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Title: **Camden Power Station – Conveyor 4A Tripper Car Drive Upgrade Project – Technical Specification**

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Auxiliary Engineering	**Auxiliary Engineering**	
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FIGURES

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TABLES

1. INTRODUCTION

1.1 OVERVIEW

Camden Power Station utilises a tripper car mounted on rails along Conveyor 4A to discharge coal received from the coal stockyard reclaim conveyor (namely, Conveyor 18) into Staithes 1 and 3.

The operation of the tripper car has not been reliable due to deficiencies of the tripper car drive system, attributed to inability to brake the tripper car safely, damaged overhead busbars interrupting power supply to the tripper car dive, and obsolescence of the drive system to ensure long term operational sustainability.

The objective of this project is to establish a cost-effective engineering solution to resolve the safety, operational, and reliability challenges currently being experienced.

This document contains the technical specifications that the appointed *Contractor* must adhere to.

1.1.1 Employer's Objective

The *Employer's* objective is to provide a capability that enables Conveyor 4A tripper car to travel along the entire length of the conveyor whilst ensuring that the tripper car can be braked safely at any desired location at either Staith 1or Staith 3.

The *Contractor* provides plant and materials, machinery, tools, labour, transportation, construction fuels, chemicals, construction utilities, administration and other services and items required to complete the scope of the works.

1.1.2 Location of the Works

Camden Power Station is located near Ermelo in the Mpumalanga Province and is approximately 18km South-East of Ermelo. Access to Site is by road transport.

A drawing of the site is included in Appendix A. The *Contractor* provides own layout of the plant based on the space allocated by the *Employer* and within the constraints imposed by the existing site and plan infrastructure. The *Contactor's* layout is subject the *Project manager's* acceptance before commencement of the Works.

2. SUPPORTING CLAUSES

2.1 SCOPE

2.1.1 Purpose

The purpose of this Technical Specification is to provide requirements and information needed to establish a complete design, construction, and commissioning of Conveyor 4A tripper car drive upgrade at Camden Power Station.

2.1.2 Applicability

This document shall apply throughout Camden 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] 240-53114002: Engineering Change Management (ECM)

[2] 240-53114026: Project Engineering Change Management Procedure

[3] 383-CMDN-AABB-D00141-2 Camden PS Conveyor 4A Tripper Car Drive Upgrade Concept Design Report

[4] ISO 9001 Quality Management Systems.

2.2.2 Informative

[5] N/A

2.3 DEFINITIONS

Definition	Description
Contractor	Person or company undertaking to perform work for the Employer
Employer	Organisation that employs others
Infrastructure	The basic physical and organizational structures and facilities (e.g. buildings, roads, power supplies) needed for the operation of a society or enterprise

2.3.1 Disclosure Classification

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

2.4 ABBREVIATIONS

Abbreviation	Description
ATL	Approved Test Laboratory
CoC	Certificate of Compliance
EDMS	Eskom Document Management System
EMD	Electrical Maintenance Department
Ex	Explosive proof protected
Hazloc	Hazardous Locations
IE	International Efficiency – Efficiency Class
IE3	Premium Efficiency
IEC	International Electrotechnical Commission
IEEE	Institute for Electrical and Electronics Engineers
IOM	Installation, Operation, and Maintenance
IR	Insulation Resistance
KKS	Kraftwerk-Kennzeichensystem
LED	Light Emitting Diode
LV	Low Voltage

Abbreviation	Description
MCB	Miniature Circuit Breaker
PFUP	Process Function Plan
P&ID	Piping and Instrumentation Diagram
SANS	South African Nation Standard
SCPD	Short Circuit ProtectionPFU Device
TEFC	Totally Enclosed Fan Cooled

2.5 ROLES AND RESPONSIBILITIES

The following sections contains specific functions within each of the following roles and responsibilities related to the execution of the works:

The **Contractor** completes the outstanding designs, procures, constructs, tests, and commissions the plant as per the requirements provided.

The **Employer** provides requirements, available design documentation and the Eskom Standards and Procedures for the completion of design, construction, and commissioning of the plant.

2.6 PROCESS FOR MONITORING

This report is governed by the Design Review Procedure (240-53113685). Any changes to this document will be performed in accordance with the Project Engineering Change Management Procedure (240-53114026).

2.7 RELATED/SUPPORTING DOCUMENTS

N/A

3. SCOPE OF WORK

The scope is for the detailed engineering designs, cost analysis, selection, procurement, fabrication, workshop assembly, inspection, testing, labelling, packing, deliver to site, erection, installation, project management, cold and hot commissioning of the entire engineering *Works* to ensure a fully functional tripper car located on Conveyor 4A.

The scope of work is based on the *Employer's* Conceptual Design (383-CMDN-AABB-D00141-2 Camden PS Conveyor 4A Tripper Car Drive Upgrade Concept Design Report, Rev. 1). All design documents and drawings are provided for information only and any validation required is the responsibility of the *Contractor* (See Appendix A for these supporting documents and drawings). Wherever changes are made to the existing infrastructure, it remains the responsibility of the *Contractor* to conduct a design verification and modify the existing structure where required as well as update all existing plant drawings of those areas and plants, to an as-built status taking full responsibility for the structure.

The scope of work as defined above is applicable to the content of this document unless otherwise specified.

The *Contractor* provides plant and materials, machinery, tools, labour, transportation, construction fuels chemicals, construction utilities, administration and other services and items required to complete the scope of the works.

3.1 SYSTEM DESCRIPTION/BACKGROUND

A single motorised tripper car is situated on Conveyor 4A. The tripper car directs coal from Conveyor 4A via the discharge legs of the chute and into the coal staithes – specifically Staith 1 and 3. Conveyor 4A is arranged in such a manner that it extend a length covering both these staithes, ensuring that the tripper car can discharge coal on both staithes.

Refer to drawing 0.36/3159 for the arrangement details.

3.2 BATTERY LIMITS

The battery limits are the following:

- Conveyor 4A Tripper Car drive system including local control panel
- Staithes 1 & 3 overhead busbars
- 380V Conveyor Board 5 (05BJA)

3.3 MECHANICAL SCOPE (REFER TO DRAWING 0.36/0000)

The Contactor designs, modifies, supplies, fabricates installs and commissions the works to accomplish

a fully functional tripper car drive system, which includes the following equipment:

a. Dismantling and removal of the existing tripper car drive system which includes an electrical motor, brake, gearbox, associated couplings, and chain transmission system (comprising of a chain and sprocket system coupled to the tripper car wheel), including transportation to the storage area as prescribed by the *Employer*.

b. Design, supply and install a geared brake motor (hereafter referred to as "drive system") directly to the rear wheel axle of the tripper car.

c. Design supply and install a drive axle to drive the tripper car wheels.

d. Design, supply and install a mounting bracket of the for the drive system. The mounting bracket is attached to the tripper car structure to support the drive system.

e. It is the *Contractor's* responsibility to determine the best suitable mounting arrangement of the drive system and furthermore make provisions prevent coal spillages on the drive system.

3.4 ELECTRICAL SCOPE

The existing electrical supply to the Conveyor 4A Tripper Car will be used to supply electrical power to the Tripper Car after modifications. Only the Tripper Car motor and its control panel will be replaced as part of the Conveyor 4A Tripper Car Upgrade Project. The defective copperhead rail shall be repaired during the execution of project activities on the Tripper Car Upgrade Project. This repair scope shall be executed by EMD. The current feeding arrangement will remain the same, as explained in detail below:

- The Conveyor 4A Tripper Car motor control panel is supplied by the 380V Conveyor Board 5 (05BJA) via an isolator which feeds the three-phase busbar system (VAHLE type L20/14 copperhead rails).
- The 380V Conveyor Board 5 is fed from the 6,6kV Substation Board 3 via the 6,6/0,4kV Coal Plant Transformer 3 (3BJT10).
- From the Coal Plant Transformer 3 the power supply feeds the 380V Coal Plant Board 3 (03BJC) which in turn feeds the 380V Conveyor Board 5.

NB: There will be no modifications on the switchgears supplying Conveyor 4A Tripper Car i.e., the 380V Coal Plant Board 3 (03BJC) and the Conveyor Board 5 (05BJA); hence the fused isolators, contactors, and cable sizes on both Boards will remain the same.

- Also, the 63A isolator which feeds the overhead busbars (copperhead rails) will not require any upgrades as it is still sufficiently rated to handle the upgrades on the Conveyor 4A Tripper Car motor.
- The slight increase in the power requirements of the Tripper Car motor from 2,2kW to 3kW does not require any Protection System upgrades on the Boards and the copperhead rails.

3.4.1 Existing Power Supply

a. The power supply to the Tripper Car is fed via the three-phase overhead busbar system which is made up of a VAHLE type L20/14 copperhead rail.

b. Optimum current collection is achieved by a pantograph system which is a VAHLE type DVD current collector that continuously makes contact with the overhead busbars.

c. The busbars are suspended from the steel structures by a VAHLE type D80 insulator with a rail holder which allows for the copperhead rails to move freely during the periods of expansion and contraction due to temperature variations.

d. Different components of the VAHLE Type L20/14 copperhead rail system include rigid joints, expansion joints, insulators and locating clamps. The technical operating specifications of each component are described in detail in the concept design report [3].

e. The power supply to Conveyor 4A Tripper Car motor is achieved by means of a VAHLE type DVD current collector (pantograph system) located on top of the Tripper Car, which makes use of carbon graphite brushes for effective current collection.

f. The pantograph system continuously makes contact with the overhead busbars, to supply the motor control panel which is located on one side of the Tripper Car. This is achieved by an insulated cable which connects the pantograph system to the control panel.

g. The output of the motor control panel is fed to the motor's terminal box to supply electric power to the motor which is coupled to a gearbox. This enables the Tripper Car to move up and down between Staithes 1 and 3 for coaling purposes. The technical operating specifications of the VAHLE Type DVD pantograph system are described in detail in the *Employer's* concept design report [3].

