

	SCOPE OF WORK	DUVHA HMD EMISSIONS
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Title: Provision of a full Mechanical maintenance service on ESP and DHP plants and the refurbishment of the DHP and ESP during outages on Units 4, 5 & 6 for a period of 5 years

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1. INTRODUCTION

This document contains a detailed scope of work for the provision of a full Mechanical maintenance service for Units 4 to 6 on Electro Static Precipitators (ESP) and Dust Handling Plant (DHP) plants and the refurbishment of the DHP and ESP during outages on Units 4, 5 and 6 for a period of 5 years. Duvha Power Station utilises Electrostatic precipitators (ESP) and dust handling plant (DHP) to contribute significantly to cleaner air, efficient power generation, and environmental sustainability at Duvha Power Station. Their proper implementation ensures a healthier environment and optimal plant performance.

The above-mentioned plants require internal and external maintenance to ensure compliance with emission standards, health risk is reduced for workers and nearby communities, prevent equipment fouling and maintains system efficiency all the time.

It is for the above-mentioned reason that a contract to conduct maintenance on those plants must be initiated.

2. SUPPORTING CLAUSES

2.1 Scope

Provision of a full Mechanical maintenance service for Units 4 to 6 on ESP and DHP plants and the refurbishment of the DHP and ESP during outages on Units 4, 5 and 6 for a period of 5 years.

2.1.1 Purpose

- The purpose of this contract is to ensure availability of the DHP and ESP plant to ensure low stack emissions throughout the station.
- To establish an effective and efficient maintenance and repair process for the ESP and DHP plants.
- Procurement lead times will be shortened by a draw off directly against a contract, instead of following the procurement process.

The parties are committed to the following:

- Continuous improvement of Plant performance
- Retention of critical skills.
- Cost Efficiency
- Safety (Zero harm policy)

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2.1.2 Applicability

Duvha Power Station employees and the contractor that will be rendering the mechanical maintenance service on site will use this document.

2.1.3 Effective date

As soon as the contractor has signed the agreement on NEC.

2.2 Normative/Informative References

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

2.2.1 Normative

- [1] Occupational Health and Safety Act No. 85 of 1993,
- [2] QM58 - Suppliers contract quality requirements specification
- [3] SANS 1200 - Standardized specification for civil engineering construction
- [4] 240-106628253 - Standard for Welding Requirements on Eskom Plant
- [4] SANS 9096-1:1994: Testing of welders, where applicable to the type of welding required
- [5] SANS 1044-3: Welding Part 3: The fusion of steel (including stainless steel): Tests for the approval of welding procedures
- [6] SANS 10044-4: Welding Part 4: The fusion welding of steel (including austenitic stainless steel): Tests for the approval of welders working where weld procedure approval is not required.
- [7] SANS 10064: The preparation of steel surfaces for coating
- [8] SANS 10341: Installation and maintenance of bearings – General guidelines
- [9] SANS 1700-5-9: Fasteners Part 5: General requirements & material properties
- [10] Section 8: Corrosion resistant stainless steel fasteners-Bolts, Screws & Studs
- [11] SANS 1700-5-10: Fasteners Part 5: General requirements & material properties Section 8: Corrosion resistant stainless steel fasteners-Nuts
- [12] SANS 1123: Pipe Flanges

2.2.2 Informative

- [13] 474-58 (Rev1): Document and Records Management

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2.3 Definitions

2.3.1 Disclosure Classification

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

2.4 Abbreviations

Abbreviation	Explanation
SANS	South African National Standards
SE	System Engineer
SHEQ	Eskom Safety, Health, Environment and Quality
QA	Quality Assurance
QM	Quality Manual
QCP	Quality Control Plan
NDT	Non Destructive Testing
WPS	Welding Procedure Specification
WPQR	Welding Procedure Qualification Record
WQR	Welder qualification record
WRT	Weir Reduction Technology

2.5 Roles and Responsibilities

Appointed Contractor – Execute the scope of work as per the employer’s specification, with adherence to all standards prescribed in this document.

Project manager – To ensure that the supplier execute all the work specified in the scope of work on the set timelines.

System Engineer – The SE will review all works which is being executed and ensure that quality assurance and compliance.

Eskom QC- Eskom QC will quality approve all activities executed in the plant and sign off the *contractors* QCP document.

2.6 Process for Monitoring

N/A

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3. SCOPE OF WORK

3.1 Description of the service

The service is the Mechanical maintenance of the dust handling plant (DHP) plants and electro static precipitators (ESP) on units 4 to 6 at Duvha Power Station during normal maintenance and planned outages. The service is the supply of skilled labour, equipment and tools to carry out maintenance.

3.1.1 Employer's requirements for the service

- The *Contractor* provides qualified labour to carry out corrective and preventive maintenance activities.
- The *Contractor* provides tools, gear, equipment and consumables to carry out the work.
- The *Contractor* ensures the safety of own personnel, other contractors and Eskom employees in the vicinity of the works by complying with the OSH Act and Construction Regulations.
- The *Contractor* plans and executes the work and provides a detailed plan for emergency work, weekend maintenance opportunity and unit outage.
- The *Contractor* performs quality control on own work as per pre-approved control plans by the system engineer and Eskom QC from TSS (technical support).
- The *Contractor* performs work within the specified period and to the acceptable quality standard.
- The Contractor is required to have a as a minimum of 4 RP's (responsible person) as per the Eskom's Plant Safety Regulations within three months from the contract start date. The Contractor is required to have one authorised supervisors as per the PSR requirement for Outages.
- The works also includes the decommissioning and re-commissioning, removal, dismantling as well as making good of areas affected by the removal thereof. All redundant equipment to be removed by the Contractor.
- All lagging and scaffolding requirement on site will be arrange for the contractor by the project manager.

3.1.2 Core Crew

The *contractor* provides a crew maintenance crew comprising of:

- 1x site manager
- 2x site supervisors
- 1x safety officer
- 1x quality control officer
- 6 x mechanical fitters
- 2x welders
- 8x trade assistants
- 1x storeman

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- 1x clerk

This crew will be required to perform maintenance work on a day to day basis and on call-out for failures after normal working hours. Maintenance includes monitoring, testing, inspecting, overhaul and repairs.

The team will be required to work the same Eskom hours which are 07:00 to 16:15 on Mondays to Thursdays and 07:00 to 12:00 on Fridays.

3.1.3 Standby crew for call-outs outside of normal working hours:

The *contractor* provides a maintenance standby crew comprising of:

- 1 x supervisor
- 1x welder
- 1x fitter
- 3 x assistants

The call-out hours will be based on the entering the gate and on completion of the work.

3.1.4 Short UCLF/PCLF maintenance crew

Duvha Power Station is often granted short maintenance opportunities with the unit offload. During these opportunities the Contractor will be required to provide additional resources for the duration of the opportunity, these resources will be required to carry out repairs on a 24 hour basis.

3.1.5 Core crew day-to-day tasks

- Conducting PM's (planned maintenance tasks) as per the SAP schedule
- Daily plant inspections and submit reports on findings
- Take own permits to work
- Carry-out repairs
- Cleaning, washing and removal of debris in the plant
- Attending meetings as scheduled by project manager
- Painting of plant/equipment as required
- Rodding of dust hoppers as per the local procedure
- Assist with opening of ESP manholes for isolations
- Monitor ESP performance from the control room and submit weekly reports
- Top-up oil and grease gearboxes
- Clean and grease wire rapper cams (monthly)
- Weekly submit reports on all inspections carried out in the week.
- Conduct quality control on all activities
- Record keeping of all emergency, opportunity and maintenance failure and inspection report of work.

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3.2 DHP detailed scope

3.2.1 Repairs/Refurbishment of the Coarse Ash Removal System (CARU).

Coarse Ash Removal Unit (1), air bleed valves (2) and isolating butterfly valve (3) of the Coarse Ash Removal System in a following manner.

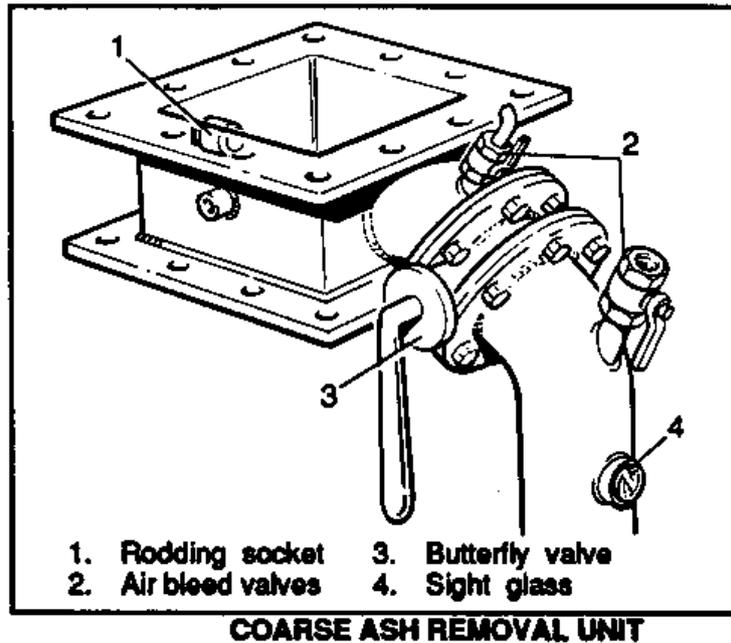


Figure 1: Coarse Ash Removal System

- **Specifications of Caru pipe:**

- Manufacture: Moller
- Material: Mild steel
- Inlet/outlet size: 300X300mm
- Discharge pipe: 100mm dia

- **Specifications CARU discharge isolation valve**

- Type: Zero offset butterfly valve with EPDM liner and Stainless steel disc.
- Maximum operating temperature of 120 deg C.
- Liner EPDM
- Disc Stainless Steel
- Size: 100mm nominal bore

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- **Specifications Air bleed valves (25 and 12.5mm)**

- Type: Ball

- **Specifications Hydrovac valve assembly**

- Manufacture: R J Spargo

- Operating pressure: 10bar

- Discharge pipe size: 100mm

- The Contractor permanently marks each CARU with a unique number that would correspond to the hopper from which it is removed.
- The Contractor strips the complete unit from the plant.
- The Contractor removes any silicon/gasket residue from the adjacent components' sealing flanges.
- The Contractor in conjunction with the Supervisor/Engineer inspects the stripped CARU for damage.
- If the CARU is holed, the part is "window patched" by the Employer, failure by the employer the contractor will be requested to conduct this work.
- If the CARU flanges are damaged, they are weld repaired by the Employer, failure by the employer the contractor will be requested to conduct this work.
- The Contractor reinstalls the CARU to the same position, as where it was removed, ensuring an installation that does not leak any dust to the environment.
- The Contractor uses new high tensile steel fasteners to install the CARU. Consumables are supplied by the employer.
- The Contractor renews all gaskets during the installation. Consumables are supplied by the employer.
- The Contractor strips, inspects, reports and repairs the 40 CARU discharge isolation valves (03) and 40 Air bleed valves (25 mm) and 40 Air bleed valves (12.5 mm).
- Walk the length of the pipe routes and clean, inspect and repair damage to the pipes.
- Report damaged insulation.
- Repair damaged pipe hangers.
- Do an internal inspection for wear (take wall thickness measurements) and blockages on dust conveying pipes such as the airlift vessel pipes, the silo filter ducts and the silo vent fan pipe system. Report and repair damage observed.

a) CARU Discharge Isolation Valve

- The Contractor permanently marks each CARU discharge isolation valve with a unique number that would correspond to the hopper from which it is removed.
- The Contractor strips the complete unit from the plant.

