	<b>Scope of Work</b>	<b>Peaking Engineering</b>
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Control Block Ventilation  
Refurbishment Project**

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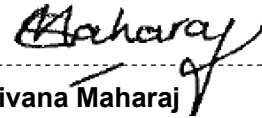
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### **CONTROLLED DISCLOSURE**

## **1. Introduction**

This document describes the Scope of Work to ensure that a new HVAC system is installed at Drakensberg Station to reduce the risk of high temperatures in the control block. This Scope of Work will form part of NEC Contract document. The NEC Contract document will be used to go to the market to contract the Engineering Work for the Design, Manufacturing, Supply, Delivery, Installation, Testing and Commissioning of the refurbished HVAC at Drakensberg Station.

## **2. Supporting Clauses**

### **2.1 Scope**

#### **2.1.1 Purpose**

This document provides the scope of work for Drakensberg Control Block Ventilation Refurbishment Project contract for the purpose of contract initiation.

#### **2.1.2 Applicability**

This document shall apply to Drakensberg Power Station only.

#### **2.1.3 Effective date**

This document will 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**

- [1] ISO 9001 Quality Management Systems
- [2] OHS Act No 85 of 1993: Occupational Health & Safety Act
- [3] 240-102547991: General Technical Specification for HVAC Systems Standard
- [4] 240-56356363: Design Standard for HVAC in Pump Storage Schemes
- [5] 240-53113685: Design Review Procedure
- [6] Government Gazette No. 36750: Proposed Regulations regarding the phasing-out and management of ozone-depleting substances.
- [7]

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### 2.2.2 Informative.

[8] 31A/4192-B: Investigation for Drakensberg Control Block Ventilation report

[9] 31A/4192-D: Concept Design Report for Drakensberg Control block

## 2.3 Definitions

Definition	Description
N/A	N/A

## 2.4 Abbreviations

Abbreviation	Explanation
NEC	New Engineering Contract
OEM	Original Equipment Manufacturer
QCP	Quality Control Plan

## 2.5 Roles and Responsibilities

Role	Responsibility
System Engineer	Provide scope of work, give input during negotiations with the OEM and review the technical sections in the final NEC contract.
System Engineering Manager	Ensure document content is true and accurate.
Engineering Manager	Authorizes the document

## 2.6 Process for Monitoring

Generation Procurement and Supply Chain Management.

## 2.7 Related/Supporting Documents

Refer to section 2.2

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### 3. Scope of Work

#### 3.1 Description of the Works

Design, manufacture, supply, delivery, installation, testing and commissioning of the new Drakensberg Control Block HVAC system and the decommissioning and removal of the old Drakensberg Control Block HVAC system equipment at Drakensberg Station.

The scope of the Drakensberg Control block refurbishment project shall include but not limited to the following:

- Replacement of the two old Chiller Units with new chillers of equivalent cooling capacity (88 kW each)
- Replacement of the Refrigerant Pipeline from Chiller Units to the Cooling Coil of the Air Handling Unit and back to the Chiller Units.
- Replacement of the condensate drain pipeline.
- Replacement of the Cooling Water Pipeline from the supply and return isolation valves to the Chiller Condenser inside the Chiller Condenser plant room.
- Inspect power cables for any physical damage and check insulation resistance (megger test) before termination is done.
- Earthing and bonding of the chiller motor to the Station earth.
- Connection of the chiller motors to the existing switchgear. Dimensions of the existing functional unit are 600x625x400mm. Existing drive size is for 25kW.
- Application and verification of compressor protection settings.
- Confirm correct rotation direction.
- Connection of the chiller motors to the existing switchgear and verification of switchgear electrical protection settings.
- Decommissioning, removal from site and disposal of the 2 x old chiller units, including the recovery and/or safe disposal of the R12 refrigerant.
- Design, supply and installation of a chiller controller, which will stop, start and load the chillers based on the cooling demand; determined from the air temperature set point and from the cooling coil inlet/outlet temperatures.
- Remote switching and monitoring of the chillers and fans statuses in the Control Room.
- Verify fire damper operation in the Control Room.
- Remote monitoring of the air flow in the Battery Room from Control Room HMI.
- Development and submission of drawings, manuals and design details in accordance with Eskom Standard.

### 4. MANAGEMENT AND START UP

#### 4.1 Engineering quality assurance requirements

The *Contractor* is not to use Plant or Materials, which are generally recognised as being unsuitable or otherwise to be avoided for the purpose for which they are intended.

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Only components of high reliability are to be utilised, with a proven operating history, to enable the Plant to achieve required reliability and availability. Plant and Material design, engineering and manufacture to accord with the best modern practice applicable to high-grade products of the type to be furnished, to ensure the efficiency and reliability of the *Works* and the strength and suitability of the various parts for the *Works*.

Plant and Materials withstand ambient conditions and the variations of temperature arising under working conditions without distortion, deterioration or undue strains in any part.

All parts are made accurately, and where practicable, to standard gauges to facilitate replacement and repairs. Like parts are interchangeable.

No repair of defective Plant and/or Materials are to be permitted without the *Employer's* approval and any such repair, if approved, are to be carried out to the satisfaction of the *Employer*.

The *Employer* is free to specify hold and witness points during the installation and on-site testing stages of the project. The *Contractor* issues preliminary notification of such hold and witness points as per agreed schedule to the *Employer* and confirms such hold and witness points at least seven working days prior to the activity.

The suggested minimum project hold points are listed below:

- a) Design Review
- b) Factory Acceptance Test
- c) Erection Completion
- d) Commissioning

Documentation regarding quality procedures is to be submitted to the *Employer* after Contract Award. The *Employer* is to review and comment on the acceptability of these documents in a time frame as per the requirements of the contract for contractual correspondence. If controlled copies of these documents have been submitted to the *Employer*, then the controlled copy numbers may be quoted in the submission.

