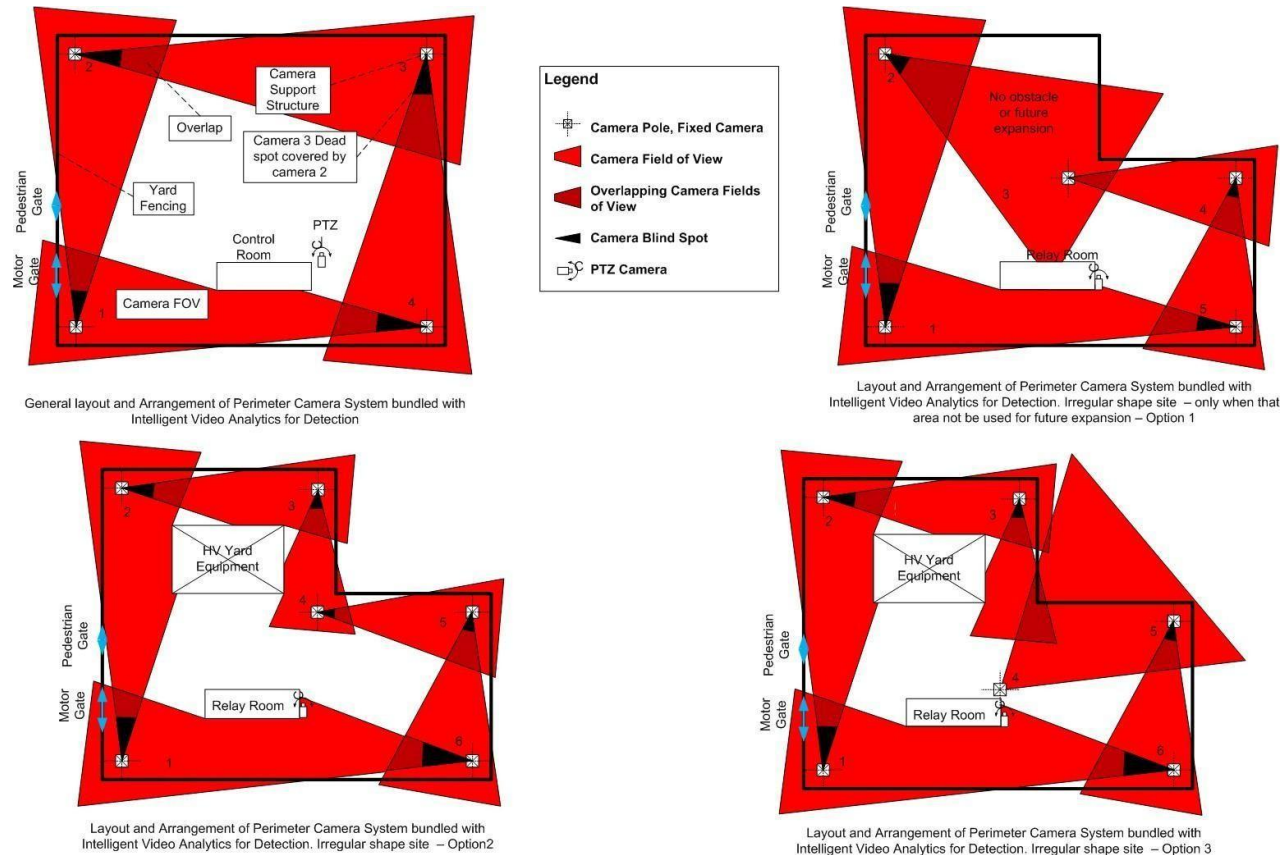


Figure 14: Examples of Camera Layouts

The perimeter detection cameras shall be mounted on poles which are steel reinforced 4.5m or 5.7m spun concrete. The pole shall be earthed via 50 x 3 mm earth tails which are buried and welded to the base of the fence, the join shall be painted the same as the fence to avoid theft.

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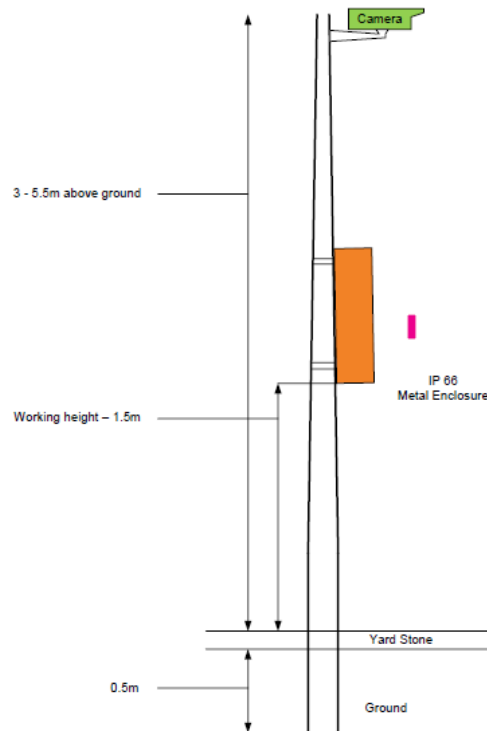


Figure 15: Camera and Metal Enclosure Mounted on Concrete Pole

Proposed CCTV solution shall integrate to the existing site security network. The following functions and specifications shall be met:

- a) Monitor for intrusion on the outer fence
- b) Monitor for intrusion on the inner fence
- c) Monitor general condition of the fence
- d) Provide reporting at CBMS level
- e) Detection shall not trigger for change of light, movement of trees, small vibrations of the camera pole, animals, and weather conditions.
- f) The camera housing shall have an IP rating of at least 65.
- g) The camera shall have a sun visor and be steel constructed/ harsh environment housing.
- h) A junction box with a minimum IP rating of 65 shall be installed on the camera mounting pole.
- i) Fixed Thermal perimeter cameras shall be installed
- j) Additionally PTZ cameras shall be installed for intruder tracking.

The perimeter cameras shall adhere to the following CCTV categories:

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Purpose	Operational Requirement
Identification	Detail should be sufficient to enable the identity of an individual to be established beyond reasonable doubt. Camera footage alone should be enough to prosecute in court.
Recognition	A high degree of certainty whether or not an individual shown is the same as someone seen before. Camera footage could aid in prosecution along with other evidence.
Observation	Be able to observe what a person is doing.
Detection	Sufficient to determine with a high degree of certainty whether or not a person is present.

