

 Eskom	Specification	Medupi Power Station
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Title: **Medupi Power Station
Medium Voltage Motor
Refurbishment Contract
User Requirement
Specification**

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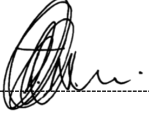
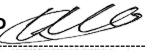
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1. Introduction

Medupi Power Station intends contracting out MV motors refurbishment to suitable contractor(s). This specification provides the minimum requirements for the refurbishment of MV electric motors for Medupi Power Station.

2. Supporting Clauses

2.1 Scope

2.1.1 Purpose

The purpose of this document is to define the MV motor refurbishment requirements for Medupi Power Station. It is therefore imperative that each Supplier aligns their organisation fully to the systems and requirements laid down in this document.

2.1.2 Applicability

This document is applicable to MV induction motors associated with Medupi Power Station.

2.1.3 Effective date

This document shall be effective from the date of the last signature.

2.2 Normative/Informative References

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

2.2.1 Normative

- [1] ISO 9001 Quality Management Systems
- [2] IEC 60034-1 to 30: Rotating electrical machines
- [3] IEC 60085: Electrical insulation - Thermal classification
- [4] ISO 10816 – Vibration severity standard
- [5] GGR 0992 Plant Safety Regulations
- [6] 32-846 Operating Regulations for High Voltage Systems
- [7] Eskom 240-89217674: Refurbishment and repair of Power Station Electric Motors Work Instruction
- [8] Eskom 240-56361435 : Transportation of Power Station Electric Motors Standard
- [9] Eskom 240-56360387: Storage of Power Station Electric Motors
- [10] Eskom 240-50237155 : New MV Motors Procurement Standard

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[11] Eskom 240-56536505 : Hazard Locations Standard

[12] Eskom 240-92360717: Medupi Power Station Outage Philosophy

[13] Eskom 240-97020108: Medupi Power Station Maintenance Contracts User Requirement Specification

2.2.2 Informative

[14] ISO 1940-1:2003 Mechanical vibration -- Balance quality requirements for rotors in a constant (rigid) state -- Part 1: Specification and verification of balance tolerance

2.3 Definitions

Definition	Explanation
Employer	Company that is a recipient of goods or services provided by a Contractor under a purchase order or contract of sale. For the purpose of this Works Information, the Employer is Eskom Holdings SOC Medupi Power Station or representative thereof.
Induction Motor	An induction or asynchronous motor is an AC electric motor in which the electric current in the rotor needed to produce torque is obtained by electromagnetic induction from the magnetic field of the stator winding.
Medium Voltage	Any AC supply Voltage exceeding 1000V
Outage	An outage is a state of an item being unable to perform its required function. An outage can either be planned or unplanned.
Refurbishment	The total process of restoring a machine or component that has become inadequate for continued use with normal maintenance, thereby making it suitable for an extended period of service
Repairer	For the purpose of this Works Information/document, the Repairer may refer to the OEM, OEM approved distributor or Contractor appointed to implement the works herein.

2.4 Abbreviations

Abbreviation	Explanation
AC	Alternating Current
DC	Direct Current
DE	Drive End
GO	General Overhaul Outage
IR	Interim Repairs Outage
MM	Material Management

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Abbreviation	Explanation
MV	Medium Voltage
NDE	Non – Drive End
OEM	Original Equipment Manufacture
PPE	Personal Protective Equipment
QC	Quality Control
SOW	Scope Of Work

2.5 Roles and Responsibilities

2.5.1 Repairer:

- a) Keep to agreed program timelines and plans.
- b) Collection & delivery of motors to Medupi site.
- c) Conduct assessment of motors (incoming inspections & tests).
- d) Complete and submit refurbishment/repair sow and QCP.
- e) Refurbishment/Repair of motors.
- f) Testing and analysis of the motor test results.
- g) Submit Datapack for motor records.

2.5.2 Employer:

2.5.2.1 Electrical Maintenance & Outages management:

- a) Complete Site breakdown/failure report.
- b) Submit breakdown reports.
- c) Book motor Back to Stores.
- d) Conduct QC during off-loading on-site.
- e) Conduct off-site QC.

2.5.2.2 Materials Management:

- a) Manage contract.
- b) Facilitate all Communication with/between service provider and Site.
- c) Make payment.
- d) Issue task orders.
- e) Assess & approve refurbishment cost.

2.5.2.3 Engineering:

- a) Approve refurbishment/repair scope.

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- b) Approval of Modifications
- c) Conduct off-site QC.

2.6 Process for monitoring

This SOW will form the basis for the Medium Voltage Motors Refurbishment. The process will be monitored using applicable contracts management and auditing processes.

2.7 Related/Supporting Documents

This document must be read in conjunction with **240-89217674 Refurbishment and repair of power station electrical motors work instruction**. The latest revision shall be applied.

3. Scope of Work

The required services are mainly for collection, transportation and refurbishment of the MV motors listed in **Appendix C Table 1**. The SOW will be implemented as per Table 1 in accordance with 240-89217674 Refurbishment and repair of power station electrical motors work instruction. Should there be any deviations, the Repairer will inform the Employer for approval first.

Once a motor has failed during service, or once a motor which is in a serviceable condition has been planned for refurbishment, the following activities shall be conducted in sequence.

The overhaul/ refurbishment steps are also highlighted on the process flowchart in Appendix A.

3.1 Breakdown Report

A breakdown report shall be developed by the employer as per 240-89217674 section 4.1.1.1. and the assessment form submitted. If there are no official site specific assessment forms, the assessment form in Appendix D of 240-89217674 shall be used.

3.2 Assessment SOW

The Employer shall develop the scope of work for the collection, dismantling, and assessment of the motor by the Contractor (Repairer) based on the investigations included in the Breakdown Report, the Employer shall compile an Assessment SOW. Requirements applicable to the Assessment SOW are stipulated in Appendix B of 240-89217674.

3.3 Motor Collection & Shipment

The transport of motors is to be in accordance with Eskom document 240-56361435. The repairer shall transport all motors with necessary care to prevent damage as a result of the transport.