3.4.2 Insulators

The busbars are suspended from the steel structures by a VAHLE type D80 insulator with a rail holder which allows for the copperhead conductor to move freely during the periods of expansion and contraction due to temperature variations. The technical operating specifications of the VAHLE Type DVD pantograph system are described in detail in Annexure B.

3.4.3 Drive Motor Scope of Work

The supplier of the Conveyor 4A Tripper Car drive motor shall meet the minimum Eskom requirements as prescribed in the document no: 240-57617975- Eskom Procurement of Power Station Low Voltage Motors Specification. In terms of the procurement, design, manufacture, testing, transport, delivery, installation, and commissioning requirements.

The following scope shall be executed by the supplier:

a. The Contractor shall dismantle the existing electrical installation i.e., the drive motor, electric cable, and the control panel

b. The Contractor shall supply, install, and commission a drive motor for the Conveyor 4A Tripper Car

c. The motor shall be designed, manufactured, tested, and perform in accordance with the latest version of SANS/ IEC 60034 and SANS 1804

d. The motor shall be a three-phase induction motor, the power supply to the motor shall be supplied by a control panel which shall be located on one side of the Tripper Car.

e. The connection from the control panel to the motor's terminal box shall be done by an insulated electrical cable.

f. The cable shall be sized to be able to handle a current which shall be eight times the nominal current during motor start-ups

g. The motor shall be suitable for direct online starting, unless otherwise specified

h. The electrical motor shall be a TEFC, foot mounted, which shall be mounted on the base plate located on one side of the Tripper Car.

i. The windings shall be insulated with either class F or class H, with class H being the preferred choice

j. Cooling methods shall be IC 41 in accordance with SANS 1804 unless otherwise specified

k. The drive motor shall be rated at 3kW, 380V, 50Hz and shall be designed to operate in a Zone 22 Hazardous Location, as per Camden Power Station Document no: 240-129018630- Classification of Hazardous Areas at Camden Power Station.

l. The motor shall be supplied with an IA (Inspection Authority) certificate from an Approved Test Laboratory (ATL) to certify that the motor is designed to be operated in a Zone 22 Hazloc area

3.4.3.1 Motor Performance

Under normal power supply conditions, motors shall be capable of the following:

a. Be rated for the specified number of starts per hour
b. Running continuously at rated output and
c. Momentary overload in accordance with SANS 1804 without exceeding the temperature rises permitted by the standard
d. Under transient abnormal conditions, the motor shall continue operating without damage. The motor shall produce rated torque voltage reduced to 70% and frequencies down to 95%.
e. in addition to this, the motor efficiencies, power factors and torques guaranteed by the supplier shall not be subject to decrease in respect of tolerances of any kind.
f. Similarly, guaranteed starting currents shall not be subject to increase for any reason

3.4.3.2 Motor Construction Requirements

The motor frame, housing and fixing arrangement shall meet the following requirements:

a. The motor housing for the motor shall be made either of cast iron or fabricated steel
b. Bearings shall be end-shield mounted so that the motor can be moved without the rotor being disturbed relative to the stator
c. The motor shall be of standard dimension as specified in SANS 1804-2
d. A machine base plate or frame shall be supplied, provided that the current base will not fit the new motor
e. Holding -down bolts holes in bed plates, frame and motor shall be provided with adequate clearances for positioning during alignment
f. Packing shims allowing for height adjustment shall be provided, where applicable
g. Jacking bolts shall be provided at each end of the base plate for positioning and aligning the motor in both horizontal and vertical directions where applicable
h. All internal and external surfaces of motors shall be prepared for painting in accordance with practices recommended in SANS 064.
i. When the complete coupling for the motor is provided by the supplier, the supplier shall be responsible for its fitting and balancing.

3.4.3.3 Motor Terminals and Cable Box

Main terminals and motor leads shall be permanently marked with letters A-B-C or U-V-W, reading from left to right when facing the terminal box in addition to this the following shall apply:

a. Internal leads to reverse motor rotation shall be easily interchangeable
b. The motor shall have both ends of each winding brought out to terminals
c. The motor shall be provided with an earth terminal mounted in an easily accessible position on the frame adjacent to the terminal box

d. The motor shall be provided with approved terminating fittings for the required cables
e. The terminal box lids shall be with “lips” over the terminal box flanges, so that the gasket will not be exposed to water and dust
f. The cable box shall be provided with the internal parts and cable glands required to connect the motor for operation
g. The cable glands shall also be supplied with an IA certificate from an ATL, to certify that it can be used in a Zone 22 Hazloc area

3.4.3.4 Motor Bearings

If the motor is supplied with either ball or roller bearings the following shall apply:

a. Ball or roller bearings shall be supplied with information relating to the grease type and the greasing frequency
b. Grease relief device shall be provided to prevent over-greasing and shall discharge excess grease from an easily accessible position
c. The greasing arrangement for ball or roller bearings shall be such that greasing can be carried out while the motor is in service
d. The supplier shall also provide the information relating to the life span of the bearings, where applicable
e. Ball or roller bearings grease maybe be inspected by Eskom prior to commissioning to ensure that it is not hard

3.4.3.5 Rating Plate and Labels

The rating plate shall give the information specified in SANS 1804. In addition to the information on the rating plate, the following information shall be included separately on the motor on a securely attached brass or stainless-steel plates:

- Make and types of bearings
- Grade and type of lubricating grease
- Recommended intervals
- Bearing fit for ball or roller bearings
- Bearing reference numbers for ball or roller bearings
- Permissible starts intervals

3.4.3.6 Quality Assurance and Documentation

To ensure that Eskom Camden Power Station receives and accepts a high-quality asset that is efficient, reliable, and maintainable throughout its intended service life. The supplier shall supply Eskom with the following:

- Materials including the motor drawings
- Technical schedules
- Quality control and assurance
- Tests and data packs

Motor drawings submitted to Eskom Camden Power Station shall meet the following requirements:

- Full dimensional outline and mounting details of the motor, with shaft diameter, shaft height, motor weight, kW output, speed, supply voltage, frequency and phases clearly shown and
- Winding and wiring schematic diagrams, with identification and physical arrangement details of terminals for external cabling arrangements
- Winding specifications of the motor shall be supplied as part of the documentation
- Cable types and sizes shall also be specified

3.4.4 Motor Control Panel Scope of Work- General

a. The motor control panel shall be designed to operate in a Zone 22 Hazloc area; and as a minimum requirement the control panel enclosure shall at least be IP 65 rated. The control panel shall have one cable entry point and one cable exit point, one to input the power supply from the current collector and the exit point to supply the electric motor's terminal box. In addition to this the following requirements shall be met:

b. The control panel shall supply a three-phase voltage of 400V at 50Hz to Conveyor 4A Tripper motor. It shall be able to operate with the power supply conditions specified in Appendix C of this document.

c. The control panel shall be designed, manufactured, tested, and perform in accordance with the latest version of SANS 61439: Low Voltage and Control gear ASSEMBLIES and SANS 1973-3: 2017- Low voltage and control gear ASSEMBLIES Part 3: Safety of ASSEMBLIES with rated prospective short-circuit currents of up to and including 10kA

d. The motor control panel shall be equipped with start and stop control buttons; as well as emergency stop button for both forward and reverse directions.

e. The motor control panel shall be equipped with indication lights to indicate the status of the Tripper Car motor for both forward and reverse directions

f. The motor control panel shall be equipped with a star delta starter to reduce current during start-up

g. The local mode of operation shall be preferred, and no remote operation of the Tripper Car shall be allowed due to safety reasons.

h. The motor control panel and cable glands shall be supplied with an IA certificate from an ATL to prove that it is designed to operate in a Zone 22 Hazloc area

i. Components shall be arranged and mounted inside the control panel, in such a way that maintenance and troubleshooting work can be performed in a safe and orderly manner

j. Control panel when mounted shall not cause injury during switching

3.4.4.1 Motor Control Panel – Construction

a. All components associated with the motor control panel shall be mounted within a single housing

b. Motor starter shall comply with SANS 60947-4-1

c. Motor starters shall incorporate isolation and switching facilities, overload and short-circuit protection and timers where applicable.

d. The design shall be such that the combinations of the different components forming a circuit ensure type 2 co-ordination. Evidence of type 2 co-ordination shall be submitted to the Employer for acceptance

e. The functional unit shall be provided with a pad-lockable, hinged door where applicable

f. The isolating device inside the functional unit shall be provided to allow for isolation of a power circuit while troubleshooting is performed on the control circuit

g. Push buttons and signal lamps shall be mounted on the door (or on the front of the assembly) where applicable.

h. Signal lamps/ indication lights preferred are the multi-LED bayonet coupling type. If the filament lamps are used, their rating shall be such that an average useful active life of at least 20 000 hours obtained and they shall have miniature Edison screw, large Edison screw or midget flange or grooved bases.

i. Signal lamp/ indication lights lenses shall be coloured as follows:

j. Motor running RED

k. Motor stopped GREEN

l. Fault-trip WHITE

m. The contacts of the buttons shall be adequately rated for the duty specified

n. The front of the push button shall be coloured as follows:

- Motor _start GREEN
- Motor _stop RED

3.4.4.2 Motor Control Panel - Protective earth conductor

a. A separate protective earth (PE) conductor, to which all metal parts are galvanically connected, shall be installed on the inside rear of the control panel along the entire length. The bar shall be in an accessible position to allow for the earthing of conductors within a closest distance from the cable entry points and have a provision for connection to the system earth on both ends.

b. Earthing or bonding to the PE conductor shall be applied to all doors by means of at least 6 mm2 cross-sectional area multi-strand conductors.

c. The size of the PE conductor shall be calculated in accordance with Annex B of SANS 61439-1 edition 2 for thermal stresses due to currents of short duration. The conductor shall also be pre-drilled.

d. The position of the PE conductor and the earth bar shall be such that it does not interfere nor obstruct the cabling.

e. The PE conductor shall be colour coded GREEN with a YELLOW stripe and the screened earth bar shall be left uncoloured

3.4.4.3 Motor Control Panel – Cables and Control Wiring

a. Cables of 2.5 mm2 and larger cross-sectional area shall be provided with cable glands

b. Power conductor wiring and connections inside the control panel shall be in accordance with SANS 61439-1

c. Components and wiring forming part of the power circuit of the motor starters, shall be suitably rated, and braced for the I2t value of the current limiting device

d. Only stranded conductor cable shall be used. Single or solid conductor shall not be used. Aluminium conductors shall also not be used

e. Multi-strand cable with conductors of 1.5 mm2 cross sectional area shall be used for control circuits. Wiring of circuits of up to 50 V shall be 0.5 mm2 multi-strand conductor cables.

f. All control wiring connected to a source of fault energy shall be capable of carrying continuously a current equal to 1,5 times the rating of the SCPD protecting it and withstanding the total I2t let-through current of the SCPD under any fault condition from overload to short circuit without suffering perceptible damage

3.4.4.4 Motor Control Panel – Isolators (Circuit disconnect), contactors and MCBs

3.4.4.4.1 Isolators / Circuit disconnect

The control panel shall be fitted with an Isolator to isolate the control panel from the electrical supply for maintenance purposes and the following requirements shall be met:

a. The Isolator shall comply with SANS 60947-3

b. The Isolator shall be capable of carrying the rated and fault currents specified

c. It shall be capable of breaking the rated load and making the fault current specified

d. The Isolator shall be of the independent manual operating type

e. Isolator shall be operated from the front of the control panel by means of a handle.

f. Switches shall be fitted with a device which indicates the positions of the contacts. This position indicator shall be connected to the moving contacts in a reliable way

g. The operating handle of the switch may form part of the indicator, provided it cannot indicate the off position unless all moving contacts are in the open position

h. The device shall be labelled as follows:
   - On or I
   - Off or O

3.4.4.4.2 Contactors

a. Contactors shall comply with the requirements of SANS 60947-4-1

b. Contactors shall be of the electromagnetic, air-break type and be arranged to interrupt all poles of the supply simultaneously

c. Contactors shall be of the held-in or latched type as specified. Latched contactors shall be provided with a trip coil as well as a closing coil

d. Contactors are required for the operation of motors and as such shall be rated such that they comply with type 2 co-ordination and correct utilisation category

3.4.4.4.3 Miniature Circuit Breakers (MCBs)

a. Miniature circuit breakers (MCB's) shall comply with the requirements of VC8036, SANS 556-1 and SANS 60947-2. The requirements stipulated in SANS 556-1 takes priority over SANS 60947-2

b. Provision shall be made for MCB's applied on multiple or single-phase distribution sections or sub-sections to be operated from the front of the ASSEMBLY and this shall only be possible after opening the front door

c. MCB's shall be of the non-adjustable type

3.4.4.4.4 Terminals and lugs

- The types of terminals and lugs for all auxiliary circuits shall be selected in accordance with 240-57649048 for the different voltage and current rating application
- All exposed terminals and cable terminations shall be shrouded using a transparent non-flammable material to prevent accidental contact. Perspex is unacceptable as a shrouding material
- Lugs are of the compression type. All lugs and their application with different types of terminals are as detailed on Eskom standard drawing 0.00-10341-01 sheet 02
- Terminals shall be provided for all cables entering the cubicle. Such cables shall not be made off directly onto other components in the cubicle

3.4.4.5 Motor Control Panel – Nameplate and Labels

The control panel shall have a nameplate stating at least the following:

a. Name of the assembly

b. Plant coding

c. Manufacturer

d. Manufacturer's address and contact telephone number

e. Contract Number

f. Standard to which it was manufactured, and design verified

g. Assembly rated current

h. Assembly rated operational voltage

i. Assembly rated insulation voltage

j. Assembly rated frequency

l. Control voltage

m. Rated power frequency withstand

n. Rated impulse withstand voltage

o. Degree of protection

p. Short-circuit rating in kA and duration in seconds

q. Form of separation of respective sections

r. Degree of Pollution

3.4.4.6 Quality Assurance and Documentation- Motor Control Panel

3.4.4.6.1 The Requirements for Drawings

Reproducible drawings shall be provided in an English language. All drawing shall be in at least A3 size.

All engineering drawings shall comply with Eskom drawing standard 240-86973501

General arrangement drawings shall be completely dimensioned, showing:

a) Arrangement of equipment
b) Top, front, and side views and cross-sections of the control panel
c) Position of each functional unit
d) Reference each functional unit type and size (e.g. 37kW DoL, 63A cable etc)
e) Clearances for opening the door
f) Details on the power and control cables
g) Incoming and outgoing cable termination positions and details
h) Cable slot positions
i) The height of all cable glands above floor level
j) Mass of the control panel
k) Details and position of the holding down bolts
l) Details of support structures

3.4.4.6.2 Schematic Drawings

Schematic wiring diagrams shall show the following:

a) Schematic diagrams shall be drawn using electrical symbols in accordance with 240-54690969
b) All protection, control, indication and devices and their contacts, each of which shall be labelled with its correct circuit function letter and number in accordance with 0.00/10341 sheet 4 drawing
c) Device terminal numbers, terminal block numbers and terminal numbers in accordance with 0.00/10341 sheet 3 drawing
d) All wiring within each functional unit
e) All internal interconnections, bus wiring, inter ASSEMBLY wiring and connections to external equipment
f) All control and protection switches
g) Power supply connections

3.4.4.6.3 Installation, Operating and Maintenance Instruction Manuals

a. Instruction manuals shall comply with the requirements laid down in the tender enquiry. The manuals that cover all equipment forming part of the assembly shall be complete with:

- Power station name and order number;
- Content list;
- List of reference drawings;
- Details of all components

b. Manuals shall contain general arrangements drawings, installation drawings and instructions, operating and maintenance instructions for all components, detailed parts lists which shall be accompanied by exploded view type drawings clearly detailing the part and uniquely identifying it,

technical descriptions of the equipment and components parts, spare part ordering instructions and instructions and type test certificates

c. Any special instructions pertaining to the storage of spare parts or to their shelf life shall be included in the manual. All drawings required for component locations, dismantling and re-assembly for maintenance shall be included in the manual. All special tools required for maintaining and operating the equipment shall be identified in a schedule to be included in the manual

3.5 GENERAL REQUIREMENTS

a. The *Contractor* shall not commence any work execution prior to review and acceptance of detail design by *Project Manager*.

b. The *Contractor* supplies packaging, transportation, and installation of all plant and materials.

c. The *Contractor* supplies all safety equipment (guards, notices, etc.) and name plates.

d. The *Contractor* ensures packing, marking and protection of all Plant and Materials for shipping and transport.

e. The *Contractor* provides spare parts for installation, commissioning, and testing. Spare parts for operations and maintenance purposes for a one year period.

f. Only equipment based on proven technology and of high reliability are considered for use.

g. All relevant technical information regarding each component or item offered is included either in the forms to be completed by the *Contractor* or as an Appendix to the Tender, in order that the *Project Manager* can make a proper evaluation of the offer.

h. The *Contractor* determines if his equipment fits into the spaces provided for the equipment, prior to Tendering. Any alteration required for specific equipment is submitted with the Tender. If no information is received with the Tender, it is assumed that the building, space, or panel accommodates the equipment offered.

i. In designing the *Works*, the *Contractor* takes due cognisance of existing plant and equipment as well as safety and housekeeping constraints. It is the responsibility of the *Contractor* to overcome any issues that may arise due to space constraints with prior consent from project management and no extra payment or claim of any kind is allowed on account of difficulties of access to the *Works* or for the requirements of working adjacent to or in the same area as others. Adequate working space is provided by the *Contractor* for all new plant and existing plant for inspection, testing, operating and maintenance purposes.

j. The *Contractor* is fully responsible for integrating his design with the existing installed plant and equipment. The *Works* comply with professional engineering practice and standards for fossil fuel power plants.

k. The *Contractor* lists all the consumable components that forms part of the *Works*, specifies each components life and includes it as part of the design package.

l. All Plant and materials used for process control are constructed of suitable material so that no corrosion or erosion by chemicals can occur, by virtue of its installation in the process.

m. The *Contractor* provides all relevant welding procedures if applicable for acceptance by the *Employer*.

n. The below technical information to be provided by the *Contractor*:

- Lubrication schedules
- Drive Schedule(s)
- Detail design drawings
- Detail design calculations
- General Arrangement Drawings
- Operating and Control Philosophies
- Maintenance Philosophies

4. TESTING REQUIREMENTS AND PROCEDURES

Unless otherwise stated in the Works Information, the *Works* are tested in accordance with the requirements and procedures accepted by the *Project Manager*. To this end the *Contractor* submits his proposed requirements and procedures for all tests (for the tests on Completion and the tests after Completion), including QCPs and ITPs, to the *Project Manager* for acceptance, within 30 days prior to any testing/commissioning date. These requirements and procedures must be developed so as to suitably and properly demonstrate that the *works* meet the *Employer*'s Requirements and must be:

- In accordance with the details (if any) stated in the Contract; and
- Further developed or amended and re-submitted at the expense of the *Contractor* until they are accepted by the *Project Manager*.