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- The Contractor removes any silicon/gasket residue from the adjacent components' sealing flanges.
- The Contractor in conjunction with the Supervisor inspects the stripped CARU discharge isolation valve for damage.
- If the CARU discharge isolation valve is damaged, it is renewed.
- The Contractor reinstalls the CARU discharge isolation valve to the same position as where it was removed, ensuring an installation that does not leak any dust to the environment.

b) CARU Air bleed valves 25 mm and 12.5mm

- The Contractor strips the air bleed valves from the plant.
- The Contractor in conjunction with the Supervisor inspects the stripped CARU air bleed valves for damage.
- If the CARU air bleed valve is damaged, it is renewed.
- The Contractor reinstalls the CARU air bleed valves to the same position as where it was removed, ensuring an installation that does not leak any dust to the environment.

c) Refurbishment of the silo outlet and CARU system hydro vacs.

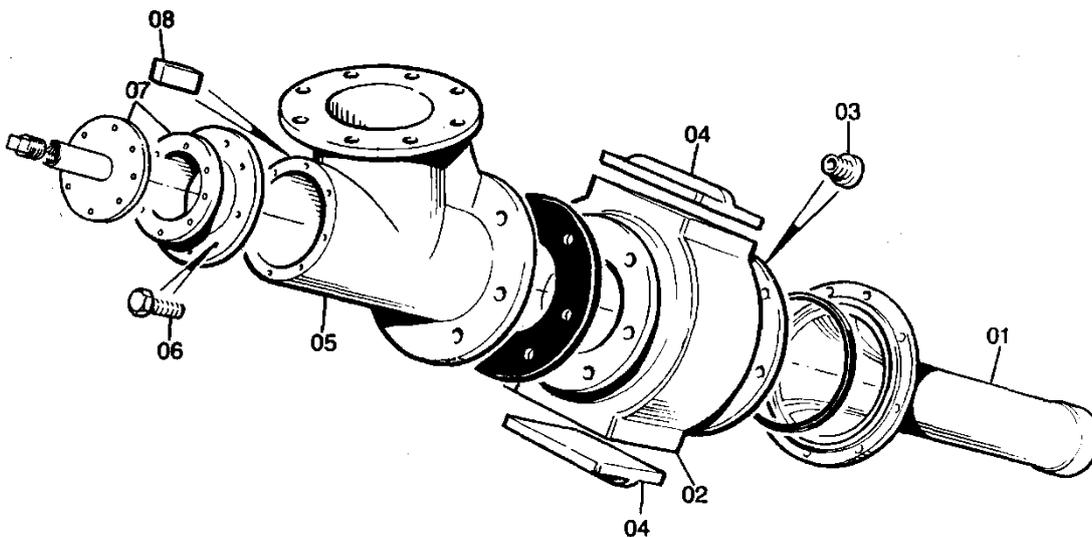


Figure 2: Hydro vac Assembly

- The Contractor strips the hydrovac into the following parts:
 - Venturi tail pipe (01)
 - Water box or Body ejector (02)
 - Nozzles (03)

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- Covers (04)
 - Y-piece or lateral (05)
 - Water supply valve
-
- The parts are cleaned of residual build-up of ash.
 - The nozzles are chemically cleaned of all ash build-up. The *Contractor* renews damaged nozzles.
 - The *Contractor* in conjunction with the *Supervisor* inspects the silo hydro vacs for visible damage.
 - All damaged parts are replaced by the Contractor. Replacement parts are supplied free issue by the *Employer*.
 - The *Contractor* assembles and reinstalls the silo hydro vacs using new gaskets and seals.
 - Inspect and repair the wear plates on the pipework at the hydro vac discharge.

3.2.2 Refurbishment of aero slides feeding the airlift vessels and dust silo.

a) Aero Slide Inlet Chute

- The *Contractor* permanently marks each aero slide inlet chute with a unique number that would correspond to the hopper from which it is removed.
- The *Contractor* strips the complete unit from the plant.
- The *Contractor* removes any silicon/gasket residue from the adjacent components' sealing flanges.
- The *Contractor* in conjunction with the *Supervisor* inspects the stripped aero slide inlet chute for damage.
- If the aero slide inlet chute is holed, the part is "window patched" by the *Contractor*
- The *Contractor* reinstalls the aero slide inlet chute to the same position, as where it was removed, ensuring an installation that does not leak any dust to the environment.
- The *Contractor* uses new high tensile steel fasteners to install the aero slide inlet chute.
- The *Contractor* renews all gaskets during the installation.

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b) Aero Slide Below the Dust Hoppers

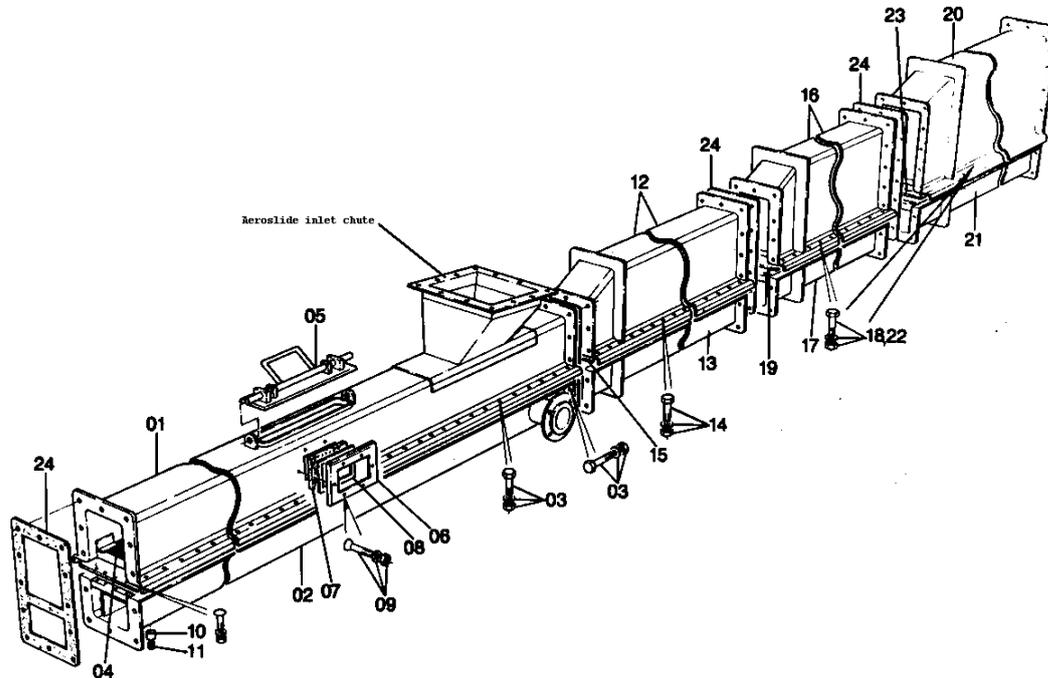


Figure 3: Aero slide

- **Specifications of aero slide**
 - Manufacturer: Rula / Johannes Moller
 - Section length: 2.4m (max)
 - Material: Steel
 - Operating angle: 5.5° incline
- **Specifications of Membrane:**
 - Type: Nomez
 - Manufacturer: Bricq&Cie
 - Duty: 240 °C continuous
- **Specifications of Aero slide air inlet throttle valve assembly**
 - Type: butterfly
 - Liner EPDM
 - Disc Stainless Steel
 - Nominal bore: 125mm

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c) Lagging and cladding on all DHP and ESP area

- The *Contractor* arranges with the *Project Manager* the need for removal of the lagging and cladding prior work.
- The *Contractor* arranges with the *Project Manager* for the reinstallation of the lagging and cladding once work is completed.

d) Aero Slides

- The *Contractor* permanently marks each aero slide with a unique number that would correspond to the position from which it has been removed.
- The *Contractor* strips the complete unit from the plant.
- The *Contractor* removes any silicon/gasket residue from the adjacent components' sealing flanges.
- The *Contractor* cleans the aero slides from any dust and build-up.
- The *Contractor* in conjunction with the *Supervisor* and Eskom QC inspects the stripped aero slide for damage.
- If the aero slide top casing (01) is holed, the part is "window patched" by the *Contractor*.
- If the aero slide top casing (01) is cracked, the part is weld repaired by the *Contractor*.
- If the aero slide bottom casing (02) is holed, the part is "window patched" by the *Contractor*.
- If the aero slide bottom casing (02) is cracked, the part is weld repaired by the *Contractor*.
- All sections with an air inlet stub should have a dividing plate as per drawing 0.57/41471 and 0.57/41472. If not, the *Contractor* welds such a dividing plate to these aero slide sections.
- Damaged membrane protective gratings are identified and the *Contractor* repairs the grating.
- At all hopper in-load points there should be a wear protective plate tacked on top of the grating.
- If not, the *Contractor* fits such a wear plate to the gratings at the gratings at the in-load points.
- If the wear plate is worn, the *Contractor* renews the wear plate.
- The *Contractor* straightens all flanges on the aero slide top (01) & bottom (02) casings
- All silicone is removed from all the parts.
- The inspection cover (05) seals are renewed to ensure dust free operation.
- If the sight glasses (07) are damaged (Cracked or not see through), they are renewed. High
- Temperature sight glasses of at least 150 °C are installed. The size is 150 x 90 x 6mm
- The sight glass gaskets (08) are renewed.
- All damaged/missing fasteners (09) nuts, bolts and washers are renewed.
- All damaged missing membrane fasteners are renewed. (Thus each section is fastened with 8 M8x25 coach bolts c/w nuts and washers, 4 on each side)
- All the membranes are renewed. .
- If the aero slide inlet throttle valve seal is damaged, it is repaired / renewed.

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- The *Contractor* reinstalls the aero slide to the same position, as where it was removed, ensuring an installation that does not leak any dust to the environment.
- The *Contractor* repairs any damaged slide hangers.
- The *Contractor* renews any missing slide hangers.
- There are membrane-damage-witness-valves (20 mm ball valves) fitted on the aero slide bottom casings in order to determine membrane leakage. Inspect and renew damaged witness valves.
- The *Contractor* uses new high tensile steel fasteners to install the aero slide inlet chute. This includes the fasteners for the fastening the top and bottom sections as well as for securing the separate aero slide units horizontally.
- The *Contractor* renews all gaskets and seals during the installation.

e) Membrane Installation

- The *Contractor* cleans both plenums from all dust residue.
- The *Contractor* matches the plenums and checks that the direction of both is correct.
- The *Contractor* checks that the dividing plate is installed on the sections with the air inlet stub.
- The *Contractor* installs the bottom supporting metal grid.
- The *Contractor* stretches the fabric over the bottom plenum
- The *Contractor* clamps the membrane and protective grating to the bottom plenum.
- The *Contractor*, using a heated tapered metal rod or soldering iron, melts the 8 mounting holes for the coach bolts.
- The *Contractor* installs the coach bolts to secure the membrane to the chamber.
- The *Contractor*, using a hot knife, cuts and seals the end sections of the membrane.
- The *Contractor*, using a heated tapered metal rod or soldering iron, melts the remaining mounting holes to secure the top and bottom sections.
- The *Contractor* checks that the upper chamber, membrane and plenum are aligned properly and installs the nuts and bolts to secure the plenum.
- The *Contractor* secures the plenum chamber to the adjacent chambers using EPDM rubber gaskets.
- Check that the section is operating properly and check/ rectify any dust leakage from the joints.

f) Diverter Pots

- The *Contractor* permanently marks each diverter pot with a unique number that would correspond to the position from which it has been removed.
- The *Contractor* strips the complete unit from the plant.