The following requirements shall be met for cable routing, wiring and general electrical requirements:

- a) All power cables shall be steel wire armoured or laid in appropriately sized plastic conduit.
- b) Wireways shall be smooth and free from sharp edges, burrs, fins, or moving parts that may damage wiring.
- c) Security systems communication cables and auxiliary power cables shall not be laid in the same conduit unless using fibre communication or DC power.
- d) All trunking shall be sized for 30% future expansion.
- e) Sufficient slack shall be allowed to ensure that there is no tension in the cables.
- f) Ferules shall be used on all wiring into terminals of connectors.
- g) Cable selection and routing shall always be done in such a way that operation of equipment is not affected by electrical interference.
- h) If power and data cables must cross, it shall be at right angles.
- i) No more than two wires shall be terminated at any terminal intersection.
- j) Terminal blocks shall be in accordance with Eskom standard 240-70413291, Specification for Electrical Terminal Blocks
- k) Joined wires shall be soldered and isolated by means of heat shrink.
- l) Ethernet -CAT5 or above shall be utilised.
- m) All power cable shall be appropriately sized to ensure voltage drops along cable runs remain within the operating specifications of the equipment being powered.
- n) All equipment shall be effectively protected against overvoltage due to lightning strikes or switching surges by strategically placed surge arrestors.
- o) Equipment shall not be affected by electrostatic discharges that are applied directly to the equipment or to metal objects in the proximity of the equipment: All electronic equipment shall be a class 2 device as specified in IEEE 1613-2009.
- p) All points of cable entry shall be through glands so as to secure the cables.

All equipment shall be labelled in accordance with the design diagrams, with durable, weather resistant labels. All equipment shall be designed for application in 'special' environmental conditions as follows:

- a) Ambient air temperature: -25 °C to +70 °C.
- b) Relative humidity (24h average): 98%.
- c) All outside equipment Including fasteners and supports should be corrosion resistant and appropriate for the environment on site.
- d) All nuts, bolts and washers use for the construction to be stainless steel. Screws can be cadmium plated.
- e) Equipment installed will need added dust protection.

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The proposed solution shall consist of a PA system that will be integrated into the existing perimeter PA system linked to the security control room with audibility across the whole extent of the facility. The positioning and quantity of loudspeakers are to be determined by the facility characteristics and in line with the requirements of the PA specification. The speakers shall be weatherproof, environmental, corrosion and vandalism resistant as well as UV resistant. The audio from the speakers shall be clearly audible throughout the perimeter and be able to handle an alarm siren without distortion.

When an alarm is generated by the alarm system, the CCTV system shall detect the alarm and know what zone was triggered in order to trigger the relevant cameras for that zone. The alarm system shall receive trigger signals from CCTV video analytics in addition to triggers from the site's traditional security sensors. Should the intruder detection system be triggered at night, the site's LED floodlights shall be activated for a period of 15 minutes. Should the alarm be triggered, all the floodlights shall be switched on simultaneously to act as a deterrent as well as provide light for the PTZ camera.

4. Employer's Design

Drawings to be issued by the Employer are listed in Table 2 below:

Table 3: Drawings issued by the Employer.

Drawing number	Title	Revision
Civil Drawings		
Mechanical Fencing		
0.90/706	Kusile Power Station Security Fence Double Swing Access Gate Plan, Elevations and Details	6
0.90/707	Kusile Power Station Security Fence Post Concrete Bases and Gate Keep Detail	2
146838-0UYX-S3916B	Kusile Power Station Security Fence Access Gate Posts Plan, Elevations and Details	0
0.90/709	Kusile Power Station Security Fence Details of Posts and Struts	1

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0.90/710	Kusile Power Station Security Fence Weldmesh Termination and Fixing Details	1
0.90/710	Kusile Power Station Security Fence Access Gate Post and Wiring Protection Details	1
Drawing number	Title	Revision
Civil Drawings		
0.90/711	Kusile Power Station Security Fence Access Gate Post and Wiring Protection Details	1
0.90/712	Kusile Power Station Security Fence With Overhang Brackets Layout and Details	1
0.90/59093	Kusile Power Station Security Fence Single Swing Access Gate Plan, Elevations and Details	4
0.90/59094	Kusile Power Station Security Fence Gate Post Foundations	2
0.90/59095	Kusile Power Station Security Fence Single Swing Gate Keep Details	0
0.90/23490	Kusile Power Station Fence Bridge – Foundations Plans, Sections and Details Fence Bridge 1	0
0.90/23491	Kusile Power Station Fence Bridge – Foundations Plans, Sections and Details Fence Bridge 1	0
0.90/23492	Kusile Power Station Fence Bridge – Foundations Plans, Sections and Details Fence Bridge 1	0
0.90/24999	Kusile Power Station Fence Bridge – Foundations Plans, Sections and Details Fence Bridge 2	0
0.90/25015	Kusile Power Station Fence Bridge – Foundations Plans, Sections and Details Fence Bridge 2	0
0.90/25016	Kusile Power Station Fence Bridge – Foundations Plans, Sections and Details Fence Bridge 2	0
Electric Fence		
0.90/49949	Kusile Power Station Concrete Slab and Post Installation	0

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5. Contractor's design

5.1 Design Services

The Contractor is responsible for developing the existing design information into a fully integrated detail design for the full scope of works. The Contractor shall be liable and full accountable for the design and constructability of their design. All submitted design documentation is signed by relevant ECSA professionally registered engineers.

The Contractor provides engineering design services in accordance with the Engineering Profession Act, 46 of 2000, Guideline for Professional Fees: Scope of services and Tariff of Fees for Registered Persons. The *Contractor* appoints and manages his *Subcontractors* for the project scope. The *Contractor* co-ordinates the work of his *Subcontractors* and satisfies the requirements of all relevant standards and regulations. The *Contractor* co-ordinates all interfaces to ensure design integration for all components of the project scope.

The Contractor performs construction and commissioning monitoring for the works. The scope of the service covers civil, structural, electrical and C&I works. The *Contractor* inspects the works for conformity with designs. The scope of the *service* is undertaken until construction completion. The Contractor notes that all rights to drawings and documents provided by the *Employer* remain the property of Eskom. Design documentation may therefore be reviewed and altered, only for the purpose contemplated under this scope. The Contractor executes the service in accordance to the ECSA Guideline Scope for Services and Professional Fees (Engineering Profession Act, 46 of 2000). The Contractor provides services of quality that are commensurate with accepted standards and practices in the profession. The *Consultant* performs the service to the extent of the contract agreement as well as the provisions of the contract.

