Eskom	Specification	Technology

Title:	**Duvha Power Station Civil Structures Inspection scope of work**	Unique Identifier:	**382-170127**
		Alternative Reference Number:	**N/A**
		Area of Applicability:	**Engineering**
		Documentation Type:	**Specification**
		Revision:	**1**
		Total Pages:	**24**
		Next Review Date:	**N/A**
		Disclosure Classification:	**CONTROLLED DISCLOSURE**

Compiled by	Functional Responsibility	Authorised By
V Chirwa	N Hlophe	O Nhapimbe
System Engineer: Civil Structures	Auxiliary Engineering Manager	Engineering Manager (Acting)
Date: 2023/06/01	Date: 2023/06/22	Date: 2023/06/23

CONTENTS

Page

1. INTRODUCTION

Duvha Power Station, owned and operated by Eskom is a coal-fired power station of six power-generating units with a combined capacity of 3,000MW (excluding unit 3 which is decommissioned). The power station is located about 13 kilometres southeast of Emalahleni in the Nkangala District Municipality, Mpumalanga Province. The location is illustrated in Figure 1 below, as well as the locality plans included under Appendix A. The centre co-ordinates (WGS 84) for the power station are as follows:

25° 57’ 40.96’’ S 29° 20’ 17.06’’ E

Duvha Power Station Civil structures are currently non-complaint with the Construction Regulations for the periodic inspection requirement under section 11(2) of the regulations. This document contains the technical requirement for the appointment of a consultant to carry out the inspection on behalf of the client and document findings to ensure compliance with the construction regulations. This document details the specification requirement for the inspection of Duvha Civil structures for a period of 5 years to ensure compliance with Construction Regulations to render the structures safe for continue use and to detect any alarming conditions that will compromise the integrity of the structures.

Figure 1: Showing a topographical location of Duvha Power Station

2. SUPPORTING CLAUSES

2.1 SCOPE

This document covers the technical requirement for the provision of professional service for Duvha Civil Structures in form of inspection, finding recording, reporting and providing recommendations for findings. The scope further covers data capturing such as testing, monitoring, surveys, etc.

2.1.1 Purpose

The purpose of this document is to describe in detailed the requirement for the provision of professional service for Duvha Civil Structures in order to comply with Construction Regulations and the Occupational Health and Safety Act, no 85 of 1993 (OHSA).

2.1.2 Applicability

This document applies to Duvha Power Station.

2.2 NORMATIVE/INFORMATIVE REFERENCES

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

2.2.1 Normative

[1] 32-727 - Eskom Safety, Health, Environment and Quality (SHEQ) Policy

[2] Occupational Health and Safety Act No. 85 of 1993, Construction Regulations

[3] ISO 9001 Quality Management Systems.

[4] 240-99527377, Inspection manual for civil works at Eskom's Power Stations

[5] 240-86973501, Engineering Drawing Standard

[6] 240-56364535, Architectural Design and Green Building Compliance Manual

[7] 240-56364545, Structural Design and Engineering Standard

[8] 240-57127955, Geotechnical and Foundation Engineering Standard

[9] 240-77801161, Inspection of Boiler Structural Supports Standard

[10] 240-106365693, Standard for External Corrosion Protection of Plant Equipment and Associated Piping with Coatings

[11] 240-106628253, Standard for Welding Requirements on Eskom Plant

[12] National Environmental Management Act, 1998 (Act 107 of 1998)

[13] National Environmental Management Waste Act, 2008 (Act 59 of 2008)

These documents are indispensable for the application of this document, i.e. documents to be used together with this document.

2.2.2 Informative

[14] 474-58 (Rev1): Document and Records Management

[15] 240-53113685, Design Review Procedure

[16] 240-53114002, Engineering Change Management Procedure

[17] 240-76992014, Project/Plant Specific Technical Documents and Records Management Work Instruction

2.3 DEFINITIONS

Definition	Description
Controlled disclosure	controlled disclosure to external parties (either enforced by law, or discretionary).
Task Order	A task order is a written instruction to proceed with the task as stipulated on the particular task order. The task order will only be valid if a "45 number" appear on the task order. The "45 number" will serve as the order number for the task and need to be stated on the invoice for the work done as per task order.
Client	The owner of the Power Station at which the inspections are to be done. Normally the Client will be represented by the Power Station or System Engineer
Consultant	Service provider consulted to provide a specific service to Eskom, Duvha Power Station.
Civil or Structural Engineering Designer	An engineer specialising in the Civil or Structural Engineering Field and having experience in the design and construction of Civil or Structural Engineering infrastructure
Employer	Eskom, or Eskom Duvha Power Station or representative
Engineer	A registered Professional Engineer or a registered Professional Engineering Technologist specialising in and having experience in the design of civil or structural assets
Inspector	A person who has been trained to conduct structural inspections i.e. Engineer
System Engineer	A person designated by the Client as having engineering responsibility for a specific plant
Sub-contractor	An individual or business which has a contract with a Consultant to provide some portion of the work or services on a project which the Consultant has agreed to perform