## **4.2 Training workshops and technology transfer**

Refer to section 7.2.9

## **5. Engineering and the *contractor's* design**

### **5.1 EMPLOYERS DESIGN**

N/A

### **5.2 Parts of the works which the *Contractor* is to design**

#### **5.2.1 Design Conditions**

The *Contractor* will design the new HVAC system taking into consideration the specified technical data below:

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### **5.2.1.1 Outdoor conditions**

The outdoor design conditions for HVAC are based on the Weather Bureau data. The mean maximum temperature (DB) for summer and mean minimum temperature for winter is taken as a design condition. The Weather Bureau does not list temperature and associated relative humidity (RH) as one set of data. The Drakensberg PS climate conditions are as follows:

- a) Summer: Ambient Temperature = 36°C DB 11.5°C WB
- b) Winter: Ambient Temperature = -3°C DB -3°C WB
- c) Elevation = 1187 m above sea level

### **5.2.1.2 Condensing Unit**

- a) Cooling Capacity: 88kW, existing rating per condenser
- b) Quantity: Two
- c) Compressor motor voltage: 380V/3ph/50Hz
- d) Operating mass: 650 kg
- e) Length: 2500mm
- f) Width: 600mm
- g) Height 1000mm
- h) Operating pressure (condenser side): 1750kPa
- i) Condenser tube material: 90/10 Copper Nickel corrosion proof
- j) Cooling water maximum temperature in summer: 25 °C
- k) Cooling water minimum temperature in winter: 8 °C
- l) Condensing pressure drop: 16 kPa
- m) Condensing water flow rate: 3.2kg/s
- n) Total power input: 25kW

### **5.2.1.3 Valves and Piping**

- Condenser water piping: 75NB
- Pipe coating internal: Galvanize
- Pipe coating external: Enamel paint to colour code
- Valve seats and discs material: Cast steel
- Valves body material: Cast steel

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The plant and material are to be designed and selected with due regard to the installation site conditions, particularly with respect to altitude, ambient temperatures and atmospheric conditions. The plant and material are to be selected to operate within the limits recommended by the manufacturers and where equipment will be required to operate at conditions deviating from the manufacturer's standard selection tables, re-rating is to be done strictly in accordance with the manufacturer's selection procedures.

The *Contractor's* design is to comprise detailed design package which will be reviewed and approved in accordance with *Employer's* design review procedure 240-53113685.

The design data specified in this Specification and those dimensions shown on the tender drawings are intended for tendering purposes only. The *Contractor* is required to take the actual measurements onsite before proceeding with design & manufacture of the complete *Works*, as dimension accuracy remains the responsibility of the *Contractor*.

The *Contractor* is to design, produce required drawings and select plant & material which satisfies:

- a) The overall plant performance and efficiency specification.
- b) The specified reliability; and keep maintenance costs to a minimum.
- c) Local and statutory authorities and construction requirements.
- d) Space constraints; and
- e) Local content

*Contractor* produces self-explanatory operating and maintenance manuals. The Operating and maintenance manuals are to include the following however not limited to:

- a) Description of *Works*
- b) Operation
- c) Maintenance
- d) As Built drawings & Commissioning Results

The *Contractor* is to execute the following:

- a) Detailed design
- b) Plant and material acceptance testing
- c) Testing and commissioning
- d) Training of operators
- e) Troubleshooting

The *Contractor* is responsible for the detailed design of the *Works* below and that such designs are submitted to the *Employer* and approved prior to procurement and manufacture of any plant and material.

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

The *Contractor* is the Design Authority for HVAC system, Controls, Electrical, and Building related *Works* of the contract as defined in the Design Review Procedure 240-53113685. The *Contractor* is responsible for following this design procedure and conducts all the design reviews as specified in this procedure. The *Contractor* is responsible for conducting the following reviews:

- a) Design Freeze Review

### **CONTROLLED DISCLOSURE**

- b) Construction Completion Review
- c) Acceptance Testing Review

The following process will be followed during submission of documents:

- a) The *Contractor* submits the documents/drawings to the Project Manager.
- b) The *Employer's* Document Controller registers the documents.
- c) The *Employer's* Document Controller will supply the documents/drawings to all relevant parties within the *Employer's* project team.
- d) The *Employer's* project team reviews the documents/drawings and will submit all comments or inputs to the *Employer's* representative and the *Employer's* representative submits to the *Contractor* for consideration.
- e) If the *Employer* finds major deficiencies in the submitted documents/drawings, the *Contractor* revises the documents/drawings and resubmits to the Project Manager.
- f) The *Employer* reviews the documents/drawings and if no major deficiencies are found, the *Contractor* organises a review session.
- g) The *Employer* and the *Contractor* conduct a review.
- h) If any fundamental errors were found in the review or further actions are required, the *Contractor* record all concerns raised and revises the documents/drawings.
- i) The *Contractor* organises a review session once all documents/drawings have been revised according to the concerns raised by the *Employer*.
- j) If no fundamental errors were found in the documents/drawings during the review session, the *Contractor* compiles the review minutes or report and submits it to the *Employer*.
- k) The *Employer's* Document Controller registers the report.
- l) The *Employer's* project team reviews the *Contractor's* report/minutes. If the report/minutes are not acceptable, the *Contractor* revises the report/minutes and resubmits to the *Employer*.
- m) The *Employer* will accept the *Contractor's* documents/drawings once the report/minutes are accepted by the *Employer's* project team. The *Employer* will have 4 weeks to reply to the *Contractor*.

The *contractor* is to implement the following activities for approval:

- a) The *Contractor* reviews, stamps, dates and signs to signify his approval and submit in the manner required by the *Employer* in orderly sequence to cause no delay in the work, all *Contractor's* drawings, equipment selections and/or samples required by the *Works* or subsequently by the *Employer*. *Contractor's* drawings, equipment selections and samples are to be properly identified as specified or as the *Employer* may require.
- b) At the time of submission, the *Contractor* informs the *Employer* in writing of any deviation in the *Contractor's* drawings, equipment selection or samples from the requirements of the *Works*.
- c) By submitting drawings, plant & material selections and/or samples, the *Contractor* represents that he has determined and verified all site measurements, site instruction criteria, materials, catalogue numbers and similar data, and that he has checked and co-ordinated each services drawing and sample with the requirements of the *Works*.