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- The *Contractor* removes any silicon/gasket residue from the adjacent components' sealing flanges.
- The *Contractor* strips the diverter pot into its maintainable parts.
- The *Contractor* cleans the diverter pot from any dust and build-up.
- The *Contractor* in conjunction with the *Supervisor* inspects the stripped diverter pot for damage.
 - If the diverter pot casing is holed, the part is "window patched" by the *Contractor*.
 - If the diverter pot casing is cracked, the part is weld repaired by the *Contractor*.
 - Damaged gratings are identified and the *Contractor* repairs the grating.
 - The *Contractor* straightens all flanges on the casings.
 - All silicone is removed from all the parts.
 - All seal and gaskets are renewed.
 - All damaged/missing fasteners nuts, bolts and washers are renewed.
 - All the membranes are renewed. The membrane is free issue by the *Employer*.
 - If the diverter pot inlet throttle valve seal is damaged, it is renewed.
- The *Contractor* reinstalls the diverter pot to the same position, as where it was removed, ensuring an installation that does not leak any dust to the environment.
- The *Contractor* repairs any damaged slide hangers.
- The *Contractor* renews any missing slide hangers.
- There are membrane-damage-witness-valves (20 mm ball valves) fitted on the diverter pot bottom casing in order to determine membrane leakage. Inspect and renew damaged witness valves.
- The *Contractor* uses new high tensile steel fasteners to assemble and install the diverter pot
- The *Contractor* renews all gaskets and seals during the installation.

g) Aero Slide/Diverter Pot Isolation Valves

- The *Contractor* strips, inspects, reports and repairs the 56 Aero Slide/Diverter Pot Isolation Valves.

h) Impact Chute

- The *Contractor* removes any silicon/gasket residue from the adjacent components' sealing flanges.
- The *Contractor* in conjunction with the *Supervisor* inspects the impact chute for damage.
 - If the impact chute is holed, the part is "window patched" by the *Contractor*. This is a welded repair that is flush with the body.
 - Repair the aeration pad membrane protective grating.
 - Renew the aeration membrane.
 - The inspection cover is a high impact area. Renew the inspection cover.

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- The *Contractor* renews all gaskets and seals during the installation.

i) Aero Slide Top of Silo

- The *Contractor* inspects and repairs the silo feeding aero slides similar to the aero slide repair specification above.

j) Ducting, Cathedral Vents and Dampers

- The *Contractor* removes all inspection covers.
- The *Contractor* in conjunction with the *Supervisor* visually inspects the exterior of the ducting for damage or leaks.
 - If the ducting is holed, the part is “window patched” by the *Contractor*.
 - The inspection cover seals/gaskets are replaced
 - The ducting is secured to the silo roof as specified in the section Civil Refurbishment.
- The *Contractor* renews all gaskets and seals during the installation of the inspection covers.
- The *Contractor* in conjunction with the *Supervisor/System Engineer* visually inspects, reports and repairs the dampers that are damaged.

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3.2.3 Refurbishment of the air lift vessels and associated sump equipment.

a) Airlift vessel

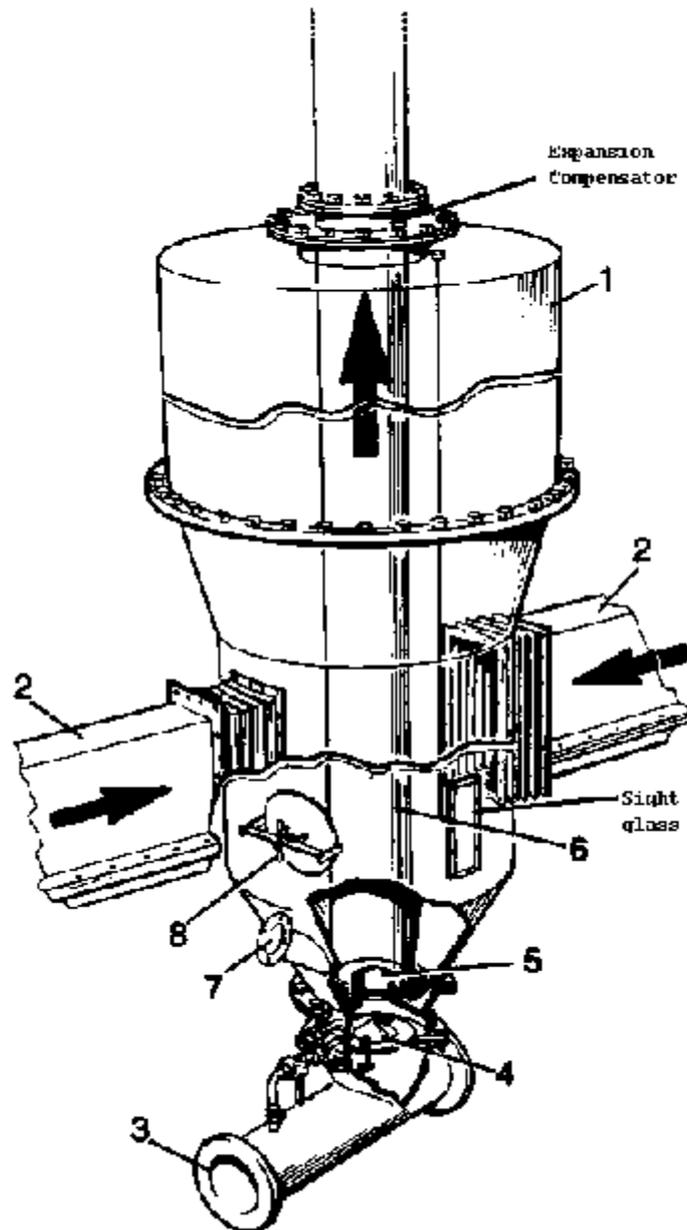


Figure 4: Airlift Vessel

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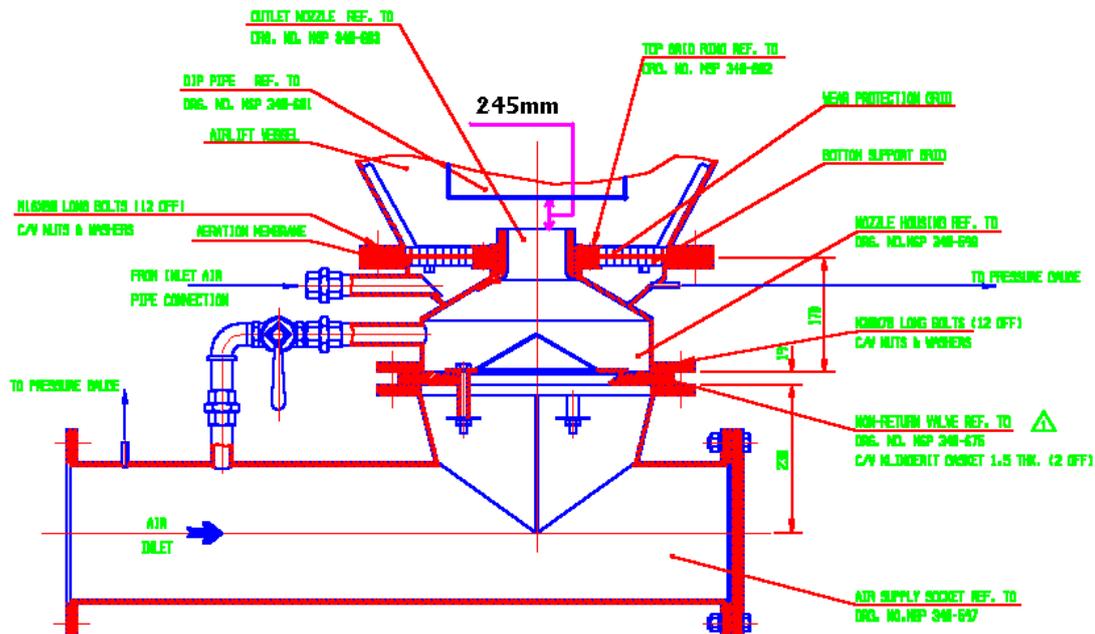


Figure 5: Detail of Airlift Vessel Inlet Nozzles and Dust Conveying Pipe

- **Specifications of airlift vessel**
 - Manufacturer: Rula / Johannes Moller
 - Model/Type: 100/02
 - Nominal Capacity: 60 ton/hour
 - Body diameter: 1 000 mm
 - Body length (nom): 3 400 mm
- **Specifications of De-dusting dome:**
 - Dia. (nom): 1 255 mm
 - Length: 1 500 mm
- **Specifications of Vertical inspection cover**
 - Cover plate: All Steel – SABS 1431/300WA
 - Angle frame
- **Specifications of Conveying pipe:**
 - Spec.: NASPIPE
 - Bore: 250 mm
 - Flange spec.: SABS 1123, Table 10
- The *Contractor* permanently marks each part with a unique number that would correspond to the position from which it is removed.

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- The *Contractor* strips the following items from the plant for inspection:
 - Air inlet pipe section (03)
 - Non-return valve (04)
 - Nozzle (05)
 - Airlift Pipe (06)
 - Dump Outlet Valve (07)
 - Manholes
 - Membrane
 - Grating
 - Dust Conveying pipe compensator.
 - Equaliser pipe bellows.
 - Sight Glass
- The *Contractor* removes any silicon/gasket residue from the adjacent components' sealing flanges.
- The *Contractor* cleans the part of the airlift vessel from any dust and build-up.
- The *Contractor* in conjunction with the *Supervisor* inspects the stripped airlift vessel for damage.
 - The *Contractor* takes wall thickness measurements of the airlift vessel body. If the dedusting dome (01) is holed (or so thin that it will be holed within the next three years), the part is "window patched" by the *Contractor*.
 - If the airlift pipe (02) is holed, the part is "window patched" by the *Contractor*.
 - All silicone is removed from all the parts.
 - If the sight glasses (08) are damaged (Cracked or not see through), they are renewed.
 - If the metal wear grids are damaged, the *Contractor* repairs it.
 - All the membranes are renewed.
 - If the emergency dump valve is damaged, it is renewed.
 - The *Contractor* takes wall thickness measurements of the airlift dust pipe. If the dust pipe holed (or so thin that it will be holed within the next three years), the part is renewed by the *Contractor*.
 - The *Contractor* inspects and repairs the dust pipe support brackets inside the air lift vessel. These brackets shall maintain the dust pipe concentric to the air nozzle at the bottom of the vessel.
 - The *Contractor* inspects and repairs the bottom aeration box air pressure indicators and pipework
 - If the compensator is damaged, it is renewed
 - If the bellow is damaged, it is renewed
 - If the Nozzle (05) is damaged, it is renewed
 - If the Non-return valve (04) is damaged, it is renewed
 - If the bellow is damaged, it is renewed.