2.4 ABBREVIATIONS

Abbreviation	Description
CCTV	Closed-Circuit Television
CV	Curriculum Vitae
CM	Contract Manager
ECSA	Engineering Council of South Africa
ESP	Electrostatic Precipitator

Abbreviation	Description
FFP	Fabric Filter Plant
ISO	International Standard Organisation
MW	megawatt
SANS	South African National Standards
SHEQ	Safety, Health, Environmental & Quality
SE	System Engineer
PPE	Personal protective Equipment
PSR	Plant Safety Regulations
QA	Quality Assurance
QC	Quality Control
QCP	Quality Control Plan
WGS	World geodetic System

2.5 ROLES AND RESPONSIBILITIES

2.5.1 Employer

Safety, Health and Environmental

The Employer shall ensure the following:

- The Consultant is in good standing with the compensation fund or any licensed compensation insurer as contemplated in the compensation for occupational injuries and diseases act, before work commencing work on site.
- A Health and Safety specification or plan is in place/available, implemented and maintained. The Employer shall also ensure that a copy of the Principal Consultant's health and safety plan is available on request to an Employee, Inspector or Consultant. Non-compliances will result in work stoppages.
- Audit periods are mutually agreed between the Client and Principal Consultant.
- Adequate provision is made for the cost of implementation of all health and safety measures.
- The Consultant is notified promptly of situations which may affect the health and safety of any person carrying out works on site.
- Sufficient health and safety information as well as resources are made available to the Principal Consultant, where changes are brought about.
- Persons appointed by the Employer may at any stage during the term of the contract:
    - Conduct health and safety audits to establish the effectiveness of the Consultant’s health and safety management systems

- Refuse employees or agents of the Consultant access to the Power Station Site if such persons commit unsafe acts or unsafe working practice or is found not competent or authorised
- Stop works should there be unsafe working practices and procedures

General

The Employer shall ensure the following:

- Structural inspections are performed.
- Employees of the Consultant have the necessary competencies and resources to carry out works.
- The work is carried out by appropriately by competent person(s)

2.5.2 Appointed Contractor/Consultant

Safety, Health and Environmental

The Principal Consultant shall ensure the following:

- Compliance with all requirements of the Occupational Health and Safety Act no 85 of 1993 and its regulations and all other relevant health and safety legislation to ensure the health and safety of persons carrying out works. This shall also be applicable to sub-contractors.
- A health and safety plan, based on the employer's health and safety specification is provided to the employer. This shall be applied from the date of commencement and duration of works. Contents of the health and safety plan shall also be discussed and negotiated with sub-Consultants. The health and safety plan shall be implemented and maintained on site.
- Compliance with Eskom's SHE policy, procedures, standards, guidelines, specifications and site regulations.
- All employees undergo safety induction training on-site.
- All employees or agents, visitors of the Consultant are medically, physical and psychologically fit to enter the Power Station and carry out works. Employees shall also have a valid medical certificate of fitness specific to the work to be performed.
- Sub-Consultant(s) are in good standing with the compensation fund or any licensed compensation insurer as contemplated in the compensation for occupational injuries and diseases act, before work commencing work on site.
- Safeguard all employees by maintaining a safe and hygiene working environment and culture.
- A safety profile is kept for tracking and auditing purposes.
- All safety and health related incidents around site or working areas and threats that pose a danger to one's life or health are immediately reported.
- Sufficient health and safety information as well as resources are made available to the Consultant, where changes are brought about
- The Consultant shall also ensure that ergonomic related hazards are evaluated and addressed in the risk assessment.

- The Consultant's employees and/or sub-Consultants are notified promptly of situations which may affect the health and safety of any person carrying out works on site
- The Consultant shall wear the full PPE as displayed at different plant areas. The provision of the PPE to the Consultants' Employees is the responsibility of the Consultant.
- Employees/agents are supervised. Full responsibility and accountability shall be taken to ensure that all employees are competent and aware of all requirements needed to execute works safely
- Perform quality control and risk assessments on all on-site inspection activities or works. These shall be performed by a competent person appointed in writing. The risk assessment shall form part of the health and safety plan to be applied on the site and shall include at least:
    - The identification of the risks and hazards to which persons may be exposed to;
    - The analysis and evaluation of the risks and hazards identified;
    - A documented plan of safe work procedures to mitigate, reduce or control the risks and hazards that have been identified;
    - A monitoring plan; and
    - A review plan
- Compliance with all applicable environmental laws and regulations, guidelines and procedures during the execution of maintenance services. Subcontractors and others under the Consultant's direction and control shall observe and comply with the latter.