Construction & Commissioning Monitoring Including Engineering Support

The Contractor provides construction and commissioning monitoring *services* in accordance with Level 3 of the ECSA Guideline Scope of Services and Professional Fees for Registered Persons [Engineering Profession Act, 46 of 2000]. The service includes the provision of on-site personnel during construction and commissioning activities, as deemed necessary by the Contractor. These services shall be required for the duration of the construction and commissioning works. The duties of the Contractor include the following but not limited to:

- Maintain a full-time presence on site for purposes of performing the service. The Contractor makes available all resources necessary to conduct the service
- Perform technical oversight and assurance i.e., provide design/technical clarifications and support including but not limited to the review of construction work procedures, repair methodologies, quality control plans, material samples and/or construction material, survey results, requests for information, concessions, data books etc. The *Consultant* attends technical meetings and provides input to Engineering Changes/Modifications and Engineering Responses
- Respond to technical queries raised by executing contractor/s during construction and commissioning execution
- Provide the executing contractor with updated design documentation etc. where changes to the design/s are required
- Attend site meetings (technical, quality assurance, construction progress)
- Management of project interfaces with other discipline engineers, construction contractor etc.

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- The Contractor performs inspection and testing activities, other than on site, of materials and plant, including inspection and testing during manufacture.
- If required, the Contractor conducts follow up geotechnical studies to confirm the current site conditions
- The Contractor co-ordinates and monitors rectification of defects

Design Review/Assessment

The Contractor shall review the existing perimeter protection designs and associated system designs prepared by others. The review shall cover the proposed perimeter protection works and shall ensure that the designs are complete, correct and suitable for the intended works.

The assessment shall be performed by a comprehensive review of all relevant deliverables, including but not limited to design reports, investigation reports, construction drawings, operating and maintenance manuals including construction data packages.

The Contractor shall identify any potential flaws, risks, omissions, or deficiencies in the scope of works and shall propose rectifications. If design risks, recommendations, or optimised solutions are identified, these shall be discussed with the Employer prior to construction execution.

The Contractor shall undertake any necessary engineering design changes in accordance with the latest revision of the Eskom Project Change Management Procedure [240-53114026]. The Employer shall ensure that the Contractor has access to the latest revision of this procedure, and any uncertainties regarding its application shall be clarified with the Employer.

The Contractor shall adjust designs, drawings, schedules and associated documentation as necessary. The review shall also include an assessment of the constructability of the proposed works.

The findings, recommendations and any required design changes arising from the review shall be consolidated into a Technical Report, which shall be submitted to the Employer for acceptance prior to construction.

Functional and Value-Add Design Changes

The Contractor shall propose and implement any design changes required prior to the start of the works. Design changes shall be classified as either Functional or Value-Add changes.

Functional changes are required to address design flaws, omissions, or deficiencies that impact the functionality of the works. Value-Add changes are intended to improve the efficiency of the design, primarily for cost and time savings.

The Contractor shall make provision for a minimum of 150 hours of Engineering Design Support and 150 hours of Draughtsperson Support for Functional changes. These hours shall be used on an as-required basis, based on the outcome of the design review of existing design data. The Contractor shall obtain approval from the Employer prior to using the allocated hours.

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The Contractor shall also make provision for a minimum of 150 hours of Engineering Design Support and 150 hours of Draughtsperson Support for Value-Add changes. These hours shall similarly be used on an as-required basis following the outcome of design reviews. The Contractor shall obtain Employer approval prior to using the allocated hours.

The Contractor shall provide motivation for any proposed engineering design modifications in the form of a Technical Report. The report shall include the proposed changes, the time and cost implications and the rationale for the modification. Only design changes that would prevent the Contractor from issuing Statutory Certification or Completion Certificates, that impact execution of the works, or that provide significant value-add for the Employer, shall be considered for acceptance by the Employer.

In addition, the Contractor shall undertake any duties arising from project scope changes, alterations, or instructions issued by the Employer, including design reviews, adaptations, or alterations of designs and documentation for all works forming part of the project scope.

All designs, design reports, and construction drawings prepared by the Contractor shall be signed off by a professionally registered Engineer or Technologist, who shall take full professional accountability for the designs.

Use of the Contractor's Design

All reports, drawings, specifications, calculations, models, data, software and other material prepared or supplied by the Contractor in connection with the works, become the property of the Employer upon creation or delivery, whichever is earlier. The Employer obtains an irrevocable licence to use, reproduce, adapt and distribute the material for any purpose related to the design, construction, operation, maintenance, or future development of the project.

The Contractor shall not use or disclose any of the material provided by the Employer for any purpose other than performing the Services without the prior written consent of the Employer.

Design Deliverables

The Contractor submits the following documentation:

a. Detailed design calculation files/reports covering the entire project elements

The calculation files/reports detail the following but not limited to:

- Design assumptions
- Design criteria/parameters/philosophy
- Reference standards/codes/specifications
- Design results and calculations for all project elements
- Software input and output files including design models

b. Investigation reports i.e. geotechnical

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- c. Construction drawings including shop/fabrication drawings
- d. As-built drawings and documentation

The *Contractor* is required to submit as-built and/or red-line data and drawings of the completed works to the *Employer* upon handover. As-built drawings are submitted in PDF and native CAD (DGN) formats. The Contractor notes that drawings issued to the *Employer* will be a minimum of one hardcopy and an electronic copy. The Contractor is required to submit drawings electronically in both native CADD format and PDF format. Drawings issued to the *Employer* may not be "Right Protected" or encrypted.

- e. Operating Manuals and Maintenance Schedules

Where required, The Contractor shall prepare and submit operating and maintenance manuals (O&M) for plant, equipment, systems and installation items under this contract. The manuals shall provide a detailed record of the safe operation and maintenance of the items. The Contractor submits the documentation to the *Employer* for review and acceptance. The Contractor submits the O&M manuals prior undertaking test and commissioning activities.

The manuals shall provide comprehensive information on the following but not limited to:

- Equipment technical data
- Detailed drawings of equipment items
- Operating procedure of equipment items
- Prescribed maintenance schedule or routine maintenance procedures/instructions per manufacturer requirements
- Commissioning procedures
- Preservation and storage requirements

- f. Statutory Certification

The Contractor issues statutory certification and certificates of compliance for new works or portions of works forming part of the project scope. The Contractor ensures that any work approved or certified by them, has been reviewed or inspected to the extent necessary to confirm the correctness of the approval or certification. Furthermore, the Contractor issues statutory certification for structural, electrical systems and any other applicable systems or components forming part of the works, to certify that the installation, erection or construction of the systems has been approved in terms of section 14(2A) of the National Building Regulations and any other applicable codes of practice. The persons who issue such certification assume full liability and responsibility for such installation, erection or construction.