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- The complete airlift vessel exterior is corrosion protected as indicated below.
- The *Contractor* in conjunction with the *Supervisor* inspects the nozzle dust conveying pipe gap. The *Contractor* rectifies this if necessary. Refer to Figure 5: Detail of Airlift Vessel Inlet Nozzles and Dust Conveying Pipe.
- The *Contractor* reinstalls the airlift vessel to the same position, as where it was removed, ensuring an installation that does not leak any dust to the environment as well as preventing any moisture from the environment being sucked into the system.
- The *Contractor* uses new high tensile steel fasteners to assemble the airlift vessel.
- The *Contractor* renews all gaskets and seals during the installation.

b) Airlift Vessel Corrosion Protection

- The exterior of the complete airlift vessel is corrosion protected. This is from the
 - Expansion joint on the equalising pipe
 - Vessel flange to the bellow on the dust conveying pipe.
 - The flanges connecting the aero slides.
 - The flange after the air inlet pipe section (03). The air inlet pipe section is also corrosion protected.
 - All the removed inspection covers are also corrosion protected.
 - The airlift vessel support stands are also corrosion protected.
- The colour selected is dove grey.
- All the cladding and lagging is removed
- All the inspection covers are removed
- All the sight glasses are taped closed as to prevent painting over them.
- The complete exterior of the airlift vessel is cleaned from any loose material.
- The surface is completely wire brushed (hand and/or power tool) to remove all the loose rust.
- The vessel is externally corrosion protected according to Eskom Specification GSP 36-1126, Specification for Corrosion Protection of Plant and Equipment with Coatings.
- All the safety precautions in the manufacturers' safety data sheets are conformed to.

c) Airlift vessel sump and pump repairs

- The Contractor removes the sump pumps, jet pulsion pumps, sump grating covers and agitation pipes from the sump.
- The Contractor cleans all debris and mud from the airlift vessel sump.
- The Contractor inspects and repairs the floor washing agitation pipework and valves.
- The contractor inspects and repairs the airlift sump jet pulsion pump
- Electric work will be done by Eskom on this plant.

CONTROLLED DISCLOSURE

3.2.4 Refurbishment of the blower house fans, blower and filtration system 3.2.4.1 Blower house axial fans

- The contractor in conjunction with the supervisor and Eskom QC inspect the blower house fans.
- The contractor replaces the bearings and do alignments on the blower house fans.
- The contractor repairs the blower house fan base and casing.
- All correct and preventative maintenance must be done by the contractor

a) Blower House Cleaning and Repairs

- This is Eskom's maintenance responsibility.

b) Aero slide fans

- The contractor in conjunction with the supervisor Eskom QC inspect the aero slide fans.
- The contractor replaces the bearings and do alignments on the aero slide fan.
- The contractor repairs the aero slide fan base and casing.
- All correct and preventative maintenance must be done by the contractor.

c) Airlift blowers

- The contractor in conjunction with the supervisor inspect the airlift blowers.
- The contractor replaces the airlift blowers and motors.
- The contractor does service on the airlift blowers.
- All correct and preventative maintenance must be done by the contractor.

d) Airlift Vessel sump

- The contractor cleans the airlift vessel sump.
- The contractor provides a submissile pump to drain the sump.
- The contractor repairs the airlift vessel casing.
- The contractor replaces and repair gratings in the airlift vessel sump.
- Jet pulsion pump replacement to be done by the contractor
- Jet pulsion valve to be worked on or replace by the contractor

e) Vent Fan

- The contractor in conjunction with the supervisor and Eskom QC inspect the Vent fan.
- The contractor replaces the vent fan.
- The contractor repairs the vent fan casing.
- The contractor replaces the vent fan valves.
- All correct and preventative maintenance must be done by the contractor.
- Inspect casing for wear and repair casing leaks

CONTROLLED DISCLOSURE

f) Exhauster fan

- The contractor in conjunction with the supervisor Eskom QC inspect the exhauster fan system.
- The contractor replaces the exhauster fan.
- The contractor repairs the exhauster fan system.
- Contractor repair and replace diaphragm on the pulsing valves.
- The contractor must do all correct and preventative maintenance.
- Overhaul filter implosion damper
- Strip, assemble and re-install the filter hopper double flap valve
- Replace and or clean the filter bags
- Inspect the Filter hopper for blockage
- Inspect the pulse tube for bend, corrosion

g) DHP filtration system

- The bag replacement is arranged 24 hr in advance by the Project Manager.
- The Project Manager arranges for isolation for the DHP for the duration of the bag replacement.
- The new free issue bags are collected from the Duvha stores
- The Contractor removes the pulse tubes and notifies the Supervisor of any damaged pulse tubes as soon as all the tubes have been removed.
- The Contractor removes and damaged pulse tube bends and notifies the Supervisor of any damaged pulse tube bends as soon as all the tubes have been removed.
- The Contractor removes the existing bags and notes which bags are torn (position). This is indicated on the sheet provided.
- The Contractor cleans the inside of the filter housing.
- The Contractor replaces any damaged seal frame/bag cage fasteners (free issue during the maintenance phase), ensuring that the correct arrangement is followed
- The Contractor installs the new free issue bags.
- The Contractor cleans the front of the filter unit of all dust, bolts or other debris.
- The Contractor closes the doors and pulses each pulse valve by loosening the pilot line on the pulse valve.
- The Contractor ensures that no debris are in the pulse valve, tube section before installing the pulse tubes.
- The Contractor installs the pulse tubes and box the unit up, ensuring that all the doors are securely tightened.

CONTROLLED DISCLOSURE

3.2.5 Refurbishment of the valves, dampers and actuators associated with the DHP system.

a) Aero Slide/Diverter Pot Isolation Valves

- The *Contractor* permanently marks each Aero Slide Isolation Valve with a unique number that would correspond to the position from which it is removed.
- The *Contractor* strips the complete unit from the plant.
- The *Contractor* removes any silicon/gasket residue from the adjacent components' sealing flanges.
- The *Contractor* in conjunction with the *Supervisor* inspects the stripped Aero Slide Isolation Valve for damage.
- If the Aero Slide Isolation Valve is damaged, it is renewed. Type: Zero offset butterfly valve with EPDM liner and Stainless steel disc. Maximum operating temperature of 120 °C.
- The *Contractor* reinstalls the Aero Slide Isolation Valve to the same position as where it was removed, ensuring an installation that does not leak any dust to the environment.

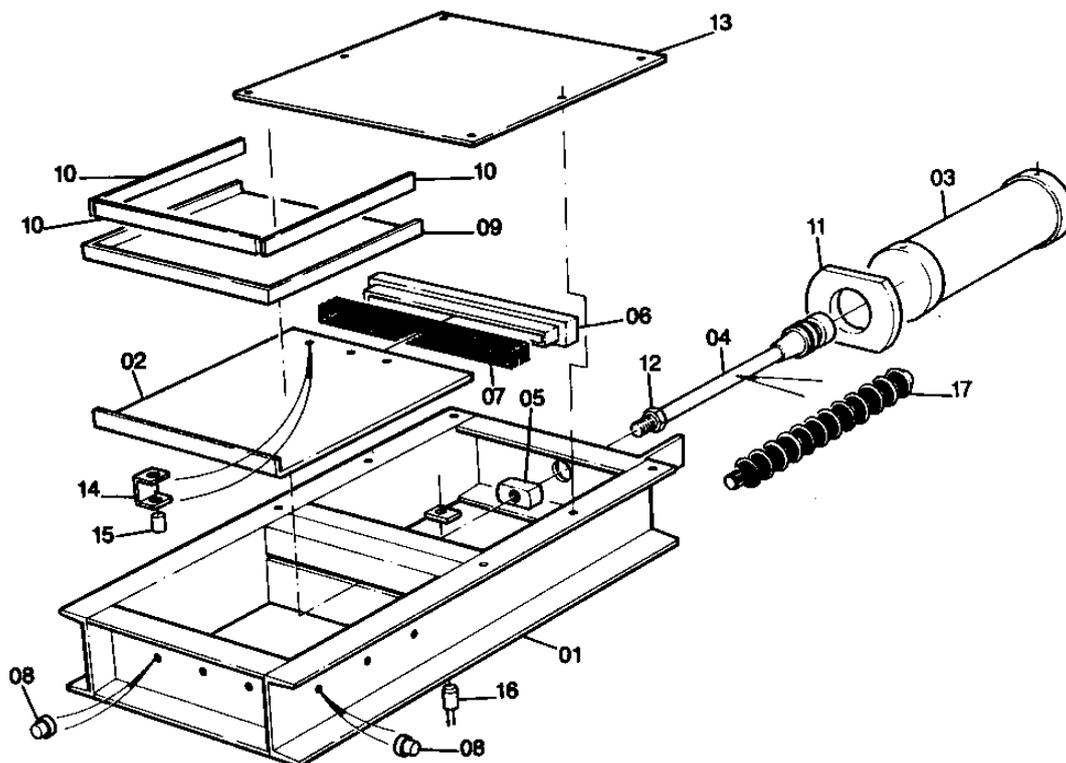


Figure 6: Pneumatic isolation knife gate valve assembly

- **Specifications of knife gate valve**
 - Manufacturers: Rula /Moller /AMD
 - Model/type: NG 300 P
 - Construction: Steel

CONTROLLED DISCLOSURE

- Size: 300X300 mm
- Mounting: Flange
- Actuator: Pneumatic cylinder

b) Knife Gate

- The *Contractor* permanently marks, strips and stores the following items from each knife gate with a unique number that would correspond to the hopper from which it is removed:
 - Pneumatic actuator (sealing the airlines and cylinder ports with tape, ensuring no dust ingress)
 - Proxy limit switches (including the proxy brackets)
- The *Contractor* strips the complete knife gate assembly from the plant.
- The *Contractor* removes any silicon/gasket residue from the adjacent components' sealing flanges.
- The *Contractor* refurbishes the knife gates in an off-site workshop.
 - Strip, clean and inspect all components
 - Renew worn components
 - Replace all glands and seals
 - Re-assemble the knife gate assembly
 - Paint the refurbished knife gate
- The *Contractor* installs the refurbished knife gates to the plant ensuring an installation that does not leak any dust to the environment.
- The *Contractor* renews all gaskets during the installation.
- The *Contractor* uses new high tensile steel fasteners to install the knife gates.
- The *Contractor* reinstalls the proxy limit switches and refurbished pneumatic actuators (See below) to the knife gates to the plant to the same position as where it was removed.

c) Knife Gate Pneumatic Actuators

- The *Contractor* in conjunction with the *Supervisor* inspects the cylinders and pneumatic fitting for any damage, prior to the removal and indicates this on the QCP.
- The *Contractor* permanently marks each pneumatic actuator with a unique number that would correspond to the hopper from which it is removed.
- On removal of the pneumatic actuators, the airlines and cylinder ports are sealed with tape, ensuring no dust ingress.
- The *Contractor* refurbishes the pneumatic actuators in an off-site workshop.
 - Strip, clean and inspect all components
 - Hone worn cylinder walls
 - Replace all glands and seals
 - Re-assemble the pneumatic actuator assembly
 - The cylinder ports are sealed with tape, ensuring no dust ingress.