General

- All Consultants shall work within the parameter of the job description and scope of work. To keep all instructions/ procedures on hand and supply Eskom power station with reference to be included in this document and supply record and history requirements.
- The Consultant is responsible for executing the works as detailed in this document. The Consultant takes all necessary precautions that may be required to safeguard existing infrastructure and services including protection of all surface works. These additional works are formally documented in method statements for the Employer’s review and acceptance.
- The Consultant takes note that review and acceptance of any document/ drawing/ design calculations by the Contract Manager in no way relieves the Consultant of his liability for the works. The Consultant remains liable for all works conducted as per this document.
- The Consultant is liable and fully accountable for the works and the constructability thereof.
- The Consultant interacts with others through the Contract Manager, to ensure seamless integration of the various works.
- Execute the scope of work as per the employer’s specification.
- Shall interface and liaise with the other functions/structures of the Employer
- Resources and tools required by personnel for executing works are provided by the Consultant.
- Shall produce and submit to the Employer for approval, the number and details of personnel that will execute the works. Qualifications and proof thereof shall also be provided to the Employer
- Shall procure or co-ordinate the supply of required consumables

- Shall assist the System Engineer in planning, organizing and managing all inspection related activities
- Shall take adequate precautions to prevent damage to civil and structural assets
- The Consultant's employees or agent shall abide to Eskom's Life Saving Rules. If found to have violated any of the Eskom Life Saving Rules, they may face disciplinary action.
    - Open, isolate, test, earth, bond, and/or insulate before touch.
    - Hook up at heights.
    - Buckle up.
    - Be sober.
    - Ensure that you have a permit to work.
    - Wear correct PPE at all times
    - Report all incidents

2.6 REQUIRED CRITERIA FOR CONSULTANT

- The Consultant must provide the CVs of the technical staff and a proof of qualification and certificates.
- The Consultant must provide a company profile showing previous work done.
- The Consultant will be required to comply with Eskom Duvha Power Station SHEQ requirements. This is mandatory, as one of Eskom values is Zero harm.

2.7 RELATED/SUPPORTING DOCUMENTS

Not Applicable

3. SCOPE OF WORKS

3.1 DESCRIPTION OF THE WORKS

The objective of the Employer is to appoint a Consultant for assessment of Duvha power station Structures, to take the professional responsibility and accountability in accordance with ECSA, for providing Inspections and assessment services. The works entails identification, assessment, management and mitigation of all risks, defects, concept, basic, detailed analyses and designs, operation and maintenance issues, development of contract documentation (incl. technical specifications, construction drawings and bill of quantities) technical supervision associated with the Civil and Structures engineering plant for Duvha Power Station.

3.2 ENGINEERING STRUCTURAL INSPECTIONS

The primary requirements are to conduct assessment for the Duvha structures listed in section 3.3 below as per the OSHA and Construction Regulations; as well as inline with the latest Inspection manual for civil works at Eskom’s Power Stations (240-99527377) and Duvha Maintenance Execution Strategy for Civil Structures Plant (ENS0040).
The assessment of the structures shall be conducted in compliance with the construction regulations (GNR.84 of 7 February 2014). The regulation states that the owner of the structures must ensure that:

- Inspections of the structures are carried out periodically by competent persons in order to render the structures safe for continued use
- That the inspections are carried out at least once every six months for the first two years and thereafter yearly
- The structure is maintained in such a manner that it remains safe for continued use
- The records of inspection and maintenance are kept and made available on request to an inspector.

Duvha power station has more than 30 years since it was built which makes the station structures to qualify for yearly inspections as per the construction regulations, unless stated otherwise by the *Employer*. All tall structures where visual inspection cannot be conducted beyond 10m due to access limitations, special equipment shall be provided for in, order to conduct the assessment required as intended. Equipment such as Drone Camera, CCTV inspections, rope access, etc.; provision shall be made.

3.3 APPLICABLE PLANT AREAS

3.3.1 Permanent Buildings (including carports):

- Main administration building
- Medical and Fire station buildings
- Main access control buildings
- Old simulator buildings
- Compressor house building
- Ablution blocks
- Shisa taba and kitchen complex
- Hydrogen plant building
- Water Treatment Plant (WTP) (south and North) and Laboratory building
- Electrical maintenance Workshop (EMD) and Maintenance training building
- Welders and Platers Workshop building
- Oil Burner Workshop
- Mogolo building
- Coal management building (CMD)
- Heavy Maintenance Workshop (HMD) and Stores Building
- Steam Cleaning building
- Sling stores
- Shot Blasting building
- Resin Store Building
- Gas Store building
- Outside Plant Control building
- Lapa
- Outside plant Electrical sub-station buildings
- New Outage Stores

3.3.2 Prefabricated buildings and Park homes (including carports):

- Outage Management Offices

- GCD offices
- Planner's offices
- Operating Support offices
- Risk Management offices
- Auxiliary Engineering offices
- Project Management offices
- Transport Department offices
- IR and HR offices
- Technical Support services offices
- Heavy Maintenance offices
- Design and Specifications offices
- Training offices and classrooms