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3.4 Motor Assessment

The Repairer shall implement the contracted Assessment SOW, without deviation, as specified in Table 1 below. The scope of work shall include but not limited to the scope of work as stipulated on Table 1 below based on the outcome of the assessment, however not all listed items below are applicable to all motors. The scope of work is as stipulated on Table 1 for uniformity. The item numbering shall remain as in the agreed scope of work for all motors, irrespective of the applicability.

Table 1 High Level MV Motor SOW

Item No.	Task Description
1	Collect motor from Medupi Power Station as per Eskom document 240-89217674 section 4.1.2
2	Deliver motor to Medupi Power Station as per Eskom document 240-89217674 section 4.2.4.
3	Strip and Assess SOW
3.1	Perform incoming visual inspection, Stator winding tests (IR, PI, Winding resistance), RTD resistances, Heaters IR and Winding resistance, bearing insulation and shaft run-out as per Eskom document 240-89217674 4.1.3.1.
3.2	Motor Dismantling as per Eskom document 240-89217674 section 4.1.3.2
3.3	Pre-cleaning assessment including core flux test, Rotor bar to bar and ELCID test, NDT, bearing, journal and seal landing dimensions and all accessories as per Eskom document 240-89217674 section 4.1.3.3
3.4	Cleaning of the motor as per Eskom document 240-89217674 section 4.1.3.4
3.5	Motor Dry-out as per Eskom document 240-89217674 section 4.1.3.5
3.6	Post-cleaning Assessment as per Eskom document 240-89217674 section 4.1.3.6.
3.7	Incoming assessment Report as per Eskom document 240-89217674 Appendix D, including Test results for tests performed e.g., NDT report, Rotor Bar ELCID and Stator Core -Flux test results.
3.8	Failure Report as per Eskom document 240-89217674 section 4.1.3.7.
3.9	Repair/Overhaul Scope of Work and QCP as per Eskom document 240-89217674 section 4.1.3.8.
	Motor Repairs

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4	Rotor Overhaul as per Eskom document 240-89217674 section 4.2.1.3
4.1	Dynamically balance the rotor and record run outs.
4.2	Paint the rotor with vanish.
5	Shaft Overhaul as per Eskom document 240-89217674 section 4.2.1.3.2 & 4.2.1.3.3
5.1	Polish DE & NDE Journals and Seal Landings
5.2	Replace dust seal
5.3	Paint shaft with antirust paint
6	Stator Overhaul as per Eskom document 240-89217674 section 4.2.1.1
6.1	Overhaul stator.
7	Bearing overhaul as per Eskom document 240-89217674 section 4.2.1.4 (Bearings differ per motor type, so some Activities may not be applicable to other motors)
7.1	Anti-Friction Bearings (Ball & Roller)
7.1.1	Inspect bearings for abnormalities and provide findings to Employer.
7.1.2	Anti-Friction Bearings shall be replaced during motor reconditioning and/or repairs that involve disassembly.
7.2	Sleeve and Tilting Pad Bearings
7.2.1	Re-metal DE & NDE Bearing Shells
7.2.2	Re-insulate DE & NDE Bearing Housing
7.2.3	Replace IP seal on DE & NDE Bearings
7.2.4	New Bearing RTD including wiring
8	Heat Exchanger Overhaul
8.1	Overhaul Cooler (Tube cleaning and gasket & seal replacements).
8.2	Pressure test two cooler bundles.
8.3	Replace sealing cooler rubber.
9	Terminal Box Overhaul

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9.1	Overhaul terminal boxes (Supply and Auxiliary boxes).
9.2	Terminal Busbar repairs/replacement
9.3	Stator winding leads extension/repairs where required
9.4	Replace all rubber seals/gasket to maintain IP rating.
10	Minor Repairs SOW (Activities may not be applicable to other motors)
10.1	Microweld journal (price per journal)
10.2	Microweld seal landing (price per seal landing)
10.3	New space heater including wiring
10.4	New water flow switch for water cooled motors
10.5	New Aluminium seal
11	Major Repairs SOW
11.1	Stator Winding Rewind as per Eskom document 240-89217674 section 4.2.1.1
11.2	New Stator Core including A frame as per Eskom document 240-89217674 section 4.2.1.2
11.3	New Rotor as per Eskom document 240-89217674 section 4.2.1.3
12	Motor Assembly as per Eskom document 240-89217674 section 4.2.2 and 4.4.4
12.1	Assemble the motor
12.2	Nameplate Engraving (Original one must be kept on the motor and not painted over)
12.2	Mechanical Checks (as per 4.4.4.1 & 4.4.4.2)
13	Motor Painting as per Eskom document 240-89217674 section 4.2.3
14	Motor Inspection & Testing as per Eskom document 240-89217674 section 4.4
14.1	Winding Insulation Resistance (IR)
14.2	Polarization Index (PI)
14.3	Winding Resistance Test
14.4	AC High Potential Test
14.5	DC High Potential Test

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14.6	DC Step Voltage Test
14.7	Impulse Test
14.8	Tan Delta
14.9	Core Flux Test
14.10	Locked rotor test
14.11	Rotor Bar Test (Bar-Bar)
14.12	Bearing Insulation & Shaft Voltage Test
14.13	Space Heater & RTD Insulation Resistance Test
13	Routine Test as per Eskom document 240-89217674 section 4.4.5
13.1	No-load test (as per 4.4.5.3), Vibrations and Customer FAT
14	Performance Tests as per Eskom document 240-89217674 section 4.4.6
	Shall be requested by the employer in writing.
15	Data Pack: Test Records as per Eskom document 240-89217674 section 5
17.1	Rotor balancing certificate, Cooler hydrostatic testing certificate, Bearing clearance, etc.
17.2	Stator Winding Insulation Condition Assessment report
17.3	No-load run Test report

***Refer to Appendix C Table 1 for specifications of the MV motors to be transported and refurbished.**

3.5 Requirements

It is required that as a minimum that the Repairer uses requirements for refurbishment and repairs of electrical motors as per the Eskom document 240-89217674. The Contractor must ensure that appropriate specifications, procedures and work instructions are used.