CONTROLLED DISCLOSURE

- The *Contractor* reinstalls the pneumatic actuator to the same position, as where it was removed, ensuring an installation that does not leak any compressed air to the environment.

d) Single Flap Valve Assembly

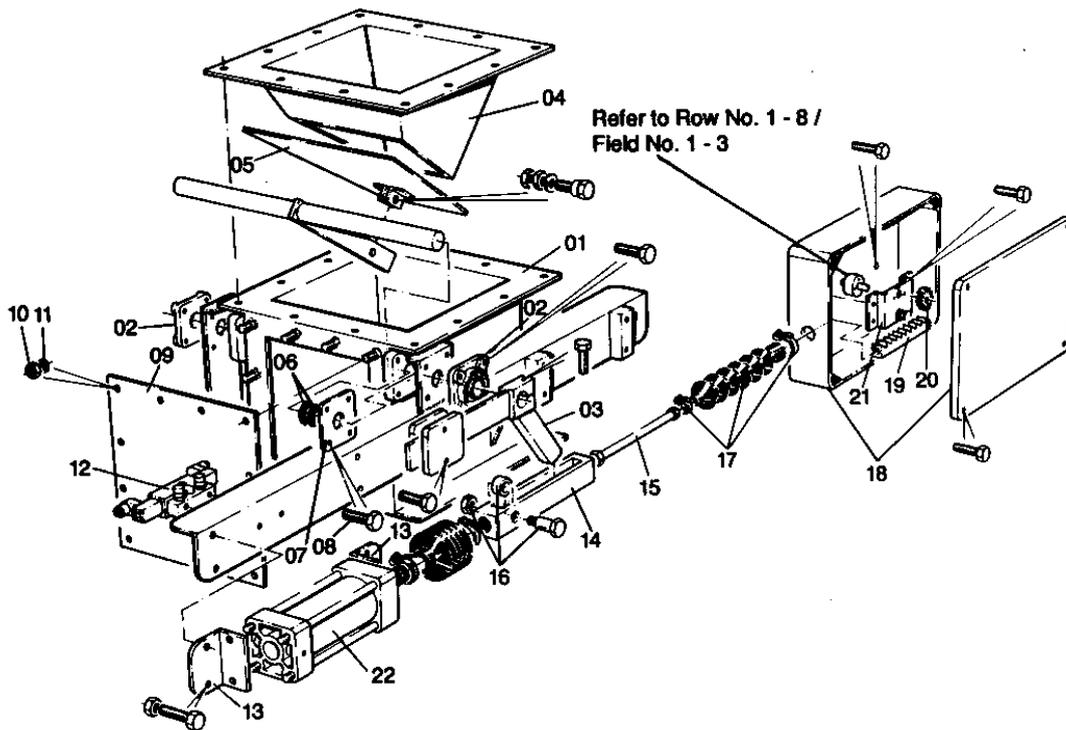


Figure 7: Single flap valves

- **Specifications of Single flap valve**
 - Manufacturer: AMD
 - Model/Type: FV 300-SG-RQ-HT-SP
 - Size: 300x300mm
 - Construction: Steel
 - Actuator: Gravity
 - Positioner : Electro-pneumatic positioner

e) Pneumatic Actuator for Back Log Recovery System (22)

- The *Contractor* in conjunction with the *Supervisor* inspects the cylinders and pneumatic fitting for any damage, prior to the removal and indicates this on the QCP.
- The *Contractor* permanently marks each pneumatic actuator with a unique number that would correspond to the hopper from which it is removed.

CONTROLLED DISCLOSURE

- On removal of the pneumatic actuators, the airlines and cylinder ports are sealed with tape, ensuring no dust ingress.
- The *Contractor* refurbishes the pneumatic actuators in an off-site workshop.
 - Strip, clean and inspect all components
 - Hone worn cylinder walls
 - Replace all glands and seals
 - Re-assemble the pneumatic actuator assembly
 - The cylinder ports are sealed with tape, ensuring no dust ingress.
- The *Contractor* reinstalls the pneumatic actuator to the same position, as where it was removed, ensuring an installation that does not leak any compressed air to the environment.
- The *Contractor* sets the counterweight and function checks the flap valve.

f) Electro Mechanical Positioner for Back Log Recovery System (18)

- The *Contractor* in conjunction with the *Employer* and *Supervisor* inspects the positioner for any visual damage.
- The *Contractor* strips the complete positioner (18) from the plant.
- The *Contractor* refurbishes the positioner assembly in an off-site workshop.
 - Strip, clean and inspect all components
 - Replace damaged components
 - Re-assemble the positioner assembly
- The *Employer* function checks the positioner during the pre-commissioning phase.
- *Contractor* in conjunction with the *Supervisor* inspects the parts (14, 15, 16, 17) linking the pneumatic actuator with the positioner.
 - If the dust cover (bellows) is damaged it is renewed.
 - If the fasteners are damaged or missing, they are renewed.
 - If the linking arm (15) is bent, the part is straightened.
 - If the guide (14) is damaged, the part is renewed.
- The *Contractor* reinstalls the positioner to the plant.

g) Flap Valve

- The *Contractor* permanently marks each Flap Valve with a unique number that would correspond to the hopper from which it is removed.
- The *Contractor* strips the complete unit from the plant and removes it for stripping and assembly in a dust free environment.
- The *Contractor* removes any silicon/gasket residue from the adjacent components' sealing flanges.
- The *Contractor* strips the complete pneumatic cylinder from the valve (See above)
- The *Contractor* strips the complete Flap Valve into all maintainable items for inspection.

CONTROLLED DISCLOSURE

- The *Contractor* in conjunction with the *Supervisor and Eskom QC* inspects the stripped Flap Valve for damage.
- The *Contractor* removes any silicon/gasket residue from the parts.
- If the body (01) is holed, the part is “window patched” by the *Contractor*.
- If the flap valve chute (04) is holed, the part is “window patched” by the *Contractor*.
- If the inspection cover (09) is holed, the part is renewed.
- Using a straight edge, check if flap (05) is bent. Renew if flap is bent.
- If the flap (05) is worn/holed, renew the flap.
- All the shafts and arms are renewed and are tungsten carbide coated on the seal area before reinstallation. See drawing 24.57/51140 for details for the manufacture and assembly of the shafts.
- All the bearings (02) are renewed. The bearings are sealed bearings and dust proof. Only SKF, FAG or other equivalent accepted by the *Project Manager* is installed.
- All the seals (06) and gaskets are renewed with Viton oil seals.
- All the gaskets are renewed.
- The guide (14) is straightened.
- If any part is severely damaged, it is renewed.
- All the studs’ threads are cleaned.
- Any damaged/missing fasteners are renewed.
- The fastener securing the flap to the arm is provided with a split pin to ensure that the nut cannot undo itself.
- The counter weight securing pins are renewed.
- Paint the refurbished flap valve assembly.
- The *Contractor* reinstalls the Flap Valve to the same position, as where it was removed, ensuring an installation that does not leak any dust to the environment.
- The *Contractor* renews all gaskets during the installation.
- The *Contractor* uses new high tensile steel fasteners to install the Flap Valve.

CONTROLLED DISCLOSURE

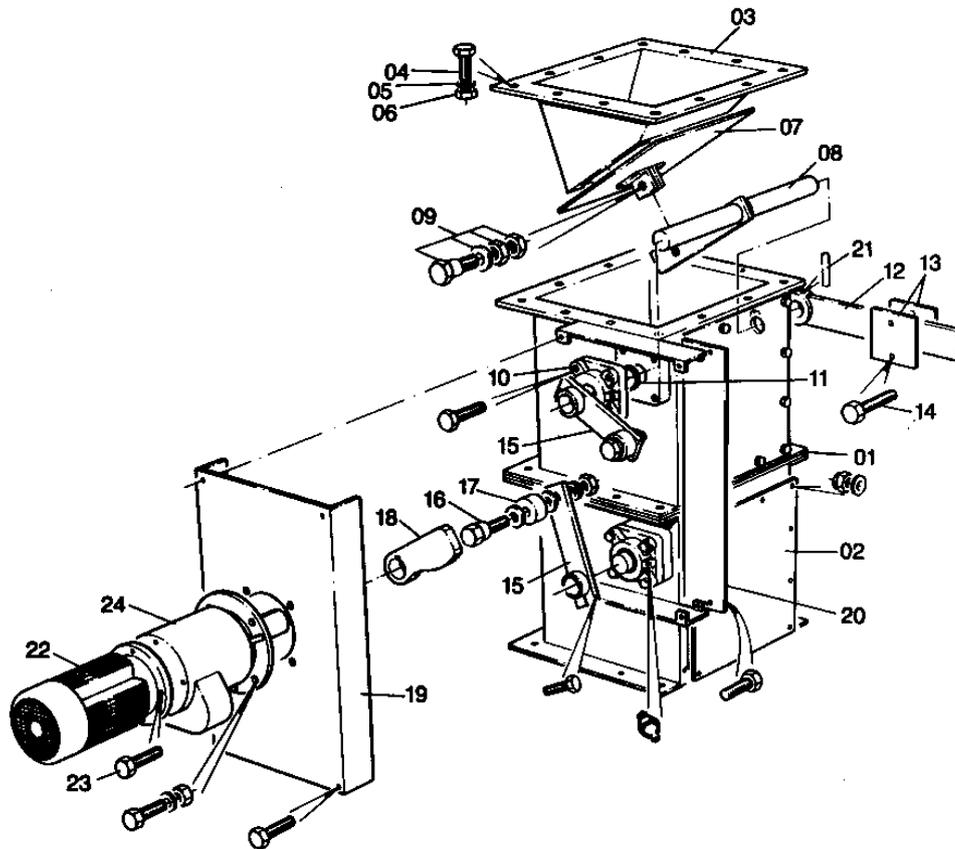


Figure 8: Double flap valve assembly

Specifications of double flap valve

- Manufacturer: AMD / Molller
- Model/Type: FV 200 DM-RQ
- Size: 300mmx300mm
- Construction: Steel
- Actuator: Gravity/motor

- Gear motor Manufacturer: SEV
- Model/Type: RF60
- Rating: 0.37kW
- Speed: 9.5rpm

h) Motor (22)

- The motor maintenance will be done by the employer. The contract is also expected to defect any abnormalities experienced or observed during plant inspection and remove and replace motor if required.