3.3.3 Power Station Structures:

- Boiler house structures (unit 1 to 6)
- Turbine house structures (unit 1 to 6)
- Coal Staithe 1 and 2
- Conveyor structures
- Precipitators & bag filter plant (unit 1 to 6)
- Auxiliary bays (unit 1 to 6)
- Ash silos (unit 4 to 6)
- Flue ducts (unit 1 to 6)
- Boiler bottom ash sumps (unit 1 to 6)
- Pump houses (cooling water, process water, ash water return, Booster)
- Water treatment plant structures (Clarifiers, concrete channels, launders, Valve pits)
- Sewage Treatment Plant
- Cooling towers 1 – 6
- Lime silos
- Smoke stack chimneys (North and South)
- Site Roads
- Station survey drains and underground drainage

Note: The contractor to make provision for inspection of future development of infrastructures within the contract period

3.4 DETAILS OF STRUCTURAL INSPECTION WORK

3.4.1 Buildings

Please refer to the references listed below for the general inspection activities that should be performed on the buildings: Inspection Manual for Civil Works at Eskom's Power Station - 240-99527377, section 8.7

Inspections shall include but not be limited to the following:

- Checking for foundation failure or settlement

- Checking the structural condition of buildings' cladding
- Checking condition of floors i.e. screeds, floor slabs
- Checking the condition of the roof sheeting
- Checking condition of all concrete and steel members or elements
- Checking condition of hand railing systems
- Checking condition of architectural features (gutters & downpipes, ceiling, doors, windows, paint/coating, etc.)

3.4.2 Drainage Structures

Please refer to the references listed below for the inspection activities that should be performed on subsurface drainage structures: Inspection Manual for Civil Works at Eskom's Power Station - 240-99527377, Section 9.5.4

Inspections shall include but not be limited to the following;

- Inspections of pipelines using Closed Circuit Television (CCTV) surveillance systems to check the condition of the sites piping network
- Surveys shall also be conducted to monitor any settlement or movement of the pipes

3.4.3 WTP Tank Structures and Foundations

Inspections shall include;

- Inspecting concrete structures for signs of spalling, cracking, rebar corrosion and degradation
- For steel structures, inspect sections for signs of structural distress
- Signs of water seepage also need to be inspected. Recommendations on the impact on the structure and remedial actions must for part of the analysis.
- Conducting a survey of the concrete foundation to monitor the movement of the slab and tanks.
- A baseline survey must be created that can be used as reference for future surveys.
- Assess the foundation for signs of overload and movement

3.4.4 Chimneys and Flue ducts

Please refer below for the inspection activities that should be performed on the chimney stacks: Inspection Manual for Civil Works at Eskom's Power Station - 240-99527377. See section 8.2
Inspections shall include;

- Checking for signs of stress cracking, acid attacks, carbonation, erosion, deflections, flaking, spalling and creep.
- Non-destructive testing may include, but is not limited to:
- Shape survey using a laser scan
- Ground penetrating radar (GPR)
- Video inspections

- Finite particle analysis

Testing

If testing is required it shall be carried out by a specialised company. This can comprise the following:

- Chemical testing of Flue Gases.
- Depth of Carbonation
- Concrete Strength on Cored Samples
- Chemical tests on concrete samples

3.4.5 Concrete Silos (Coal Staithe, Lime Silos & Dust Silos)

Please refer below for the inspection activities that should be performed on concrete silos: Inspection Manual for Civil Works at Eskom's Power Station - 240-99527377. See section 8.3
Inspections shall include;

- Checking for signs of stress cracking, acid attacks, carbonation, deflections, flaking, spalling and creep on the exterior of the silo.
- For steel frames, inspect the sections for signs of structural distress
- Assess the foundation for signs of overload and movement.
- Non-destructive testing may include, but is not limited to:
    - 3 D scan or shape survey using a laser scan
    - Ground penetrating radar (GPR)
    - Video inspections
    - Finite particle analysis

Due to the criticality of the silo, the testing on the interior must be done such that impact on the operations of the station is minimised and the information gathered is sufficient to provide a detailed assessment of the structure.

3.4.6 Cooling Towers

Please refer below for the inspection activities that should be performed on the auxiliary cooling towers: Inspection Manual for Civil Works at Eskom's Power Station - 240-99527377, Section 8.1
Inspections shall include;

- Inspecting the structure for signs of spalling, bio-chemical attack (by algae or other microorganisms), scale build-up, thermal stresses, degradation of concrete walls and erosion of reinforcement cover.
- Check for water seeping through the shell. This takes place where grout leakage has occurred, and generally occurs at the horizontal construction joints at the concrete casting lifts. It can be particularly noticeable on the negative slopes
- Signs of water seepage also need to be inspected. Recommendations on the impact on the structure and remedial actions must form part of the analysis
- Check the joints between the foundation and the cooling water duct inlets for spalling. Check for visible signs of sandpaper texture formation as a result of condensate attack.