6. Construction

6.1 Temporary works, Site services & construction constraints

6.1.1 General

The *Contractor* duties include the following:

- Submits a cost proposal for the works
- Submits a project specific safety file to the *Employer* for acceptance, prior to the commencement of works

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-
- Submit a detailed level 4 schedule for the works to the *Project Manager* for acceptance following contract award
 - Manage his activities on site to ensure that no interference takes place between his work and that of others.
 - Supply to the *Employer*, all consumer power requirements, potable water requirements and any other termination interface requirements that are required to complete the *Works*
 - The *Contractor* confirms the available space in the site area for construction of the *Works* taking note of all existing services, pipes, structures, and any obstructions to the
 - The *Contractor* to furnish all material, labour, and equipment necessary to perform and complete the *Works*.
-
- Provides a detailed Construction Method Statement for all work activities including the duration of each activity. All Method Statements shall be submitted to the Employer for review and acceptance prior to commencement of the *Works*.

The Construction Method Statement shall include, at a minimum:

- A comprehensive description of the construction methodology for all project activities.
 - Clear definition of responsibilities of the Contractor's personnel involved in each activity.
 - Health, safety, and quality control measures applicable to the activities.
 - All plant, equipment, and machinery required for the execution of the *Works*.
 - Design and use of any temporary works required for the execution of the *Works*.
 - Technical Data Sheets for all materials, including product description, composition, material and performance properties, installation and application procedures, and any limitations on product use.
 - Plans for collection, containment, and disposal of waste generated during removal or construction operations.
 - Measures to safeguard existing infrastructure and services.
-
- The *Contractor* shall arrange for and conduct all required test works for process control.
 - The *Contractor* shall be responsible for quality control and management of all assigned *works*
 - The *Contractor* submits as-built drawings for all components of the completed *works*
 - The *Contractor* shall compile and submit complete data packages for the *works* which shall include but not be limited to:
 - Construction drawings used to execute the *works*
 - Approved construction method statements,
 - Quality Control Plans (QCPs)/Inspection and Test Plans (ITPs)
 - Material certificates and data sheets

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5.1.2 Site Preparation & Clearance

The Contractor shall prepare the site for construction by clearing, removing, and disposing of all unsuitable materials and obstructions that are not part of the Works. This includes the removal of approximately 700m of razor mesh fencing and preparation of the site along the fencing line.

Site preparation shall comply with the latest revision of the Employer's Execution of Site Preparation and Earthworks Standard [19], the SANS 1200 series, and SANS 2001 BE1. The Contractor shall be responsible for the disposal of all waste generated within the construction area. All excavated excess or unsuitable materials shall be transported to a designated spoil site, and all hazardous waste shall be disposed of at a registered and Employer-approved waste disposal facility.

5.1.3 Excavations and Associated Water Control

Excavations & Scanning of Underground Services

No excavations shall be undertaken without a valid excavation permit issued by the Project Manager. The Contractor shall comply with the requirements of the Construction Regulations, the Employer's Execution of Site Preparation and Earthworks Standard [19], and the Kusile Trench and Excavation Procedure [203-13626].

The Contractor shall scan all areas for underground services prior to excavation. Geophysical assessments shall be performed as necessary to detect subsurface utilities, with the methodology determined by the Contractor. The Contractor shall submit the results of the scans to the Project Manager and indicate any potential interference with the Works. The Contractor shall obtain and review all relevant drawings showing the position of potential underground services in the work area.

The Contractor shall demarcate and protect all underground utilities. Any damage to services or structures that could reasonably have been located or protected by the Contractor shall be the Contractor's responsibility, including repair works. All excavation works shall be executed in accordance with the SANS 1200 series and SANS 2001 BE1.

Water Control on the Works

The Contractor shall be responsible for controlling water during construction, including dewatering excavations, to ensure the safety and integrity of the works. The Contractor shall provide, operate and maintain all equipment required for dewatering, including pumps and well points.

The Contractor shall design, construct, and maintain all temporary drainage controls, including sumps, drains, trenches and any other measures necessary for the protection of permanent works. Temporary drainage controls shall be reinstated or removed when no longer required. The Contractor shall repair any damage to the works caused by flooding, water ingress, or failure of dewatering or flood protection measures. The Contractor shall allow for high water table conditions during rain events or seasonal variations, and the cost of protection works and rectification of any damages shall be borne by the Contractor.

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5.1.4 Temporary Works

The Contractor shall design all temporary works required for the execution of the Works. The Contractor shall fulfill all duties of a Designer in terms of Construction Regulations 2014, Clause 6(2) (a–d) for temporary works designs.

5.1.5 Contractor 's Programme

The Contractor shall submit the first programme to the Project Manager for acceptance within two weeks of the contract Date.

The Contractor shall submit revised programmes at intervals not exceeding four weeks, or at such other times as instructed by the Project Manager.

Each programme submitted shall:

- Show the Starting Date, Access Dates, Key Dates and Planned, Completion Dates and Planned Completion Date
- Show the order and timing of the operations which the Contractor plans to do to provide the works
- Show the float, time risk allowances, and health and safety requirements
- Be in sufficient detail to allow progress to be monitored and compensation events to be assessed.

If the Contractor does not submit a programme which the Project Manager can accept, the Project Manager may withhold acceptance of applications for payment, in accordance with the NEC3 Engineering and Construction Contract.

6.2 Completion, Testing, Commissioning and Correction of Defects

6.2.1 Testing Requirements

The Contractor shall be responsible for carrying out all testing required to provide the works. The works shall be tested in accordance with the latest applicable South African National Standards (SANS) and any other relevant codes of practice. All testing shall be undertaken in accordance with recognised standard methods and procedures. The cost of all testing carried out by the Contractor in accordance with the Contract, including the taking of samples, reinstatement of areas where samples have been taken, provision of testing equipment, labour, materials and any associated activities, shall be included in the prices and shall not be paid for separately.

The Contractor shall carry out, as a minimum, all field and laboratory testing associated with the construction works, including concrete and earthworks testing. Soil testing shall include but not be limited to identification tests such as Atterberg Limits and Sieve Analysis, as well as soil compaction testing. All laboratory testing shall be conducted in accordance with the latest standard test methods and procedures as published by the relevant authorities, including BS / Eurocodes, ASTM, AASHTO, ISRM, SABS and SANS, as applicable.