CONTROLLED DISCLOSURE

i) Flap Valve

- The *Contractor* permanently marks each Flap Valve with a unique number that would correspond to the hopper from which it is removed.
- The *Contractor* strips the complete unit from the plant and removes it for stripping and assembly in a dust free environment.
- The *Contractor* removes any silicon/gasket residue from the adjacent components' sealing flanges.
- The *Contractor* strips the complete Flap Valve into all maintainable items for inspection.
- The *Contractor* in conjunction with the *Supervisor* inspects the stripped Flap Valve for damage.
- The *Contractor* removes any silicon/gasket residue from the parts.
- If the body (01) is holed, the part is "window patched" by the *Employer*.
- If the flap valve chute (03) is holed, the part is "window patched" by the *Employer*.
- If the inspection cover (02) is holed, the part is renewed.
- Using a straight edge, check if flap (07) is bent. Renew if flap is bent. The flaps are free issue by the *Employer*
- If the flap (07) is worn/holed renew flap. The flaps are free issue by the *Employer*
- All the shafts and arms are renewed and are tungsten carbide coated on the seal area before reinstallation. See drawing 24.57/51141 for details for the manufacture and assembly of the shafts.
- All the bearings (02) are renewed. The bearings are sealed bearings and dust proof. Only SKF, FAG or other equivalent accepted by the *Project Manager* is installed.
- All the seals (06) and gaskets are renewed with Viton oil seals.
- All the gaskets are renewed.
- All the studs' threads are cleaned.
- Any damaged/missing fasteners are renewed.
- The fastener securing the flap to the arm is provided with a split pin to ensure that the nut cannot undo itself.
- Any damaged cams (18) & cam followers (17) or rollers (15) are renewed.
- The counter weight securing pins are renewed.
- The *Contractor* reinstalls the Flap Valve to the same position, as where it was removed, ensuring an installation that does not leak any dust to the environment.
- The *Contractor* renews all gaskets during the installation.
- The *Contractor* uses new high tensile steel fasteners to install the Flap Valve.
- The *Contractor*, in conjunction with the *Employer* function checks the installed double flap valves.

CONTROLLED DISCLOSURE

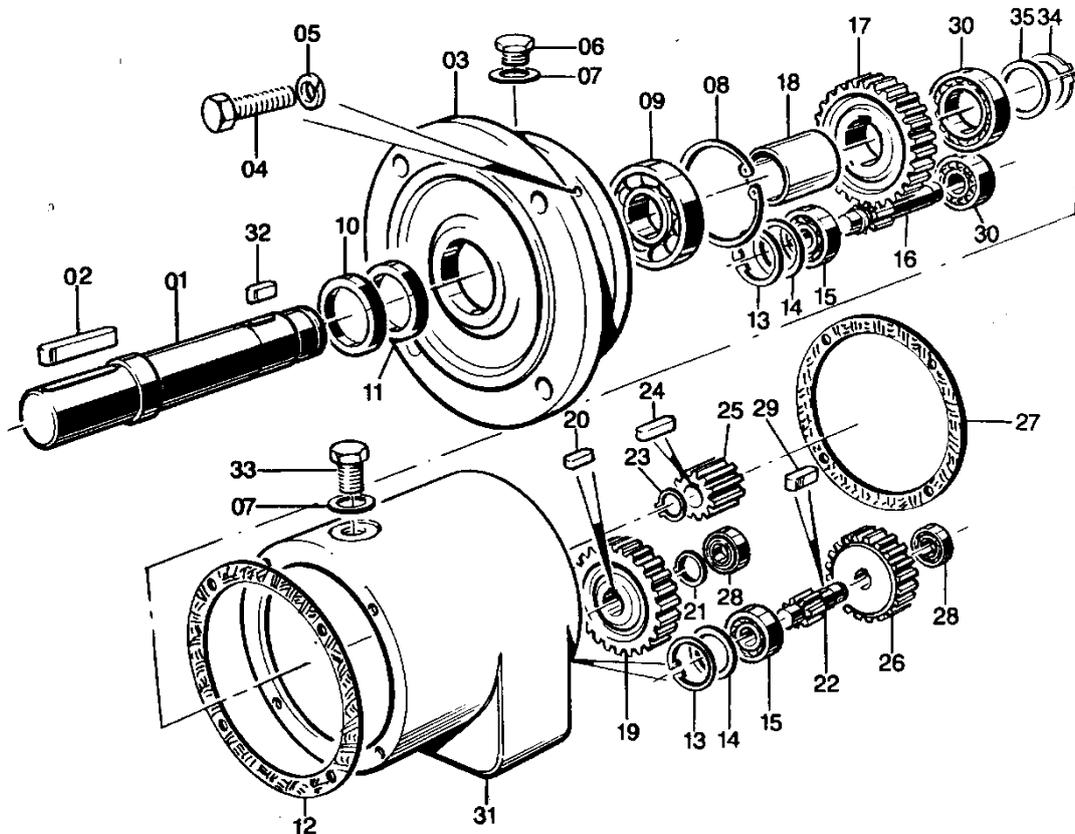


Figure 9: Double flap valve gearbox (22) assembly

- The *Contractor* strips and cleans the complete gearbox (24) completely in a clean dust free environment.
- The *Contractor* in conjunction with the *Supervisor* inspects the stripped gearbox for damage. (the part numbers in brackets are checked for correctness by the *Contractor* before any spares are bought. This will only be bought by a contractor only if the employer cannot provide these spares)
 - The sealing washer (7) is renewed. (Din 7603 Cu)
 - The ball bearing (9) is renewed if damaged/worn. (6206Z DIN625)
 - The seal (10) is renewed (dia A35 x 17 x 7, DIN 3760)
 - The seal (11) is renewed (dia 35 x 47 x 7/9)
 - The gasket (12) is renewed.
 - The roller bearing (15) is renewed if damaged/worn. (6302 DIN625)
 - The gasket (27) is renewed.
 - The ball bearing (28) is renewed if damaged/worn. (6301 DIN625)
 - The ball bearing (30) is renewed if damaged/worn. (6301 DIN625)
 - All other damaged parts are renewed.

CONTROLLED DISCLOSURE

- The *Contractor* assembles the gearbox.
- The *Contractor* arranges with the *Project Manager* for the *Employer* to assemble the motor to the gearbox and for the *Employer* to fill it with oil before the required operation.
- The *Contractor* ensures a leak free installation.

j) Manual slide gates

Specifications of manual slide gate

- Manufacture: Rula/Moller/AMD
- Model/type: NG 200 P
- Construction: Steel
- Size: 200X200 mm
- Mounting: Flange
- Actuator: N/A

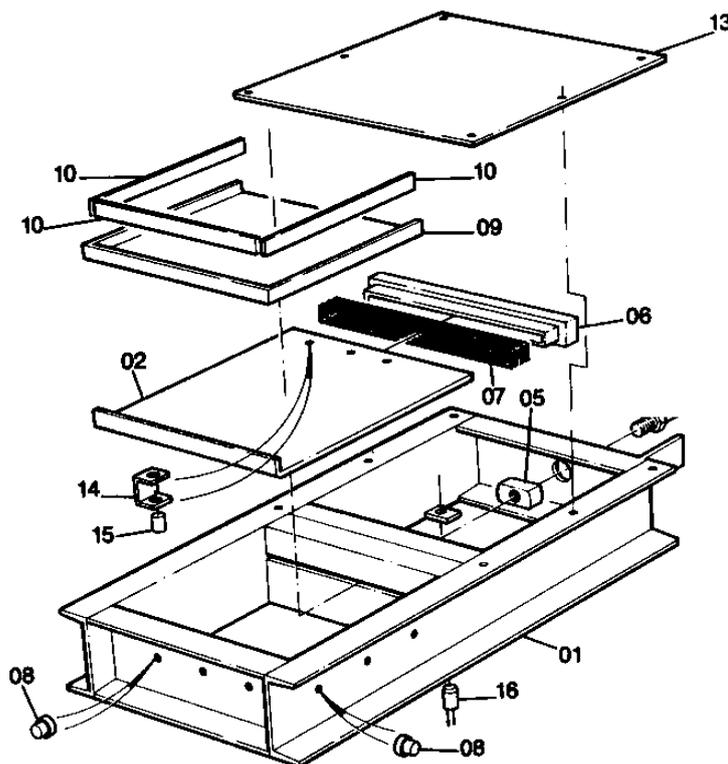


Figure10: Manual Knife Gate

CONTROLLED DISCLOSURE

k) Knife Gate

- The *Contractor* strips the complete knife gate assembly from the plant.
- The *Contractor* removes any silicon/gasket residue from the adjacent components' sealing flanges.
- The *Contractor* strips the complete knife gate assembly for inspection.
- The *Contractor* in conjunction with the *Supervisor* inspects the stripped parts:
 - All the seals, packings and gaskets are renewed. Included is Gland packing (07) Univex 150 – SQ
Inlet seal (09) is replaced with a non-asbestos, high temperature fibre seal, accepted by the Project Manager.
 - If the knife (02) is damaged, it is renewed free issue from the *Employer*.
 - If the supports (08) are damaged or missing, they are renewed with 304 SS.
 - If the clamping strips (10) are damaged, they are renewed.
 - If the spindle is damaged, it is repaired/replaced.
- The *Contractor* ensures an installation that does not leak any dust to the environment.
- The *Contractor* renews all gaskets during the installation.
- The *Contractor* ensures an installation that does not leak any dust to the environment.
- The *Contractor* uses new high tensile steel fasteners to install the new free issue knife gates.

l) Fan Implosion Damper

- The *Contractor* in conjunction with the *Supervisor* inspects the damper for visible damage.
- Any visible damaged is repaired.

3.2.6 Refurbishment of the aero slide air heater systems.

- Maintenance will be done by the contractor. The contract is also expected to defect any abnormalities experienced or observed during plant inspection

3.2.7 Under/Over Pressure Valve

- The *Contractor* in conjunction with the *Supervisor* inspects the valve for visible damage.
- The foam rubber seal is replaced with 25m x 6mm black foam rubber to ensure leak free operation
- Any visible damaged is repaired

3.2.8 Silo Cleaning

- The *Contractor* permanently marks each inspection/manhole cover with a unique number that would correspond to the position from which it is removed.
- The *Contractor* removes all inspection/manhole covers to provide access for inspection.

CONTROLLED DISCLOSURE

- The *Contractor* cleans any remaining dust out of the silo. The last 1 m of dust is removed manually.
- The *Contractor* renews all gaskets and seals during the reinstallation of the inspection/manhole covers.

3.2.9 Aeration Pads

- The *Contractor* permanently marks each Air Pad with a unique number that would correspond to the position from which it is removed.
- The *Contractor* strips the complete unit from the plant.
- The *Contractor* removes any silicon/gasket residue from the adjacent components' sealing flanges.
- The *Contractor* cleans the Air Pads and the inside of the air distribution pipework from any dust and build-up.
- The *Contractor* in conjunction with the *Supervisor* inspects the stripped Air Pad for damage.
 - If the Air Pad top frame is holed, the part is "window patched" by the *Contractor*.
 - If the Air Pad bottom casing is holed, the part is "window patched by the *Contractor*. This is a welded repair that is flush with the body.
 - The *Contractor* straightens all flanges on the Air Pad top frame & bottom casings
 - All silicone is removed from all the parts.
 - If the metal wear grids are damaged, they are weld repaired by the *Contractor*.
 - If the Air Pad is severely damaged, it is completely renewed.
 - If any of the air distribution pipework is holes, it is weld repaired by the *Contractor*.
 - The aeration membranes are renewed.
- The *Contractor* reinstalls the Air Pad to the same position, as where it was removed, ensuring an installation that does not leak any dust to the environment.
- The *Contractor* uses new high tensile steel fasteners to install the Air Pads.