In the absence of the manufacturer's specifications, or Eskom's specifications, Electrical Motor's applicable South African National Standards (SANS) shall be used, as appropriate for the class of motor. Whether using Eskom's specifications, national or international specifications, instructions for the work and testing to be done on each motor will be approved by the Employer. The Repairer shall use the following documents as a guide when developing scopes of work for refurbishment and repairs, supplying of data books and tests to be conducted on motors.

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- a) Repair Assessment Form Eskom document 240-87739380
- b) Data Pack Information Appendix C on Eskom document 240-89217674
- c) Motor Breakdown Report Appendix D on Eskom document 240-89217674
- d) Test Equipment Specifications Appendix E on Eskom document 240-89217674.

3.5.1 Refurbishment limitations

Motors shall be refurbished provided that Eskom and the repairer has agreed on the assessment, scope and cost. Subsequent failures after major Repairs may lead to the Employer permanently taking the specific motor out of service without consultation with the Repairer. Initial stripping of motors shall only be carried out in the presence of the Employer's technical representative, unless in cases where a go-ahead is given in writing by the Employer's representative for the Repairer to continue with stripping without them.

3.5.1.1 The list of MV motors to be refurbished over the contract duration is provided in Appendix C Table 1 of this document.

- a) Ex rated motors shall be tested by an approved lab and an Ex certificate is to be supplied with the motor as per Eskom 240-56536505 and relevant Hazloc SANS.

3.5.1.2 Outages:

- a) This scope will also cover refurbishments/Overhauls to be executed during outages. The expected outage intervals are indicated in Table 2 below. It is expected that the repairer must be able to refurbish/overhaul the approximated number of motors and deliver them to site within the indicated outage durations.

Table 2 Outage intervals with durations and expected number of motors to be overhauled per outage.

Outage Type	Interval years	Duration (Days)	Approximate number of motors to be Overhauled
IR1&3	1.5	42	7
IR2	3	42	7
GO1	6	90	14
GO2	12	90	14

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3.5.1.3 Miscellaneous: The repairer will also be required to provide miscellaneous MV motor spare parts. These miscellaneous spares include flow switches, bearings, bearing seals, terminal box seals, CTs, brushes, space heater elements, dial gauges, radiators etc. These spares will only be supplied on request as and when required.

Since the cataloguing process is still in process for most of these spares, an allowance of **3%** of the total estimated cost for items covered in Appendix C (Table 1) needs to be added to the total contract cost to cover the miscellaneous spares unaccounted for in Table 1.

- Cost Estimate of Miscellaneous spares = 3% of Total estimated Cost for refurbishment of motors covered in Appendix C Table 1.

3.5.2 Deficiencies and modifications

No modification shall be done on the motor without the approval of the employer.

3.5.3 Turnaround time

3.5.3.1 Off-site repairs:

- a) The duration for supplier to collect the motor, conduct assessment, develop recommended refurbishment SOW and provide quote is 5 working day.
- b) The refurbishment duration to be agreed by both employer and supplier after finalising refurbishment SOW. Refurbishment SOW must have timeliness and the supplier shall adhere to timeliness on the program.

3.5.3.2 On-site repairs

The on-site repairs will be considered for emergencies and minor repairs. The maximum duration for on-site repairs by the supplier is 5 working days.

3.5.3.3 Painting

- a) With a combination of commercially accepted cleaning agents, abrasive blasting, power tools, and hand tools cleaning. Metal surfaces shall have sufficient roughness to provide proper adhesion of new paint.
- b) At least one primer coat and two finish coats of compatible outdoor paint shall be applied in accordance with the paint manufacturer's instructions. Two-part epoxy-type paint is required because of its toughness and durability.
- c) Unless otherwise specified on the Refurbishment Form and Check Sheet, the finish colour shall be emerald grey (G29) on external metal.
- d) Coatings: Coatings shall be applied in accordance with the manufacturer's procedures. Details of coating requirements can be obtained from Purchaser's Technical Contact if these are not clearly defined on the Check Sheet.

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3.5.5 Record keeping

The supplier will keep originals of the test results, quality and any other documents used on the motor for the period of the contract plus three (3) years.

The employer shall be given the copy of the tests results.

3.5.6 Data Pack

The motor shall be returned to site with a data pack comprising of documents stipulated in Eskom document 240-89217674 section 5 as a minimum. The data pack shall be submitted in both electronic format and hard copy format.

3.5.7 Warranty

Any refurbished motor shall have a 1 year warranty granted by the supplier to the Employer. The period shall commence on the day the motor is accepted back on the Employer's site.

3.5.8 Transport

The Repairer is responsible and accountable for transporting the motors from Medupi Power Station to their sites and from their sites to Medupi Power Station. All motors shall be transported as per Eskom document 240-56361435: Transportation of Power Station Electric Motors Standard.

3.5.9 Quality

The Repairer shall provide a complete Quality Control Assurance plan in accordance with the requirements of ISO 9001:2015 to the Employer for approval. This plan must ensure an integrated quality service as part of the contract. All quality hold points and witness points must be done in the presence of an Eskom employee. Quality documents to be handed over to the employer.

- a) All quality hold points, and witness points shall be done in the presence of an Eskom employee or representative.
- b) Quality documents to be handed over to the employer.
- c) Any new or amended QCP's shall be discussed with the employer.

A basic layout of a typical quality inspection plan is shown in Appendix B. QCPs must be signed off before motors are delivered to site.

3.5.10 Adherence to Eskom generic policies

The Supplier employees shall comply with Eskom's policies and site regulations, including but not limited to, use of cell phones in restricted areas, adherence to Eskom's lifesaving rules, no smoking policy, zero tolerance on alcohol usage, etc. These requirements will be detailed during the induction training process.

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3.5.11 Special tests and investigations

The Repairer will perform special tests, investigations and recordings of all findings and the findings shall be shared with the employer. For Ex rated motors, the motors have to be tested by an approved lab and an Inspection Authority (IA) certificate to be supplied with the motor.