4.1 MECHANICAL TESTING (FACTORY TESTING)

4.1.1 Drive Units

a. The drive unit must be completely assembled, aligned and run under light load before delivery to site.

b. Assembled drive units are to be tested by the *Contractor*. These tests must be witnessed by the *Supervisor*. After a machine has successfully passed the test it is inspected by the *Project Manager* prior to leaving the *Contractor*'s or his Subcontractor's workshop for delivery.

c. If a drive unit is rejected during this inspection, repair or replace the unit to the satisfaction of the *Project Manager*. It is subject to complete pre-delivery tests and inspections.

d. Ensure the provision of assistance, labour, materials, electricity, fuel, stores, apparatus and instruments as may be a requisite to performing the tests and inspections and as may be reasonable demanded to carry out such tests efficiently. Ensure that all gauges, templates, tools and other equipment required to check the accuracy of the work are calibrated at regular intervals by a laboratory accepted by the National Calibration Services of the Council for Scientific an Industrial Research of South Africa, or by the respective authority in the country of origin of the equipment.

4.2 MECHANICAL TESTING ON COMPLETION

Without derogating from or limiting the provisions of Sub-Clause - *Contractor*'s Obligations, the Tests on Completion must be carried out subject to the provisions as set out below:

a. After manufacture and erection, the *Contractor* satisfies himself that the equipment is complete in all respects and carries out the necessary tests of the Plant, (supplied by the *Contractor*). During this period the *Supervisor* carries out visual inspection on the Plant and witnesses the tests.

b. The *Contractor* provides personnel and all equipment necessary for the tests.

c. The *Contractor* submits, for acceptance to the *Project Manager*, a complete and detailed test and inspection procedure for test before commissioning. This test and inspection procedure includes all tests and inspections required in terms of the respective specifications and other tests and inspections deemed necessary by the *Contractor* to prove that the Plant has been delivered according to this specification and includes stability tests, operational tests under simulated conditions, functional tests, tests to prove the integrity of the safety and limit systems and inspections for final quality, including paint quality.

d. After acceptance of the test and acceptance procedure by the *Project Manager*, the *Contractor* fully tests the Plant supplied by him in the presence of the *Project Manager* and according to the accepted procedure.

e. Training and certification of the Employer's personnel are done during this period to render them competent to operate and maintain the plant.

f. Preliminary Operating and Maintenance manuals are handed over one month prior to commencement of tests. Three hard copies and one electronic copy of the final manuals and preliminary as-built drawings are handed over before commissioning.

g. All motions of the plant are tested under static-load and static-load plus simulated dynamic load conditions (static tests loads are provided by the *Contractor*), where applicable, to prove correct operation and to enable position indicators and limit switches to be set, and to make other operational adjustments. Live-load are defined as the safe working load when the machine is working at maximum capacity, and including dynamic factors such as wind loads, shock loads due to acceleration and deceleration, etc.

h. The Plant is tested in empty running condition to confirm that the complete Plant performs according to the specification. The following is tested and confirmed:

- Confirmation that the control system performs according to the design with reference to control and sequence starting and stopping and that all protection devices, limits and the communication links operate correctly.

i. Before the commencement of any tests the *Contractor* provides the initial fill of oil for all gearboxes and grease for components which require grease lubrication. Until Completion the *Contractor* is responsible for all maintenance and topping up of oil.

j. All simulation devices and test weights required are provided by the *Contractor*.

4.3 MECHANICAL TESTING AFTER COMPLETION

a. The *Contractor* must apply formally for each test / test phases to start. The test must only start when the Plant is in a fully operational state. Plant commissioning and optimization must not be allowed during testing.

b. The *Contractor* to submit, for acceptance by the *Project Manager*, a complete and detailed test and inspection procedure for tests after take over. This test and inspection procedure must include all tests and inspections required in terms of the respective specifications and other tests and inspections deemed necessary by the *Contractor* to prove to the *Project Manager*'s satisfaction that the Plant is performing according to this specification.

c. The *Employer* reserves the right to carry out further tests on the installation.

d. On completion of the tests the *Contractor* supplies in triplicate complete test certificates as necessary, and such prescribed statutory documents as are required certifying that the equipment is in complete working order and that all working parts are effectively lubricated.

4.4 ELECTRICAL TESTING

For standard Plant and Materials, the *Contractor* submits type test certificates before commencing with manufacturing. Type tests are performed at least once for each type of component, or system.

Any component or system offered by the supplier as part of the *Works* is subject to pre-delivery tests. It is important to note that where not specified, the routine testing requirements are as per the relevant Eskom, national and/or international standards. These tests include performance tests, insulation tests, equipment checks with regards to the drawings and any other tests or checks necessary to confirm conformance of the Works.

4.4.1 Tests and Tests Certificates for the Electrical Motor

The following Electrical tests shall be performed at the factory on the motor before it is delivered on site at Camden Power Station:

- Winding Insulation resistance
- Polarisation Index test
- Winding resistance test
- Uncoupled test run

Eskom, or its authorised representative, reserves the right to inspect the motor components and to witness type tests and routine tests where applicable. The supplier shall ascertain whether, and at what stages, inspection and witnessing is required by Eskom and shall then give Eskom not less than seven days' notice of when the inspection maybe undertaken. Motor's dispatched to site without the required inspection maybe returned at the supplier's cost on Eskom discretion. Routine tests shall be witnessed by Eskom and or an authority, independent of the supplier or contractor.

Before the delivery date of the motor, type, and routine certificates where applicable, shall be submitted for approval. Motor tests shall be recorded on the Eskom Standard form, example attached in Appendix B. The motor shall not be delivered without agreement of readiness to receive.

4.4.2 Tests and Tests Certificates for the Control Panel

The following routine tests shall be performed at the factory on the control panel in accordance with SANS 61439-1, before it is delivered on site at Camden Power Station:

4.4.2.1 Construction

- Degree of protection of enclosure – Zone 22 Hazloc Area
- Clearances and creepage distance
- Protection against electric shocks and integrity of the protective circuits
- Internal electric circuits and connections
- Terminals for external conductors

4.4.2.2 Performance

- Dielectric properties
- Wiring, operational performance and functionality tests

Functionality tests, correctness of wiring shall also be verified after the control panel has been erected and bolted into the final position before energizing. The wiring and the electrical installation must be certified by issuing of a CoC to confirm that the installation complies with *SANS 10142-1: The Wiring of Premises Part 1: Low-voltage installations*. Another CoC shall be issued to certify that the whole electrical installation is compliant with all the requirements of *SANS 10108: The Classification of Hazardous Locations and The Selection of Apparatus for Use in Such Areas*

5. COMMISSIONING

Commissioning is in accordance with a commissioning plan to be supplied by the *Contractor* and accepted (prior to commencement of commissioning) by the Project Manager under the Contract, due regard being given in respect of the plant supplied by Other Project Contractors.

The *Contracto*r provides the Project Manager with records of all readings and data recorded or used during the commissioning of every plant item, together with records of an adjustments or modifications found necessary during the initial running of the plant. Commissioning must be catered for in Design (sampling points etc.)

Plant start-up includes all activities, procedures and tests required to bring installed systems and Plant to a state of readiness for the Employer's acceptance, and for commercial operation.

The *Contractor* designates a resident start-up manager who is responsible for implementing the start-up program for the *Contractor's* scope of Works.

5.1 MECHANICAL COMMISSIONING

5.1.1 General

a. To conform to requirements set out in the Employer's standard, 240-55864503.

b. Carry out in stages as follows:

- Pre-commissioning tests including factory test, carrying out inspections and dimensional checks to ensure the conveyor system installation is complete and in accordance with the works.
- Cold commissioning or no-load tests.
- Hot commissioning or load tests.

5.1.2 Pre-commissioning Testing

During the pre-commissioning test period, ensure that the drive system installation is complete, and all equipment made ready to run. At least carry out the following checks:

- All drive components correctly aligned using laser alignment equipment.
- Gearboxes is filled to correct levels.
- All motors wired for correct direction of rotation.
- All brakes correctly set (if applicable).

- All bearings correctly lubricated.
- All control and safety interlocks functioning correctly.
- All equipment suitably guarded, or where guards have been removed for testing, suitable barriers and warning signs erected.
- All equipment and walkways clear of debris.

5.1.3 Cold Commissioning

When all pre-commissioning checks have been completed to the satisfaction of the *Project Manager*, commence with no load testing. This involves the running of all equipment and operating the machines over the entire working range without product.

Determine the exact test procedures to ensure full verification of correct systems and machine function. However, the tests at least include the following:

- Ensure electrical power to all motors are connected.
- During this running period, the following is carried out:
  - Direction checks of motors.
  - Drive motor currents recorded for starting and steady running conditions.
  - Drive units checked for overloading, excessive vibration or noise, oil leaks, overheating, coupling alignment, etc.
- Thorough testing of interlocks and protective systems.
- Check calibration of all instrumentation.
- Final inspection of plant by commissioning engineer.
- Replace all guards and covers removed to carry out this work.