3.2.10 Commissioning of the refurbished dust handling plant.

- The Contractor provides assistance with the commissioning of the plant as required by the Employer. This include agitation of dust hoppers, CARU system and unblocking of DHP slide.

CONTROLLED DISCLOSURE

3.3 ESP Detailed scope

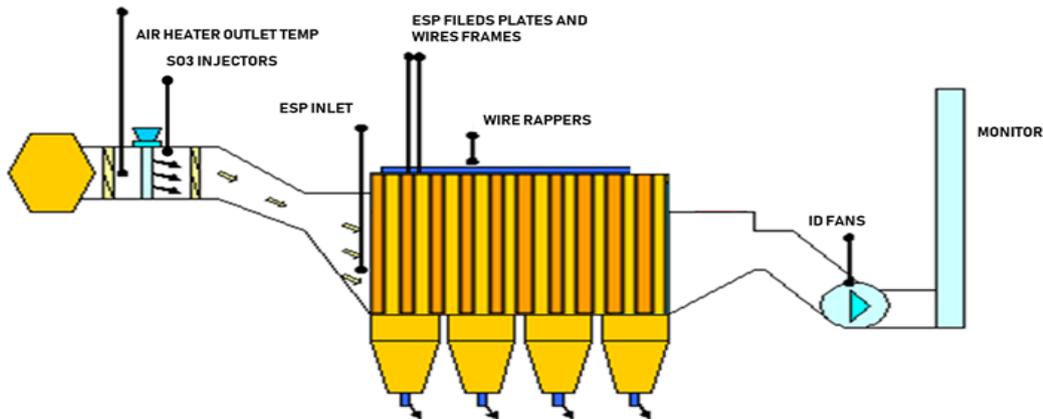


Figure 11 ESP lay out

3.3.1 Dust Hoppers

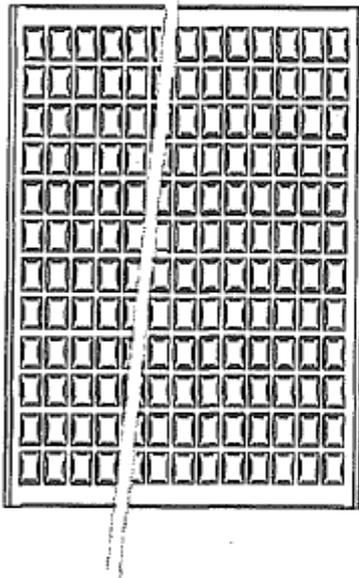
- The Contractor will ensure all dust hoppers are empty during any opportunity maintenance
- The contractor will Inspect hopper casings for leaks and repair.
- Repair hopper chains and agitator handles.
- Clear all bridges inside the dust hoppers.
- Dumping of the ash on the floor when required.
- On load rodding / unblocking of ESP dust hoppers on load as per provided procedure.
- Monitor, clean and paint the dust hopper area.
- Clean walkways off dust build-ups and other debris.
- Perform daily inspections on all dust hoppers, issue a daily report and weekly report.
- Perform blow through on all dust hopper high and low alarm to ensure true hopper level.
- Unblock all high and low alarm pipe work.

3.3.2 Baffle plate

- Repair damaged hopper baffle plates.
- Repair damaged baffle plates walkways.
- Service hinges on rear hopper baffles.
- Cleaning of the slopping at the rear end beams.

CONTROLLED DISCLOSURE

3.3.3 Perforated screen



28 a	Perforated Plate Item 10 Size 1150 X 1204 X 2 MM
28 b	Perforated Plate Item 11 Size 1150 X 2004 X 2 MM
28 c	Perforated Plate Item 12 Size 1400 X 1204 X 2 MM
28 d	Perforated Plate Item 13 Size 1400 X 2004 X 2 MM

Figure12: Perforated screen

- Replace damaged perforated screens.
- Clean and remove debris from all screens and their walkways.
- Clean all ESP fields (discharge and collection).
- Inspect the complete ESP roofing and repairs.

3.3.4 Collecting plates

- Re-align misaligned collecting plates.
- Repair bent plates.
- Remove and replace damaged collector plates.
- Tension loose collector plates.

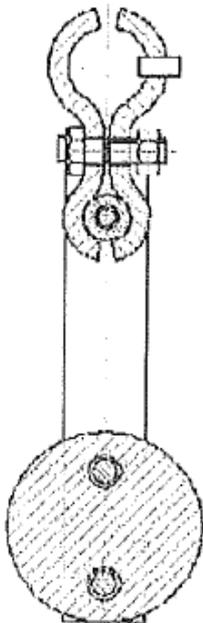
3.3.5 Wire frames

- Re-align misaligned wire frames.
- Remove broken or loose discharge wires.
- Remove and replace damaged wire frames.

CONTROLLED DISCLOSURE

3.3.6 Plate rapper system

- Inspect, top up/replace gearbox oil and reduction gearbox grease.
- Replace drive shaft seals.
- Align hammers and drive shaft.
- Replace damaged hammers.
- Repair/replace bent rapper bars.
- Repair damaged guide plates.
- Replace damaged drive support bearings.
- Align hammers with anvils.
- Replace broken anvils.
- Replace damaged retaining plates, rings and covers.
- Replace damaged shaft bearings.
- Uncouple and couple motor from the gearbox.
- Remove and replace damaged gearbox.
- Strip, assess and repair damaged gearboxes.

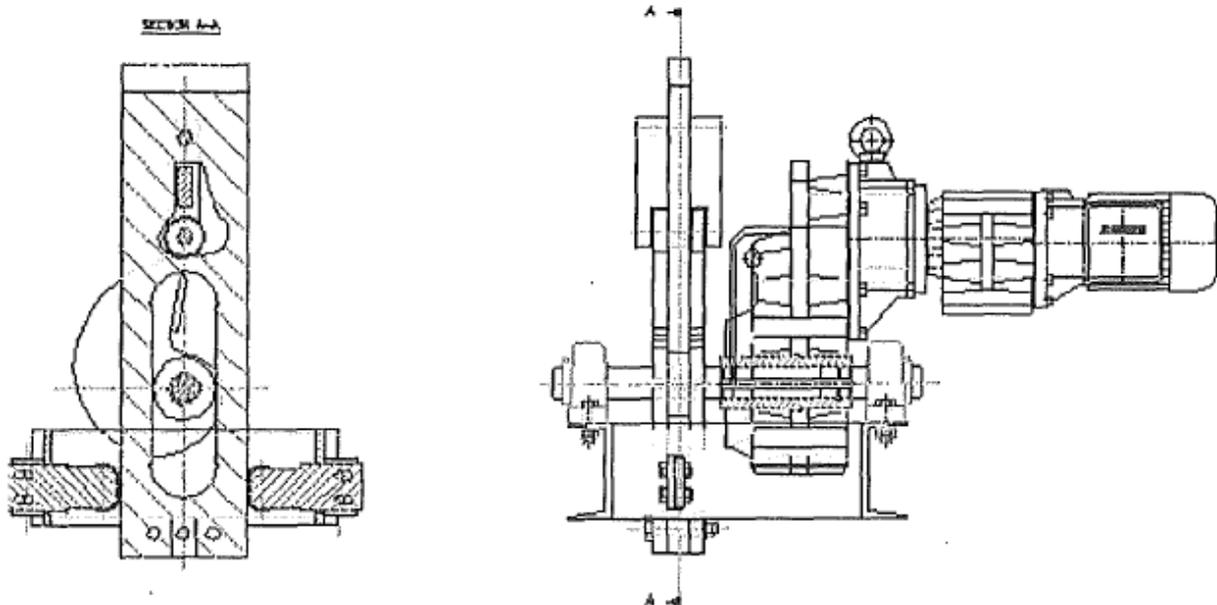


15	SE clip type hammers complete	1
15.1	Hammerhead with handles	1
15.2	Locking plates	1 SET
15.3	Tension sleeve	1
15.4	Hex bolt and nut M16 x 45 LG	1
15.5	Flat washer	1

Figure 13: Plate hammer assembly.

CONTROLLED DISCLOSURE

3.3.7 Wire Rapper System



1.
2.

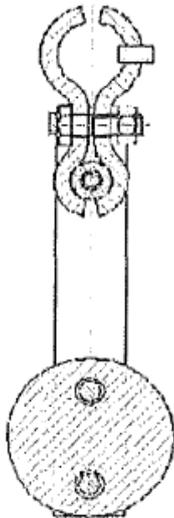
Figure 14: Cam release and wire rapper motor and gear box assembly.

- Replace damaged cam release units
- Inspect, clean and re grease cam release element..
- Clean rapper insulators.
- Replace damaged deva bushes and bearings.
- Replace worn lifting lever pins.
- Inspect and top up/replace gearbox oil.
- Replace broken shear lock pins.
- Replace damaged hammers.
- Replace damaged anvils.
- Replace broken or bent hammers shafts.
- Align hammers with anvils.
- Set rapper mechanism as per OEM procedures.
- Remove and refurbish damaged tie-rod assembly.
- Clean roof beams.

CONTROLLED DISCLOSURE

- Replace damaged coupling taper locks.
- Replace damaged fenner flex coupling.
- Replace damaged axle pins.
- Remove and replace damaged gearbox.
- Uncouple and couple motor from the gearbox.

Strip, assess and repair damaged gearboxes.



26	NE Clip type hammers complete	304
26.1	Locking plates	608
26.2	Hex bolt and nut M16 x 45 din 933	304
26.3	M16 Flat washer 2 per/set	608

Figure15: Wire rapper hammer

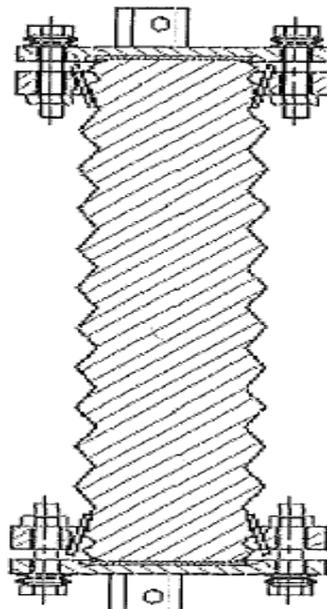


Figure 16 Wire rapper insulator

CONTROLLED DISCLOSURE

3.3.8 Access doors

- Roof beam access doors seals(penthouse).
- Side access door seals.
- Dust hopper access door seals.
- Repair damaged door hinges and locking mechanism.
- Maintain the castell key system mechanisms.