3.5.12 Insurance

All motors' insurance shall be covered by the supplier as from the time they leave Employers' site until delivery back on the Employers' site.

3.5.13 Quotations

All quotations shall be given in South African Rand (ZAR).

3.5.14 Industrial Relation

Any industrial relation issues from the supplier should be discussed with the Service manager.

3.5.15 Contract output

Eskom will furnish the contractor with its objectives for the contract. Both Eskom and the contractor will agree on the KPA for the duration of the contract and the criteria. Monthly or quarterly KPA discussion meeting will be held between Eskom representative and the contractor. The contractor will be scored according to the KPA criteria. The KPA will be a pillar of this contract. The KPA measurement will focus on contractor performance, Quality, Cost, compliance to procedures and safety.

3.5.16 Meetings

Meetings will be scheduled as and when required and must be chaired by an Eskom representative.

4. Acceptance

This document has been seen and accepted by:

Name	Designation
Derrick Chauke	Electrical Engineering Line Manager
Portia Lutumbu	Electrical Maintenance Department Manager
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Name	Designation
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5. Revisions

Date	Rev.	Compiler	Remarks
December 2024	3	Thembelihle Majozi	Scope update.
May 2023	2	Prince Twala	To act as an instruction to service provider for the Refurbishment of MV Motors.
May 2015	1	Moses Nonyane	To act as an instruction to service provider for the Refurbishment of MV Motors.

6. Development Team

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

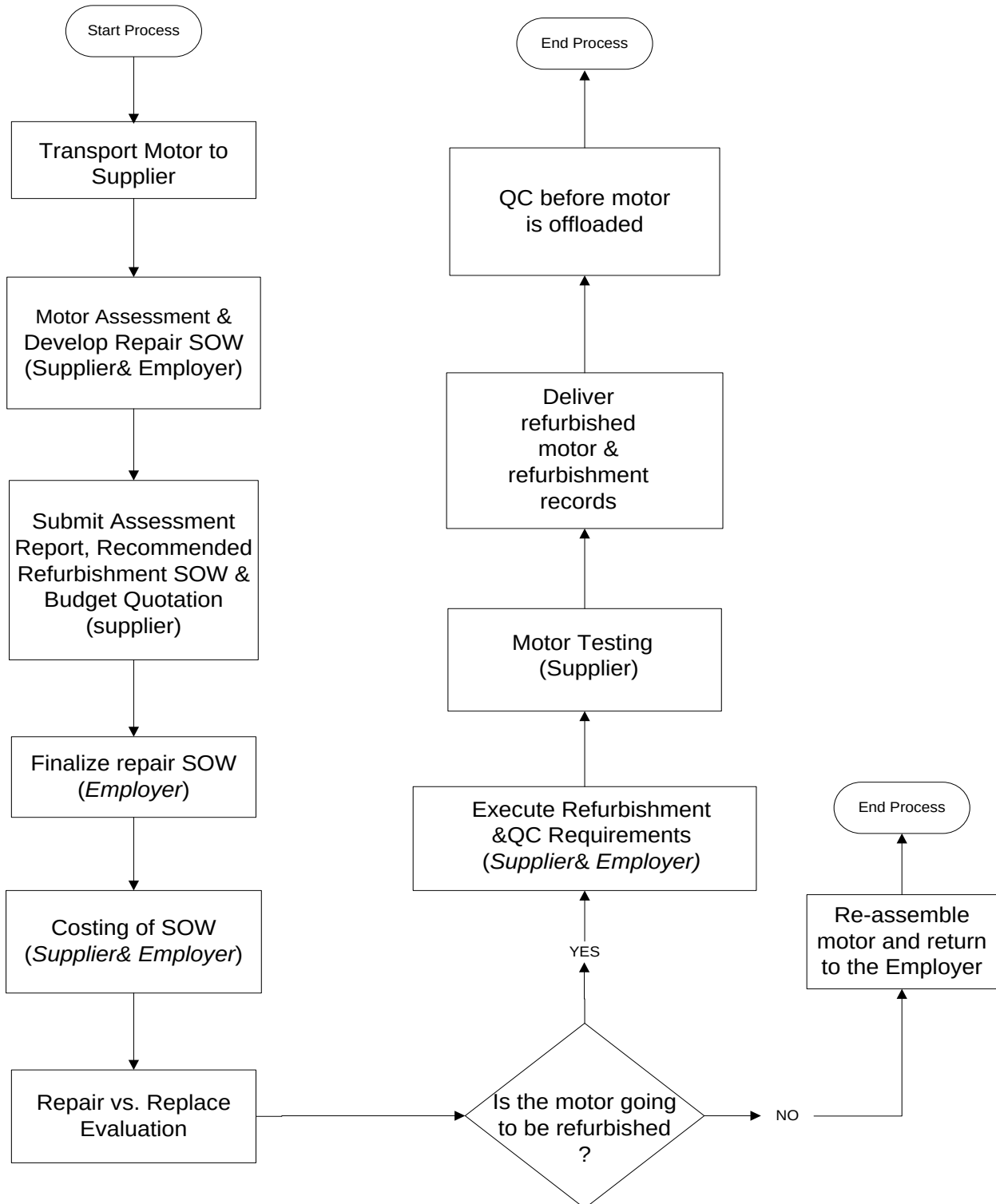
- Catherine Mathiyana
- Peter Maheso
- Derrick Chauke
- Portia Lutumbu
- Moses Nonyane
- George Mbangula

7. Acknowledgements

Thanks to the EMD and Engineering electrical team for all the contributions made towards this document.