**CONTROLLED DISCLOSURE**

- d) The *Employer* reviews *Contractor's* drawings, plant & material selections and samples to cause no delay, but only for conformance with the design of the *Works*. The *Employer's* approval of a separate item does not indicate approval of an assembly in which the item functions.
- e) The *Contractor* makes any corrections required by the *Project Manager* and re-submits the required number of corrected copies of the *Contractor's* drawings, plant & material selections or new samples until approved. The *Contractor* directs specific attention in writing on resubmitted drawings to revisions other than the corrections required by the *Project Manager* on previous submissions.

The following documents are supplied to the *Employer* by the *Contractor* as a minimum:

- a) Documents including equipment data sheets and specifications for selected equipment, electrical cabling and other associated equipment.
- b) Dimensioned shop drawings showing the general arrangement of all plant and equipment including isometrics and P&ID's or PFD's where required. Sufficient views must be given to ensure clarity and the drawings are to have at least a plan and two different elevations or sections giving overall dimensions.
- c) Dimensioned shop drawings showing proposed method of fixing of all the plant and equipment
- d) Detailed electrical wiring diagrams including schematic and control circuits.
- e) Detailed sequencing manner for installation procedure of *Works*
- f) Detailed programme for the *Works* in sufficient detail as to represent the units of work to enable the representative to assess the progress of the *Works*
- g) Technical specification and literature for all items of equipment that forms part of the complete installation, including, evaporators, condensing units, refrigerant circuits, ventilation fans, electrical and control circuits etc.
- h) Proposed corrosion protection systems, including data sheets for coating of proposed equipment
- i) List of recommended spares and technical specifications for the spares, part numbers and the stock levels required
- j) Detailed maintenance, reliability, control and operating philosophies
- k) Testing, balancing and commissioning procedures
- l) Plant and material acceptance testing
- m) Detailed operation & maintenance manuals with As-Built drawings & Commissioning Results
- n) Plant codification lists for each section of the *Works*
- o) Construction completion reviews
- p) Accepted testing reviews
- q) ITP or QCP
- r) Close out report

#### **5.4 Other requirements of the *Contractor's* design**

#### **CONTROLLED DISCLOSURE**

The *Contractor* is to comply with all legislated safety requirements as well as Eskom's health and safety standards.

The decommissioning, removal of all redundant equipment and making good where required is to include the following, however not limited to:

- a) The *Contractor* is responsible for decommissioning, dismantling, removal, lifting, transport and storing (including making good thereof) of existing redundant or retired equipment to the allocated space provided by the *Employer*.

The term "making good" refers to the following, however not limited to:

- a) All areas where old plant or material is removed on the plant are made neat by means of closing of holes, grinding of old anchor points and welding, repainting and resurfacing.
- b) The interface point between the new system and existing plant or material is made neat and functional to prevent weak points in the final delivered product e.g. the fixing of brackets and supports of interface boxes, covers, locking nuts etc.

The *Contractor* provides all scaffolding, crane, transport, etc necessary for decommissioning, dismantling, removal, lifting and transportation of the existing redundant or retired equipment.

The *Contractor* provides dust sheets and everything necessary for clearing and removal of all rubble due to the work, for the protection of the work from damage due to the operations. *Contractor* is to take adequate precautions to the satisfaction of the *Employer* to prevent damage to existing apparatus during erection operations.

The retired HVAC equipment is to be decommissioned and dismantled according to the manufactures' instructions and the relevant codes & standards. The retired HVAC equipment containing a refrigerant is to be pumped down of both refrigerant & oil and should be labelled as containing no refrigerant as soon as it's been decommissioned, dismantled and stored away.

Items to be removed are marked clearly before decommissioning start to avoid the removal of incorrect plant or material.

All existing plant that is removed is deemed re-usable and remains the property of the *Employer*.

Decommissioning and dismantling of retired HVAC equipment that maybe required for future use should include the following however not limited to:

- a) Disconnection of power supply and making safe thereof.
- b) Disconnecting of water supply and draining of, to nearest drain point.
- c) Removal of all refrigerant into approved recovery approved containers for retention or returned to the supplier or manufacturer for reclaiming as defined by SANS 10147, SANS 10250, ISO 11650, BS EN 378-4 or any relevant standard.
- d) Safe dismantling of the existing machines and the safe removal from site to the allocated storage area provided by *Employer*.

## 5.5 Use of *Contractor's* design

The *Contractor* grants to the *Employer*, with effect from the starting date, an irrevocable royalty-free non-exclusive licence to use all the documents provided to provide the *Works* (including, but not limited to calculations, drawings, manuals, models and other documents of a technical nature). This is for any purpose whatsoever, including for the purpose of operating, repairing, maintaining, dismantling, re-assembling and making adjustments to all parts of the *Works*.

## CONTROLLED DISCLOSURE

## 5.6 Design of Equipment

The minimum general equipment design criterion that is to be met is as follows:

- a) The equipment is to be designed to facilitate efficient manufacture, inspection, transportation, installation, maintenance, cleaning and repairs.
- b) The equipment is to be designed to ensure safe and satisfactory operation for at least 15 years for Direct Expansion under the conditions prevailing at Drakensberg Power Station.
- c) The equipment is to be designed to prevent undue stresses being produced by expansion and contraction due to temperature change and other local natural and manmade conditions.
- d) The equipment is to be designed to keep maintenance costs to a minimum.
- e) The equipment is to be designed to comply with all the legal requirements in respect of safety and the prevention of environmental pollution.
- f) The equipment is to be designed to satisfy any specific requirements contained in the relevant statutory codes and standards.
- g) The equipment is to be designed for operation of 365 day per annum, 24hrs per day.
- h) The equipment is to be designed such that all material from which the equipment is manufactured from is compatible with the intended duty and service conditions. All equipment is suitable treated and protected from corrosion.
- i) After the design freeze, the information stated in the data sheets is to be fully complied with through the installation, unless otherwise agreed upon by both the *Employer & Contractor* in writing.

## 5.7 Equipment required to be included in the works

The *Contractor* is required to provide lifting facilities (hoist/crane) and other equipment required for the execution of the complete *Works* as detailed by the Scope of Work. All such equipment shall be adequately designed, tested and installed in accordance with the lifting equipment regulations and shall remain behind to form part of the works, to be used by the *Employer* for maintenance.

