

# SCOPE OF WORK FOR MILLING PLANT MAINTENANCE

## INTEGRITY, TRACEABILITY AND DUE DILIGENCE

The contractor partners, directors and shareholders must be South African Citizens by birth with the appropriate proof and security clearances.

## DESCRIPTION OF THE SERVICE

The scope of work consists of core services (daily routine maintenance) and overhauling of milling plant group components as per the available maintenance work instructions and procedures and outage works. Any of the work is doable as per all defects within the below mentioned boundaries.

### 1.1.1 BOUNDARIES OF RELEVANT PLANT

#### Includes:

##### **The Mill**

The mill internally & externally, the gearbox and its auxiliaries i.e. the lube oil system, cooling water system (from the horizontal common supply and discharge pipes), tensioning system from the gas cylinder & the mill motor. The contractor collects, removes, installs and aligns all the motors.

##### **Raw coal system**

The bunker coal gate to the mill inner raw coal pipe including all the components within the raw coal distribution system, the coal feeder and its auxiliaries.

##### **PF distribution system**

The two PF outlet pipes on top of each mill classifier to the last flange of the PF pipe below the burner box including all the components on the PF distribution system.

##### **Hot and cold air system:**

###### **Hot air:**

- The hot air common duct to the primary air (PA) fan suction damper excluding the damper and its pneumatic opening and closing controls at unit 1 - 5.
- The hot air common duct to the PA fan louvre vane control damper excluding the damper and its electrical opening and closing controls at unit 6 – 10.
- The primary air fan outlet casing flange to the mill PA inlet flanges including expansion joints and welds on the mill inlet pressure tapping points to the next fitting.
- From the hot air common duct to the PA fan suction damper including the hot air damper seals and its controls.
- The hot air damper hydraulic oil supply pipes from the Lockheed pump below 40feet level to the dampers, the cylinders, the valves and all the accessories for the damper controls at unit 1 – 5.
- The hot air common duct, the expansion bellows, the damper seals, the damper, the control arms and the mechanical part of the actuator, the motor, the venture, the hot PA suction duct and the quick closing damper with its accessories at unit 6 – 10.

###### **Cold/Tempering air system:**

- From the cold air common duct to the PA inlet flange, the mechanical part of the damper controls, the tadpole seals and the cold air ducting excluding the electrical actuator at unit 1 – 5.
- The cold air common duct, the expansion bellows, the damper seals, the damper, the control arms, the mechanical part of the actuator the motor at unit 6 – 10 and the colds air discharge duct to the hot PA duct at unit 6 – 10.

**Excluded:**

All C&I and electrical work

### 1.1.2 Scope of work

**Pre Job Plan:**

- Compile risk assessment and request the permit to work from the relevant Senior Shift Supervisor Operating
- QC must be notified prior to any inspection or work to be carried out
- Inform workers about all the risk hazards, precaution in case of emergency or an accident, required PPE and scope of work
- Confirm at the planners meeting date and time day before inspection or test is required
- Ensure an isolation permit has been obtained and gas test certificate issued
- Ensure hot work approval documents/permit has been obtained and a fire watcher is available.

**Safe Wok Procedure:**

- Ensure that all work is done in compliance with Occupational Health and Safety Act of 1993
- Ensure that all dangers/hazards have been identified and explained
- Wear necessary protective clothing such as hard hat, overalls, safety shoes, leather gloves, eye protection and ear protection
- Do not work under crane load or suspended load
- Always use legal tools or equipment or approved hand-made tools
- Beware of fellow workers safety
- Beware of ultra violet rays and hot surfaces when welding work in progress
- Beware of sharp edges and falling or rolling objects
- Safety barriers and notices must be erected
- All workers will stand clear when equipment and parts being lifted or lowered
- Work area must be kept clean at all times
- Work area to be adequate lit and only 32 v lighting to be used inside plant
- **Note:** Always watch out for the nipping points

**Risk/Precautions:**

- The mill is a confined space, gas test certificate must be issued
- There must be sufficient light and ventilation
- Only 32v light to be used inside the mill
- A person cleaning around mill must wear the dust mask to prevent the dust intake which will affect a person's health and dispose the pulverized fuel at the correct area
- The area is noisy and dusty, ear muffs and dust must be used
- Beware of hot plant and working at height
- Beware of ultra violet when welding work in progress
- Ensure that the door is properly hooked onto the bracket
- Do not use compressed air for external cleaning.

**Note:** Refer to the Milling Plant base line risk assessment for comprehensive milling plant related risks, hazards and dangers.

**SHEQR requirements:**

- The Quality Inspection Plan as per the procedures and instructions( Appendix D) are developed and are to be followed to ensure quality work
- Before work commence, the supervisor or responsible person must assess the working area and inform the co-workers about the **Potential Risks or Hazards**.

**Note:** The basic hazards and precautions are indicated in the Risk Assessment above.

**NORMAL MILLING PLANT MAINTENANCE ACTIVITIES AS PER THE ENGINEERING STRATEGY**  
**HSSTPMM 005 Rev. 3**

**1. BALL CHANGE/ADD AND SERVICE UNTI 1- 7 (INSTRUCTION HSIPMM 558)**

***Frequency: During Outage as per the Engineering philosophy and as and when required.***

**1.2 Clean mill internally:**

- 1.2.1 Position portable step ladder.
- 1.2.2 Open the top and the main inspection door and obtain gas test certification.
- 1.2.3 Use a brush or broom to sweep the PF on top of the ring.
- 1.2.4 Use scrapper to remove PF from reject brushes doors and reject box.
- 1.2.5 ***Never use compressed air*** to clean the mill and feeder on the outside.
- 1.2.6 Remove the coal, debris, PF, clinkers and possible tramp irons from reject chamber.
- 1.2.7 Clean around the mill by using a broom ***never compressed air***

**1.3 Lift the grinding ring:**

- 1.3.1 Remove the mill motor fan cover and install special bracket.
- 1.3.2 Depressurise the hydraulic loading system.
- 1.3.3 Remove the top tension rams pins and use the clamp with chain to support the cylinders.
- 1.3.4 Loosen the silent block bushes support brackets.
- 1.3.5 Loosen the stay brackets.
- 1.3.6 Visually check the lugs.
- 1.3.7 Using the lever hoist of 6 ton and of shackle 12 ton, pull the loading unit external arms until knuckles disengage from the stirrups.
- 1.3.8 Lift the spider and the top ring with 4 off the 6 ton lever hoists and special chain sling (***Use the ring protection pieces***)
- 1.3.9 Remove the balls from the mill with special pins and the sling with the mobile crane or special boom fitted to forks of the forklift.
- 1.3.10 Clean the PF and the raw coal from bottom ring.
- 1.3.11 Replace the missing tiles and silicone sealant.
- 1.3.12 **1.4 Hold points:**
- 1.3.13 Measure the grinding balls and point the size but if less than 600mm in diameter – dispose at the correct area in the scrap yard.
- 1.3.14 Measure the rings profile and record in the notification.
- 1.3.15 Check and repair the throat segment (Rotating type and stationary type) wear and record throat gap (Average: 19mm on stationary throat) – Call out PPD to inspect and confirm and sign QIP.