5.1.4 Hot Commissioning

When the no load tests have been completed and recorded to the satisfaction of the *Supervisor*, the *Contractor* commence load testing. This stage of testing must be completed before Completion can be obtained. The function of this stage is to prove that the conveyor/feeder systems and machines can perform as per design specifications under the actual operating conditions.

Determine the exact test procedures to ensure full verification of correct Mechanical function. During this period tests at least the following:

- Drive motor currents recorded for starting and steady running conditions.
- Drive units checked for overloading, excessive vibration or noise, oil leaks, overheating, etc.
- Gearbox and motor temperatures monitored for overloading.

- Check the calibration and rectify where necessary all system instrumentation.
- Verification of sequence controls and interlocks.

5.2 START-UP PROCEDURES REQUIRED TO PUT THE *WORKS* INTO OPERATION

The *Contractor* gives the *Project Manager* written notice that the *works* are ready for energisation. Such notice must suit the requirements of the *Employer* but must not, unless otherwise agreed, be less than 48 hours or more than fourteen (14) calendar days.

No alterations or adjustments must be made to the *works* after functional checks are done without the *Project Manager*'s written permission.

At this stage the following must have been achieved:

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

5.3 PERFORMANCE TESTS AFTER COMPLETION

The *Contractor* to carry out necessary tests after completion to demonstrate the performance of the Plant.

The *Contractor* is required to provide a detailed method statement on how this verification must be achieved and any instrumentation/equipment required must be part of the system provided by the *Contractor.*

6. SPARES

The *Contractor* submits a schedule of, and includes in the offer, all spares that are considered necessary for the long-term operation and maintenance of the Plant, taking into account the life expectancy and lead time of the components. The above is to be priced separately.

7. DOCUMENT MANAGEMENT

The documentation requirements cover the various engineering stages, from the design stage through fabrication, installation, testing and commissioning and most importantly for the operating, maintenance, and training stage of the project. The *Contractor* ensures that the Technical Documents and Records Management Work Instruction (240-76992014) is used for any documentation requirements.

The Contractor is responsible for the compilation and the supply of the documentation during the various project stages and to provide the documentation programme to link with the milestone dates. Documentation and drawings are programmed for delivery to meet the milestone dates and in accordance with the agreed VDSS.

All documents supplied by the *Contractor* shall be subject to the *Employer's* acceptance. The language of all documentation shall be in English. The *Contractor* shall include the *Employer*'s drawing number in the

drawing title block. This requirement only applies to design drawings developed by the *Contractor* and his or her Subcontractors. Drawing numbers will be assigned by the Employer as drawings are developed.

7.1 DOCUMENT IDENTIFICATION

7.1.1 Identification of the Documentation

The Contractor shall ensure that document has the following minimum attribute on the cover page:

- Title of the document
- Document Unique Identification number (Eskom number)
- Contractor Document number, if applicable
- Document status
- Revision number
- Document Type
- Document security level
- Document revision table/history
- Page number on the footer
- Document Author/Authoriser
- Document Originator Contractor

The following additional attributes are important for technical documents:

- Package/System name, sub-system if applicable
- Unit(s) number
- Contractor name
- Contractor number
- Plant Identification Codes

7.1.2 Format and Layout of Documents

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

7.1.3 Layout and Typography

Every document should comply with the following font specifications:

- Font Colour: Black
- Main Headings Font Type: Arial, Bold, Capital Letters
- Main Heading Font Size: 12pt
- Sub Headings Font Type: Arial, Bold, Title Case

- Sub Headings Font Size: 11pt
- Body Font Type: Arial, Sentence Case i.e., only the first letter of the first word is a capital letter.
- Body Text Font size: 11pt
- Line Spacing: 1.5 line spacing
- Margins: standard
- Alignment: full justification to be used
- Paragraphing: one line skip between paragraphs
- Pagination: centred page numbers (about 0.5 inches from bottom)
- Indentations: standard tab for all paragraphs (about 0.4 to 0.5 inches)

7.1.4 Document Headers

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

7.1.5 Naming of files

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

For documents that have approval date and signature

(YYYYMMDD_DocType_DocumentTitle_UniqueIdentifier_Revision.FileExtention)

For documents that do not necessarily require the ‘Approved Date’ and ‘Revision & Versioning’, use the date of update

(YYYYMMDD_DocType_DocumentTitle_UniqueIdentifier_Revision.FileExtention)

All further requirements are according to IEC 61355 – 1:2008 (Edition) Classification and designation of documents for plants, systems and equipment – Part 1: Rules and classification tables.

7.2 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.

In addition, the Contractor shall be provided with the following standards which must be adhered to:

- Documentation Management Review and Handover Procedure for Gx Coal Projects
- Project Documentation Deliverable Requirement Specification.

- Technical Documentation Classification and Designation Standard

7.3 TRANSMITTALS

1. All document exchange is done using formal Transmittals. The following is the minimum information required for sending transmittals:
    - Title of the document
    - Reason for issuing/submission
    - Transmittal Number
    - Transmittal Name
    - Transmittal Description
    - Contract Number:
    - Package Number
    - Transmittal purpose
    - Sender Name
    - Sender E-Mail
    - Sender Organisation
    - Recipient Name
    - Recipient E-Mail
    - Recipient Organisation
    - Disclosure Classification
    - Date received
    - Quantity of documentation referenced on the transmittal
    - Number of copies
    - Format/medium submitted (e.g. paper, DVD, etc.)
    - Sender signature
    - Recipient signature, once submitted, to acknowledge receipt
2. If a transmittal is in response to an Eskom communication via transmittal, the Eskom Transmittal Number is referenced in the transmittal response and is provided in addition to the meta-data required in Section 7.3 (1).
3. The *Contractor* follows a structured and standard definition for Transmittal Descriptions, i.e. subject line convention of YYYYMMDD – <Contract Number> – <Vendor> – <Short Description> – <Sender Initials>.
4. The *Contractor* follows a structured method of communication as defined within Communication Interface Memorandum (CIM) for any correspondence

5. The *Contractor* follows a structured and standard definition for email subjects i.e., a subject line convention of YYYYMMDD – < Project File Number> – > – <Email Subject line>.
6. The *Contractor* selects the purpose for transmittal in line with the standard Eskom Selection Criteria:
    - Issued for Approval
    - Issued for Award
    - Issued for Basic Design
    - Issued for Commissioning
    - Issued for Concept Design
    - Issued for Consideration
    - Issued for Construction
    - Issued for Detail Design
    - Issued for Document Review
    - Issued for Handover
    - Issued for Information
    - Issued for Installation
    - Issued for Manufacturing
    - Issued for Procurement
    - Issued for Review
    - Issued for Tender
7. Issuing of documents with different transmittal purposes is done separately and is not combined into one transmittal. This ensures fast and efficient processing of incoming and outgoing transmittals and information exchange.

Electronic technical data submittals are made using the *Project Managers* email address and where applicable via Zendto, a Web-based file transfer service. If *Contractor* does not already have Zendto transmittal capability, information is available at https://zendto.eskom.co.za/. (The Uniform Resource Locator [URL] to be used for electronic file submittals are made available upon Contract award.)

In case of email submission, the Contractor should note that if a single file to be transmitted is over 2MB in size, then the document is uploaded on Zendto portal.

Notification to *Project Manager* that submittals have been posted to Zendto is in accordance with the correspondence requirements of this Contract. *For the Zendto submission, a transmittal record must be submitted to the project email document control address information the* Employer *of such a submission.*

The hard copy prints are submitted to the address indicated for Technical Documents in the Supplementary Terms and Conditions of this Contract. The following number of prints are submitted unless otherwise indicated in the Schedule of Submittals:

Submittal Description	Copies Required
Performance Curves	2
Design Data	2
Test and Inspection Data	2
Drawings	2

7.4 DRAWINGS

The creation, issuing and control of all Engineering Drawings will be in accordance with the latest revision of Engineering Drawing Standard (240-86973501). 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.

Drawings are in sufficient detail to indicate the kind, size, arrangement, component weight, breakdown for shipment, and operation of component materials and devices; the external connections, anchorages, and supports required; the dimensions needed for installation and correlation with other materials and equipment; and the information specifically requested in the Schedule of Submittals.

The *Contractor* fully completes and certifies drawings for compliance with the Contract requirements. Drawings have title block entries that clearly indicates the drawing is certified.

Each submitted drawing is project unique and is clearly marked with the name of the project, unit designation, *Employer’s* Contract title, *Employer’s* Contract file number, project equipment or structure nomenclature, component identification numbers, and Employer's name. Equipment, instrumentation, and other components requiring Engineer-assigned identification tag numbers are clearly identified on the drawings. If standard drawings are submitted, the applicable equipment and devices furnished for the project are clearly marked.

Transmittal letters identify which Schedule of Submittals item (by item number) is satisfied by each drawing or group of drawings. The transmittal letter includes the manufacturer’s drawing number, revision number, and title for each drawing attached. Each drawing title is unique and is descriptive of the specific drawing content. Transmittal letters for resubmitted drawings include the Employer’s drawing numbers.

The *Contractor* includes the *Employer’s* drawing number in the drawing title block. This requirement only applies to design drawings developed by the *Contractor* and his Sub-Contractors. It does not apply to drawings developed by manufacturers for equipment and material such as valves, instruments, etc. Drawing numbers are assigned by the Employer as drawings are developed.

The project name is listed on all drawings, including manufacturers’ drawings. Tag numbers and equipment names are listed on all manufacturers’ drawings. A separate sheet may be attached to the submittal if

needed to adequately list all tag numbers associated with the drawings such as valves or instruments which may have numerous tag numbers associated with it.

The language of all documentation is in the English language. The units of measure are metric.

