Eskom	Specification	Technology

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Compiled by	Functional Responsibility	Authorised by
Al Khumalo	**Mishack Mduli**	**Mokgoba Mathabatha**
LDE: Common Plant Engineer	**Senior Technologist Engineer**	**Engineering Manager**
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1. INTRODUCTION

The document provides design status information of the completed technical specification for the turbine hall cranes upgrade

The technical specification will provide input into the Works Information document that will go out into the market for tender

System Identification

- Two turbine hall 100 Ton cranes with 25 Ton Auxiliary

System Overview

Camden Power Station is a coal fired power station that was commissioned in 1967 The station was mothballed in 1990 and later returned to service in 2003 The power station consists of eight 1600 [MW] electricity generating boiler-turbine units The turbine hall has two 100 ton and two 25 ton semi-portal cranes The two 100 ton cranes are installed such that they operate on a single long travel track This exposes the cranes to the risk of collision when approaching one another Anti-collision sensors would prevent that kind of accident from occurring A similar risk exists on the 25 ton cranes

2. SUPPORTING CLAUSES

2.1 SCOPE

2.1.1 Purpose

The purpose of this specification is to provide the necessary requirements to upgrade the cranes for safe operation

2.1.2 Applicability

This document shall apply to Camden Power Station only

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] 83-CMDN-AABB-D00138-53 Camden Power Station Crane Upgrade Stakeholder Requirements definition

[2] 240-106680663 Lifts, Escalators, Lifting and Crane Design Guideline

[3] Occupational Health and Safety (OHS) Act 85, Regulation 18 of the Driven Machinery Regulations

[4] BS EN 15011 Cranes. Bridge and Gantry Cranes

[5] Eskom standard 39-98 Safe use of lifting machines and lifting tackle

[6] SANS 10142-1 The wiring of Premises Part 1 Low-Voltage Installation

[7] Eskom Standard No 240-56227516 - LV Switchgear and Control Gear Assemblies and Associated Equipment for Voltage up to and including 1000V AC and 1500V DC Standard

[8] *Work instruction No 240 - 64550692 - Label Specification and Plant Codification*

2.2.2 Informative

[9] ISO 9001· Quality Management Systems

[10] 240-53113685 Design Review Procedure

[11] 240-53665024 Engineering Quality Manual

[12] 240-53114002 Engineering Change Management Procedure

[13] 240-50317699 Manage Technical Queries Procedure

[14] 240-53114186 Document and Records Management

2.3 DEFINITIONS

Definition	Description
Rail	The rails are the tracks on which the wheels of the crane run The rails are located on top of the runway and girder beams
Runway	The runway of the crane is supported by the existing building structure in the turbine hall and runs along the top of the turbine hall
Girders	The girders travel across the runway and support the crab frame
Crab Frame	The crab frame travels along the girders and supports the main hoist, auxiliary hoist and the electric chain hoist
Turbine Overhead Main Hoist	The main hoist is an electrically operated wire rope hoist with a SWL of 100 tonne The main hoist is supported by the crab frame
Turbine Overhead Auxiliary Hoist	The auxiliary hoist is an electrically operated wire rope hoist with a SWL of 25 tonne The auxiliary hoist is supported by the same crab frame as the main hoist
Electric Chain Hoist	The electric chain hoist operates independent from the crane itself and is used to lift and lower equipment to the crab frame The electric chain hoist is located on the crab frame of the crane

2.3.1 Disclosure Classification

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

2.4 ABBREVIATIONS

Abbreviation	Description
ICASA	Independent Communication Authority of South Africa
KKS	Kraftwerk- Kennzeichen-System
LDE	Lead Design Engineer
LMI	Lifting Machinery Inspector
P&ID	Pipe & Instrument Drawings
SRD	Stakeholders Requirements Definition
SWL	Safe Working Load
DCS	Digital control system

2.5 ROLES AND RESPONSIBILITIES

- Lead Design Engineer (LDE) The LDE is responsible for the technical content of this document relating to his engineering discipline
- Engineering Manager It is the responsibility of the Engineering manager to authorise this document
- LDE Supervisor The LDE supervisor takes functional responsibility for the content of this document