**Note:** When welding and repairing of gladiator fingers beware of UV rays and hot surfaces.

**1.4 Replacing the grinding balls:**

- 1.4.1 Install the correct size balls into the mill (verify the size with the Supervisor or Technician).
- 1.4.2 Lower the top rings onto the grinding balls.
- 1.4.3 Remove the lifting equipment and rotate the spider ring until knuckles (swivels) are at the main door.
- 1.4.4 On a grinding ball addition and service, replace long stirrup and short swivels with short stirrup and long swivels (Knuckles).
- 1.4.5 Align the stirrups with the internal arms by rotating the mill motor.
- 1.4.6 Inspect and repair the inner raw coal pipe.

- 1.4.7 Engage the loading levers short swivels (knuckles) with the stirrups by pulling with the crane (loading lever number 3 with 6 ton pull lift).
- 1.4.8 Recharge the cylinders with gas at required pressure and also check for gas leaks.
- 1.4.9 Open motor/gearbox coupling guard and inspect the condition of the coupling element and replace it if cracked.
- 1.4.10 Close the mill doors and ensure that they are air tight sealed.
- 1.4.11 Inspect and repair the inner and the outer reject doors and seals.
- 1.4.12 Ensure that workers tools and debris are removed from the mill as per PSR.

## **1.5 Clean work area:**

- 1.5.1 Clean the feeder and repair as per feeder inspection and repair as per instruction HSIPMM064 and HSIPIIM 086
- 1.5.2 Inspect and repair the raw coal pipe below feeder.
- 1.5.3 Clean and change the lube oil filters and repair any oil leaks or defects in the mill gearbox lube oil system as per the system service instruction HSIPIMM 087

## **1.6 Clear the permit:**

**Note:** Ensure that all the relevant documentation is submitted as per the PSR GGR 0992 (use the latest revision applicable as it supersedes the older version).

## **2. GRINDING BALL SIZE CHECK AND INTERNAL INSPECTION (UNIT 1 to 7) INSTRUCTION HSIPM084 AND HSIPMM546**

**Frequency:** *During the Outage, as per the Engineering philosophy and as and when required.*

### **2.1 Ball size check:**

- 2.1.1 Position portable step ladder close to the mill door.
- 2.1.2 Open the door and lower with the appropriate lifting equipment.
- 2.1.3 Measure the grinding ball sizes outside diameter with the special callipers and record; they are easily accessible through the inspection door.
- 2.1.4 Check the top and the bottom rings for any possible damages or defects.
- 2.1.5 Inspect and repair the other mill components as per the Thermal Performance Based Inspection of Vertical spindle Mills standard 240-115052916.
- 2.1.6 **Hold point**
- 2.1.7 Close the door and secure. Ensure that a proper sealing is achieved.
- 2.1.8 Inspect the entire mill group system and create defect notifications if found, remove the scaffold.

### **2.2 Clear the permit:**

**Note:** Ensure all the relevant documentation is submitted as per the PSR GGR 0992 (use the latest revision applicable as it supersedes the older version).

## **3. MILL REBUILD OR OVERHAUL (UNIT 1 – 7) INSTRUCTION HSIPMM074**

**Frequency:** *During the Outage, as per the Engineering philosophy and as and when required.*

### **3.1 Cleaning the mill internally:**

- 3.1.1 Open the inspection door.
- 3.1.2 Make sure the damper is open to boiler and that there is a draft flowing to the boiler.
- 3.1.3 Stand outside the mill and use an air hose with a steel pipe at the front and blow the coal and P.F. in the throat to the reject chamber
- 3.1.4 **Note:** Wear gloves, safety goggles and dust mask before commencing with any PF or dust cleaning

- 3.1.5 Do not use compressed air to clean mill and feeder on the outside
- 3.1.6 Remove the coal and PF from reject chamber
- 3.1.7 Clean around the mill by using a broom (no compressed air)

### **3.2 Mill motor removal:**

- 3.2.1 All electrical supply to be disconnected by electrical department
- 3.2.2 Remove and inspect the coupling guards and the coupling element.
- 3.2.3 Remove and inspect the base bolts and the jacking bolts.
- 3.2.4 EMD to assist when motor is removed.

### **3.3 Raw coal pipes:**

- 3.3.1 Remove and inspect the raw coal pipes between feeder and the mill top (tiled with ceramic wear protection linings)

### **3.4 Production outlet pipes:**

- 3.4.1 Support outlet pipes by using a 6 ton chain block, loosening flanges, and bolts and remove production outlet pipes/bends

### **3.4 Removal of the mill top/classifier:**

- 3.4.1 Remove classifier flange bolts using the impact wrench.
- 3.4.2 Loosen the lower classifier cone and remove classifier stays.
- 3.4.3 Lift the lower cone into position.
- 3.4.4 Using the mobile crane, remove the mill top/classifier and safely support it on A-frames.

### **3.5 Stripping of the mill**

- 3.5.1 Depressurise the hydraulic loading system.
- 3.5.2 Remove the top pins and lower the tension ram cylinders onto special brackets.
- 3.5.3 Remove flexible gas pipes.
- 3.5.4 Remove the top tension rams pins and use the clamp with chain to support the gas cylinders and lower them with the forklift lift.
- 3.5.5 Use the lever hoist to pull the lever of the loading unit to disengage the knuckles from the stirrups.
- 3.5.6 The spider or top ring shall be removed with a crane and special slings.
- 3.5.7 Remove the grinding balls from the mill (Refer to the Ball change procedure HSIPMM 558).
- 3.5.8 Loosen three (3) throat segments (rotating type) and remove (cut if solid/stationary type).
- 3.5.9 Remove the bottom ring.
- 3.5.10 Remove the centre plate and loosen the yoke bolts.
- 3.5.11 Remove the remainder of the throat segments.
- 3.5.12 Use the crane to remove the mill table.  
**Note:** Be careful not to damage labyrinth seal.
- 3.5.13 Remove the gearbox jacking and base bolts.
- 3.5.14 Drain the oil from the gearbox and remove the oil pipes.
- 3.5.15 Withdraw or remove the gearbox and transport it to cleaning bay.