## 5.8 As-built drawings, operating manuals and maintenance schedules

The importance of managing the "as-built", "operate-to" and the "maintain-to" operation and maintenance manuals including maintenance schedules for each piece of equipment of the equipment is critical to the life of the plant. The operating & maintenance manuals are to be detailed enough to operate, maintain, dismantle, reassemble, adjust and repair plant & equipment.

### 5.8.1 As – built Drawings

The *Contractor* is to provide "As Built" drawings based on the shop drawings embodying all modifications made during construction. The "As Built" drawings are to include general arrangement and sections of all plant and equipment including isometrics and P&ID's or PFDs. Safety, instrumentation, control and operation drawings are also to be included "As Built" drawings indicating the intended functioning, capacity data and control functioning of all systems.

The As-Built drawing is to indicate all relevant plant coding and labelling. The determination of these codes and labels is to be done in accordance with the documents listed in this Scope of Work.

Two hard copies of "As Built" drawings are to be submitted to the *Employer* for approval.

**CONTROLLED DISCLOSURE**

#### 5.8.1.1 Transfer of Rights

The *Contractor* to transfer rights over drawings, documents, designs and the like to the *Employer* after Completion of the *services*.

#### 5.8.2 Operating Manuals and Maintenance Schedules

The Operating & Maintenance Manual must describe how the facility is to be operated and by whom, as well as the desired level of training and orientation required for the building occupants.

The operation and maintenance manuals are to consist of the following as the minimum:

- a) List of Contents (Index)
- b) Introduction
- c) General description of the functions of each of the systems including detailed description of each element of each system, how it functions, how it operates and how to maintain it and what attic stock or tools to carry.
- d) Full as-built drawings and detailed drawings, brochures and catalogues for each system and each element of each system.
- e) The format of the O&M documentation is to be A4 and is to be a specially bound document with hard cover and with metal ring binding. (All drawings and details are to be reduced to A3 format and folded into A4 format). A soft copy is to be provided as well
- f) The names, addresses and telephone/fax numbers/email addresses of all responsible persons and manufacturers/suppliers are to be listed in the O&M document.
- g) Colour diagrams are to be provided to illustrate the operation and function of each system with reference to the relevant as-built drawings or brochures of equipment. These diagrammatic drawings are to also indicate the locations of valves with their numbers.

### 6. Procurement

#### 6.1 PLANT AND MATERIALS

##### 6.1.1 Quality

The *Contractor* is not to use Plant or Materials which are generally recognised as being unsuitable or otherwise to be avoided for the purpose for which they are intended.

Only components of high reliability are to be utilised, with a proven operating history, to enable the Plant to achieve required reliability and availability. Plant and Material design, engineering and manufacture to accord with the best modern practice applicable to high-grade products of the type to be furnished, to ensure the efficiency and reliability of the *Works* and the strength and suitability of the various parts for the *Works*.

Plant and Materials withstand ambient conditions and the variations of temperature arising under working conditions without distortion, deterioration or undue strains in any part.

All parts are made accurately, and where practicable, to standard gauges to facilitate replacement and repairs. Like parts are interchangeable.

No repair of defective Plant and/or Materials are to be permitted without the *Employer's* approval and any such repair, if approved, are to be carried out to the satisfaction of the *Employer*.

**CONTROLLED DISCLOSURE**



### 6.1.2 Guarantee Inspection

N/A

### 6.1.3 Product Support

The *Contractor* is to select product from an OEM who is available locally. The *Contractor* shall hand over to the *Employer* any warranty balance with the OEM

### 6.1.4 Defects correction

The *Contractor* is to correct all defects arising from the work done by the *Contractor*. The *Contractor* shall have 12 months period to correct all defects. A maximum response time of 2 days will be allowed for all failures from the time the notification had been delivered to the contractor.

### 6.1.5 Plant & Materials provided “free issue” by the *Employer*

None

### 6.1.6 *Contractor's* procurement of Plant and Materials

The *Contractor* is to take all necessary steps to ensure that all Plants and Materials are adequately protected against damage during shipping, transport and storage.

### 6.1.7 Spares and consumables

The *Contractor* is to provide a list of recommended spares to the *Employer* for approval.

## 6.2 Tests and inspections before delivery

The *Employer* carries out quality inspections at own discretion. The *Employer* is to inspect and approve stages of manufacture of all equipment necessary to ensure the correct quality of equipment as prescribed in the approved project quality plan.

All inspections and testing to be performed in accordance with the Quality Control Procedure (QCP) developed by the *Contractor* after approval by the *Employer*.

The *Contractor* is to provide facilities for inspection of all items of equipment at the place of the manufacture and this requirement is to be extended to all Sub-contractors and suppliers. All material labour or assistance, tools, gauges, articles or apparatus that the *Employer* may require for the purpose of testing, gauging and inspection, are to be provided by the *Contractor*. The *Contractor* is to provide all such facilities for testing, and the contract price is to include for this.

The *Employer* reserves the right to reject items that do not conform to the *Employer's* requirements. When the plant has passed the test referred to in this Scope of Work document, the *Employer* is to furnish to the *Contractor* a certificate or endorse the *Contractor's* test certificate to that effect. Examination by the *Employer* is not to relieve the *Contractor* from the responsibility of carrying out all tests which may be necessary to ensure the required standard of manufacture or from any obligations in terms of the contract.

The achievement of adequate standards during the tests at the place of manufacture, if performed, is only the first requirement. The final criterion is the performance onsite, and any of the requirements which prove defective due to bad workmanship or material are to be replaced forthwith by the *Contractor* at his/her own cost on the instruction of the *Employer*.

**CONTROLLED DISCLOSURE**



The following tests are conducted by the *Contractor* and are to be witnessed by the *Employer* at the manufacturer's *Works* or *Contractor's* premises as a minimum requirement:

- a) Visual inspection of the equipment.
- b) Review of the certification requirements.
- c) Functional tests of the systems and controls including starting & stopping procedures.
- d) Inspection of paint work and corrosion protection.
- e) Verification that all components are delivered to the *Contractor's* premises.
- f) Verification that all power plugs is correct.
- g) Verification that components installed is correct.
- h) Verification that all labels are correct.
- i) Phase rotation.