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6.2.2 Materials facilities and samples for test and inspections

The Contractor shall provide all materials, facilities, equipment, and samples required for all tests and inspections. The Employer reserves the right to request samples of materials or equipment offered and to inspect workmanship as the works proceed. The Employer may accept or reject materials, equipment, or workmanship based on such inspections. Acceptance of any samples or inspections does not relieve the Contractor of the responsibility to provide the works in accordance with the Contract. The Contractor remains fully liable for providing complete and properly functioning plant, materials and workmanship.

6.2.3 Miscellaneous Materials and Services

The Contractor shall make provision for all resources, services, materials and facilities necessary to provide the works, including but not limited to the following:

- The Contractor shall provide all erection tools, special tools and test equipment required for erection, testing, start-up and operation of the equipment. This includes all associated transport, shipping and delivery costs to and from the site.
- The Contractor shall provide all construction services, storage facilities and utilities required to execute the works, as specified in the Contract.
- The Contractor shall supply all miscellaneous materials and services necessary to complete the works, whether or not specifically described in the Contract, provided they are reasonably required to provide the works in accordance with the Contract.
- The Contractor shall design, provide, install, operate, maintain, and remove all construction power supplies, temporary lighting and sewer drainage, required for the works.
- The Contractor shall design, supply, install, maintain and remove all temporary support structures required for the execution of the works.
- The Contractor shall carry out all surveying and setting out of the works from the control points designated by the Employer or the Project Field Manager.
- The Contractor shall provide all welding materials, equipment and consumables required for the attachment of equipment, piping or structural steel forming part of the works.
- The Contractor shall protect all existing underground utilities, foundations, buildings and equipment from damage arising from the execution of the works.
- The Contractor shall provide all solvents, cleaning materials and construction consumables necessary to complete the Works.
- The Contractor shall provide Material Safety Data Sheets (MSDS) for all hazardous materials supplied or used by the Contractor in the execution of the works.
- The Contractor shall restore any damage caused to the site as a result of the execution of the works.
- The Contractor shall furnish and install symbolic safety signage for Contractor-installed equipment in accordance with SANS 1186.
- The Contractor shall maintain accurate as-built drawings for all erection works and shall submit final as-built drawings to the Employer on completion of the works.
- The Contractor shall attend coordination meetings at the Site at times determined by the Employer to discuss matters relating to the execution of the Contract.
- The Contractor shall carry out the initial and final filling of oils, greases, and other lubricants for all equipment installed by the Contractor.

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- The Contractor shall grout, pour concrete, set, align and erect all pipe support foundations forming part of the works, including foundations, foundation bolts and bolt sleeves etc.
- The Contractor shall provide all grouting materials and shall carry out the placing of grout for all pipe support foundations installed under the Contract.

Finishing Works, Protection, and Associated Obligations

The Contractor shall supply, carry out surface preparation and apply all painting and galvanising to piping and structural steel furnished by the Contractor, in accordance with Eskom Standard SSZ_45-17 (Medupi Power Station Corrosion Protection Specification).

The Contractor shall carry out touch-up priming and touch-up finish painting to all painted piping, piping attachments, accessories and structural steel members. The Contractor shall provide all materials required for surface preparation and painting. Touch-up galvanising is not permitted, except to exposed threads after assembly or where approved by the Employer. Where touch-up galvanising is required and not approved, the affected materials shall be removed and re-galvanised.

6.2.4 Pre-Commissioning Tests and Commissioning

The Contractor shall be responsible for all pre-commissioning and commissioning activities for the mechanical, electrical and control and instrumentation (C&I) systems, installed by the Contractor. This responsibility includes planning, provision of labour, plant, materials, equipment, supervision and execution of all commissioning activities. Commissioning activities shall be carried out in accordance with the On-Site Commissioning for Low Pressure Systems Standard [240-56356376], the Works Information, the Employer's Specifications and all applicable South African National Standards and other relevant codes of practice. The Contractor shall perform all tests required by the Works Information, applicable standards and any additional tests instructed by the Employer or the Project Manager in accordance with the Contract. The Contractor shall prepare commissioning procedures for each plant and system forming part of the works. These procedures shall be submitted to the Employer for review and acceptance prior to the commencement of commissioning activities. The Contractor shall supply all test equipment, monitoring devices, tools and instrumentation necessary to pre-commission, test and commission the works. The Contractor shall maintain accurate and complete records of all pre-commissioning, commissioning and testing activities. These records shall be submitted to the Employer as part of the handover documentation.

Factory Acceptance Testing

The Contractor shall carry out all routine factory acceptance tests on selected electrical, C&I and mechanical plant, as required by the Employer. Factory Acceptance Tests shall be performed at the supplier's premises prior to dispatch of equipment to site.

The Contractor shall provide all test reports, certificates and any applicable statutory documentation for the equipment tested. Test reports shall include, as a minimum:

- Technical data of the component,
- Test type and method,
- Test evaluation results.

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Performance Testing

The Contractor shall carry out performance testing on selected electrical, C&I and mechanical equipment, as required by the Employer. Performance tests shall be conducted at the supplier's premises prior to dispatch of the equipment to site.

The Contractor shall prepare and submit testing procedures, Quality Control Plans and the acceptance criteria, for review and acceptance prior to the commencement of performance testing. A representative of the Employer shall witness the performance tests. The Contractor acknowledges that witnessing by the Employer does not relieve the Contractor of responsibility for the proper functionality and performance of the plant or equipment.

The Contractor shall arrange performance test witnessing with the Project Manager and shall submit all test certificates and records upon completion of testing. The Contractor shall provide all labour, materials, plant and equipment required for the performance testing activities.

Site Acceptance Tests

The Contractor shall perform site acceptance testing on selected plant and equipment, as required by the Employer. Site Acceptance Tests shall be carried out at the Employer's premises and witnessed by a representative of the Employer.

The Contractor shall test and commission installations as individual systems and as integrated systems, as required by the system configuration, following completion of the works. The Contractor shall provide competent and adequately resourced personnel for the full duration of the testing and commissioning process.

The Contractor shall ensure that all equipment is pre-commissioned and confirmed to be in safe and operational condition prior to requesting witnessing of Site Acceptance Tests by the Employer. The Contractor shall arrange witnessing of test activities with the Project Manager.

The Contractor shall submit all test certificates, test records and any prescribed statutory documentation certifying that the equipment is in complete working order. Where required, the Contractor shall provide the initial fill of oils, lubricants, grease, and other consumables necessary for commissioning and testing activities.