### **3.6 Cleaning:**

- 3.6.1 Clean the mill, the classifier and all loose parts thoroughly
- 3.6.2 Record all profiles and ball sizes

### **3.7 Inspections:**

- 3.7.1 Inspect the raw coal pipes for wear not less than 3 mm thick.
- 3.7.2 The Production outlets for erosion.
- 3.7.3 The Mill gearbox base for wear and on the base contact surfaces and the gearbox feet out of level (Maximum 0.2 mm. If worn, it must be machined and corrected. Thickness packers to be made up to ensure alignment of bottom ring and mill throat. Base height to the dome bottom = 1245 mm)

- 3.7.4 Inspect horseshoe for wear.
- 3.7.5 Check hold down bolts and hold threads.
- 3.7.6 The Inner reject door must be repaired if damaged.
- 3.7.7 The Outer reject door to be replaced.
- 3.7.8 Check and repair reject chamber liners.
- 3.7.9 Inspect seal air cone and seal rings.
- 3.7.10 Classifier blade to be repaired and reset to 290 mm at 35 ° on mills 1 – 5.
- 3.7.11 Inspect vortex finder, repair or replace. The measured length from top plate must be 450 mm ± 3.
- 3.7.12 Inspect the classifier cone, coal inlet pipe.
- 3.7.13 Remove the turret top to renew the liner.
- 3.7.14 Check & turret outlets 90 °. Re-tile with 6 mm tiles with outlet pipes as centres.
- 3.7.15 Renew classifier return skirts.
- 3.7.16 Inspect hanger brackets. Hanger studs and classifier studs.
- 3.7.17 Inspect table keys.
- 3.7.18 Inspect yoke surface if damaged, renew or re-sleeve such it is within > 0.2 mm concentricity
- 3.7.19 **Hold point for quality inspection**

### **3.8 Assembling the mill:**

- 3.8.1 Ensure that all surfaces are clean and smooth.
- 3.8.2 Coat the contact surfaces of mill gearbox feet and base with anti-seize compound.
- 3.8.3 Position the gearbox firmly against the horse shoe and align gearbox axis to metal axis and secure.
- 3.8.4 Coat output coupling on the gearbox with anti-seize compound.
- 3.8.5 Lower the table yoke on the output coupling and ensure key fits properly and secure the yoke bolts.
- 3.8.6 Check the yoke alignment to steel ring clearance at 4 points (0.7 mm – 0.2 mm)
- 3.8.7 **Hold point QC to check**
- 3.8.8 Fit labyrinth seal and check alignment at four points 0.5 mm ± -0.1.
- 3.8.9 **Hold point QC to check**
- 3.8.10 Fit the bottom ring onto the table, ensure the keys fit neatly and ring rests flat on the table.
- 3.8.11 Check the level between throat and ring.
- 3.8.12 Rebuild the throat and set to 19 mm and seal weld.
- 3.8.13 **Hold point QC and witness**
- 3.8.14 Fit the ball holding down units to mill casing.
- 3.8.15 Place 9 x 730 mm balls on bottom ring
  - Refer Ball change instruction HSIPMM 558)
- 3.8.16 Lower the top or spider ring in position.
- 3.8.17 Tighten the new stirrups bolts and weld metal plates to lock into position.
- 3.8.18 Fit correct length knuckles to spider ring (Hook up stirrups with lever hoist pull in hold down unit levels to enlarge stirrups and knuckles)
- 3.8.19 Lift the classifier / till top and position correctly, align with production outlets Ensure that flanges are well coated with sealing compound
- 3.8.20 Secure mill / classifier flanges
- 3.8.21 Fit the production outlets and raw coal pipes and raw coal pipe fit gaskets and sealing compound on all flanges
- 3.8.22 Install and align mill motor
- 3.8.23 **Hold point QC and witness**
- 3.8.24 Fit new reject brushes
- 3.8.25 Fit mill motor coupling element and replace safety guard
- 3.8.26 Ensure all knuckles and stirrups engage correctly
- 3.8.27 Install hydraulic cylinders and fit oil / gas pipes
- 3.8.28 Secure silent block bush brackets nuts
- 3.8.29 Fit gearbox oil pipes and fill gearbox with oil to correct level
- 3.8.30 **Hold point for quality inspection and quality control**

### **3.9 Clear the permit:**

Note: Ensure all the relevant documentation is submitted as per the PSR GGR 0992 rev.2

### **3.10 Prepare mill for service:**

3.10.1 Box up/close all mill inspection doors and check for leaks

### **3.11 Re-commission the mill:**

**Note:** Ensure the relevant recommissioning check list is followed and signed.

## **4. ALIGNMENT AND TENSIONING OF THE PRESSURE RING AND PHI MILL SERVICE AND REPAIR UNIT 8 -10 (INSTRUCTION HSIPMM545 AND HSIPIM085)**

- **Frequency:** Outage, as per the engineering philosophy and as and when required.

### **4.1 Pre job arrangements:**

4.1.1 Compile risk assessment

4.1.2 Do a pre-job brief

5.1.3 Obtain Permit to Work (Refer to Eskom Plant Safety Regulation – GGR 0992 rev.2)

5.1.4 QC must be notified two (2) days prior to any inspection to be carried out as per RWM

5.1.5 Inform the workers about all the risk hazards, precaution in case of emergency or an accident, required PPE and scope of work

5.1.6 Risk assessment shall be revised when the scope of work or plant condition changes

5.1.7 Minimise the use of flogging spanners by using pneumatic, safe finger or hydraulic tools or slogging hammers.

### **5.2 Following steps are in sequential:**

5.2.1 Obtain permit to work as per Plant Safety Regulations.

5.2.2 Sign workman's declaration if work is not done by the responsible person

### **5.2 Mill internal cleaning:**

5.2.1 Open inspection door

5.2.2 Make sure riffle box is open to the boiler and that there is a draft flowing to the boiler

5.2.3 Stand outside mill and use air hose with a steel pipe at the front and blow the coal and PF in the throat to the reject chamber (Please note: wear gloves, safety goggles and respirator)

5.2.4 Do not use compressed air to clean mill and feeder on the outside

5.2.5 Remove the coal and PF from reject chambers

5.2.6 Clean around mill or externally by using brooms (no compressed air)

### **5.3 Riffle box and PF distribution/splitter box inspection and repair:**

5.3.1 Remove thermal insulation from riffle box covers

5.3.2 Remove covers i.e. bottom and top covers

5.3.3 Clean internally (Ceramic tiles, raw coal and PF, rough coal in the riffle box damper means inefficient grinding or raw coal leaking into the PF system)

5.3.4 Ensure that the dampers operate freely (Left hand threaded spindle) in both directions (open/shut) and confirm if contact is made by the limit switches

5.3.5 Inspect and repair the first (Bottom flapper stage) and second stage (Top riffle plates/vanes)

5.3.6 Clean and lubricate the spindle and hand wheel nut.

- Refer to procedure number HSPMM048

5.3.7 **Hold point for Quality controller, Milling plant supervisor and Plant performance**