### **6.3 Marking Plant and Materials outside the Working Areas**

All Plant and Material paid for by the *Employer* must be clearly labelled as being the *Employer's* property.

### **6.4 Contractor's Equipment (including temporary works).**

The *Contractor* provides the following to complete the *Works*:

- a) All scaffolding required.
- b) Any equipment necessary to complete the *Works*.
- c) Lifting facilities.

The *Contractor* supplies, installs, maintains and removes all temporary construction facilities and utilities necessary to provide the *Works*.

### **6.5 Cataloguing requirements by the Contractor**

None

## **7. CONSTRUCTION**

### **7.1 Temporary works, Site services & construction constraints**

#### **7.1.1 Contractor's equipment**

The *Contractor* shall submit to the *Employer* a method statement describing the proposed procedures and sequences for the delivery to site and hoisting into final position of the mechanical and electrical services equipment for each stage of the project

#### **7.1.2 Equipment provided by the Employer**

None

#### **7.1.3 Site services and facilities**

- a) General

**CONTROLLED DISCLOSURE**

- Access to the Power Station is restricted to authorized personnel only. All *Contractors'* staff is required to be cleared by security. *Contractor* gives 24 hours' notice to the *Employer* of his intention to enter security-controlled areas.
- As the *Works* are performed within an operating power station environment, the *Contractor* liaises and interacts with the power station operating staff and from time to time all other *Contractors* working on other projects. The *Contractor* ensures that access routes remain open throughout the period of construction.

b) Source of Water Supply

- The nearest potable water connections will be indicated but it is the *Contractor's* responsibility to arrange for all such services required in the execution of the *Works*. No warranty is offered or given by the *Employer* that the existing water supply availability will be adequate for the *Contractor's* purpose nor is that such supply in any way guaranteed.
- *Contractor* makes his own provision for standby supplies to maintain continuity of work. Claims of any nature relating to discontinuity of water supply are not considered

c) Source of Power Supply

- The nearest electrical power supply will be indicated but it is the *Contractor's* responsibility to arrange for all such services required in the execution of the *Works*.
- There is no energy charge for electricity used. No connection is made to the permanent installation at the power station without the prior acceptance of the Project Manager.
- No guarantees of power supply quality are given and power supply breaks of some duration may occur without warning. However, every longer interruption of more than 1 hour per week has as a minimum impact on the time schedule. Solutions must be considered mutually.
- Any electrical equipment, or appliances used by the *Contractor* conforms to the applicable OHS ACT safety standards and is maintained in a safe and proper working condition. The *Employer* has the right to stop the *Contractor's* use of any electrical equipment, or appliance, which, in the opinion of Project Manager, does not conform to the foregoing.
- The *Contractor* provides at his own expense, all temporary wiring and cabling to lead power from the *Employer's* supply points, to where it is required, maintain same and remove on completion. These points of supply are the points designated by the *Employer*

d) Ablution facilities

- The *Employer* indicates which ablution facilities including toilets may be used

e) Telephones

- No telephones will be provided.
- The *Contractor* shall plan for his own telephone facilities.

f) Lighting

- Temporary local lighting in accordance with the requirements of the OH&S ACT as amended is provided by the *Contractor* at his own expense. No local lighting is provided by the *Employer*. All construction lighting is the responsibility of the *Contractor*.

g) Site Induction

**CONTROLLED DISCLOSURE**

- The *Employer* performs a Safety and Environmental induction on site.
- This will be arranged prior to commencement of the *Works*.
- h) Accommodation and office space.
  - The *Employer* will not be responsible for accommodation or provision of office space. The *Contractor* will have to make arrangement for this.
- i) Vehicles
  - No vehicle will be allowed underground unless it is required for transportation of material or equipment.

#### **7.1.4 Facilities provided by the Contractor**

The *Contractor* provides all facilities and services required for completion of the *works* as detailed in the *Scope of Works*, including site medical and fire-fighting facilities.

#### **7.1.5 Existing premises, inspection of adjoining properties and checking work of Others**

The *Contractor* will inspect the work of others on the adjoining properties, which can affect the work done by the *Contractor*

#### **7.1.6 Survey control and setting out of the works**

The *Contractor* will conduct surveys of the site before any *Works* commence.

#### **7.1.7 Excavations and associated water control**

No excavations will be necessary. The *Contractor* will utilise the existing water supply point at the station.

#### **7.1.8 Underground services, other existing services, cable and pipe trenches and covers**

The *Contractor* will not disturb other existing services while undertaking the new HVAC *Works*.

#### **7.1.9 Sequences of construction or installation**

The *Contractor* ensure that the construction will be conducted in a systematic manner to avoid delays in the completion as per agreed program.

#### **7.1.10 Hook ups to existing works**

The *Contractor* will utilise the existing HVAC services to complete the HVAC *Works*

### **7.2 Completion, testing, commissioning and correction of Defects**

#### **7.2.1 Work to be done by the Completion Date**

The contract is deemed to be complete when the following have been completed in accordance with the relevant specifications:

**CONTROLLED DISCLOSURE**

- a) The Plant is erected, and commissioned
- b) Signed erection and safety clearance certificates.
- c) The final drawings have been submitted and accepted
- d) All documentation has been submitted including testing reports and the associated certificates received. All Quality Control Plan (QCP) documentation received. Final Draft of the Technical, Operating, Maintenance manuals delivered
- e) The Plant and all documentation / drawings are coded and labelled.
- f) All special tools have been supplied

	Item of work	To be completed by
	As built drawings of All parts of the <i>Works</i>	Within 30 days after Completion
	Performance testing of the <i>Works</i> in use as specified section 5.2.1.2 of this Scope of Work.	See performance testing requirements.

#### **7.2.2 Use of the works before Completion has been certified**

*Employer* may not use any part of the *Works* before Completion has been certified.

#### **7.2.3 Materials, facilities and samples for tests and inspections**

The *Contractor* provides all Materials, facilities and/or samples required for tests and inspections.

The *Employer* reserves the right to call for samples of equipment offered to inspect the workmanship as the work proceeds and either accept or reject the equipment or workmanship. The *Employer's* approval of the design, material and workmanship are to in no way reduce the *Contractor's* liability to provide a complete and proper working plant which is abreast with modern technology.