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Appendix A: Process flowchart



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Appendix B: Quality Control Plan

QUALITY CONTROL PLAN								
Client:		"Name of Client"					Plan number:	
Site:		"Definition of Site on which work will be conducted"		1=Supplier	S= Supervision	W= Witness Point	Contract No:	
				2= Client	H= Hold Point		Supplier:	
Work Area:		"Definition of work area on defined site e.g. Turbine Plant"						
Job Description:		"Description of work to be done, summarizing listed activities in the plan"						
Item	Description of operation	Input Action		Inspection required	Reference Document	Supplier	Client	
		1	2			Sign/Date	Sign/Date	
1	Prerequisites, Precautions, Limitations –"Standard part of QCP operations"							
1.1	"Description of anything that has to be in place to ensure effective execution of the defined actions in the QCP e.g. permit-to-work requirements, spare parts, scaffolding requirements, skills requirements"							
1.2								
2	"Operation description e.g. assemble vaMVe"							
2.1	"Description of activities which forms part of the operation defined"							
2.2								
3	"Operation Description"							
3.1	"Description of activities which forms part of the operation defined"							
4	General equipment inspection after completion of compete job–"Standard part of QCP operations"							
5	Work area inspection for cleanliness–"Standard part of QCP operations"							

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Appendix C: MV Motor Specifications

Item	Plant	Installed Base	OEM	Motor Description	Bearing Specification
1	Condensate Extraction Motor 1 & 2	12	Actom	MOTOR, ELECTRIC: POWER: 1800 KW; SPEED: 1484 RPM; FRAME: UNIBOX; CURRENT: 198.6 A; POTENTIAL: 6.6 KV; MOUNTING: BASE PLATE; ENCLOSURE RATING: IP55; SHAFT SIZE: DIA 140 MM; CONNECTION LOCATION: RH; POLES: 2; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; SPECIFICATION: IEC 60034; TYPE: ASYNCHRONOUS; REFERENCE NO: CO4908	BRG DIA (DE/NDE): 140 mm; TYPE: SLEEVE; MAKE: GB BEARINGS;SUMP CAPACITY (DE/NDE): 7.3 LITRES PER BRG; BRG DIA CLEARANCE: 0.169 - 0.234mm; BRG METAL GRADE: GMA 106; LUBRICANT:OIL THB 32
2	Left & Right Hand Primary Air Fan Motor	12	Actom	MOTOR, ELECTRIC: POWER: 3250 KW; SPEED: 996 RPM; FRAME: UL-800/200; CURRENT: 340.8 A; POTENTIAL: 6.6 KVAC; MOUNTING: IMB3; ENCLOSURE RATING: IP55; SHAFT SIZE: 215.046 MM; CONNECTION LOCATION: RIGHT; POLES: 6; INSULATION CLASS: F; PHASE: 3; DIRECTION: BI-DIRECTIONAL; SPECIFICATION: IEC 60034; TYPE: SQUIRREL CAGE; REFERENCE NO: D004959/60/61/62/63/64/5001	BRG DIA (DE/NDE): 225 mm; TYPE: LEEVE WITH FLOOD LUBRICATION; MAKE: GB BEARINGS;SUMP CAPACITY (DE/NDE): 21 LITRES PER BRG; OIL FLOW: 6.6 L/MIN ; BRG DIA CLEARANCE: 0.294 -0.369 mm, BRG METAL GRADE: GMA 106; LUBRICATION TYPE: FLOOD; LUBRICANT: VG68
3	Mill Motors 1-5	30	Actom	MOTOR, ELECTRIC: POWER: 1000 KW; FRAME: UL500/160; POTENTIAL: 6.6 KVDC; CURRENT: 112 A; ENCLOSURE RATING: IP55; POLES: 6; DRAWING NO: B114116-75-31-ID04-00004 REV 0; FOR USE ON COAL MILL; KKS: HFC10-50AJ001	BRG DIA (DE/NDE): 150 mm; TYPE: ANTI FRICTION - DE: NU230 C3 ROLLER, NDE: 6230 C3 Ball & NU230 C3 Roller; MAKE: SKF BEARINGS; LUB. QUANTITY (DE): 104 GRAMS; LUB. QUANTITY (NDE): 208 GRAMS; LUBRICATION TYPE: GREASE; LUBRICANT:BP LS2

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4	Left & Right Hand Induced Draught Fan Motor	12	Actom	MOTOR, ELECTRIC: POWER: 9500 KW; SPEED: 747 RPM; FRAME: UL-1000/315; CURRENT: 615 A; POTENTIAL: 11 KVAC; MOUNTING: IMB3; ENCLOSURE RATING: IP55; SHAFT SIZE: 280.052 MM; CONNECTION LOCATION: RIGHT; POLES: 8; INSULATION CLASS: F; PHASE: 3; DIRECTION: CLOCK WISE; SPECIFICATION: IEC 60034; TYPE: SQUIRREL CAGE INDUCTION; MANUF P/N: , MANUFACTURER: HOWDEN; REFERENCE NO: D004947/48/49/50/51/52/99; FOR USE ON ID FANS; MOTOR REFERENCES 60-10HNC10 AN001-M01 AND 60-1-HNC20 AN001-M01	BRG DIA (DE/NDE): 280 mm; TYPE: SLEEVE WITH FLOOD LUBRICATION; MAKE: GB BEARINGS;SUMP CAPACITY (DE/NDE): 30.5 LITRES PER BRG; OIL FLOW RATE: 10.2 L/MIN; BRG DIA CLEARANCE: 0.294 -0.369 mm, BRG METAL GRADE: GMA 106; LUBRICATION TYPE: FLOOD; LUBRICANT: VG68
5	Left & Right Hand Forced Draught Fan Motor	12	Actom	MOTOR, ELECTRIC: POWER: 3700 KW; SPEED: 995 RPM; FRAME: UL800/250; CURRENT: 232.8 A; POTENTIAL: 11 KVAC; MOUNTING: IMB3; ENCLOSURE RATING: IP55; SHAFT SIZE: 225.046 MM; CONNECTION LOCATION: RIGHT; POLES: 6; INSULATION CLASS: F; PHASE: 3; DIRECTION: ANTI CLOCKWISE; SPECIFICATION: IEC 60034; TYPE: SQUIRREL CAGE INDUCTION; DRAWING NO: B114116-75-31-ID04-00001 REV 0; REFERENCE NO: D004953/54/55/56/57/58/5000; REFERENCES 60-10HLB10 AN001-M01 AND 60-10HLB20 AN001-M0; FOR USE ON FD FAN; KKS: HLB10/20AN001	BRG DIA (DE/NDE): 225 mm; TYPE: S LEEVE WITH FLOOD LUBRICATION; MAKE: GB BEARINGS;SUMP CAPACITY (DE/NDE): 21 LITRES PER BRG; OIL FLOW RATE: 6.6 L/MIN ; BRG DIA CLEARANCE: 0.294 -0.369 mm, BRG METAL GRADE: GMA 106; LUBRICATION TYPE: FLOOD; LUBRICANT: VG68
6	LP Drain Recovery Pump Motor	6	Alstom	MOTOR, ELECTRIC: POWER: 185 KW; SPEED: 1475 RPM; FRAME: 1LA1350-4; CURRENT: 20 A; POTENTIAL: 6.6 KV; MOUNTING: BASE PLATE; ENCLOSURE RATING: IP55; SHAFT SIZE: 85 MM; CONNECTION LOCATION: LH; INSULATION CLASS: F; PHASE: 3; CASING MATERIAL: CI; SPECIFICATION: IEC 60034; TYPE: ASYNCHRONOUS; REFERENCE NO: A002001	BRG DIA (DE/NDE): 95 mm; TYPE: BALL & ROLLER - DE: NU219 ECM C3 ROLLER + 6219 C3 BALL, NDE: NU219 ECM C3 ROLLER ; MAKE: SKF BEARINGS; LUB. QUANTITY (DE): 40 GRAMS; LUB. QUANTITY (NDE): 40 GRAMS; LUBRICATION TYPE: GREASE; LUBRICANT: Shell Alvania RL2