5.3.8 Repair as required and as per the work instruction or replace

5.3.9 **Hold point for quality controller**

5.3.10 Replace covers with an airtight seal and notify contractors to replace thermal insulation

#### **5.4 Raw coal feeder inspection and repair:**

- 5.4.1 Close feeder or bunker coal gate
- 5.4.2 Open inspection covers
- 5.4.3 Clean raw coal build ups from the feeder casing into the mill - Use compressed air internally only
- 5.4.4 Check raw coal pipe liner thickness, coal build up and liner securing bolts and nuts
- 5.4.5 Check and repair for raw coal leaks from feeder casing, measure casing liner thickness and cut off bent edges or replace the feeder casing
- 5.4.6 Check spiral length, diameter and spiral thickness and replace if wear is more than 20% especially below the raw coal supply pipe.
- 5.4.7 Check and clean coal build ups and repair raw coal leaks on the feeder outlet chute
- 5.4.8 Check gearbox, clean and repair oil leaks. Check oil level and top up.
- 5.4.9 Check around the feeder system for cleanliness and empty excessive oil from the drip tray.
- 5.4.10 Check feeder speeds pick up proper alignment to the motor fan and tightness
- 5.4.11 Check speeds pick up blades on the fan (2 off at 180 degrees) and report EMD if broken/missing.
- 5.4.12 Report to C & I if loose wiring is evident.
- 5.4.13 Check and clean raw coal around the coal feeder casing.
- 5.4.14 Clean gearbox breather and clean by blowing with compressed air or replace if damaged
- 5.4.15 Inspection doors – Replace the seals and close properly.
  - Refer to instruction HSIPMM551.
- 5.4.16 Hold point quality controller**
- 5.4.17 Inform Plant performance department to check critical performance areas and do PF sample when the mill is on load if required.
- 5.4.18 Check all the inspection door/cover to be closed before PTW clearance
- 5.4.19 Check the plant for cleanliness, tools and debris removed
- 5.4.20 Check if the service is carried out as per the work instruction
- 5.4.21 Check mill gearbox oil level and top up to out of service gearbox oil level with Meropa 220 oil
  - Refer to instruction HSIPMM543

#### **5.5 Mill inspection and repair:**

- 5.5.1 Close the riffle box damper and lock
- 5.5.2 Open mill inspection doors
- 5.5.3 Remove coal and PF out from mill and clean
- 5.5.4 Measure the profiles of each roller with a special gauge and record.
- 5.5.5 Check for damage, abnormal scratches and cracks and report
- 5.5.6 Inspect the pressure rings, the mill casing, the thrust pads and rebound wearing plates.
- 5.5.7 Erect scaffolding or use proper platform and a slogging hammer and renew if necessary (Housing/ pressure ring to have 3mm gap as maximum)
- 5.5.8 Check trust pads studs length after final alignment, machine to correct length (Stud to protrude with less than 5 and more than three threads behind the nut) and lubricate with anti-seize compound
- 5.5.9 Check and adjust mill tension to 48 Mpa with 3 jacks simultaneously and 515mm distance between the pressure and spring ring
- 5.5.10 Inspect the nozzle ring for wear and cracks
- 5.5.11 Inspect the mill throat for wear especially behind roller number 2, check for damage and repair
- 5.5.12 Inspect the wiper bar / reject scrapper for wear and replace
- 5.5.13 Inspect the yoke protection plates (bottom and sides) and general condition of the mill internally repair and replace ceramic tiles
- 5.5.14 Inspect the tension cables for wear, damage and replace
- 5.5.15 Inspect seal air pipes for wear, damage, blockages and replace
- 5.5.17 Repack the labyrinth seal with new gland packing.
- 5.5.18 **Hold point quality controller**



## **5.6 Mill classifier inspection and repair:**

- 5.6.1 Remove the explosion disc to gain access into the classifier cone for proper inspections and avoid using fingers to worn out areas.
- 5.6.2 Check and clean classifier cone internally
- 5.6.3 Check classifier blades, the cone, production outlet and raw coal pipe for erosion, replace or repair
- 5.6.4 Cut out holed/worn out areas on the cone, production outlet and raw coal pipe until the thickness is more than 3mm and window patch with original thickness plate. Replace the tiles on the repaired areas.
- 5.6.5 Seal the gap between the production outlet pipe and the classifier inner pipe with rope and silicon sealant.
- 5.6.6 Check and reset blades to 390mm - 410mm average.
- 5.6.7 Check vortex for wear and measure the height to be 380mm
- 5.6.8 Inspect classifier reject trap flaps for free movement and neat seating on hanging position.
  - Refer to HSIPMM 549 procedure
- 5.6.9 **Hold plant for the quality controller or the supervisor to inspect the mill components and confirm repairs done**

## **5.7 Mill motor alignment check:**

- Pre-service check by Condition Monitoring – Check latest vibrations report
- 5.7.1 Remove coupling guards
- 5.7.2 Remove Fenna flex coupling rubber or tyre and inspect for cracks
- 5.7.3 Align mill motor axis to the gearbox input shaft to the correct tolerances maximum misalignment less than 0.2mm
- 5.7.4 **Hold point** – Call QC to confirm alignment
- 5.7.5 Run motor for vibration check (Maximum 2mm/sec) and direction test
- 5.7.6 Fit tyre or coupling rubber onto the coupling halves and tighten properly
- 5.7.7 Replace safety guards and check if rubbing against the shafts and rectify
  - Refer to HSIPMM562 procedure

## **5.8 Mill lubrication oil system inspection and repair:**

- 5.8.1 Remove filters and clean with solvent and blow lightly with compressed air.
  - **Note:** Compressed air to be used outside station
- 5.8.2 Check O ring close up filters
- 5.8.3 Check for any oil leaks – Request the system to be on load
- 5.8.4 Clean all spilled oil and discard in drums to the oil disposal area at the scrap yard.
  - Refer to HSIPIM087 procedure

## **5.9 Tensioning of the pressure rings:**

- 5.9.1 Clean PF or raw coal from the tension sling block to provide level and solid support
- 5.9.2 Clean dust from both coupler (fittings) before connecting
- 5.9.3 Do not lift the hydraulic cylinders by using the hoses
- 5.9.4 Test the hydraulic power pack for correct operation before installation
- 5.9.5 Correctly install the hydraulic cylinder on the tension sling block.
- 5.9.6 Install the spacer/s below the plunger and ensure proper alignment
- 5.9.7 Operate to ensure stability of the cylinder and the spacer
- 5.9.8 Stand clear from the cylinders, spacers and hydraulic oil pipes
  - **Note:** Ensure that the operator of the hydraulic power pack is familiar with the operation of machine
- 5.9.9 Operate the power pack until the tension spacers are loose
- 5.9.10 Measure the distance between pressure ring (top) and spring ring (bottom)

- 5.9.11 Calculate the sizes of spacers to be installed to get the distance of 515mm between the rings.
- 5.9.12 Check the cylinders and oil pipes for oil leaks and stability, and the spacers for stability
- 5.9.13 Check if the pressure is not slowly going down - distance not closing
- 5.9.14 If the three cylinders are available, use them to pressurise the 3 units simultaneously to 48Mpa and measure the size of spacers to install – This method should be the first preference.
- 5.9.15 Pressurise more than 48Mpa and install the calculated (measured) size spaces.
- 5.9.16 Stand clear from cylinders oil pipes and spacers and release the pressure
- 5.9.17 Allow the PF dust to settle inside the mill
- 5.9.18 Check (confirm) the distance between pressure ring and spring ring to be 515mm or use the three cylinders simultaneously to check the tension pressure to be 48Mpa
- 5.9.19 Visually check the pressure ring level to determine the effectiveness of the springs
- 5.9.20 Check any welding done during the repairs to ensure it is applied at the correct places
  - Refer to instruction HSIPMM545
- 5.9.21 **Hold plant for the supervisor/QC to inspect the mill components and sign box up certificate**