The *Contractor* must allow for control samples of the following which are to be approved by the *Employer* and are to be held in the site office to establish the quality standards:

- a) Control sample of ducting to establish the ductwork quality standard
- b) Control sample of welded, insulated, and cladded piping to establish the pipework quality standard.

#### **7.2.4 Commissioning**

The *Contractor* is to submit a consolidated commissioning plan to the *Employer* for acceptance. The consolidated commissioning plan will be compiled following SANS and CIBSE codes or other commissioning procedure or code approved by the *Employer*.

**CONTROLLED DISCLOSURE**

The *Contractor* does comprehensive pre-commissioning, commissioning as well as quality monitoring on all the HVAC and its sub-systems and is to provide a report with the following details.

- a) Demonstrate that the services were commissioned in compliance with SANS OR CIBSE Commissioning Codes or ASHRAE Commissioning Guideline for all mechanical services.
- b) Include commissioning dates, records of all functional/commissioning testing undertaken, a list of any future seasonal testing, and a written list of outstanding commissioning issues.
- c) Include the outcomes and changes made to the building as a result of the commissioning process, accounting for all the recommendations; and
- d) Reference appended extracts of commissioning records for major plant and equipment.
- e) Ensures that the correct performance of the equipment, safety of plant and personnel, and compliance with the Technical Information before commissioning of plant commences is achieved.

The commissioning procedure is to be prepared by the *Contractor*. During commissioning the *Contractor* set the installation to work and competent personnel demonstrates and explain the operation and maintenance procedures for the installation and for each item of plant to the *Employer*. During commissioning if any item is found to be unsatisfactory the fault is rectified and/or new components fitted and commissioned by the *Contractor* at their own expense. The *Contractor* then rebalances and commission the system or part thereof affected at their own expense.

After successful completion of the commissioning and proof period of the installation and any maintenance materials as listed in the Specification and those normally supplied by equipment manufacturer are handed over, the maintenance period commences. Items of equipment which are of a specialist nature e.g. automatic controls etc. are to be commissioned by the manufacturer's representative who instruct the *Employer* on the function and proper operation of the equipment.

#### **7.2.5 Start-up procedures required to put the *Works* into operation**

No alterations or adjustments are to be made to the *Works* after functional checks are done without the *Employer's* written permission.

At this stage the following is to be achieved:

- a) Installation and pre-commissioning completed.
- b) Testing report and the associated certificates received.
- c) Signed erection and safety clearance certificates.
- d) Final Draft of the Technical, Operating, Maintenance manuals delivered.
- e) All Quality Control Plan (QCP) documentation received.

#### **7.2.6 Take over procedures**

The *Employer* takes over the *Works* after successful commissioning.

**CONTROLLED DISCLOSURE**

### 7.2.7 Access given by the *Employer* for correction of Defects

The *Contractor* will correct all defects resulting in the *Works* undertaken by the *Contractor*. The *Employer* allows the *Contractor* access and sufficient time to correct defects after the completion of *Works*

### 7.2.8 Performance tests after Completion

The *Contractor* performs a pressure test on the condensing unit as specified in section 5.2.1.2

### 7.2.9 Training and technology transfer

After completion of the contract, the *Contractor* is required to provide training and transfer system knowledge to the *Employer*. This is done by submitting the documented Design Intent, As-built drawings, Operational and Maintenance Manual, Commissioning Records, Commissioning Report and by providing training on all the systems to the *Employer's* personnel to ensure that they have all the information and understanding needed to operate and maintain the features and systems in the various areas.

The *Contractor* is to provide on-site training and training material to the Engineers, Operators and Maintenance personnel prior to taking-over of the *Works*. The training is preferable to be offered during the commissioning and testing for a minimum of ten (10) personnel. The *Contractor* is to, prior to handing over of the *Works*, satisfy the *Employer* that maintenance and operational personnel are competent and adequately trained to maintain and operate the equipment supplied.

The training is to cover the following, however not limited to:

- a) Information provided in the design intent report (including energy/environmental features)
- b) Review of controls set up, programming, alarms and troubleshooting
- c) Review of O&M manuals
- d) Building operation (start up, normal operation, unoccupied operation, seasonal changeover, shutdown)
- e) Measures that can be taken to optimise energy efficiency
- f) Occupational health and safety (OH&S) issues
- g) Maintenance requirements and sourcing replacements
- h) Obtaining and addressing occupant satisfaction feedback

Steps for conducting On-site Training are to include:

- a) Preparation
- b) Introduction
- c) Explanation
- d) Demonstration
- e) Practice Under Supervision
- f) Conclusion

**CONTROLLED DISCLOSURE**

The operating and maintenance manual are to be available during the training of *Employer's* personnel. *Employer's* personnel are to be made familiar with the contents of that manual.

#### 7.2.10 Operational Maintenance after Completion

N/A

### 8. PLANT and Materials standards and workmanship

#### 8.1 Investigation, survey and Site clearance

The design data specified in this Scope of Work and those dimensions shown on the tender drawings are intended for tendering purposes only. The *Contractor* is required to take the actual measurements onsite before proceeding with design & manufacture of the *Works* as dimension accuracy remains the responsibility of the *Contractor*.

#### 8.2 Building works

N/A

#### 8.3 Civil engineering and structural works

The *Contractor* will design, the chillers of the new HVAC system to be supported by the existing supports of the old HVAC system. The Contractor shall assess the existing chiller supports for adequacy, if the existing chiller supports are found to be inadequate, the Contractor shall design manufacture, install, test and commission the new supports for the chillers.