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7	Overland Conveyor 1 Motors 1-3	3	Siemens & Actom	MOTOR, ELECTRIC: POWER: 550 KW; SPEED: 1485 RPM; FRAME: 355G; CURRENT: 58 A; POTENTIAL: 6.6 KVAC; MOUNTING: IMB3, HORIZONTAL WITH FEET WITHOUT FLANGE; ENCLOSURE RATING: IP65; SHAFT SIZE: DIA 100 MM; CONNECTION LOCATION: LH/RH SIDE; CLASSIFICATION: NON SPARKING MOTOR, ZONE 2; POLES: 4; INSULATION CLASS: F; PHASE: 3; CASING MATERIAL: CI; SERVICE FACTOR: 0.86; TEMPERATURE CLASS: F; DIRECTION: BI-DIRECTIONAL; TYPE: SQUIRREL CAGE INDUCTION; MANUF P/N: IMS4 354-4AN70-Z; REFERENCE NO: N-C21348314020002/2012; FOR USE AS OV1 CONVEYOR BELT DRIVER; COOLING METHOD: IC411 RIB COOLED; SELF VENTELATED; SPEED MONITORING H70; ROTARY PULSE ENCODER; ANTI CONDENSATION HEATER M13 220-240VAC; EXT IIIC T135 DEG C DB; IA CERTIFICATE TO BE SUPPLIED WITH MOTOR	TYPE: ROLLING CONTACT BEARING; DE: DIN625 6224C3; NDE: DIN625 6220C3; COOLANT TEMP: DE ≤ 25°C & NDE ≤ 40°C; LUB. QUANTITY (DE): 40g; LUB. QUANTITY (NDE): 20g; OPERATING HOURS (DE): 8000 h ; OPERATING HOURS (NDE): 4000h; LUBRICATION TYPE: GREASE SHELL GADUS S2 V100 3
8	Overland Conveyor 2 Motor	1	Siemens	MOTOR, ELECTRIC: POWER: 675 KW; SPEED: 1487 RPM; FRAME: 400G; CURRENT: 73 A; POTENTIAL: 6.6 KVAC; MOUNTING: IMB3, HORIZONTAL WITH FEET WITHOUT FLANGE; ENCLOSURE RATING: IP65; SHAFT SIZE: 120 MM; CONNECTION LOCATION: LH/RH SIDE; CLASSIFICATION: NON-SPARKING MOTOR, ZONE2; POLES: 4; INSULATION CLASS: F; PHASE: 3; CASING MATERIAL: CI; SERVICE FACTOR: 0.85; TEMPERATURE CLASS: F; DIRECTION: ANTI CLOCKWISE; TYPE: SQUIRREL CAGE INDUCTION; MANUF P/N: 1MS4 402-4AN70-2; REFERENCE NO: N-C21348428010001/2012; FOR USE ON OV2 CONVEYOR AS DRIVER; COOLING METHOD IC411 RIB COOLED; SELF VENTELATED; SPEED MONTORING H70; ROTORY PULSE ENCODER; ANTI CONDENSATION HEATER M13 220-240VAC; EXT IIIC T135 DEG C DB; IA CERTIFICATE TO BE SUPPLIED WITH MOTO	TYPE: ANTIFRICTION ; DE: 6228C3; NDE: 6224C3; COOLANT TEMP: DE ≤ 25°C & NDE ≤ 40°C; LUB. QUANTITY (DE): 40g; LUB. QUANTITY (NDE): 20g; OPERATING HOURS (DE): 6000 h ; OPERATING HOURS (NDE): 3000h; LUBRICATION TYPE: GREASE SHELL GADUS S2 V100 3