## 6. **SPIRAL COAL FEEDER INSPECTION AND REPAIR (INSTRUCTION HSIPMM 551 REV. 2)**

- **Frequency: Outage, as per the philosophy and as and when required.**

### 6.1 **Step by step maintenance instruction:**

- 6.1.1 Close bunker coal gate.
- 6.1.2 Run the raw coal pipe empty
- 6.1.3 Inspect raw coal pipe liner.
- 6.1.4 Clean feeder inside and outside
- 6.1.5 Inspect feeder coal gate
- 6.1.6 Check the casing liner for wear visually.
- 6.1.7 Check feeder outlet chute for wear visually
- 6.1.8 Check gear box for leaks
- 6.1.9 Remove equipment from site
- 6.1.10 Check the spiral for damages especially directly below the raw coal supply pipe
- 6.1.11 The maximum wear 20% of the original dimension the spiral must be replaced
- 6.1.12 Check all the bolts and welding
- 6.1.13 Check oil condition and oil level on the feeder gearbox
- 6.1.14 Check and clean /replace gearbox breather
  - Note:** If the feeder and raw pipe are not drained of coal don't weld the feeder and raw coal pipe
- 6.1.15 **Hold point for quality inspection and quality control**
- 6.1.16 Clean and replace inspection cover seals

**NOTE:** Boiler 6, 7, 8 and 10 spiral lengths must be 150mm shorter than the original new spiral length

### 1.1.3 **OUTAGE SCOPE OF WORK:**

#### **IN (Inspections Repairs):**

Item	Area and activity	Responsible party
1	<b>Mills</b>	<b>The Contractor</b>
1.1	Obtain Mill group Permit to work	√
1.2	Apply for gas test and hot work approval permit	√
1.3	Open inspection doors	√
1.4	Clean the mills internally	√

1.5	Clean the mills externally and the work area	√
1.6	Repair mills as per inspection report	√
1.7	Repair the raw coal leaks on mill top and around the mills	√
1.8	Inspect and repair tension system	√
1.9	Inspect, clean and replace hot and cold air damper tadpole seals	√
1.10	Take ball sizes & do due ball changes	√
1.11	Fit new gaskets and seals	√
1.12	Do all outstanding defects (As per SAP Notification system)	√
1.13	Clean gearboxes filters and breathers	√
1.14	Inspect all mill gearboxes defects and repair	√
1.15	Final inspections and box up certification	The <i>employer</i> & the <i>contractor</i>
1.16	Close all inspection doors	√
1.17	Attend outage meetings and provide progress feedback	√
<b>2</b>	<b>Rejects and Brush box</b>	<b>The Contractor</b>
2.1	Clean out rejects from the brush plough box/chamber	√
2.2	Replace worn out or damaged rejects brushes/ploughs	√
2.3	Fit new packing on rejects box outer door (if necessary)	√
2.4	Close the reject box/chamber doors	√
2.5	Final inspections and box up certification	The <i>employer</i> & the <i>contractor</i>
2.6	Clean the work area	√
<b>3</b>	<b>Coal Feeders</b>	<b>The Contractor</b>
3.1	Clean the feeders internally and externally	√
3.2	Inspect feeders internally and externally	√
3.3	Repair feeders as per inspection report	√
3.4	Check and re-set all relevant settings	√
3.5	Clean feeder gearboxes, check and top up oil level	√
3.6	Clean the raw coal below the feeder table	√
3.7	Re-set seal air height from the waffle plates to 3mm	√
3.8	Re-set feeder ploughs' height to 3mm	√
3.9	Replace feeder shaft seals and close inspection doors	√
3.10	Check and replace feeder and the build-up scrapper	√
3.11	Do all outstanding defects (As per SAP Notification system)	√
3.12	Inspect and repair feeder coal gates	√
3.13	Window patch worn out feeder outlet chutes (For tiles repair)	√
3.14	Repair holed (patched) intermediate bunkers	√
3.15	Final inspections and box up certification	The <i>employer</i> & the

		<i>contractor</i>
3.16	Clean the work area	√
<b>4</b>	<b>Mill gearboxes and lube oil system</b>	<b>The Contractor</b>
4.1	Inspect gearboxes as per monthly oil sampling report	√
4.2	Clean or replace lube oil filters and gearbox breathers	√
4.3	Change oil (according to monthly oil report)	√
4.5	Check and clean cooling water system	√
4.6	Check lube oil pumps for leaking oil seals & remove for repair	√
4.7	Inspect coupling and replace if damaged	√
4.8	Run system to check for oil leaks (repair if any leaks)	√
4.9	Clean excessive raw coal and PF around the gearbox and work area	√
4.10	Final inspections and box up certification	The employer & the contractor
<b>5</b>	<b>PF and raw coal pipes</b>	<b>The Contractor</b>
5.1	Online inspection on all PF pipes (Pf leaks) and steel hanger brackets	√
5.2	Off load inspection of PF pipes (patches) hanger brackets (steel hangers)	√
5.3	Repair or replace PF pipes found with leaks during inspection	√
5.4	Arrange and replace raw coal pipes liners previously removed or damaged	√
5.5	Repair or replace patched raw coal pipes, including mill inner raw coal pipe	√
5.6	Repair and repack leaking Johnson couplings (spool pieces)	√
5.7	Repair patched intermediate bunkers	√
5.8	Final inspections and box up certification	The employer & the contractor
5.9	Clean the area	√
5.10	Complete notifications of all the work done and submit to be closed	√
5.11	Complete box up certificate and Clear PTW	√

**IR:**

<b>Item</b>	<b>Area and activity</b>	<b>Responsible party</b>
<b>1</b>	<b>Mills</b>	<b>The Contractor</b>
1.1	Obtain Mill group Permit to work	√
1.2	Apply for gas test and hot approval permit	√
1.3	Open inspection doors	√
1.4	Clean the mills internally	√
1.5	Clean the mills externally and the work area	√
1.6	Repair mills as per inspection report	√
1.7	Repair the raw coal leaks on mill top and around the mills	√
1.8	Inspect and repair tension system	√

1.9	Take ball sizes & do due ball changes	√
1.10	Fit new gaskets and seals	√
1.11	Do all outstanding defects (As per SAP Notification system)	√
1.12	Inspect, clean and replace hot and cold air damper tadpole seals	√
1.13	Clean gearboxes filters and breathers	√
1.14	Inspect all mill gearboxes defects and repair	√
1.15	Close all inspection doors	√
1.16	Attend outage meetings and provide progress feedback	√
1.17	Final inspections and box up certification	The employer & the contractor

<b>2</b>	<b>Rejects box, the chamber and Brushes</b>	<b>The Contractor</b>
2.1	Clean out rejects from the brush plough box/chamber	√
2.2	Replace worn out or damaged rejects brushes/ploughs	√
2.3	Fit new packing on rejects box outer door (if necessary)	√
2.4	Final inspections and box up certification	The employer & the contractor
2.5	Close the reject box/chamber doors	√
2.6	Clean the work area	√