- Check safety of walkways, handrails and cat ladder, even though safety issues are regarded as a part of the normal plant operating procedures.
- Check whether walkway support beams rest fully on their supports, or whether they slide on them. If in timber, deterioration is usually the result of the intermittent dry and wet conditions experienced.
- Check for Vertical cracks. Vertical cracks in the top third of cooling towers tend to occur as a consequence of wind-induced vibration; foundation movements; and thermal conditions inherent in the operation of the towers.

Testing

In the case that testing is recommended following the visual inspection, the consultant shall made provision of conducting the tests by a competent person
. These tests shall comprise of but not limited to the following:

- Reading of Concrete Surface Hardness to provide indication of concrete strength;
- Depth of Carbonation;
- Concrete Strength of Cored Samples;
- Chemical Tests on the Cooling Water and Condensate;
- Chemical tests on concrete samples;
- If possible, chemical analysis of the soils under the slab of the ponding area and foundations;
- 3D Survey to assess possible foundation settlements.

3.4.7 Sewage Treatment Plant

Inspections shall include;

- Inspecting structures for signs of spalling, bio-chemical attack (by algae or other microorganisms), scale build-up, degradation of concrete walls and erosion of reinforcement cover.
- Signs of water seepage also need to be inspected. Recommendations on the impact on the structure and remedial actions must for part of the analysis

Testing

In the case that testing is recommended following the visual inspection, the consultant shall made provision of conducting the tests by a competent person. These tests shall comprise of but not limited to the following:

- Chemical attach tests
- If possible, chemical analysis of the soils under the slab of the Ponding Area and foundations
- Depth of Carbonation;
- Concrete Strength of Cored Samples;

3.4.8 Conveyor Structures

Please refer below for the inspection activities that should be performed on the conveyor structures:

Inspection Manual for Civil Works at Eskom's Power Station - 240-99527377. See section 8.5
Inspections on conveyor structures shall include:

- An inspection of structural steel members and structural supports areas for structural distress, i.e. deformation and sagging.
- Checking for ash, coal or clinker build-up.

Internal inspections of conveyor structures can only be performed with the necessary permit however the necessity of a detailed internal investigation will be required based on the outcome of detailed external investigations

3.4.9 Turbine House Structures

Please refer below for the inspection activities that should be performed on the turbine house and associated structures:
Inspections on the turbine hall must include

- For steel structures, inspect sections for signs of structural distress
- For concrete structures, check for concrete cracking, areas of structural distress i.e. large deflections or sagging
- A survey of the turbine floor to assess the movement of floor and the turbine, if any
- The structure must be surveyed by means of 30 scanning, or any similar means. A baseline survey must be created that can be used as reference for future surveys.
- Assess the foundation for signs of overload and movement
- A finite particle analysis to identify areas that require increased attention to assist in the allocation of maintenance efforts or the need of an intervention.
- Determining the depth of the corrosion on concrete surfaces by doing a phenolphthalein test on the concrete. Also determine the remaining life span of the passivating layer i.e. concrete thickness between surface and reinforcement.

3.4.10 Boiler House Structures

Please refer below for the inspection activities that should be performed on the boiler house and associated structures: Inspection of boiler supports - Conventional Fossil Fuel Fired Power Station - 240-77801161 and Inspection Manual for Civil Works at Eskom's Power Station - 240-99527377.

- For steel frames, inspect the sections for signs of structural distress
- For concrete works, check for concrete cracking, spalling, rebar corrosion and exposed reinforcing and aggregates
- The structure must be surveyed by means of scanning, or any similar means. A baseline survey must be created that can be used as reference for future surveys.
- Assessment of the boiler hangers and associated bolts, used for the suspension of the boiler, for signs of stress and strain. Finite element analysis or another recognised means must be used to provide reliable analysis.
- Determining the depth of the corrosion on concrete surfaces by doing a phenolphthalein test on the concrete. Also determine the remaining life span of the passivating layer i.e. concrete thickness between surface and reinforcement
- Assess the foundation for signs of overload and movement.
- For grit sumps, drain water and check for concrete cracking, spalling, rebar corrosion and exposed reinforcing and aggregates.