2.6 PROCESS FOR MONITORING

The contents of this document shall be monitored through internal and multi-disciplinary reviews as set out by the 240-53113685 Eskom Design Review Procedure

3. SYSTEM REQUIREMENTS

3.1 DESCRIPTION OF EXISTING SYSTEM

Camden Power Station is a coal fired power station that was commissioned in 1967 The station was mothballed in 1990 and later returned to service in 2003 The power station consists of eight 1600 [MW] electricity generating boiler-turbine units The turbine hall has two 100 ton and two 25 ton semi-portal cranes The two 100 ton cranes are installed such that they operate on a single long travel track This exposes the cranes to the risk of collision when approaching one another Anti-collision sensors would prevent that kind of accident from occurring A similar risk exists on the 25 ton cranes

In 2013 an incident occurred in Camden Power Station whereby an operator fell from 6 metres above the floor when he was attempting to disembark on a crane cabin which had been parked in the middle of the cross travel gantry This resulted in serious injury. Subsequently Rotek management decided to embark on a project to change the turbine hall crane operating philosophy such that the cranes are operated from a wireless controller from the turbine hall floor This scope of the work will be included in this project

The technical specifications of the Turbine overhead crane are as follows

- AKZ label

Description of Crane / Location	AKZ/ ID Number
Turbine House East main Overhead Crane	01SMT01AE001
Turbine House East Auxiliary Overhead Crane	01SMT01AE002
Turbine House West main Overhead Crane	02SMT01AE001
Turbine House West Auxiliary Overhead Crane	02SMT01AE002

- Capacity

  Main hoist - 100 Ton
  Auxiliary Hoist - 25 Ton

3.2 INTERNAL INTERFACES IDENTIFICATION

The turbine cranes are not allowed to travel when personnel are using the scissor-lift to do lighting maintenance in the turbine house

3.3 EXTERNAL INTERFACES IDENTIFICATION

Not applicable

3.4 OPERATING CONDITIONS

3.4.1 Operating Description for Normal Operations

- Crane start-up

Whenever crane operation is required, the crane operator shall turn on the main electrical switch of the crane before switching on the crane by pushing the "on" switch on the ireless controller

- Crane operation

A trained operator shall operate the crane via a wireless controller The controller shall control motion in the long and cross travel directions. The main and auxiliary hoists shall also be controlled by the operator via the wireless controller The two turbine cranes shall be operated independently

- Parking the crane

Whenever the crane is not in operation, is being inspected or maintained, the crane shall be parked in a designated parking bay The crane operator shall switch off the crane and also the main electrical switch after parking the crane

- Operating the Crab Frame Hoist

The electric chain hoist shall be operated via a separate wireless controller This hoist shall only be used for lifting equipment to and from the crab frame if the crane is parked

3.4.2 Operating Description for Normal Operations

- Overload

In the case of overloading the main hoist, auxiliary hoist or the electric chain hoist an overload device shall stop all crane operations except those required to reduce the load The wireless controller shall indicate which hoist is overloaded

- Collision

In the case of a collision between the two overhead turbine cranes, the main electrical switch of both the cranes shall switch off The operators shall be required to manually switch on the cranes before continuing operations

- Over speed

Whenever a component of the crane travels 110% faster than its rated maximum speed in any travel direction, all crane motions shall cease and the crane shall switch off The brakes shall be designed to be failsafe and engage whenever there is a loss of power to the cranes After the fault has been corrected the operator has to manually reset the crane controller before continuing with normal operations

- Moving past limits

If any component of the crane moves past its set limits, all crane motions shall cease and the crane shall switch off The operator has to manually reset the crane controller after the fault has been fixed to return the crane to normal operations

- Control Room Concept

The cranes will be controlled and monitored locally No interface with DCS is required Each of the turbine cranes will be controlled independently, each on its own wireless frequency

3.5 DESIGN REQUIREMENTS

3.5.1 *Mechanical Design*

The *contractor* shall inspect and test all retained components All retained components fit for re-use shall be declared so by a competent person All components not fit for re-use shall be replaced with new components capable of performing the same or better functions All new components shall be standard, type-tested and suitable for operation in the turbine hall environment

All crane components shall be converted for Wireless Remote Control operation The upgraded cranes shall comply with BS EN 15011 Cranes Bridge and Gantry Cranes