Commissioning Procedures and Programme

The Contractor shall submit a detailed commissioning programme to the Project Manager at least 14 days prior to the commencement of commissioning activities.

The commissioning programme shall include as a minimum:

- A schedule of equipment to be commissioned
- The proposed tests and testing methods
- Commissioning check sheets,

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- Planned dates and durations of commissioning activities.

6.2.5 Correction of Defects

The Contractor shall correct any defects notified in the works at no additional cost to the Employer. The Contractor shall respond within reasonable timeframes to instructions issued by the Project Manager and shall carry out the corrective work within the period stated in the Defect notification or as otherwise agreed with the Project Manager. Where required, the Contractor shall submit evidence of correction and compliance, including inspection records, test results, certificates, or other supporting documentation confirming that the defect/s has been properly corrected.

If the Contractor fails to correct a notified defect within the required period, the Employer may recover the costs of correction or withhold final payments, in accordance with the provisions of the Contract.

7. Plant and Materials standards and workmanship

7.1 Materials, Workmanship and Products

a. Materials and Workmanship

The Contractor shall use only new, undamaged, and fit-for-purpose materials in the execution of the Works.

Materials intended for permanent incorporation into the Works shall not be used for temporary purposes on the Site.

All workmanship shall be of a standard acceptable to the Employer and executed in accordance with the manufacturer's written recommendations and instructions, relevant standards, and the requirements of the Contract.

b. Products

All products supplied and incorporated into the works shall be new, fit for purpose and suitable for the conditions in which they are to be used. Products shall comply with the requirements of the Contract, the relevant South African National Standards (SANS), applicable codes of practice and the manufacturer's specifications. The Contractor shall submit product data, samples, certificates, and technical information for review where required by the Works Information or requested by the Project Manager. The Contractor notes that acceptance of any product, sample, or technical submission by the Project Manager does not relieve him of responsibility for the performance, quality, or compliance of the product. Where products are substituted or proposed as alternatives, the Contractor shall obtain the Project Manager's acceptance prior to use and shall demonstrate that the proposed product meets or exceeds the specified performance and quality requirements.

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7.2 Civil engineering and structural works

The Contractor shall execute all civil engineering and structural works in accordance with the latest editions of the South African National Standards (SANS), prescribed Eskom standards and any other applicable codes of practice, specifications or statutory regulations. Where the contract references standards, manuals, or codes, whether specifically or by implication, it shall be understood to refer to the latest edition in effect at the contract award date.

The Contractor shall adhere to the normative references listed in Section 2.1.4 and shall ensure that all works comply with these references. If any contradiction, discrepancy or ambiguity is identified within or between the codes, standards, or specifications, the Contractor shall promptly liaise with the Employer for clarification before proceeding. The Contractor acknowledges that the lists of standards and codes provided in the contract are not exhaustive and shall remain fully responsible for complying with all applicable design codes, standards, and statutory requirements, whether or not specifically referenced in the contract.

All civil and structural works shall be executed to a high standard of workmanship, ensuring safety, durability and compliance with the contract requirements.

7.3 Electrical, Mechanical, and Services Works

The Contractor shall execute all electrical, mechanical and C&I works in accordance with the latest editions of SANS, Eskom standards, and any applicable codes, specifications, or regulations. Where design or installation ambiguities arise, the Contractor shall liaise with the Employer for clarification before proceeding.

8. OTHER REQUIREMENTS FOR THE WORKS

8.1 Spares

The Contractor shall submit a priced schedule of recommended spare parts for the long-term operation and maintenance of plant equipment and machinery. The schedule shall include full particulars of each item, including serial numbers where applicable. Technical Data Sheets or Material Certificates shall be provided for all listed spares..

8.2 Special Tools Requirements

The Contractor shall identify and submit a priced list of all special tools required for the operation and maintenance of the installed plant equipment. This list shall include, but is not limited to:

- OEM-specific tools or devices.
- Tools required for routine maintenance and servicing of the equipment

The Contractor shall ensure that all spares and special tools are suitable, available and documented to support safe and effective operation and maintenance of the equipment.

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8.3 Training

The Contractor shall provide comprehensive training for the Employer's personnel to ensure the safe, efficient and effective operation and maintenance of all installed plant, equipment and systems.

Training Scope

The training shall cover, but is not limited to:

- Operation of equipment and systems i.e. normal operation, start-up, shutdown and emergency procedures.
- Maintenance procedures i.e routine, preventive, and corrective maintenance, including lubrication, adjustments, calibration and inspections etc.
- Troubleshooting i.e. identification of faults, diagnostics and remedial actions.
- Safety requirements i.e. safe working practices, personal protective equipment requirements, hazard identification, and lockout/tagout procedures.

Training Delivery

- The Contractor shall provide both classroom-based and practical training.
- Classroom sessions shall include presentations, manuals etc.
- Practical sessions shall provide operation and maintenance experience on the actual equipment or representative simulators.

Training Materials

The Contractor shall supply all training materials, including:

- Operating manuals/instructions.
- Maintenance manuals/instructions including schedules, checklists and troubleshooting guides.
- Safety guides and procedures
- Any digital or multimedia aids required to support the training.

Training Records and Assessment

- The Contractor shall maintain attendance registers and training records for all participants.
- The Contractor shall provide certificates of completion for personnel successfully trained.
- Records shall form part of the final handover documentation.

Training Programme

The Contractor shall submit a detailed training schedule and programme for review and acceptance by the Employer at least 14 days prior to training commencement.

- The programme shall include:
 - List of personnel to be trained.
 - Duration and timing of each training session.
 - Topics to be covered in each session.
 - Required resources and facilities.

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Contractor Responsibility

- The Contractor remains fully responsible for ensuring that all trained personnel are competent to operate and maintain the systems safely and effectively.
- The Contractor shall update training content to reflect any modifications or changes in equipment or procedures prior to final handover.

8.4 Configuration Management Requirements

The *Contractor* supplies a comprehensive configuration management program in accordance to ISO 10007 (2nd Edition) to ensure that plant structures, components etc conform to approved design requirements. In addition, the as-built *Works* shall be accurately reflected in selected documents and databases, including those for design, procurement, construction, operation, testing and training. The configuration program shall be applicable for use throughout all phases of the project life cycle, including management of spare parts, replacement parts and product upgrades, and shall form part of deliverables for hand-over to the *Employer* for use during the operation and maintenance phases of the plant.