3.4.11 FFP Support Structures and ESP Support Structures

Inspections on the FFP and ESP support structures will include the following:

- Inspecting concrete components for cracking, excessive crack widths and spalling
- Inspecting steel elements for excessive deflections, deformation and signs of erosion, scaling, corrosion and fatigue. Make general determination of structural distortion
- Checking for dust ingress and build up around steelwork and connections which could lead to overloading
- Inspecting cladding and sheeting for visible holes, corrosion and looseness

3.4.12 Roads

Please refer below for the inspection activities that should be performed on the conveyor structures: Inspection Manual for Civil Works at Eskom's Power Station - 240-99527377. See section 9

Inspections are conducted to determine:

- Road condition indices;
- Maintenance and rehabilitation needs;
- Prioritisation

3.5 SECONDARY REQUIREMENTS; “AS AND WHEN” REQUIRED.

- Provision of quantity surveying and cost engineering consulting services.
- Reinforcement Concrete survey for GPR scanning.
- Ultrasonic testing of reinforced concrete and structural steel.
- Concrete testing for Carbonation depth penetration.
- Geotechnical Investigations for new and existing infrastructures.
- Topographical survey, Lidar survey, Bathymetric survey, Geophysical survey (including seismicity studies), 3D point cloud scanning, pipeline survey.
- Assist in the training or skills transfer of personnel where applicable.
- Compilation of scope of works or to advice in the compilation of scope of works.
- Provides advice on contracting strategies and the NEC options to be used for the various contracting strategies.
- Preparation of Bills of Quantities / Activity Schedules.
- Provide estimate cost of proposed contracts based on the scope of work.
- Perform economic analysis on tender received and provides comparison with market related costs.
- Define price adjustments for inflation formulae to be included in enquiry documents.
- Compensation Event analysis.
- Contract administration on selected contracts.
- Provides assistance and advice in resolving contractual claims and disputes.
- Cash expenditure forecasts and final cost projections.
- Finalising costs and auditing of contracts on completion as required.
- Act as a member of the negotiating team on Duvha Power Station’s behalf.
- Prepare maintenance and operational manual for new designs when required

- Construction supervision and post project documentation
- Ensure that the *services* are carried out in conformance with the Site Regulations issued by the *Employer* applicable to Duvha Power Station.
- Assist the Project Manager in the verification of the *Consultants* Quality Control documentation to ensure that it complies with the Operation and Maintenance (O&M) manual for the operating and maintenance of the Duvha Power Station, specifications and contract requirements.
- Assist the Project Manager to ensure that the contract is carried out to comply with the specifications, procedures, good maintenance practices and quality in accordance with the O & M manuals.
- Identify and mitigate risks associated with the execution of the operating and maintenance of the plant at Duvha Power Station.
- Revise O&M manuals if and when required.
- Perform Safety Risk assessments when required.
- The Consultant compiles technical plan budgets, Definition Release Approval (DRA), Execution Release Approval (ERA), and Finalization Release Approval (FRA) for civil projects at Duvha Power Station.

3.6 SPECIFICATION AND DESCRIPTION OF THE *SERVICES*

The scope of work includes the following:

- To act as the responsible professional engineer in terms of the Engineering Professional Act, Act 46 of 2000 and fulfil the role of Designer as per Construction Regulations.
- perform all duties and responsibilities as stipulated above under “Deliverables”.
- To visit, review and update where necessary the operations and maintenance philosophy on all Civil Structures against;
  - Duvha Power Station Operations and Maintenance Manuals.
  - Eskom Inspection Manuals
  - All statutory legislation, standards and regulations.
  - All Eskom’s standards, policies and procedures.
- To review and update all documentation related to the Civil Maintenance Strategy e.g. PM’s, to ensure optimal functionality of the plant.
- To perform periodic inspections and submit reports with recommendations on the condition of the plant as per:
  - Civil Engineering Standards and practices.
  - Duvha Power Station Operations and Maintenance Manual.
  - Inspection Manual for Generic Civil Works at Eskom’s Power Stations.
  - The legal requirements in terms of the relevant acts
  - Eskom Policies and Procedures.
  - Statutory Safety Regulations.
- To provide consultation services as well as documentation in terms of the “Engineering Change” requirements of Duvha Power Station. This includes:
  - To compile User Requirement Baseline data for approval.
  - To create Concept Design Baseline data for approval.
  - To create Basic Design Baseline data for approval.

- To provide contractual support services “as and when” required during execution phase as stipulated in the specifications.
- To develop Acquisition Requirements Baseline documentation e.g. works information and pricing documentation in accordance to the NEC standards
- To conduct new designs as and when required by the Employer
- All structural detailed inspections/assessment such as structural analysis and designs report shall be a full package which includes the following as a minimum signed by a Professional Civil Engineer/Technologist:
    - Calculations
    - Design Models (with input and output data)
    - Drawings and sketches
    - Assumptions
    - Exclusions
    - Standards adopted
    - Design criteria adopted
    - Bill of Quantities
    - Detailed scope of work
    - Engineer’s cost estimate

4. REPORTING

The Engineer must inform the System Engineer of any issues identified during the engineering inspections. A report must be compiled by the Engineer on the matters raised during the inspection. The content of the written report must confirm what is pointed out in the inspection and if necessary discussed with the System Engineer. A signed and dated copy of the report must then be submitted to the Client. Inspection reports must detail amongst others the following:

- The date of the inspection, name and affiliation of the Engineer
- Names of plant personnel present during the inspection
- What assets were inspected, and what portions of those assets were inspected. It must not be assumed that where a report records nothing there were no problems. Reasons for not inspecting certain portions must also be documented e.g. restricted or unsafe access
- Possible root causes of defects.
- Details of any alterations made to or improper usage of infrastructure, including exposure to conditions not generally designed for.
- Evaluation of the Client's operating and maintenance programme
- The Engineer must recommend that all structural elements categorised as 4 or 5 be repaired or replaced.
- Photographic records of the inspections showing the condition of the assets (findings, defect risk and severity rating and recommendations for repair)
- Structural elements requiring remedial actions to be taken must be noted. These must be prioritised according to Table 2
- Bill of Quantities and Scope of Work for implementation / construction of repair designs together with technical specifications.
- Engineer’s cost estimate for executing remedial work design.

- Concept, Basic and Detailed Designs (including calculation reports) and development of construction drawings, if required.
- Technical supervision of construction.
- Certification in accordance with SANS 10400-A.

4.1 CONDITION CATEGORIES AND PRIORITISATION OF ELEMENTS

In order to ensure consistency of reporting and common understanding of the severity of deterioration of plant structures, five condition categories are used, as defined in Table 1 below

Table 1: Condition Categories

Category	Description	% Original Strength	Typical Remedial Action
0	The plant assets are in excellent condition, with no deterioration evident. Safe use of the plant assets is assured.	100	None Required
1	The plant assets have slight evidence of surface deterioration, but to an extent that there is no reduction in strength	100	None Required
2	The plant assets have some deterioration, to an extent that there is slight reduction in strength. Safe use of the plant assets is assured	95-100	Repaint, tighten bolts, other minor work
3	The plant assets show deterioration, to an extent that there is some reduction in strength. There is some compromise to safe use of the plant structure. Repair must receive attention in maintenance scheduling.	75-95	Repair, repaint, tighten bolts, other minor work
4	The plant assets show severe deterioration, to an extent that there is a major reduction in strength. Safe use of the plant is severely compromised. Urgent attention must be given to repair.	50-75	Repair or replace components
5	The plant assets show severe deterioration, to an extent that they have little useful residual strength. Safe use of the plant is impossible. Urgent attention must be given to repair.	< 50	Repair or replacement of components required urgently

Table 2: Prioritisation of Elements

Priority	Description

X	Where a structure or portion of a structure cannot be used for its intended purpose in its current condition, but may not be required to be used for some time, it must be recorded as Priority X.
1	All members in condition category 5, any primary structural members in conditions category 4, and any other members where the deterioration leads to risk to personnel safety must be recorded as Priority 1. Repair or replacement of the structural members, or other recommended work, requires urgent, immediate action.
2	All secondary or tertiary members in condition category 4, and any other structural members requiring repair or replacement in the short term must be recorded as Priority 2. Repair or replacement of the structural members, or other recommended work, should be scheduled as soon as possible, but not later than one year from date of this report.
3	Repair of the structural members, or other recommended work, will be required within the next three years.

- A written report must be submitted to the System Engineer within four weeks after the date of the inspection.
- All safety critical findings must be communicated to the System Engineer immediately on completion of the engineering visual inspection.
- A brief written report of all safety critical findings must be submitted within one week after the date of inspection. Safety critical items include only those items that are considered by the Engineer to constitute an immediate hazard to the safety of personnel in the plant.
- All inspection reports submitted must be signed by an Engineer or Technologist professionally registered with ECSA

4.2 FOLOW-UP

Within one month of receiving the Report of Safety critical Items, the Client must submit to the Structural Engineer a statement of what actions has been taken to rectify each of the safety critical items identified. Should this statement not be received, the Structural Engineer must then request it from the Client, or must visit the site to ensure that appropriate action has been taken.

Within six months of receiving the structural inspection report, the Client must submit to the Engineer a statement of what action has been taken as a result of the report, and what further action is planned, in addressing the recommendations made in the report.

4.3 DOCUMENTATION REQUIREMENT

All design drawings shall be submitted in electronic format DGN format (Micro Station), PDF and 2 x A1 hardcopies as well as 3D models and scan data. All drawings shall be constructed in two (2) dimensional views. The drawings shall be in plan, section and elevations and details which are drawn to scales as specified in SANS 10400. Eskom may request to transfer all drawings onto an Eskom

template for registration purpose. Site plans shall indicate definite true dimensions from borders / other buildings. All services and connections shall also be indicated on the site plan.

Timelines for submission of each task deliverable shall be agreed up on between the Consultant and the Employer depending on the complexity of the work to be executed.