<b>3</b>	<b>Coal Feeders</b>	<b>Contractor</b>
3.1	Clean the feeders internally and externally	√
3.2	Inspect feeders internally and externally	√
3.3	Repair feeders as per inspection report	√
3.4	Check and re-set all relevant settings	√
3.5	Clean feeder gearboxes, check and top up oil level	√
3.6	Clean the raw coal below the feeder table	√
3.7	Re-set seal air height from the waffle plates to 3mm	√
3.8	Re-set feeder ploughs' height to 3mm	√
3.9	Replace feeder shaft seals and close inspection doors	√
3.10	Check and replace feeder and the build-up scrapper	√
3.11	Do all outstanding defects (As per SAP Notification system)	√
3.12	Inspect and repair feeder coal gates	√
3.13	Window patch worn out feeder outlet chutes (For tiles repair)	√
3.14	Repair holed (patched) intermediate bunkers	√
3.15	Final inspections and box up certification	The employer & the contractor
3.16	Clean the work area	√

<b>4</b>	<b>Mill gearboxes and lube oil system</b>	<b>Contractor</b>
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4.1	Inspect gearboxes as per monthly oil sampling report	√
4.2	Clean or replace lube oil filters and gearbox breathers	√
4.3	Change oil (according to monthly oil report)	√
4.4	Remove one mill gearbox for proper cleaning (Highest particle count)	√
4.5	Check and clean cooling water system	√
4.6	Check lube oil pumps for leaking oil seals & remove for repair	√
4.7	Inspect coupling and replace if damaged	√
4.8	Run system to check for oil leaks (repair if any leaks)	√
4.9	Clean excessive raw coal and PF around the gearbox and work area	√
4.10	Inspect gearboxes as per monthly oil sampling report	√
4.11	Final inspections and box up certification	The <i>employer</i> & the <i>contractor</i>
<b>5</b>	<b>PF Distribution System</b>	Contractor
5.1	Online inspection on all PF pipes (Pf leaks) and steel hanger brackets	√
5.2	Off load inspection of PF pipes (patches) hanger brackets (steel hangers)	√
5.3	Replace patched PF pipes and those found with leaks during inspection	√
5.4	Arrange and replace raw coal pipes liners previously removed or damaged	√
5.5	Replace patched raw coal pipes, including mill inner raw coal pipe	√
5.6	Repair and repack leaking Johnson couplings (spool pieces)	√
5.7	Replace patched Y-pieces	√
5.8	Repair patched intermediate bunkers	√
5.9	Final inspections and box up certification	The <i>employer</i> & the <i>contractor</i>
5.10	Clean the work area	√
5.11	Complete notifications of all the work done and submit to be closed	√
5.12	Clear PTW as per PRS	√

**MO Mini General Overhaul:** Additional may crew may be required.

Item	Area and activity	Responsible party
<b>1</b>	<b>Mills</b>	<b>The Contractor</b>
1.1	Obtain Mill group Permit to work	√
1.2	Apply for gas test and hot work approval	√
1.3	Open inspection doors	√
1.4	Clean the mills internally	√
1.5	Clean the mills externally and the work area	√
1.6	Repair mills as per inspection report	√
1.7	Clean and repair rotating throat and gladiator fingers	√
1.8	Repair the raw coal leaks above the mills and coal feeders	√

1.9	Inspect, clean and repair tension system	√
1.10	Take ball sizes & do due ball changes/add, services and repairs	√
1.11	Plan and carry out due mill rebuilds (minimum two)	√
1.12	Check, repair and set the classifier blades angles	√
1.13	Fit new gaskets and seals on inspection doors	√
1.14	Do all outstanding defects (As per SAP Notification system)	√
1.15	Clean gearboxes filters and breathers	√
1.16	Remove oil coolers for workshop to clean and pressure test	√
1.17	Inspect all mill gearboxes defects and repair	√
1.18	Remove one mill gearbox for internal repairs (highest particle count)	√
1.19	Clean out rejects from the brush plough box/chamber	√
1.20	Replace worn out or damaged rejects brushes/ploughs	√
1.21	Close and check inner doors for proper sealing and repair	√
1.22	Fit new packing's/seals on rejects box outer doors (if necessary)	√
1.23	Close the reject box/chamber doors	√
1.24	Inspect and replace all hot and cold air damper tadpole seals	√
1.25	Inspect and repair oil leaks around hot air and suction dampers	√
1.26	Inspect, replace and tighten mill motor couplings	√
1.27	Inspect, clean and replace leaking expansion joints	√
1.28	Clean excessive PF and raw coal on mill tops	√
1.29	Final inspections and box up certification	<i>The employer &amp; the contractor</i>
1.30	Clean the work area and close all inspection doors	√
1.31	Attend outage meetings and provide progress feedback	√
<b>2</b>	<b>Coal Feeders</b>	<b>The Contractor</b>
2.1	Clean the feeders internally and externally	√
2.2	Inspect feeders internally and externally	√
2.3	Repair feeders as per inspection report	√
2.4	Check and re-set all relevant settings like inner raw coal pipe height	√
2.5	Clean feeder gearboxes, check and top up oil level	√
2.6	Clean the raw coal below the feeder table	√
2.7	Re-set seal air height from the waffle plates to 3mm	√
2.8	Clean seal air supply pipe	√
2.9	Re-set feeder ploughs' height to 3mm	√
2.10	Replace feeder shaft seals and close inspection doors	√
2.11	Check and replace feeder and the build-up scrapper	√
2.12	Do all outstanding defects (As per SAP Notification system)	√
2.13	Inspect motor couplings, re-do alignment and tighten couplings properly	√

2.14	Inspect and repair feeder coal gates	√
2.15	Window patch worn out feeder outlet chutes and arrange tiling	√
2.16	Repair holed (patched) intermediate bunkers and arrange tiling	√
2.17	Final inspections and box up certification	The <i>employer</i> & the <i>contractor</i>
2.18	Clean the work area	√
<b>3</b>	<b>PF and raw coal pipes</b>	<b>The Contractor</b>
3.1	Online inspection on all PF pipes (Pf leaks) and steel hanger brackets	√
3.2	Off load inspection of PF pipes (patches) hanger brackets (steel hangers)	√
3.3	Replace all patched PF pipes and those found with leaks during inspections	√
3.4	Measure the PF pipes for thickness and replace those with thickness of 3mm or less.	√
3.5	Repair/ replace steel hangers on PF pipes	√
3.6	Inspect raw coal pipes liners and replace previously removed and damaged	√
3.7	Repair or replace patched raw coal pipes	√
3.8	Repair intermediate bunker inspection covers	√
3.9	Support PF pipes and remove a piece of PF enable burners removal	√
3.10	Remove PF pipes to enable other contractor to work on oil burners and re-install	√
3.11	Repair and repack Johnson couplings (spool pieces)	√
3.12	Repair patched intermediate bunkers and arrange tiling	√
3.13	Remove and repair bunker coal gates and re-install	√
3.14	Final inspections and box up certification	The <i>employer</i> & the <i>contractor</i>
3.15	Clean the area.	√
<b>4</b>	<b>Mill gearboxes and lube oil system</b>	<b>The Contractor</b>
4.1	Inspect gearboxes as per monthly oil sampling report	√
4.2	Clean or replace lube oil filters and gearbox breathers	√
4.3	Change oil (according to monthly oil report)	√
4.4	Remove one mill gearbox for proper cleaning (Highest particle count)	√
4.5	Check and clean cooling water system	√
4.6	Check lube oil pumps for leaking oil seals & remove for repair	√
4.7	Inspect coupling and replace if damaged	√
4.8	Run system to check for oil leaks (repair if any leaks)	√
4.9	Clean excessive raw coal and PF around the gearbox and work area	√
4.10	Inspect gearboxes as per monthly oil sampling report	√
4.11	Final inspections and box up certification	The <i>employer</i> & the