3.3.9 Access precipitators

- Get permit to work (LV PTW, Dust hoppers PTW and Gas Pass Permit).
- Open all access doors.
- Adhere to Environmental Legislation requirements.
- Adhere to Quality as per ISO standards.
- Create QCP for all activities and approved by Engineering, Maintenance & TSS.
- To carry any activities, to keep Duvha within the Atmospheric License.
- Perform internal inspection and fault finding on all ESPs tripping on under voltage and or arching and parking and submit report of findings and repairs
- Perform daily inspections on the ESP including but not limited to plate, wire rappers and issue a daily feedback and weekly report.
- Perform internal inspection on ESP including but not limited to(Access doors , Wire Rapper System, Plate rapper system, Wire frames, Collecting plates, Perforated screen, Dust hoppers, Walk ways, Baffle plates ,Anvil and Shaft alignment)during opportunity maintenance and submit a report.
- Inspect ESP roof for possible leaks.
- Inspect and lubricate all mechanical components (gearboxes, cam release elements, etc).

3.4 Outage detailed scope for DHP and ESP

Item no	Description	Quantity	Price
1.	Course Ash Removal System		
1.1	Remove all defected Hydrovac isolating valve and replace with new (as per spec on SAP)	8	
1.2	Remove Hydrovac Nozzles and replace with new	24	
1.3	Remove pipe and bend conduct thickness test to determine repair or replacement	16	
1.4	Open and clean blocked pipes on CARU system	40	

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1.5	Commissioning crew for CAR system	1	
2	Hopper slide gate		
2.1	Remove slide gate and fit washing pans. Blank of aero-slide	40	
2.2	Inspect slide gate frame and blade	40	
2.3	Refurbish damage slide gates	7	
2.4	Remove and replace pneumatic air cylinder.	40	
2.5	Remove all defects and replace with new or refurbished slide gate valves. (which is according to spec SAP)	40	
3.	Silo discharge system		
3.1	Remove defected slide gates hand operated	7	
3.2	Remove defected pneumatic valves	7	
3.3	Unblock discharge lines from the silo	7	
3.4	Remove and replace pneumatic air cylinders	7	
3.5	Remove and replace defected water isolating valve	8	
3.6	Unblock water box nozzles and replace defected water box	7	
3.8	Strip the connecting pipe between slide gate and hydro-vac for inspection. Replace pipe if thickness is less than 4mm from the thickness test	7	
3.9	Strip and inspect Y piece change defected based on thickness test, HP clean and paint Y piece that can be renewed.	7	
3.10	Change defected venturi pipes and extension pipes. Re- used venturi pipes and extension pipes should be HP cleaned and painted.	14	
4.	Flap valves		
4.1	Remove flap valves and inspect. Replace all defected flap valves and check the functionality.	16	
4.2	Inspect and Repair flap valve cams, followers, flap and chutes.	16	
4.3	Inspect and renew seals	16	
4.4	Inspect and re-install flap valves	16	
4.5	Set counter weights	16	
4.6	Function check pneumatic piston, solenoid spool, v/v.	16	
4.7	Remove/replace motor for EMD.	16	
4.8	Drain and refill gearbox oil.	16	
4.9	Mark each item to ensure it is replaced in the same position	16	

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5	Aero slides		
5.1	Clean out old dust and obstructions inside slides. Slide 1 to 8	8	
5.2	Remove aero slides and inspect membrane and casing	8	
5.3	Replace all membranes per slide section		
5.4	Replace all damaged slide gates		
5.5	Replace inspection cover seal		
5.6	Renew seal between aero slides		
5.7	Replace all patched aero slide with new slides (include all cages of the aero slide.		
6.	Airlift vessel		
6.1	Strip the airlift	2	
6.2	Inspect airlift vessel pipe and replace if necessary.	2	
6.3	Replace the membranes	2	
6.4	Check the functionality of the airlift NRV and replace if necessary.	2	
6.5	Clean airlift vessel sump	2	
6.6	Inspect and replace door seals	2	
6.7	Inspect and replace side glass	4	
7	Expansion impact chute		
7.1	Inspect impact chute	2	
7.2	Repair/replace deflector plate	2	
7.3	Inspect cover and replace if damaged	2	
8	DHP Silo		
8.1	Clean out residual dust	1	
8.2	Clean out dust ingress into pads	30	
8.3	Replace membrane on pads	30	
8.4	Repair/replace broken pads and holes in piping	10	
8.5	Blow aeration lines clean	7	
8.6	Inspect and replace protection grid on membrane pad		
8.7	Check pressure/vacuum relief flap.	1	

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8.8	Replace seal on access door	1	
8.9	Inspect Silo roof for leaks and repair accordingly		
9	DHP Silo filter system		
9.1	Inspect casing for wear and repair casing leaks	1	
9.2	Overhaul silo implosion dampers	1	
9.3	Remove rotary valve clean and inspect	1	
9.4	Overhaul rotary valve	1	
9.5	Replace filter bags	180	
9.6	Replace pulse pipes	30	
9.7	Inspect and replace exhauster fan dampers	2	
10.	Drain pumps in airlift bilge sump		
10.1	Install an electric pump to drain water if jet pulsion pump is not working.	2	
10.2	Remove jet pulsion pump and service	2	
10.3	Refurbish or replace water isolation valves	2	
10.4	Refurbish bilge sump target nozzles	2	
10.5	Clean bilge sump remove ash and scrap material.	2	
11.	Inspect the vent fan pipe and replace if necessary or based on thickness test results.		
12	Inspect and replace DHP silo vent pipe fan check valve		
13.	Clean and paint walk all ways around DHP area		
14.	Access precipitators		
14.1	Get permit to work (LV PTW, Dust hoppers PTW and Gas Pass Permit).		
14.2	Open all access doors.		
14.3	Adhere to Environmental Legislation requirements.		
14.4	Adhere to Quality as per ISO standards.		
14.5	Create QCP for all activities and approved by Engineering, Maintenance & TSS.		
14.6	To carry any activities, to keep Duvha within the Atmospheric License.		
15.	Inspection		
15.1	Perform daily inspections on the ESP including but not limited to plate, wire rappers and issue a daily feedback and weekly report.		

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15.2	Perform daily inspections on all dust hoppers, issue a daily report and weekly report.		
15.3	Perform internal inspection on ESP including but not limited to(Access doors , Wire Rapper System, Plate rapper system, Wire frames, Collecting plates, Perforated screen, Dust hoppers, Walk ways, Baffle plates ,Anvil and Shaft alignment)during opportunity maintenance and submit a report.		
15.4	Inspect ESP roof for possible leaks.		
15.5	Inspect and lubricate all mechanical components (gearboxes, cam release elements, etc).		
16.	Access doors		
16.1	Roof beam access doors seals(penthouse).		
16.2	Side access door seals.		
16.3	Dust hopper access door seals.		
16.4	Repair damaged door hinges and locking mechanism.		
16.5	Maintain the castell key system mechanisms.		
17.	Wire Rapper System		
17.1	Replace damaged cam release units.		
17.2	Clean rapper insulators.		
17.3	Replace damaged deva bushes and bearings.		
17.4	Replace worn lifting lever pins.		
17.5	Inspect and top up/replace gearbox oil.		
17.6	Replace broken shear lock pins.		
17.7	Replace damaged hammers.		
17.8	Replace damaged anvils.		
17.9	Replace broken or bent hammers shafts.		
17.10	Align hammers with anvils.		
17.11	Set rapper mechanism as per OEM procedures.		
17.12	Remove and refurbish damaged tie-rod assembly.		
17.13	Clean roof beams.		
17.14	Replace damaged coupling taper locks.		
17.15	Replace damaged fenner flex coupling.		
17.16	Replace damaged axle pins.		
17.17	Remove and replace damaged gearbox.		
17.18	Uncouple and couple motor from the gearbox.		

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17.19	Strip, assess and repair damaged gearboxes.		
18	Plate rapper system		
18.1	Inspect, top up/replace gearbox oil and reduction gearbox grease.		
18.2	Replace drive shaft seals.		
18.3	Replace damaged hammers.		
18.4	Repair/replace bent rapper bars.		
18.5	Repair damaged guide plates.		
18.6	Replace damaged drive support bearings.		
18.7	Align hammers with anvils.		
18.8	Replace broken anvils.		
18.9	Replace damaged retaining plates, rings and covers.		
18.10	Replace damaged shaft bearings.		
18.11	Uncouple and couple motor from the gearbox.		
18.12	Remove and replace damaged gearbox.		
18.13	Strip, assess and repair damaged gearboxes.		
19.	Wire frames		
19.1	Re-align misaligned wire frames.		
19.2	Remove broken discharge wires.		
19.3	Remove and replace damaged wire frames.		
20.	Collecting plates		
20.1	Re-align misaligned collecting plates.		
20.2	Repair bent plates.		
20.3	Remove and replace damaged collector plates.		
20.4	Tension loose collector plates.		
21.	Perforated screen		
21.1	Replace damaged perforated screens.		
21.2	Clean all screens.		
21.3	Clean all precip fields (discharge and collection).		
21.4	Inspect the complete precip roofing and repairs.		
22.	Dust Hoppers		
22.1	Empty all dust hoppers when required.		
22.2	Inspect hopper casings for leaks and repair.		

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22.3	Repair hopper chains and agitator handles.		
22.4	Clear all bridges inside the dust hoppers.		
22.5	Dumping of the ash on the floor when required.		
22.6	Monitor and clean the dust hopper area.		
23.	Walk ways		
23.1	Clean walkways off dust build-ups and other debris.		
24	Baffle plates		
24.1	Repair damaged hopper baffle plates.		
24.2	Repair damaged baffle plates walkways.		
24.3	Service hinges on rear hopper baffles.		
24.4	Cleaning of the slopping at the rear end beams.		
25.	Tests		
25.1	Suspend/Clear permit to carry out post repairs test.		
25.2	Test run rapping system prior electrical tests.		
25.3	Obtain permits to fix defects found after tests.		
26.	Weekend and outage labour		
26.1	Supervisor		
26.2	Safety officer		
26.3	Welder		
26.4	Fitters		
26.5	Fitter Assistants		
26.6	Transport per day		
26.7	Consumables and equipment		
26.8	Rigger		
26.9	Quality Controller		
26.10	Consumables (welding rods, gas, cutting disks etc)		
26.11	Responsible Person (PSR authorised)		
26.12	Authorised Supervisors (PSR authorised)		
26.13	Safety Officers		
26.14	Planner		

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26.15	On-site transport		
26.16	SHE Reps		
26.17	Fire Watch		
26.18	Tools and equipment		
27	Precip spares to supply		
27.1	Retaining rings		
27.2	Retaining plates		
27.3	M12 X100 HT Bolts and nuts		
27.4	SE retaining rings		
27.5	Intermediate brackets		
27.6	Lifting lever pins		
27.7	Upper tie rods		
27.8	NE Rollers		
27.9	NE Roller bush		
27.10	Lift insulator		
27.11	SE Hammer shaft L/H		
27.12	SE Hammer shaft RH		
27.13	NE Hammer clips		
27.14	SE Hammer clips		
27.15	Shear lock pins		

4. ACCEPTANCE

This document has been seen and accepted by:

Name	Designation
Mzamo Ngomane	Outage
Ndweleni Tshivhase	Boiler
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Richard Tshehla	HMD ash plant.

5. REVISIONS

Date	Rev.	Compiler	Remarks
April 2024	0	EP Mohlala	N/A

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6. DEVELOPMENT TEAM

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

- Thami Khumalo
- Naeem Tootla
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