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9	SY1 Drive Motor	1	Siemens	MOTOR, ELECTRIC: POWER: 200 KW; SPEED: 1480 RPM; FRAME: 315H; CURRENT: 23 A; POTENTIAL: 6.6 KVAC; MOUNTING: IB3, FOOT; ENCLOSURE RATING: IP65; SHAFT SIZE: 90 MM; CONNECTION LOCATION: RH SIDE(NEUTRAL) AND LH SIDE(MAIN); CLASSIFICATION: ZONE 21/22; POLES: 4; INSULATION CLASS: F; PHASE: 3; CASING MATERIAL: CI; SERVICE FACTOR: S1; TEMPERATURE CLASS: F; DIRECTION: BI-DIRECTIONAL; TYPE: SYNCHRONOUS; MANUF P/N: 1LA4-310-4AN70-Z; SY1 DRIVE; EXT IIIC T135 DEG C DB; IA CERTIFICATE TO BE SUPPLIED WITH MOTOR	TYPE: ANTIFRICTION ; DE: 6220C3; NDE: 6218C3; COOLANT TEMP: DE $\leq 25^{\circ}\text{C}$ & NDE $\leq 40^{\circ}\text{C}$; LUB. QUANTITY (DE): 40g; LUB. QUANTITY (NDE): 20g; OPERATING HOURS (DE): 8000 h ; OPERATING HOURS (NDE): 4000h; LUBRICATION TYPE: GREASE SHELL GADUS S2 V100 3
10	SYS 1&2 Drive Motor	4	Siemens	MOTOR, ELECTRIC: POWER: 355 KW; SPEED: 1483 RPM; FRAME: 315F; CURRENT: 39 A; POTENTIAL: 6.6 KVAC; MOUNTING: IMB3, FOOT; ENCLOSURE RATING: IP65; SHAFT SIZE: 90 MM; CONNECTION LOCATION: ONE TERMINAL BOX THAT CAN CONNECT RH OR LH SIDE; CLASSIFICATION: ZONE 21/22; POLES: 4; INSULATION CLASS: F; PHASE: 3; CASING MATERIAL: CI; TEMPERATURE CLASS: F; DIRECTION: BI-DIRECTIONAL; TYPE: SQUIRREL CAGE INDUCTION; MANUF P/N: 1LA4 316-4AN70-Z; TYPE SYS1 AND 2 AND TI A AND B MOTOR; TO BE SUPPLIED WITH 220/240V 288-343W ANTI CONDENSATION HEATER (M13); EXT IIIC T135 DEG C DB; IA CERTIFICATE TO BE SUPPLIED WITH MOTOR	TYPE: ANTIFRICTION ; DE: 6220C3; NDE: 6218C3; COOLANT TEMP: DE $\leq 25^{\circ}\text{C}$ & NDE $\leq 40^{\circ}\text{C}$; LUB. QUANTITY (DE): 40g; LUB. QUANTITY (NDE): 20g; OPERATING HOURS (DE): 8000 h ; OPERATING HOURS (NDE): 4000h; LUBRICATION TYPE: GREASE SHELL GADUS S2 V100 3
11	SYR1&2 Drive Motor	4	Siemens	MOTOR, ELECTRIC: POWER: 250 KW; SPEED: 1480 RPM; FRAME: 315H; CURRENT: 27.5 A; POTENTIAL: 6.6 KVAC; MOUNTING: IMB3, FOOT; ENCLOSURE RATING: IP65; SHAFT SIZE: 90 MM; CONNECTION LOCATION: ONE TERMINAL BOX THAT CAN CONNECT RH OR LH SIDE; CLASSIFICATION: ZONE 21/22; POLES: 4; INSULATION CLASS: F; PHASE: 3; CASING MATERIAL: CI; TEMPERATURE CLASS: F; DIRECTION: BI-DIRECTIONAL; TYPE: SQUIRREL CAGE INDUCTION; MANUF P/N: 1LA4 312-4AN7V-2+B20; EXT IIIC T135 DEG C DB; IA CERTIFICATE TO BE SUPPLIED WITH MOTOR	TYPE: ANTIFRICTION ; DE: 6220C3; NDE: 6218C3; COOLANT TEMP: DE $\leq 25^{\circ}\text{C}$ & NDE $\leq 40^{\circ}\text{C}$; LUB. QUANTITY (DE): 40g; LUB. QUANTITY (NDE): 20g; OPERATING HOURS (DE): 8000 h ; OPERATING HOURS (NDE): 4000h; LUBRICATION TYPE: GREASE SHELL GADUS S2 V100 3

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12	SYS2 A&B Drive Motor	2	Siemens	MOTOR, ELECTRIC: POWER: 800 KW; SPEED: 1491 RPM; FRAME: 450 SHAFT HEIGHT, 1250 FOOT MOUNTED DISTANCE (SIDE VIEW); CURRENT: 87 A; POTENTIAL: 6.6 KVAC; MOUNTING: IMB3, FOOT; ENCLOSURE RATING: IP65; SHAFT SIZE: 130 MM; CONNECTION LOCATION: RH AND LH SIDE; CLASSIFICATION: ZONE 21/22; POLES: 4; INSULATION CLASS: F; PHASE: 3; CASING MATERIAL: CI; TEMPERATURE CLASS: F; DIRECTION: BI-DIRECTIONAL; TYPE: SQUIRREL CAGE INDUCTION; MANUF P/N: 1LA4 404-4AN70-2+B20; EXT IIIC T135 DEG C DB; IA CERTIFICATE TO BE SUPPLIED WITH MOTOR	TYPE: ANTIFRICTION ; DE: 6228C3; NDE: 6226C3VL0241; COOLANT TEMP: DE ≤ 25°C & NDE ≤ 40°C; LUB. QUANTITY (DE): 40g; LUB. QUANTITY (NDE): 20g; OPERATING HOURS (DE): 6000 h ; OPERATING HOURS (NDE): 3000h; LUBRICATION TYPE: GREASE SHELL GADUS S2 V100 3
13	Ash Shiftable Conveyor Motor 1&2	2	Siemens	MOTOR, ELECTRIC: POWER: 315 KW; SPEED: 1482 RPM; FRAME: 316; CURRENT: 34 A; POTENTIAL: 6600 V; MOUNTING: IMB3; ENCLOSURE RATING: IP 55; SHAFT SIZE: 90 MM; CONNECTION LOCATION: LHS & RHS; CLASSIFICATION: NON HAZARDOUS; POLES: 4; INSULATION CLASS: F; PHASE: 3; TEMPERATURE CLASS: B; TYPE: SQUIRREL CAGE INDUCTION; MANUF P/N: 1LA4316-4AN70-Z; ASH SHIFTABLE CONVEYOR	TYPE: ROLLING CONTACT BEARING; DE: 6220C3; NDE: 6218C3; COOLANT TEMP: DE ≤ 25°C & NDE ≤ 40°C; LUB. QUANTITY (DE): 40g; LUB. QUANTITY (NDE): 20g; OPERATING HOURS (DE): 8000 h ; OPERATING HOURS (NDE): 4000h; LUBRICATION TYPE: GREASE SHELL GADUS S2 V100 3
14	Ash Overland Conveyor Drive Motor 1&2	2	Siemens	MOTOR, ELECTRIC: POWER: 630 KW; SPEED: 1490 RPM; FRAME: 402; CURRENT: 69 A; POTENTIAL: 6600 VAC; MOUNTING: IMB3; ENCLOSURE RATING: IP 55; SHAFT SIZE: 120 MM; CONNECTION LOCATION: LHS & RHS; CLASSIFICATION: NON HAZARDOUS; POLES: 4; INSULATION CLASS: F; PHASE: 3; TEMPERATURE CLASS: B; TYPE: SQUIRREL CAGE INDUCTION; MANUF P/N: 1LA4402-4AN70-Z; ASH OVERLAND CONVEYOR	TYPE: ROLLING CONTACT BEARING; DE: 6228C3; NDE: 6224C3; COOLANT TEMP: DE ≤ 25°C & NDE ≤ 40°C; LUB. QUANTITY (DE): 40g; LUB. QUANTITY (NDE): 20g; OPERATING HOURS (DE): 6000 h ; OPERATING HOURS (NDE): 3000h; LUBRICATION TYPE: GREASE SHELL GADUS S2 V100 3