The *Contractor* retains project design calculations and information for the entire life cycle of the plant and provides these to the Employer on prior written notice at any time notwithstanding the expiry or termination of the contract.

7.4.1 Drawing Submittal

All documents and records management are performed according to Project/Plant Specific Documents and Records Process. Any uncertainty regarding this is clarified with the Employer. The *Contractor* complies with all minimum document metadata as specified in Technical Documentation Classification and Designation Standard (240-54179170).

The *Contractor* submits electronic copies of the documents using a fully secure web-based solution providing carefully controlled access to appropriate project information for authorized personnel. All electronic design data and documents is in such a form which enables importing such data, documents and drawings, including 3-dimensional drawings, seamlessly into the EDMS. Hard copy submittals are only required for the IOM Manuals and final as-built submittals.

Transmittal letters are provided with each document submittal. The transmittal letter includes the *Contractor* drawing number, revision number, and title for each drawing attached. Each drawing title is unique and is descriptive of the specific drawing content.

Catalogue pages are not acceptable, except as drawings for standard non engineered products and when the catalogue pages provide all dimensional data, all external termination data, and mounting data. The catalogue page is submitted with a typed cover page clearly indicating the name of the project, unit designation, specification title, specification number, component identification numbers, model number, *Contractor* drawing number, and *Employer's* name. Drawings are submitted with all numerical values in metric units.

7.4.2 Information Requirements

The Employer requires drawings, documentation, plans, information and data (collectively “Information”) from the *Contractor* for two fundamental purposes; namely for the management and execution of the Contract and for the operation, maintenance and support of the *Works* during its entire operational phase until disposal and decommissioning.

The *Contractor*, during the progress of and upon completion of the *Works*, supplies the Information required in terms of the Contract and all such Information as may usually be supplied in connection with similar Works, including, whether or not specified in the Contract, all Information necessary or useful for:

1. Design reviews and the interface management of the Works with the Project Works;
2. Quality assurance and control; and
3. The operation, maintenance, support, inspection, integrity management, training and technical optimization of the Works, over the lifecycle thereof.

The scope of supply of Information from the *Contractor* includes drawings, documents, lists and data according to the types defined in Table 1 below:

Table 1: Typical Document Requirement List

Document Group	Description of document type (includes information data sets)
General	Equipment arrangement drawings Piping & Instrument Diagrams (P&ID's) Material handling flow diagrams Engineering and procurement schedule Equipment list Isometric Drawings Valve list Pipeline list Hanger list 3D model Interface list Equipment specifications & data sheets Drawings and data for all equipment and material Installation, Operation, and Maintenance (IOM) Manuals Spare parts list Factory Acceptance Test (FAT) report
Quality Assurance	Quality assurance manual Quality control plans Quality control reports Weld summary index Material traceability certificates Manufacturing test reports Manufacturing Non-Conformance Reports (NCR's)
Civils & Structures	Site Layout Geotechnical Investigation Report Building arrangement and floor layouts Structural drawings Architectural drawings Structural analysis and design report Foundation drawings Structural support drawings Access Platform/Walkway Drawings

Document Group	Description of document type (includes information data sets)
Construction	Transportability study/report (including heavy haul study) Site management plan (QA, Safety, Environmental etc.) Construction schedule Site storage requirements for major equipment Construction test records (hydrotest, concrete strength, pile integrity test, etc.) Maintenance records for all equipment while stored on site Constructability report
Commissioning	Commissioning schedule Test & Evaluation Master Plan (TEMP) Commissioning procedures Commissioning database Performance test procedure Performance test reports Field test reports and certificates
Operations	Operating procedures Plant operational documentation Plant tech specs Incident & upset mitigation procedures Operating scenarios (for C&I control purposes)
Logistic Support	Maintenance concept Plant maintenance documentation ISI plan/program Spare parts assessment Plant RAM analysis Equipment access and removal paths assessment Fault finding diagrams
Training	Training plan Training manuals and instructions
Safety & Protection	Fire hazard analysis Waste management plan

Document Group	Description of document type (includes information data sets)
Design Analyses	Reliability model and analysis Transient / Transition Analysis Flow dynamics analysis Thermo-hydraulic analysis Pipe Stress Analysis Maintainability analysis FMECA / FMEA analysis HAZOP analysis 3D model interference checks
Electrical	Motor list Electrical load list Circuit list Raceway list Single line diagram Protection schematic diagram Electrical load flow and fault studies report Cable block diagrams Cabling routing and cable racking layout diagrams Cable termination diagrams EMC and earthing standards report Earthing layout drawings Lighting layout drawings

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

The Project Manager reviews the Contractor's submitted documents. The Contractor ensures adherence to the Works Information and that a technically sound design approach is incorporated. Specific information required from the Contractor during tender phase and as part of the Works are as set out in the VDSS, in Appendix E.

Each document submitted to the *Project Manager* requires a transmittal note (refer to Employer's template 240-71448626 for minimum metadata requirements) from the Contractor. The Contractor includes interpretation of results in every report compiled. All project documents are submitted to the Project Manager in accordance with Project / Plant Specific Technical Documents and Records Management Work Instruction (240-76992014). The *Contractor* is required to submit documents as electronic and hard copies and both copies must be delivered to the *Project Manager* with a transmittal note.

7.5 DOCUMENTATION RECORDING

The *Contractor* develops, documents, and maintains the Master Document List (MDL) with all the required metadata which are submitted to the Employer in the monthly basis for tracking purposes irrespective of whether there are updates or not. The MDL includes a list of drawings and documents and contains the following minimum information for each document:

- Date of submission
- Transmittal number
- Transmittal title
- Document description
- Document number (both *Contractor* and *Employer*)

- Document Type
- Revision number
- Document Approval Status
- Document Authorisation Status (i.e., Accepted with Comments, Not Accepted with Comments, Accepted)
- Transmittal Reason for Issue

In addition, the *Contractor* adheres to the following standards:

- Project / Plant Specific Technical Documents and Records Management Procedure (240-53114186).

7.6 DOCUMENTATION REQUIREMENTS

All documents supplied by the *Contractor* are subject to Eskom's approval. For consistency, it is important that all documents used within the project follow the same layout, style and formatting as described in the Technical Documents and Records Management Work Instruction (240-76992014). Documents such as QCP's, Method Statements and other documents impacting the work is accepted by the *Employer* at least 3 working days prior to commencement of the *Works*.

Each revision of a document or drawing is accompanied with a list of the comments made by the *Employer* on the previous revision if applicable and the response/corrective action taken by the *Contractor*. Changes are recorded in a revision table contained in each drawing/document.

Documents and drawings indicate the *Employer's* number as allocated by the *Employer*. The *Contractor* may have his own internal document or drawing number on the document or drawing, but where reference is made among documents, the *Employer's* number is used as the reference number.

The *Contractor* compiles a complete data book for all work done during manufacturing, construction and commission containing the following as a minimum if applicable:

1 Scope of work

2 Approved "As built" drawings

3 Design calculations

4 Approved QCP / ITP

5 Inspection reports

6 Pipe ovality reports if applicable

7 As built drawings (isometric drawings and P&IDs)

8 Material summary that gives full traceability between components used, drawings and material certificates

9 All material certificates for pipes, fittings and all components used.

10 Pressure test certificate and the calibration certificates of the gauges used.

11 Pressure test procedures

12 The manufacturer's/repairer's certificate as defined in PER.

13 All CAR's and corrective actions

14 Operating Philosophy including all alarm and trip values

15 Parts catalogue

16 Maintenance manual

17 Storage, packing and transportation instructions

The Contractor submits documentation to the Eskom Representative as well as the Project's Documentation Centre in the following media:

- Electronic copies are submitted to Eskom Documentation Centre through generic email address agreed to by the project. Electronic copies large for email are delivered on large file transfer protocol and/or hard drives to the Project Documentation Centre. A notification email, with the transmittal note attached, is sent to the project generic email address. The Representative is copied on the email as well.
- Hard copies are submitted to the Eskom Representative accompanied by the Transmittal Note.

The *Contractor* ensures two (2) sets of documentation are supplied, one (1) set in the form of an electronic format (dgn, native files and pdf) and one (1) set of paper prints.

7.7 AS-BUILT PLANT DRAWINGS

The contractor shall be responsible to update all existing drawings of the "as-built plant" with the new system information. New drawings are to be supplied where changes have been made to the plant. The following drawings/diagrams will be required:

- Datasheets of all new equipment
- Piping and Instrumentation drawings of as is plant
- Hydraulic calculations
    - With design points
    - Without design point
- Isometric drawings
- Mechanical detail design report
- Process flow diagrams of as is plant
- Water supply curve at the interface with the existing system
- Pipe stress analysis
- Spray density
- Nozzle specification
- Valve Specification
- Design temperature

7.8 GENERAL REQUIREMENTS

The *Contractor* includes the *Employer's* drawing number in the drawing title block. This requirement only applies to design drawings developed by the *Contractor* and his Sub-*Contractor*s. It does not apply to

drawings developed by manufacturers for equipment and material such as valves, instruments, etc. Drawing numbers are assigned by the *Employer* as drawings are developed.

The project name is listed on all drawings, including manufacturers' drawings. A separate sheet may be attached to the submittal if needed to adequately list all tag numbers associated with the drawings such as valves or instruments which may have numerous tag numbers associated with it.

The language of all documentation is in the English language. The units of measure are metric.

The *Contractor* retains project design calculations and information for the entire life cycle of the plant and provides these to the *Employer* on prior written notice at any time notwithstanding the expiry or termination of the contract.