3.5.2 Electrical Design

The current existing electrical power supply shall be used as far as practical possible

3 5 2 1 The electrical overall design system as per Eskom Standard No. 240-56227516 shall achieve a safe and low maintenance running costs.
3 5 2 2 Replace the bus bar power supply rails with flat cable system to improve the availability and movement of the cranes
3 5 2 3 Remove the manual operating set up and introduce a wireless remote operated system to allow an operator to control the crane with all its fixtures remotely from the floor.
3 5 2 4 Two more wireless control intelligence electronic device (IED) shall be provided for spares purposes
3 5 2 5 Make provision to control the crane in case the wireless system is not working
3 5 2 6 One permanent fixed wall mounted control station shall be provided on the east and west at 12 metre level to control the cranes in case the wireless system is lost or malfunctioning These stations must have a master locks to be used to lock the overhead cranes operating system to prevent unauthorised use

3.5.3 *Wireless Remote Control.*

The overhead traveling cranes shall be equipped with a radio control signal receiving unit and a hand held radio control transmitter The radio control signal transmitter on the overhead cranes shall be capable of controlling both hoists (main and auxiliary) from the same transmitter Provision shall be made for each hoist on the larger overhead crane (main and auxiliary) to be controlled simultaneously to enable flipping-over and manipulation of loads The controller shall meet the following requirements

- It shall have a data logger for issuing access card
- It shall have a software to be able to track an authorized person use of crane
- It shall meet ICASA regulations (National Radio Frequency Plan)
- It shall have an emergency stop button
- Only authorised personnel will receive access type cards to enable use of the wireless controller, this must be controlled centrally and disabled as soon as authorisation lapses
- It must be SABS approved
- No interferences with turbine set instrumentation
- Must be rated IP65 as minimum
- Weight of the load shall appear on the remote

- Anti-collision device shall be installed

The radio control shall have a switch to disable the cabin control so that only one of the control systems can be used at any given time All crane functions and movements shall be controlled, using either of these devices

3.5.4 General

The *Contractor* ensures

- The overhead crane will be available 24 hours per day 7 days per week over a 20 year project life and must have an operational availability exceeding 95%
- The crane and hoist are capable of intermittent on-off operation as required
- *All materials are suitable for their purpose and are in accordance with the relevant specifications*
- Upon completion of the work the and prior to put the crane in service, the crane should be certified by a lifting equipment specialist and a registered lifting machinery inspector
- Handover of the plant shall be done, and shall include all relevant documentation

3.6 MAINTENANCE STRATEGY

The same maintenance strategy for the cranes will be retained as per 240-78024412 Lifting equipment maintenance execution strategy The maintenance strategy of the remote controller, anti-collision device should be added to the strategy post commissioning of the crane

3.7 OPERATING

Crane operations shall be performed according to Eskom standard 39-98 Safe use of lifting machines and lifting tackle The cranes shall have an availability exceeding 95% The contractor shall provide operating philosophy on the upgrade crane

3.8 QUALITY AND INSPECTION REQUIREMENTS

The *Contractor* shall exercise strict and adequate quality control during all phases of the work The *Contractor* shall prepare suitable quality control plans (QCP's) and Inspection and Test Plans (ITP's) for all work carried out The QCP's/ITP's shall be subject to the Employer's approval and shall indicate all inspection and test points, the methods and procedure to be used and the acceptance criteria to be applied The *Contractor* is required to notify the Employer 24 hours in advance of witness and hold intervention points

3.8.1 Reinstatement of Crane into Service

The crane shall be reinstated into service by an Eskom-approved registered LMI

3.9 DESCRIPTION OF THE WORKS

3.9.1 Scope of Work

This scope is for the design, procurement, install and commissioning of the entire engineering works to ensure fully functional upgraded wireless remote control systems, herein after referred to as the Works The Works include as a minimum the following

1 Dismantling of the existing crane components as required by the upgrade Material supply, installation, access platforms, and other necessary components for the installation of upgraded equipment