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15	Extendable Conveyor 1&2 Drive Motors 1- 4	4	Siemens	MOTOR, ELECTRIC: POWER: 710 KW; SPEED: 1490 RPM; FRAME: 404; CURRENT: 76 A; POTENTIAL: 6600 V; MOUNTING: IMB3; ENCLOSURE RATING: IP 55; SHAFT SIZE: 120 MM; CONNECTION LOCATION: LHS & RHS; CLASSIFICATION: NON HAZARDOUS; POLES: 4; INSULATION CLASS: F; PHASE: 3; TEMPERATURE CLASS: B; TYPE: SQUIRREL CAGE INDUCTION; OEM P/N: 1LA4404-4AN70-Z; ASH EXTENDABLE CONVEYOR	TYPE: ROLLING CONTACT BEARING; DE: 6228C3; NDE: 6224C3; COOLANT TEMP: DE ≤ 25°C & NDE ≤ 40°C; LUB. QUANTITY (DE): 40g; LUB. QUANTITY (NDE): 20g; OPERATING HOURS (DE): 6000 h ; OPERATING HOURS (NDE): 3000h; LUBRICATION TYPE: GREASE SHELL GADUS S2 V100 3
16	Fire Water Pump Motors 1&2	2	CMG & Siemens	MOTOR, ELECTRIC: POWER: 355 KW; SPEED: 1488 RPM; FRAME: 400; CURRENT: 77 A; POTENTIAL: 6600 V; MOUNTING: B3 FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: 110 MM; CONNECTION LOCATION: LHS NDE; POLES: 4; PHASE: 3; SERVICE FACTOR: S1; TEMPERATURE CLASS: F; TYPE: SQUIRREL CAGE; MANUF P/N: HTE400-4; SUPPLIER TO ENSURE MOTOR IS FM GLOBAL APPROVED FOR USE ON FIRE WATER	TYPE DE: NU324(ECM); TYPE NDE: 6222C3; LUB. QUANTITY (DE): 72g; LUB. QUANTITY (NDE): 38g; OPERATING HOURS (DE): 4300h ; OPERATING HOURS (NDE): 8120h; LUBRICATION TYPE: GREASE SHELL GADUS S2 V100 2
17	North Process Air Compressor Motors 1& 2	2	Siemens	MOTOR, ELECTRIC: POWER: 1600 KW; SPEED: 2990 RPM; FRAME: 560; CURRENT: 158 A; POTENTIAL: 6600 V; MOUNTING: 1MB3; ENCLOSURE RATING: IP55; SHAFT SIZE: 160 MM; CONNECTION LOCATION: LH SIDE FROM NDE; CLASSIFICATION: NON HAZARDOUS; POLES: 2; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; DIRECTION: BI-DIRECTIONAL; TYPE: SQUIRREL CAGE INDUCTION; OEM P/N: 1LA4560-2FD70-Z; PROCESS AIR COMPRESSOR	

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18	South Process Air Compressor Motors 1&2	2	Siemens	MOTOR, ELECTRIC: POWER: 1400 KW; SPEED: 2987 RPM; FRAME: 504; CURRENT: 140 A; POTENTIAL: 6600 V; MOUNTING: IMB3 FOOT; ENCLOSURE RATING: IP55; SHAFT SIZE: 140 MM; CONNECTION LOCATION: LH SIDE FROM NDE; CLASSIFICATION: NON HAZARDOUS; POLES: 2; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; DIRECTION: BI-DIRECTIONAL; TYPE: SQUIRREL CAGE INDUCTION; MANUF P/N: 1L4A504-2FD70-Z; FOR AIR COMPRESSOR	
19	North/South Service Air Compressor Motors 1 & 2	2	Siemens	MOTOR, ELECTRIC: POWER: 630 KW; SPEED: 2984 RPM; FRAME: 402; CURRENT: 64 A; POTENTIAL: 6600 V; MOUNTING: IMB3; ENCLOSURE RATING: IP55; SHAFT SIZE: 120 MM; CONNECTION LOCATION: LH SIDE FROM NDE; CLASSIFICATION: NON HAZARDOUS; POLES: 2; INSULATION CLASS: F; PHASE: 3; SERVICE FACTOR: S1; DIRECTION: BI-DIRECTIONAL; TYPE: SQUIRREL CAGE INDUCTION; MANUF P/N: 1LA4402-2FD70-Z; SERVICE AIR COMPRESSOR	

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