#### 8.4 Electrical Works

The *Contractor* is responsible for the design and provision of the following, as a minimum:

- a) The *Contractor's* electrical discipline allows for the detail design; supply, delivery, installation, testing, commissioning and handing over of the HVAC related electrical *Works*. The *Contractor* also needs to verify the protection set points on the switchgear for the chiller.
- b) Plant and material selection; installation and as built drawings; testing, balancing and commissioning Documentation; Operating Instruction and Maintenance Manuals; and Inspection Record Cards/Checklists.
- c) The Contractor will use the existing cables as far as possible to execute the *Works*.
- d) The *Contractor* is responsible for the design and provision of all necessary earthing material for the plant. Earthing of the plant complies with the requirements set out in 240-56356396. The Contractor connects all earthing bars to the nearest existing earth mat bar.
- e) Testing and commissioning of HVAC related Electrical *Works*

##### 8.4.1 Electrical Power Supply

- a) The parameters of the existing motor starter functional unit are as follows:
  - dimensions 600x625x400mm as shown in drawing 0.48/4138

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- drive size 25kW

- b) It is the responsibility of the *Contractor* to perform the temperature rise verification, as per *Contractor's* design based on the given functional unit dimensions. In a situation that verification indicate that the functional unit volume is inadequate, the *Contractor* makes provision for a stand-alone control panel, conversion of existing motor starter circuit to a feeder circuit and the cables from that feeder circuit to a new control panel.

#### 8.4.2 The following shall be incorporated when designing the HVAC power supply:

- a) All electrical cabling and Earthing & lighting protection standard will comply with Eskom specification 240-56227443 and 240-56356396 respectively.
- b) All cables and plant equipment shall be labelled (Electrical warning signs, Arc flash sticker and KKS coding)
- c) All cable to be secured on cable racks.

#### 8.4.3 HVAC Distribution Panel

The *Contractor* submits the designs to the *Employer* as per section 5.3 (PROCEDURE FOR SUBMISSION AND ACCEPTANCE OF CONTRACTOR'S DESIGN) of this document for acceptance. It is responsibility of the *Contractor* to ensure that the designs comply with requirements specified in 240-56227516 and SANS 10142-1.

#### 8.4.4 Cable and Racking

The *Contractor* designs and provides all power and control cables, cable racking and support structures required for the provision of the *Works*. Provision of cabling is in accordance with 240-56227443. The *Contractor* is responsible for sizing, selection and installation of all cables from Air Conditioning Control Block board to the HVAC plant.

The *Contractor* provides cable schedules and cable termination schedules using the templates provided by the *Employer*.

Existing cables and cable racks are to be used as far as possible, and it is the *Contractor's* responsibility to perform all the cable tests

#### 8.4.5 The Employer provides the following documentation/templates for Electrical plant:

- a) Applicable Eskom standards and specifications.
- b) Electrical Load List Template (240-56227927)
- c) Electrical LV Switchgear Schedule Template (240-56356421)
- d) Electrical Cable Schedule (240-56176097)
- e) Electrical Termination Schedule Template (240-77302094)

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All *Employer* information and property made available to the *Contractor*, including the work done by the *Contractor* for the Employer, is confidential and may not be disclosed.

#### 8.4.6 The Employer will accept the following set of drawings:

- a) General Arrangement drawings for each panel
- b) Single line drawings
- c) Schematic diagrams for each circuit (this must include all the wire numbers, termination numbers, termination strip numbers, fuse sizes and spare contacts).
- d) Electrical Load List.
- e) Electrical Cable Schedule.
- f) Electrical Termination Schedule and
- g) Technical Manuals

#### 8.5 Mechanical Works

The *Contractor* will design the new HVAC system as per scope of work in section 2.1, taking into consideration the operating condition and existing HVAC equipment technical data in section 5.2.

The scope of supply shall include, but is not limited to the following:

- Supply of the two Chiller Units, each with the following specification:

Parameter	Dimensions
Mass	650kg
Cooling Capacity	88kW
Compressor Motor Voltage	380V, 3ph, 50Hz
Length	2500
Width	600mm
Height	1000mm
Operating Pressure	1750kPa

- Supply of the cooling water supply piping to the Chillers and return piping from the chillers with the following specification:

Item	Material	Dimensions	Quantity
Supply Pipeline Diameter	Carbon Steel	3" (75NB)	
Supply Pipeline Length	Carbon Steel	9.4m	1

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Return Diameter	Pipeline	Carbon Steel	3" (75NB)	
Return Length	Pipeline	Carbon Steel	10m	1

- Supply of the cooling water supply piping valves and joints to the Chillers and return piping valves and joints.

Item	Material	Dimensions	Quantity
Gate Valves	Cast Iron	3" (75NB)	6
Throttle/Control Valve	Cast Iron	3" (75NB)	2
Y strainer connected to 3" (75NB) Carbon Steel pipe	Carbon Steel	3" (75NB)	2
90 Deg Elbow Bends	Carbon Steel	3" (75NB)	4
Return Length	Pipeline	Carbon Steel	10m
T Junction	Carbon Steel	3" (75NB)	2

- Refrigerant supply pipeline to the AHU and return pipeline from the AHU

Item	Material	Dimensions	Quantity
Refrigerant Supply Pipe Diameter	Copper	1" (25NB)	
Return Refrigerant Pipe Diameter	Copper	2" (50NB)	
Refrigerant Supply Pipe Length	Copper	9m	2
Return Refrigerant Pipe Length	Copper	10m	2
Solenoid Operated Valves connected to 2" (50NB) copper pipe	Brass	2" (50NB)	4
Gate valves	Brass	2" (50NB)	10
Y strainer	Brass	2" (50NB)	2
Filters	Brass	2" (50NB)	2

**CONTROLLED DISCLOSURE**

## 8.6 C&I Works

The *Contractor* shall ensure that the supplied equipment is capable of communicating with the Control Room HMI via IEC 61850 ((preferred option) or Modbus TCP/IP. The communication shall support the transmission of all required operational feedbacks, status indications, and alarm signals to enable full remote monitoring and alarm annunciation on the Control Room HMI.

The *Contractor* shall ensure remote switching and monitoring of the chiller status and fans in the control room.

The *Contractor* shall verify fire damper operation in the control room. The Contractor shall also ensure that in the Battery Room there is full remote airflow monitoring and alarm annunciation on the Control Room HMI

## 8.7 Commissioning and Hand over Documentations:

The *Contractor* submits commissioning documentation to the *Employer* for approval. The *Contractor* follows the 240-60665215 – Project Delivery Commissioning Management Procedure, when compiling commissioning documentation.