		<i>contractor</i>
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**GO MAJOR GENERAL OVERHAUL (GO):** Additional crew required

<b>1</b>	<b>Mills</b>	<b>Responsible party</b>
1.1	Obtain Mill group Permit to work	<b>The Contractor</b>
1.2	Apply for gas test and hot work approval	√
1.3	Open inspection doors	√
1.4	Clean the mills internally	√
1.5	Clean the mills externally and the work area	√
1.6	Repair mills as per inspection report	√
1.7	Clean and repair rotating throat and gladiator fingers	√
1.8	Repair the raw coal leaks above the mills and coal feeders	√
1.9	Inspect, clean and repair tension system	√
1.10	Take ball sizes & do due ball changes/add, services and repairs	√
1.11	Plan and carry out due mill rebuilds (minimum two)	√
1.12	Check, repair and set the classifier blades angles	√
1.13	Fit new gaskets and seals on inspection doors	√
1.14	Do all outstanding defects (As per SAP Notification system)	√
1.15	Clean gearboxes filters and breathers	√
1.16	Remove oil coolers for workshop to clean and pressure test	√
1.17	Inspect all mill gearboxes defects and repair	√
1.18	Remove motor & mill gearboxes for internal repairs	√
1.19	Clean out rejects from the brush plough box/chamber	√
1.20	Replace worn out or damaged rejects brushes/ploughs	√
1.21	Close and check inner doors for proper sealing and repair	√
1.22	Fit new packing's/seals on rejects box outer doors (if necessary)	√
1.23	Close the reject box/chamber doors	√
1.24	Inspect and replace all hot and cold air damper tadpole seals	√
1.25	Inspect and repair oil leaks around hot air and suction dampers	√
1.26	Inspect, replace and tighten mill motor couplings	√
1.27	Inspect, clean and replace leaking expansion joints	√
1.28	Clean excessive PF and raw coal on mill tops	√
1.29	Clean the work area and close all inspection doors	√
1.30	Attend outage meetings and provide progress feedback	√
1.31	Final inspections and box up certification	<i>The employer &amp; the contractor</i>

<b>2</b>	<b>Coal Feeders</b>	<b>The Contractor</b>
2.1	Clean the feeders internally and externally	√
2.2	Inspect feeders internally and externally	√
2.3	Repair feeders as per inspection report	√
2.4	Check and re-set all relevant settings like inner raw coal pipe height	√
2.5	Clean feeder gearboxes, check and top up oil level	√
2.6	Clean the raw coal below the feeder table	√
2.7	Re-set seal air height from the waffle plates to 3mm	√
2.8	Clean seal air supply pipe	√
2.9	Re-set feeder ploughs' height to 3mm	√
2.10	Replace feeder shaft seals and close inspection doors	√
2.11	Check and replace feeder and the build-up scrapper	√
2.12	Do all outstanding defects (As per SAP Notification system)	√
2.13	Inspect motor couplings, re-do alignment and tighten couplings properly	√
2.14	Inspect and repair feeder coal gates	√
2.15	Window patch worn out feeder outlet chutes and arrange tiling	√
2.16	Repair holed (patched) intermediate bunkers and arrange tiling	√
2.17	Final inspections and box up certification	The employer & the contractor
2.18	Clean the work area	√
<b>3</b>	<b>PF and raw coal pipes</b>	<b>The Contractor</b>
3.1	Online inspection on all PF pipes (Pf leaks) and steel hanger brackets	√
3.2	Off load inspection of PF pipes (patches) hanger brackets (steel hangers)	√
3.3	Replace all patched PF pipes and those found with leaks during inspections	√
3.4	Measure the PF pipes for thickness and replace those with thickness of 3mm or less.	√
3.5	Repair/ replace steel hangers on PF pipes	√
3.6	Inspect raw coal pipes liners and replace previously removed and damaged	√
3.7	Install and remove raw coal chutes used for coal drainage for all bunkers	√
3.8	Replace patched raw coal pipes	√
3.9	Repair intermediate bunker inspection covers	√
3.11	Support PF pipes and remove a piece of PF enable burners removal	√
3.12	Remove PF pipes to enable other contractor to work on oil burners and re-install	√
3.13	Repair and repack Johnson couplings (spool pieces)	√
3.14	Repair patched intermediate bunkers and arrange tiling	√
3.15	Remove and repair bunker coal gates and re-install	√

3.16	Final inspections and box up certification	The <i>employer</i> & the <i>contractor</i>
3.17	Clean the work area.	√
<b>4</b>	<b>Mill gearboxes and lube oil system</b>	<b>The Contractor</b>
4.1	Inspect gearboxes as per monthly oil sampling report	√
4.2	Clean or replace lube oil filters and gearbox breathers	√
4.3	Change oil according to monthly oil report)	√
4.4	Remove one mill gearbox for proper cleaning (Highest particle count)	√
4.5	Check and clean cooling water system	√
4.6	Check lube oil pumps for leaking oil seals & remove for repair	√
4.7	Inspect coupling and replace if damaged	√
4.8	Run system to check for oil leaks (repair if any leaks)	√
4.9	Clean excessive raw coal and PF around the gearbox and work area	√
4.10	Replace gearboxes as per monthly oil sampling report	√
4.11	Final inspections and box up certification	The <i>employer</i> & the <i>contractor</i>

#### **1.1.4 SERVICE INFORMATION:**

- 1.1.4.1 Core services consist of preventative, corrective maintenance, preservation of mills on the running units, units that are on cold reserve or extended inoperability or any classifications and shall be relevant to maintaining plant availability and reliability in a cost effective way.
- 1.1.4.2 The *employer* revises the number of skills in the team and the specific skills requirement annually and adjusts accordingly.
- 1.1.4.3 Notifications/*defects* to be identified prioritised as per Work Prioritisation Procedure 240-44948953. Planned, executed and closed as per routine works management policy and week work management procedure 240-130843041. No ageing/outdated outstanding work orders allowed, PM's and Scheduled work compliance to be improved and maintained above 95%. Emergent work is 20% and less. No statutory PM order violation.
- 1.1.4.4 *Contractor* provides the *employer* with a labour force and toolboxes as per the attached list (Appendix E) consisting of:
- Site Manager
  - Supervisor (Mechanical)
  - Assistant Supervisor (Mechanical)
  - Boiler Makers L5
  - Mechanical fitter L5
  - Welders (Class B)
  - Riggers L5
  - Safety officer
  - Semi-skilled (Mechanical)