8.4.1 Plant Codification

Plant Coding shall be undertaken by the *Contractor*. The KKS system shall be used for classifying and designating both plant and related documentation. The *Contractor* complies with the requirements of the Technical documentation classification and designation standard [240-54179170], Eskom Hybrid Coding Standard [240-131050729], publication KKS power plant classification (B105e) 5th Edition 2003 and the KKS Applications: Guideline and explanations A, B1-4 (B106e) etc. All maintainable plant shall be coded up to KKS breakdown level 3 (i.e., Mechanical, Electrical, C&I and Civil systems)). Omissions or deviations from the latter requirements shall not be permitted without approval from the *Employer*.

Detailed nameplates or label lists with the service legends, including the KKS Code shall be prepared by the *Contractor* and submitted to the *Employer* for review and acceptance before commencing manufacture of the labels. All maintainable plant equipment and components shall be labelled by the *Contractor*, including all pipework.

The *Contractor* shall use Eskom – specific interpretations of the KKS standards, which will be reviewed and agreed on after Contract Award. The following variations relating to 240-93576498 are noted.

- Breakdown level 3 component code -> not used in P&ID's and PFUP's, only used by control hardware supplier.
- Breakdown level 0: will be shown as a general remark on the P&ID not on the individual KKS number.
- F0-level is not used; FN level is free -> no general decoding system.

The *Contractor* shall code all plant within the scope of supply. KKS codes shall appear on all plant related documentation, drawings, lists and correspondence.

The *Contractor* shall be responsible for ensuring accuracy, completeness, and consistency of all plant and document designations.

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8.4.2 Plant Labelling

The Contractor shall manufacture and install new labels for all equipment and infrastructure provided as part of the works. Labels shall be anodized aluminium nameplates in accordance with the Employer's Standard: 240-71432150 – KKS Plant Labelling and Equipment Descriptions Standard.

The Employer shall appoint a coding practitioner to liaise with the Contractor regarding KKS coding. The Contractor shall prepare detailed nameplate descriptions and submit these to the Employer for review and acceptance prior to manufacturing. The Contractor shall ensure that all labels are applied in accordance with the Eskom Standard 240-93576498 - *KKS Power Plant Classification (B105e), 5th Edition, 2003* published by Verlag VGB PowerTech Service GmbH (Essen) *KKS Applications: Guidelines and Explanations A, B1–B4 (B106e)*

The Contractor shall label all equipment and infrastructure associated with the works, including but not limited to:

- Lighting poles (~50 nameplates)
- Camera poles (~15 nameplates)
- Manholes (~15 nameplates)
- Surveillance cameras (~10 nameplates)
- Public Address (PA) speakers (~10 nameplates)
- Junction boxes (~15 nameplates)

The Contractor shall verify the number, location and content of all labels with the Employer prior to production and installation. All labelling shall be permanent, durable, legible and compliant with the KKS system, and shall form part of the as-built documentation submitted at handover.

8.5 Documentation Requirements

The *Contractor* ensures that the Technical Documents and Records Management Work Instruction, [240-76992014] is adhered to for all documentation requirements. The *Contractor* is responsible for the compilation and the supply of all documentation during the various project stages. The *Contractor* makes provision in their programme for the submission of design documentation. For consistency, it is important that all documents used within the project follow the same layout, style and formatting as described in the Technical Documents and Records Management Work Instruction. Documents such as QCP's, Method Statements etc. that impact the project works to be approved by the *Employer* at least 3 working days prior to commencement of works.

Each revision of a document or drawing shall be accompanied with a list of comments made by the *Employer* on previous revisions, if applicable. The responses/corrective actions taken by the *Contractor* to be recorded in a revision table contained in each drawing/document.

Documents and drawings to indicate the *Employer's* unique identification number as allocated by the *Employer*. The *Contractor* may also have his own internal document or drawing number on the document or drawing.

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Document Identification

The *Contractor* shall ensure that documents have the following minimum attributes on the coverpage:

- Document title
- Document unique identification number (Eskom number)
- *Contractor* document number, if applicable
- Document status
- Revision number
- Document type
- Document revision table/history
- Page number on the footer
- Document author/authorizer
- Document originator

The following additional attributes are important for technical documents:

- Package/system name/sub-system name
- Unit number
- *Contractor* name
- Contract number
- Plant identification codes

Format and Layout of Documents

For consistency, it is important that all documents used within a specific domain follow the same layout, style, and formatting standard.

Layout and Typography

Every document should comply with the following font specifications:

- Font Colour: Black
- Main Headings Font Type: Arial, Bold, Capital Letters
- Main Heading Font Size: 12pt
- Subheadings Font Type: Arial, Bold, Title Case
- Subheadings Font Size: 11pt
- Body Font Type: Arial, Sentence Case i.e., only the first letter of the first word is a capital letter.
- Body Text Font size: 11pt
- Line Spacing: 1.5 line spacing.
- Margins: Standard
- Alignment: Full justification to be used
- Paragraphing: One line skip between paragraphs
- Pagination: Centred page numbers (about 0.5 inches from bottom)
- Indentations: Standard tab for all paragraphs (about 0.4 to 0.5 inches)

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Document Headers

The header should include the project name, document title, document number, revision number and page number.

Naming of files

The *Consultant* complies with the Eskom standard for naming documentation files. The standard is as follows:

For documents that have an approval date and signature;
(YYYYMMDD_DocType_DocumentTitle_UniqueIdentifier_Revision.FileExtension)

For documents that do not necessarily require the 'Approved Date' and 'Revision & Versioning', use the date of update:
(YYYYMMDD_DocType_DocumentTitle_UniqueIdentifier_Revision.FileExtension)

Document Submissions

The *Contractor's* program to allow a minimum of 21 days for mailing, processing, and review of drawings and data by the *Employer*. All documents and records must be submitted and managed according to the Project/Plant Specific Technical Document and Records Management Procedure, 240-76992014 as well as the Generation (Gx) Projects Documentation Deliverable Requirements Specification, 240-65459834. The *Employer* shall ensure that the Contractor is provided with the latest revisions of the mentioned documents.

Information Requirements

The *Employer* requires information and data from the *Contractor* for management and execution of the contract as well as the operation, maintenance, and support of the *works*. The *Contractor* to supply all information required in terms of the contract including all information necessary for:

- a) Design reviews and interface management of the *works*,
- b) Quality assurance and control,
- c) Operations, maintenance, training etc.