2 The *Contractor* designs and procures all installation material and equipment required to perform the Work
3 The *Contractor* identifies and includes all items required to form a complete, reliable, fit for purpose operating works, which complies with the requirements as stipulated in this Works
4 The *Contractor* supplies drawings and documentation as specified in the Works This includes, but is not limited to, drawings, legislative documentation, maintenance and operating manuals for the fabrication and installation of the new crane components
5 *Existing components are reused to the extent possible in accordance with the Contractor's design*
6 Training of Employees, i e engineering, operating and existing crane maintainer Training shall be provided for technical maintenance and operational for employees
7 The *Contractor supplies plant codification and labelling (AKZ labelling) as specified in the Works*
8 Factory Acceptance Testing (FAT) of the components and Site Acceptance Testing (SAT)
9. Critical spares must be readily available in the country for the life span of the plant

Important Notes:

The upgrade of the turbine hall crane must be performed by an authorised person and must be optimized including the following requirements, namely

- The new components shall be designed with the view that they will operate in a dusty environment within the turbine hall

3.10 TENDER RETURNABLE

At tender stage, the *Contractor* shall provide the following supplementary information and documents as requested by the Employer

1 Company profile
2 Proof of conformance to the Occupational health & Safety Act 85 of 1993
3 Reference to association with ECSA (Engineering Council of South Africa)
4 Company Organogram
5 Brochures and Technical Information as specified
6 CVs and proof of competency for all key personnel, including qualification
7 Proof of registration with Department of Labour and Classification of Business

4. DOCUMENT MANAGEMENT

All documents supplied by the *Contractor* shall be subject to Eskom's approval The language of all documentation shall be in English

4.1 DOCUMENTATION IDENTIFICATION

The *Contractor* is required to submit the Vendor Document Submission Schedule (VDSS) as per agreed dates to the delegated Eskom Representative Eskom will pre-allocate document numbers on the VDSS and send back to the *Contractor* through the delegated Eskom Representative The VDSS is revisable and changes must be discussed and agreed upon by all parties Changes in the VDSS can be additional documentation to be submitted, changes in submission dates or corrections In documentation descriptions, document numbers, etc The Contractor's VDSS shall indicate the format of documents to be submitted

4.2 DOCUMENT SUBMISSION

All project documents must be submitted to the delegated Eskom Representative with transmittal note according to Project / Plant Specific Technical Documents and Records Management Work Instruction (240-76992014) *In order to portray a consistent image it is important that all documents used within the* project follow the same standards of layout, style and formatting as described in the Work Instruction The *Contractor* is required to submit documents as electronic and hard copies and both copies must be delivered to the *Eskom Representative* with a transmittal note

4.3 ENGINEERING CHANGE MANAGEMENT

All Design change management shall be performed in accordance to the latest revision of the Eskom Project Engineering Change Management Procedure (240-53114026) and the Employer shall ensure that Contractor is provided with latest revisions of this procedure Any uncertainty regarding this *procedure should be clarified with the Employer* All design reviews will be conducted

4.4 DRAWING FORMAT AND LAYOUT

The creation, issuing and control of all Engineering Drawings will be in accordance to the latest revision of 240-86973501 Engineering drawing Standard Drawings issued to Eskom will be a minimum of one hardcopy and an electronic copy All *Contractors* are required to submit electronic drawings in Micro Station (DGN) format, and scanned drawings in pdf format. *No drawings in TIFF, AUTOCAD or any other* electronic format will be accepted Drawings issued to Eskom may not be "Right Protected" or encrypted

4.5 PLANT CODING AND LABELLING

4.5.1 Plant Coding

Plant coding shall be done when applicable

The Employers AKZ Coding Manual (15ENG MN-676) shall be used to allocate codes to plant or system included in the Works

4.5.2 Plant labelling

It is the responsibility of the *Contractor* to manufacture and install coded equipment labels. Labels are manufactured and installed according to Plant Labelling standard (240-71432150)

5. AUTHORISATION

This document has been seen and accepted by

Name	Designation
Oscar Tilodi	Auxiliary Engineering Manager
Jabulani Radebe	Electrical System Engineer
Selelepoo Ntoampe	Senior Technician Engineering – Camden P/S

6. REVISIONS

Date	Rev.	Compiler	Remarks
November 2020	01	A Khumalo	Final Document

7. DEVELOPMENT TEAM

The following people were involved in the development of this document

- Not Applicable

8. ACKNOWLEDGEMENTS

- Christo Coetzee