The *Contractor* will submit to the *Employer* hand over documentation for approval. The *Contractor* will follow 240-124341168 – Project/Plant Specific Technical Documents Handover Work Instruction, when compiling the hand over documentation. The *Contractor* shall ensure that the documentation is complete, correct and up to date.

## 8.8 Process control and IT works

- a) The *Contractor* designs, procures, installs, engineers, tests and commissions HVAC plant controllers for the new HVAC plant.
- b) The *Contractor* will use a proprietary control system for the new HVAC chiller.

## 8.9 OTHER

### 8.9.1 Applicable Standards and Codes

Number	Title
SANS 10400	The Application of the National Building Regulations
SANS 10108	The Classification of Hazardous Locations and the Selection of Equipment for Use in Such Locations
SANS 10103	The measurement and rating of environmental noise with respect to annoyance and to speech communication
SANS 61800	Adjustable speed electrical power drive Systems
SANS 10140-3	Identification colour marking Part 3: Contents of pipelines
SANS 10142-1	The wiring of premises Part 1: Low-voltage installations
SANS 10147	Refrigerating Systems including plants associated with air-conditioning Systems
SANS 1551-1	Check valves (flanged and wafer types) Part 1: PN series
SANS 1551-2	Check valves (flanged and wafer types) Part 2: Class series
SANS 1849	Butterfly valves for general purposes

**CONTROLLED DISCLOSURE**

Number	Title
ASHRAE 15	Safety Codes for mechanical refrigeration
ASHRAE 62	American Society of Heating Refrigeration and Air Conditioning Engineers. Ventilation for acceptable indoor air quality
ASHRAE 55	Thermal environmental condition for human occupancy
ASHRAE 52/76	Standard test method for filters
ASHRAE G1	Guideline for commissioning of air conditioning System
240-56355754	Field Instrumentation Installation Standard
240-56355815	Field Instrument Installation Standard - Junction Boxes and Cable Termination
240-56227443	Requirements for Control and Power Cables for Power Stations Standard
240-56356396	Earthing and Lightning Protection Standard
240-40643427	Coding and Labelling Standard
240-56227516	LV Switchgear and Control Gear Assemblies and Associated Equipment for Voltage up to and Including 1000V AC and 1500V Standard
240-56176097	Electrical Cable Schedule Template
240-56227927	Electrical Load List Template
240-56356421	Electrical LV Switchgear Schedule Template
240-56356465	Electrical LV List of Switchboards Template
240-77302094	Cable Termination Schedules
240-70164623	Design Guideline for HVAC in the Eskom Coal Fired Power Stations
240-102547991	General Technical Specification for HVAC Systems Standard
NFPA 70	National Electrical Code
240-56364545	Structural Design and Engineering Standard
SANS 2001-CC1: 2012	South African Standard Construction Works Part CC1: Concrete Works (structural)
Government Gazette No. 36750	Proposed Regulations regarding the phasing-out and management of ozone-depleting substances.

## 9. LIST OF DRAWINGS

### 9.1 Drawings issued by the *Employer*

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

Note: Some drawings may contain both Works Information and Site Information.

Drawing number	Revision	Title
0.48/2503	-	Control Block 1190.250 & 1194.100 Levels Air Conditioning

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

0.48/5670	-	Station Control Block Air Ventilation System P&ID
0.48/2504	-	Control Block 1187.150 Level Air Conditioning
0.48/2505	-	Control Block 1184.000 Level Air Conditioning
0.48/2506	-	Control Block 1180.750 Level Air Conditioning
0.48/2507	-	Control Block 1170.500 Level Air Conditioning
0.48/3110	-	Control Room and Equipment 1190 & 1194.100 Level Air Conditioning Layout Arrangement and Detail
0.48/3111	-	Control Room Air Conditioning 1190.200 & 1191.150 Levels Builders Details
0.48/3112	-	Control Block Air Conditioning Duct Riser Builders Work Details
0.48/3113	-	Communications Offices and Toilets 1187.150 Level Air Conditioning Duct Arrangement and Details
0.48/3114	-	Communications Offices and Toilets 1187.150 Level Air Conditioning Builders Details
0.48/3115	-	Control Block Air Conditioning Duct Risers
0.48/3215	-	Control Block Air Conditioning Layout 1180,720 Level Cable Spreading Detail
0.48/3216	-	Control Block Battery Room Air Conditioning 1117,550 Level Layout
0.48/3291	-	Control Block 1184,000 Level Switchgear Area Air Conditioning Layout
0.48/3412	-	Control Block Air Conditioning and Ventilation Fresh Air Duct Riser Arrangement and Details
0.48/3735	-	Air Conditioning 1187,150 Level Control Block Wiring and Electric Diagram
0.48/3737	-	Air Conditioning 1187-150 Level Control Block Wiring and Schematic Diagram
0.48/3758	-	Plant Room Control Block Level 1187,150 Air Conditioning Layout
0.48/3816	-	Air Conditioning Control Block 1187,150 Level Wiring Electric Diagram
0.48/3817	-	Control Block 1187,150 Level Air Conditioning Wiring Diagram
0.48/3818	-	Control Block 1187,150 Level Air Conditioning Wiring Diagram
0.48/3819	-	Control Block 1187,150 Level Air Conditioning Wiring Diagram

**CONTROLLED DISCLOSURE**

0.48/3842	-	Control Block Mezzanine and Ground Floor Air Conditioning Ducting Layout
0.48/4065	-	Air Conditioning Control Block Board Layout
0.48/4138	-	Air Conditioning Control Block Board Layout

## 10. Acceptance

This document has been seen and accepted by:

Name	Designation	Signature
Richard Marr	Chief Engineer (Mechanical Reviewer)	
Sithembile Zondo	LDE(Electrical)	
Abu-Bakir Boltman	LDE (C&I)	
Kwanele Nkosi	Electrical Maintenance Manager	

## 11. Revisions

Date	Rev.	Compiler	Remarks
March 2026	0	S. Dlamini	Issued for Review
March 2026	1	S. Dlamini	Final Revision for Signatures

## 12. Development Team

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

- Sbongiseni Dlamini
- Sithembile Zondo
- Abu-Bakir Boltman

## 13. Acknowledgements

- None

**CONTROLLED DISCLOSURE**