The scope of supply of information from the *Contractor*, to include the following but not limited to:

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Table 7: Typical Document Requirement List (As-built) (where applicable)

Document Group	Description of document type (includes information data sets)
General	Equipment arrangement drawings Piping & Instrument Diagrams (P&ID's) 3D model Equipment list Isometric Drawings Valve list Pipeline list Hanger list Equipment specifications & data sheets Drawings and data for all equipment and material Installation, Operation, and Maintenance (IOM) Manuals Spare parts list Factory Acceptance Test (FAT) report etc. Databooks
Civils & Structures	Site layout Structural drawings Drainage layouts Foundation drawings Geotechnical report Survey report Design report

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Document Group	Description of document type (includes information data sets)
Construction	Transportability study/report (including heavy haul study) Site management plan (QA, Safety, Environmental etc.) Construction schedule Site storage requirements for major equipment Construction test records (hydrotest, concrete strength, pile integrity test, etc.) Maintenance records of all equipment while stored on site Constructability report Etc.

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Document Group	Description of document type (includes information data sets)
Commissioning	Commissioning schedule Commissioning procedures Performance test procedure Performance test reports Field test reports and certificates Etc.
Quality Assurance	Quality assurance manual Quality control plans Quality control reports Weld summary index Material traceability certificates Manufacturing test reports Manufacturing Non-Conformance Reports (NCR's)
Operations	Operating procedure Maintenance procedures and schedules Operating and maintenance manuals Etc.
Logistic Support	Maintenance concept Plant maintenance documentation ISI plan/program Spare parts assessment Plant RAM analysis Equipment access and removal paths assessment Fault finding diagrams Etc.

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Document Group	Description of document type (includes information data sets)
Training	Training plan Training manuals and instructions Etc.
Safety & Protection	Fire hazard analysis Waste management plan Etc.
Design Analyses	Reliability model and analysis Transient / Transition Analysis Flow dynamics analysis Thermo-hydraulic analysis Pipe Stress Analysis Maintainability analysis FMECA / FMEA analysis HAZOP analysis 3D model interference checks Etc.

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Document Group	Description of document type (includes information data sets)
Electrical	Motor list Electrical load list Circuit list Raceway list Single line diagram Protection schematic diagram Electrical load flow and fault studies report Cable block diagrams Cabling routing and cable racking layout diagrams Cable termination diagrams EMC and earthing standards report Earthing layout drawings Lighting layout drawings Design reports Etc.

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Document Group	Description of document type (includes information data sets)
C&I	Alarm and set-point schedule Instrument schedule Instrument data sheets Mechanical hook-up drawings Electrical hook-up drawings Cable Schedule Termination Schedules Junction Box GA and Internal Layout Junction Box and Instrument location drawings Instrument Stand GA Maintenance Manuals and procedures Operating and Control Philosophies Functional Logic diagrams Field device calibration certificates Level measurement installation report

In addition to the official documentation submittals listed in Appendix E the *Contractor* shall provide additional information for review and design coordination as requested by the *Employer* from time to time.

The *Contractor* shall use the *Employer's* Smart Plant Environment and all design tools as the delivery mechanism for all project data and document deliverables. The EDMS and design tools shall be provided to the *Contractor* pre-configured based on *Employer's* data handover requirements. Any project data and document deliverables not generated from design tools provided by the *Employer* shall be supplied in a format specified by the *Employer*.

Drawings

The creation, issuing and control of all Engineering Drawings shall be in accordance to the latest revision of the Engineering Drawing Standard, 240-86973501 - to be supplied as part of the enquiry documents. Drawings issued to the *Employer* will be a minimum of one hardcopy and an electronic copy. The *Contractor* is required to submit drawings electronically in both native CADD format and PDF format. Drawings issued to the *Employer* may not be "Right Protected" or encrypted.

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9. Project Deliverables

The *Contractor* shall be responsible for the handover of all works associated with the contract. The Contractor shall provide all deliverables necessary to demonstrate completion of the works in accordance with the Contract. All deliverables shall be prepared, reviewed and submitted for acceptance by the Employer. The handover submissions shall include but not limited to the following:

- **Design and Construction Documentation**

The Contractor shall provide the following documentation for the entire scope of Works including civil, structural, electrical, mechanical, and C&I disciplines:

- Detailed design reports and design calculations, including all “Functional” and “Value-Add” design changes, signed off by a professionally registered ECSA Engineer.
- Approved construction drawings, signed off by a professionally registered ECSA Engineer.
- Construction quality assurance documentation, including Quality Control Plans and Inspection and Test Plans (QCP/ITP).
- Construction method statements.
- As-built drawings reflecting all modifications made during construction.
- Operation and Maintenance Manuals for all equipment and systems, including preventive and corrective maintenance schedules.
- Technical Data Sheets and Material Certificates for all installed plant, equipment and materials.
- Commissioning and testing documentation, including FAT, SAT and pre-commissioning results.
- Training materials and training records, including attendance registers and certificates of completion.
- Safety and warning signage schedules

- **Geotechnical and Survey Documentation**

The Contractor shall submit:

- Geotechnical investigation report relevant to the works.
- Survey reports confirming as-built conditions etc

- **Testing, Inspection, and Certification**

The Contractor shall submit all test records, inspection reports and statutory certifications required to demonstrate compliance with the Contract, including but not limited to:

- Material testing results for soil, concrete, and other construction materials etc.
- Commissioning, performance and functional test certificates for installed equipment and systems.
- Electrical, C&I, and mechanical safety compliance certificates.

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- Handover and Completion Documentation

The Contractor shall submit, as part of the handover package:

- Complete as-built documentation for all works.
- Practical Completion Certificates (PECs) and/or Certificates of Compliance (CoCs) for completed works.
- Construction supervision and quality records as required by the scope of works.

- Submission Requirements

- All deliverables shall be submitted in electronic format (PDF and native formats) and hard copy, as specified by the Employer.
- As-built documentation, handover records and statutory certificates shall be submitted within six (6) weeks of construction completion, unless otherwise stated in the Contract.
- Acceptance of deliverables by the Employer does not relieve the Contractor of responsibility for the accuracy, completeness, performance, or compliance of the Works.

All deliverables shall be accurate, complete, legible, and submitted in electronic and hard copy formats as required by the Employer. Submission of documentation does not relieve the Contractor of responsibility for compliance, performance, or quality of the Works

10. Acceptance

This document has been seen and accepted by:

Name	Designation

11. Revisions

Date	Rev.	Compiler	Remarks

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12. Development Team

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

13. Acknowledgements

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