8. CONFIGURATION MANAGEMENT

The Contractor supplies a comprehensive configuration management program according to ISO 10007 (2nd Edition) to ensure that plant structures, components and computer software conform to approved design requirements. However, a project specific Configuration Management Plan document is developed which is aligned to ISO 10007. In addition, the Works as-built physical and functional characteristics are accurately reflected in selected documents and databases, including those for design, procurement, construction, operation, testing and training. The configuration program is applicable for use throughout all phases of the project life cycle, including management of spare parts, replacement parts and product upgrades, and forms part of deliverables for hand-over to the Employer for use during the operation and maintenance phases of the plant.

8.1 PLANT IDENTIFICATION

8.1.1 Plant Labelling

a) New labels are provided for all plant, material and equipment provided as part of the Works. It is the responsibility of the *Contractor* to manufacture and install labels according to station based labelling standard. Eskom to provide the labelling standard.

b) All labels are made as specified in the Employer's Plant Labelling Standard (240-109607332)

c) Coding and labelling of components inside electrical and C&I panels are done by the *Contractor*.

d) The Coding practitioner facilitates base-lining of all equipment lists from the *Contractor*, and only baseline equipment lists are used as a basis for the production of labels.

8.1.2 Plant Coding

Plant coding is done by the Contractor and the Employer reviews all the codes. The KKS system is used by the Contractor for classifying and designating both plant and their associated documents. All technical documentation as per "Technical documentation classification and designation standard – 240-54179170" contains a KKS code as part of the documentation identification relevant to the plant equipment. All plants (Process, electrical, C&I and Civil) are coded to KKS breakdown level 3. The KKS code contains a break down level 1, break down level 2 and breakdown level 3. Omission of any break down level is not permitted. The system is applied from the concept stage until project closeout. The rules specified in the VGB guidelines are used but all rules specified in the Employer's documents takes precedence.

Detailed nameplate or label list with the service legends and including the KKS Code are prepared by the Contractor and submitted to the Project Manager for acceptance before commencing manufacture of the labels. All maintainable plant equipment and components are labelled including pipework.

The rules for applying the KKS and the KKS codes are contained in the Employer's Standard 240-93576498 and in the publication KKS power plant classification (B105e) 5th Edition 2003 published by Verlag VGB PowerTech Service GmbH (Essen) , and the KKS Applications: Guideline and explanations A,B1-4 (B106e).

The *Contractor* uses the *Employer's* –specific interpretations of the KKS standards, which is reviewed and agreed on after Contact Award. The following variations relating to 240-93576498 are noted.

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

The *Contractor* codes all plant within scope of supply according to the KKS Classification System to Breakdown Level 3 where possible. The relevant KKS codes thus allocated appears on all plant related documentation, drawings, lists and correspondence.

The *Contractor* is responsible for ensuring the accuracy, completeness and consistency of the designations in all documents. This applies both to designations within documents (plant designations) and of Documents (documents designations). The *Contractor* submits these to the *Project Manager* for acceptance.

A list of the KKS designations allocated are drawn up by the *Contractor* for each scope of delivery. Methods of KKS designation, list formulation and submission format are proposed by the *Contractor* and accepted by the *Project Manager*.

The *Contractor*, as soon as possible after the contract has been placed, provides the *Project Manager* with the following:

- Outline drawings or diagrams showing the contractor's reference
- Coding for systems and equipment.
- In respect of items procured by the contractor from another
- Manufacture or vendor, the Contractor shall provide the name of
- The actual manufacturer and his coded drawing or reference
- Numbers and relevant technical data for identification purposes.

The *Contractor* manufactures and installs labels according to 240-71432150 - KKS Plant Labelling and Equipment Descriptions Standard. Any abbreviations to plant descriptions are prepared in accordance with *Employer's* standard. VGB Detailed nameplate or label lists with the service legends and including the KKS Codes are prepared by the *Contractor* and submitted to the *Project Manager* for acceptance before commencing the manufacture of the labels.

Any abbreviations to plant descriptions are prepared in accordance with the *Employer's* abbreviation standard, 240109607332. Detailed nameplate or label lists with the service legends and including the KKS Codes are prepared by the *Contractor* and submitted to the *Project Manager* for acceptance before commencing the manufacture of the labels.

8.2 DESIGN REVIEWS AND CHANGE MANAGEMENT

8.2.1 Design Reviews

The *Employer* reviews the *Contractor*'s submitted documents and ensures adherence to the *Works* and that a technically sound design approach is incorporated. Specific information required from the vendors

during tender phase is set out in the Vendor Document Submittal Schedule, Appendix E.

After a contract is established, the *Contractor* proceeds in the detail design phase. Each document requires a transmittal note from the vendor. *Employer's* review cycle is in-line with NEC contract requirements and is finalised during contract negotiations with the *Contractor*. Appendix E lays out the specific documents requiring *Employer's* approval before the *Contractor* can proceed with design, fabrication, and construction activities.

The *Contractor* is the Design Authority 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 design reviews:

1. Design Freeze Review
2. System Integrated Design Review
3. Pre-Commissioning Review
4. Acceptance testing Review
5. Handover Review

The *Contractor* conducts design reviews as per the *Contractor's* official design review procedure. The *Contractor* further takes note of the *Employer's* Design Review Procedure (240-53113685) and participates in all design reviews as specified by the *Employer*. The *Employer* shall indicate the outcome of a design review as "Accepted"; "Accepted with Comments" or "Rejected".

If required, the *Contractor* makes the necessary revisions on the documentation and ensures acceptance is obtained from *Employer*. The *Contractor* includes these design reviews as part of the schedule and suggests appropriate timing for such reviews.

8.2.2 Change Management

All design change management is performed in accordance with the latest revision of the Eskom Project Engineering Change Management Procedure (240-53114026). The *Employer* ensures that *Contractor* is provided with latest revisions of this procedure. Any uncertainty regarding this procedure should be clarified with the *Employer* and clarification updates should be reflected in updated versions of this procedure. All design reviews will be conducted according to the Design Review Procedure (240-53113685).

8.3 HANDOVER

Apart from any statutory data packages required, the Contractor also compiles and supplies a data package of the relevant drawings, test certificates etc. to the *Employer* for acceptance.

Detailed handover requirements are as per the requirements defined in Appendix F.

8.4 TRAINING

Training on the operation and maintenance of the *Works* is conducted, if required/applicable, training is targeted for the following audiences:

- Operating
- Maintenance
- Engineering

Training manuals and maintenance manuals are made available for all the above-mentioned areas.

9. CODES AND STANDARDS

Work performed under these specifications shall be done in accordance with codes and standards or equivalent international codes and standards accepted by the *Project Manager*. SANS standards where applicable, shall take precedence over other standards. In the event that codes and standards are listed in Appendix D but not listed in technical sections, the *Contractor* shall comply with the codes and standards in Appendix D. In the event codes and standards are listed in the technical sections but not listed in Appendix D, the *Contractor* shall comply with the codes and standards listed in the technical sections.

Refer to Appendix D for a list of applicable codes and standards.

10. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
[redacted]	Engineering Group Manager: Camden Power Station
[redacted]	Plant Engineering Design Work Lead: Camden Power Station
[redacted]	Auxiliary Engineering Manager: Camden Power Station
[redacted]	Senior Engineer: Camden Power Station
[redacted]	Electrical Engineering Manager: Camden Power Station
[redacted]	Senior Engineer: Camden Power Station
[redacted]	Senior Technician: Camden Power Station
[redacted]	Engineer: Camden Power Station
[redacted]	Engineer: Camden Power Station
[redacted]	Electrical Maintenance Manager: Camden Power Station
[redacted]	Senior Supervisor: Camden Power Station

11. REVISIONS

Date	Rev.	Compiler	Remarks
June 2022	0.1	[redacted]	Initial Draft
July 2022	1	[redacted]	Authorised Document

12. DEVELOPMENT TEAM

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

- [redacted]
- [redacted]
- [redacted]

13. ACKNOWLEDGEMENTS

- N/A

14. ANNEXURES

Appendix Title
Appendix A – Drawings
Appendix B – Motor Routine Test Certificate
Appendix C – Power Supply Conditions
Appendix D – Codes, Standards and Guidelines
Appendix E – Vendor Document Submittal Schedule (VDSS)
Appendix F – Documentation Requirements for Final Handover

APPENDIX A : DRAWINGS

Document Number	Rev.	Document Title
0.36/15137	8	Building Layout – KKS Codification
0.36/0000 Sheet 1	0	Conveyor 4A Tripper Car – Concept 3
0.36/0000 Sheet 2	0	Conveyor 4A – Drive Motor Mounting Bracket
0.36/3159	1	Stacking Belts 4A & 4B Arrangement
0.36/5850	1	Arrangement of Motor Driven Belt Tripper Car & Crossover – Conveyor 4A & 4B
0.36/5851	1	Arrangement of Motor Driven Belt Tripper Chute & Crossover – Conveyor 4A & 4B
0.36/15072 Sheet 4	1	6,6kV Substation Board 3
0.36/14057 Sheet 3	7	380V Coal Plant Board Single Line Diagram
0.36/14057 Sheet 2	6	380V Coal Plant Board Single Line Diagram
0.36/14057 Sheet 1	12	Coal Plant Board 3 and 4 General Arrangement
0.36/ 14072 Sheet 1	9	380V Conveyor Board 5 GA
0.36/ 14072 Sheet 1	7	380 Conveyor Board 5 Single Line Diagram

APPENDIX B : MOTOR ROUTINE TEST CERTIFICATE

Eskom	ROUTINE TEST CERTIFICATE FOR LV MOTORS Project Name: Project No:

PLANT DESCRIPTION	
DRIVEN MACHINE (Direct-on-Line)	
MANUFACTURER NAME	
MANUFACTURER Serial No.	
DATE	

1A	Motor Details	Design data	Factory Test Data
A.1	Voltage (V)		
A.2	Frequency (Hz)		
A.3	Frame Size		
A.4	IP Code		
A.5	Connection		
A.6	Phase		
A.7	Uni/Bi directional		
A.8	Insulation class		

1B	Guarantees	Design data	Factory Test Data
B.1	Rated power (kW)		
B.2	Temperature rise (degrees)		
B.3	Rated current (A)		
B.4	Rated torque (Nm)		
B.5	Efficiency at rated load (%)		
B.6	Power factor at rated load		
B.7	No load current (A)		

2A	Routine Tests				
2.1	Cold Winding Resistance (Ohms)		2.2 Cold temperature (degC)	2.3 Heater resistance (ohms)	
	U - V			Heater Voltage (V)	
	U - W			2.4 RTD Resistance	(Ohms)
	V - W			U1	
				U2	
2.5	No load test at rated voltage			V1	
	No-load voltage (V)	No- load current (A)	No- load power (W)	V2	
				W1	
2.6	No load losses			W2	
	No load losses (W)	Friction and windage	Core losses (W) at rated volt	2.7Bearing insulation resistance	(ohms)
				Drive end	
2.8	Shaft voltage (V)			Non-drive end	
2.9	Vibrations		IEC 60034-9 and 14	Design data	Factory Test Data
	Drive End horizontal (mm/s)				
	Drive End vertical (mm/s)				
	Drive End axial (mm/s)				
	Non - Drive End horizontal (mm/s)				
	Non - Drive End vertical (mm/s)				
	Non - Drive End axial (mm/s)				
2.10	Final Bearing Temperature (degC)			2.11 Stator winding insulation resistance and HV test	
	Drive End	Non - Drive End	Ambient temperature	Stator IR (MΩ) 1Min at.....V	
				Stator IR (MΩ) 10 Min	
2.12	Rotation on Drive end	2.13 Run Down (min/sec)		High voltage test at.....V	
				Stator IR (MΩ) 1Min at.....V	
2.14	Locked Rotor Test at ..... Times Full Load Current			Stator IR (MΩ) 10 Min	
	Voltage(V)	Current(A)	Input Power(kW)	2.15 Noise level (dB)	
				Design data	Factory Test Data
2.16	Unsaturated Starting Torque(p.u.)				
2.17	Unsaturated Starting Current (p.u.)				
2B	Power Quality			IEC 60034-1 and -2	Factory Test Data
	Voltage unbalance (%)				
	Frequency deviation (%)				
	Total Harmonic distortion (%)				

APPENDIX C : POWER SUPPLY CONDITIONS

C.1 CONDITIONS FOR AC SYSTEMS

The LV Switchgear and Control gear ASSEMBLIES shall be issued with a routine test certificate by the manufacturer, fully installed and commissioned in accordance with the requirements of this standard prior to being connected to a power system with the characteristics.

C.1.1 System normal power supply conditions

Extremes of these parameters can occur simultaneously:

a) Voltage: 400 V ± 10 %, 525 V + 5%, 690 V + 5%

b) Voltage unbalance: Negative Phase Sequence (NPS) voltage up to 0.02 of nominal Positive Phase Sequence (PPS) voltage

c) The Zero Phase Sequence Voltage (ZPSV) component can be up to 1% of the PPS component.

C.1.2 System abnormal power supply conditions

The amplitude and duration of temporary abnormal voltage operating characteristics which can occur on the power supply are as follows:

d) **Short duration abnormal conditions**: Short duration under-voltage conditions arise either due to a loss of supply or the supply voltage being depressed due to a short-circuit on the network as well as starting large motors.

e) **Loss of power supply**: When the supply is isolated, the supply voltage either drop rapidly to 0% of nominal value or is sustained at low amplitude at a reduced frequency because of back generation of electrical drives. The initial voltage amplitude during these conditions is less than 80% of nominal value and decays with a time constant of up to 1.5 seconds. The time duration from loss of supply until supply restoration is between 1 second and 2.5 seconds.

f) **Short-circuit**; Depression of supply voltage due to short circuits can result in voltages as low as 0% of nominal value. The duration of the drop can be up to 1 second.

g) **Over-voltage**: Over voltages with amplitudes of 110% of nominal value can occur for up to 10 seconds.

h) **Medium duration power supply deviations**: The switching of loads, such as starting induction motors, can cause voltage depressions of medium duration. The supply voltage can fall as low as 75% of nominal value and the duration of this depression can be up to 15 seconds. An alternative source of this abnormal condition is when power swings occur after a severe disturbance on the network. The supply voltage amplitude may oscillate at a frequency between 0.2 and 2 Hz. In this case, the voltage can fall as low as 65% of nominal and can rise up to 110% of nominal during a swing. The voltage shall not fall below 70% for longer than 0.5 seconds. However, these oscillations, or repeated abnormal voltage conditions, can continue for up to 60 seconds.

i) **Long duration power supply deviations**: Long duration abnormal supply voltage conditions usually originate from operating the plant at its limits. The supply voltage can be up to 110% of nominal value and can drop as low as 90% of nominal value. The duration of such abnormal conditions is up to 6 hours.

C.1.3 Harmonic voltage distortion

The harmonic distortion of the supply voltage under normal operation is as follows:

a) The Total Harmonic Distortion (THD) of the voltage can be up to 5% of the fundamental component.

b) The voltage waveform can contain harmonic components up to the 100th harmonic.

c) The amplitude of any individual component can be up to 1% of the fundamental component.

C.2 CONDITIONS FOR DC SYSTEMS

C.2.1 Voltage rated at 24 V DC

2. Voltage: +25 %, -12.5 %

d) Maximum RMS ripple voltage: 2.5 %

APPENDIX D : CODES AND STANDARDS

Reference to codes, standards and guidelines of any society, organisation, or association, whether such reference be specific or by implication, mean the latest standard, manual, or code in effect as at the time of Contract Award, unless specifically stated otherwise. Except for technical requirements, no provision of any such standard, manual, or code is effective to change the duties or responsibilities otherwise established in this Contract.

Mechanical

Code	Description
240-119637905	Eskom Belt Conveyor Design Review Standard
240-55864503	Belt Conveyor Mechanical Components Specification
240-55864505	Erection of Belt Conveyor Mechanicals Standard

Electrical

Code	Description
240-56227443	Requirements for Control and Power Cables for Power Stations
240-56355815	Junction Boxes and Cable Termination Standard
240-56356396	Earthing and Lightning Standard
240-56356411	Fire Barrier Seals for Electrical Cable Installations
240-56227516	LV Switchgear Control Gear Assembly Associated Equipment for Voltage 1000V AC and 1500V Standard
240-56360387	Storage of Power Station Electric Motors Standard
240-56361435	Transport of Power Station Electric Motors Standard
240-57617975	Procurement of Power Station Low Voltage Electric Motors Specification Standard
240-56227778	Fault Current Calculations & Rating Switch-Gear Standard
240-56536505	Management of Hazardous Locations Standard
240-56535950	Electrical Plant Information Files Standard
240-129018630	Classification of Hazardous Areas at Camden Power Station
IEC 60034-1 to 30	Rotating Electrical Machines
IEC 60085	Electrical Insulation – Thermal Classification

240- 57617975	Eskom Procurement of Power Station Low Voltage Motors Specification
IEEE 112: 2004	IEEE Standard test procedure for polyphase induction motors and generators
240-56357518	Power Station Electric Motor Standard
240-115583001	LV Switchgear and Control gear Assembly Technical Schedule A and B
240-56356421	Low voltage switchgear schedule template
SANS 1973-3: 2017	Low voltage and control gear ASSEMBLIES Part 3: Safety of ASSEMBLIES with rated prospective short-circuit currents of up to and including 10kA
240-57649048:	Fault Monitoring Equipment for Power Systems Standard.
SANS 61439	Low Voltage and Control gear ASSEMBLIES
SANS 10142-1	The Wiring of Premises Part 1: Low-voltage installations
SANS 60529	Degrees of Protection Provided by Enclosures
SANS 10108	The Classification of Hazardous Locations And The Selection of Apparatus For Use In Such Areas
SANS 10242: 1992,	The rewinding and refurbishment rotating electrical machines-part 1: Low voltage 3-phase IM's informative
240- 89217674	Eskom Refurbishment of Power Station Electric Motors Work Instruction

System Integration

Code	**Description**
240-49230046	Failure Mode and Effects Analysis Guideline
240-49230111	Hazard and Operability Analysis Guideline
240-53113685	Design Review Procedure
240-76992014	Technical Documents and Records Management Work Instruction
240-53114186	Document and Record Management Procedure
240-86973501	Engineering Drawing Standard Common Requirements
240-71448626	Minimum metadata requirements
240-76992014	Project / Plant Specific Technical Documents and Records Management Work Instruction

240-53114186	Project / Plant Specific Technical Documents and Records Management Procedure
240-53114026	Project Engineering Change Management Procedure
240-128515850	Documentation Handover Specification
240-109607332	Abbreviation Standard for Labelling of Plant
240-54179170	Technical Documentation Classification and Designation Standard
240-93576498	KKS Coding Standard
240-71432150	KKS Plant Labelling and Equipment Descriptions Standard

APPENDIX E : VDSS

APPENDIX F : DOCUMENTATION REQUIREMENTS FOR FINAL HANDOVER