4.3.1 Use of *Consultant*'s design

The *Employer* may use the *Consultant's* design for any purpose related to the *Employer's* operational requirements. All documents and drawings are to be submitted to the Employer for review and acceptance prior to execution. The reviews done by the Employer does not relieve the Consultant of their liability and accountability.

4.3.2 Design of Equipment

The *Consultant* shall review Designs for *contractor's* temporary works where applicable (e.g. where such is supported from existing infrastructure) or equipment intend to use for the delivery of the units to the Project Manager for consideration and approval.

4.3.3 Take-over

After the *Project Manager* has verified the completed installation, all the required documentation shall be submitted by the *Consultant*. This shall include but not limited to the following:

- Compliance Certificate that all systems comply with all the relevant standards
- Complete set of "As Built" drawings
- Operational instruction and maintenance manuals for the complete installation.
- Certification in accordance with SANS 10400 and the OHS Act (Construction Regulations)

After successful completion of the commissioning and acceptance testing, the *Consultant* shall restore the relevant system to its operational condition.

4.3.4 As Built Documentation

"As Built" drawings shall be submitted on Eskom's drawing template in electronic format as well as hard copy. Electronic format shall be in Micro-station and/or DXF format.

5. SAFETY REQUIREMENTS

- System Engineers shall accompany the Engineer or inspector when inspections are conducted. The System Engineer and the Engineer shall be conversant with all safety and operational procedures of the plants. Also a minimum of 2 persons shall conduct inspections in the civil and structural plants at any given time.
- Safety File must be pre-approved by Duvha Safety Department.
- Consultant employees must complete Duvha Safety Induction Course, before any work can be executed.
- Risk assessment and Pre-job brief shall be conducted by Consultant Supervisor with all his employees. Copies shall be handed over to the client.
- No work shall be performed without a Permit to Work. Domestic installations are exempted.
- No work shall be performed without pre-arrangement with the contract manager.
- All required Personal protective equipment (PPE) must be worn all the time.

- All Eskom's and other safety rules must be adhered to all the time.

5.1 RISK ASSESSMENT

A risk assessment must be conducted prior to carrying out inspections to identify any hazards and risks that may be encountered during maintenance activities

5.2 ACCESS AND LIGHTING

The inspections will generally be performed from the ground or from easily accessible floors, stairs and walkways. The Consultant shall be responsible to provide access equipment as well and portable flash lights if necessary.

6. QUALITY REQUIREMENTS

The *Contractor's* ISO 9001:2015 Certificate of compliance or equivalent must be supplied with tender documents. If the *Contractor* is not certified, the objective evidence of a developed and fully implemented Quality Management System that complies with ISO 9001:2015 requirements shall be submitted.

The *Contractor* shall comply with the *Employer*'s Quality Requirements as specified in the Supplier Quality Management Specification 240 – 105658000 (QM-58). Form A (Tender and contract quality requirements for QM 58 and Quality Requirements for ISO 9001 standard) of this Specification indicates the specific application thereof.

All Quality Control documentation must be submitted to the *Employer* at least one month before project start. Quality Control Plans must include hold and witness points, must clearly state 3rd party interventions and quality/test specifications where applicable.

The Quality Control documentation that will be handed over within 30 days of order placement by the successful *Contractor* to the Employer and shall consist the following:

6.1 QUALITY CONTROL PLAN

The Quality Control Plan shall consist of the following as a minimum and shall be accepted by the *Quality representative* of the *Contractor* prior to commencement of work and shall be sent to Eskom for approval. The QCP will also include welding procedures where applicable.

A covering page, table of contents and QCP which includes and makes provision for the following but not limited to:-

- QCP unique number.
- Revision number.
- Page number
- Provision for QCP approval signatures by the *Contractor* (Supervisor and Quality Controller) and Eskom System Engineer and/ or Eskom QC.
- Provision to incorporate all inspection reports or any form of records to prove conformity to requirements.
- High level description of work in execution including Item/ component/ system/ sub-system.
- Provision for nomination of intervention points for each activity as per SOW.

- Provision for review and approval signatures and dates by the *Contractor* (Supervisor and Quality Controller) and Eskom System Engineer and/ or Eskom QC.
- Provision for final acceptance/ releases approval signatures by the *Contractor* (Supervisor and Quality Controller) Eskom System Engineer and/ or Eskom QC.

6.2 TEST REPORTS

Where tests were performed they shall be recorded and the positions of measurements are traceable to the specific area of testing against the records. Therefore the Contractor will submit all test reports that has been performed in the form of Data Pack.

6.3 PROCEDURES

Contractor to submit all work procedures/instructions before any work commences. These must be submitted together with QCP for approval.

7. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
[redacted]	[redacted]

8. REVISIONS

Date	Rev.	Compiler	Remarks
May 2023	0	[redacted]	Draft Document
May 2023	0.1	[redacted]	Incorporation of comments
June 2023	1	[redacted]	Final Document