Planner – Outages

Administration clerk

Un-skilled/Labourer

- 1.1.4.5 The contractor provides proof of qualifications and experience for all the above listed skills. The listed skilled personnel are authorised and accredited with relevant authorities and proof is submitted to the *Service Manager* at the start of contract.
- 1.1.4.6 The *contractor* ensures that his/her personnel are authorised to take out permits to work (PTW) in accordance with Generation Plant Safety Regulations 36-381 within three months of being awarded the contract by sending the employees to the relevant training. All the fitters, boilermakers and welders must be authorised.
- 1.1.4.7 The *contractor* trains all the artisans to be authorised to safely operate the forklifts, mobile and overhead cranes within the station. The crane and forklift driver's scope of work is driving anywhere within Hendrina Power Station premises including assisting other sections as authorised/approved by the *employer*.
- 1.1.4.8 The *contractor* trains and appoints the semi-skilled employees to be hot work observers or fire watchers when hot work is in progress as per procedure HSPMM 005 to prevent violation of the PSR.
- 1.1.4.9 The *contractor* maintains, inspect, service, repair, safeguard, uses and the milling plant assets as per appendix G. Replace missing asset if negligence is proven.
- 1.1.4.10 The *contractor* provides 24 hour service for any plant failures, with a response time of 0 -1 hour by providing standby team of one fitter authorised as per PSR, one boiler maker/welder or authorised as per PSR and one semi-skilled with the response time of 0 - 1 hour after hours including weekends and public holidays.
- 1.1.4.11 The contractor reduces milling plant related UCLF and maintains it below 0.5%, Execute internal safety audit twice per year, Reduces LTIR and keeps it at zero as per the attached KPI's (Appendix C)
- 1.1.4.12 The *contractor* supplies material, tools and equipment to ensures adherence and compliance to the control of plant construction, repair and maintenance welding activities procedure 36-775.
- 1.1.4.13 The *contractor* supports and assists in promoting the Plant Fundamental Management Policy.
- 1.1.4.14 The *contractor* makes available the written safe working procedures for the maintenance, service and overhauling of milling plant as per the scope of work.
- 1.1.4.15 Mill services and rebuilds are executed as per milling plant maintenance strategy. Normal mill rebuild scope of work is completed within 15 (Fifteen) calendar days, Grinding ball changes /Add& services is completed in 2 (Two) calendar days to reduce the risk of another mill failure resulting in extended UCLF duration.
- 1.1.4.16 The *contractor* makes available the written quality inspection plans (QIP's) for the maintenance, overhauling of milling plant as per the scope of work and attached maintenance instructions and procedure (Appendix D) and enforces usage as per Hendrina Power station quality Manual QMM 001 to avoid rework on mechanical work. The quality control programme must meet the requirements of the code of practice for quality systems, ISO 9001:2015.

- 1.1.4.17 The contractor adheres to the tendered prices as listed, ensures invoices are prepared and submitted in time for a cash flow control purpose, annual escalations are implemented timeously and planned overtime is kept below 10%.

## **APPENDIX A**

### **Milling Plant Maintenance Instructions and Procedures**

#### **MILLING PLANT PROCEDURES AND INSTRUCTIONS:**

<b>NUMBER</b>	<b>DESCRIPTION</b>	<b>PROC./INSTR.</b>
HSPPI030	BOILER 1 - 10 MILL BUNKER AND COAL PIPE INSPECTION/REPAIR	PROCEDURE
HSPPI031	MILL LUBRICATION SYSTEM INSPECTION AND REPAIR	PROCEDURE
HSIPMM303	MILL OIL LUBRICATION SYSTEM INSPECTION AND CLEAN	INSTRUCTION
HSIPMM071	FEEDER COAL GATE AND OVERHAUL: BOILERS 6-10	INSTRUCTION
HSIPMM061	FEEDER COAL GATE CHANGE AND OVERHAUL - BOILER 1 - 5 MILLS	INSTRUCTION
HSIPIM227	A TO F COAL BUNKERS INSPECTION AND REPAIRS - BOILERS 1 - 10	INSTRUCTION
HSIPIM089	BOILERS 8 - 10 PEKRUN PHI MILL GEARBOX INTERNAL INSPECTION	INSTRUCTION
HSIPIM094	MILL CLASSIFIER INSPECTION AND REPAIR: BOILERS 1 - 7	INSTRUCTION
HSIPIM084	MILL INSPECTION AND REPAIRS BOILER 1 - 7	INSTRUCTION
HSIPIM091	MILL GEARBOX INSPECTION BOILERS 1 - 7 MILLS	INSTRUCTION
HSIPIM080	THRUST WEAR CHECK MILL GEARBOXES BOILERS 1 - 10	INSTRUCTION
HSIPIM027	RIFFLE AND DISTRIBUTION BOX INSPECTION	INSTRUCTION
HSPPM048	RIFFLE BOX CHANGE AND REPAIR	PROCEDURE
HSPPM041	FEEDER AND GEARBOX REPAIR	PROCEDURE
HSIPIM382	MILLS MOBILE EQUIPMENT FORK LIFTS - 3 MONTHLY INSPECTION	INSTRUCTION
HSIPMM046	MOTOR UNCOUPLE AND RE-COUPLE MILL SECTION - BOILERS 1-10	INSTRUCTION
HSPPM001	FEEDER GEARBOXES (OIL LEVEL CHECK)	PROCEDURE
HSIPIM086	BOILERS 1 - 10 MILL BUNKER & COAL PIPES INSPECTION & REPAIR	INSTRUCTION
HSIPMM543	MILL GEARBOX PEKRUN CHANGE	INSTRUCTION
HSIPMM544	PHI MILL TABLE CHANGE	INSTRUCTION
HSIPMM545	ALIGNMENT AND TENSIONING OF THE PRESSURE RING MILLS 8 - 10	INSTRUCTION
HSIPMM546	BALL SIZE CHECK BOILERS 1 - 7 MILLS	INSTRUCTION
HSIPMM547	MILL GEARBOX OIL CHANGE	INSTRUCTION
HSIPMM548	GEARBOX CHANGE BOILERS 1 - 7	INSTRUCTION
HSIPMM549	MILLS 1 - 10 CLASSIFIERS INSPECTION AND REPAIR	INSTRUCTION
HSIPMM550	FEEDER GEARBOX OIL CHANGE UNITS 1 - 10	INSTRUCTION
HSIPMM551	BOILER 9 - MILL SPIRAL FEEDER	INSTRUCTION
HSIPMM553	MILL GEARBOX BREATHER INSPECTION	INSTRUCTION
HSIPMM555	PEKRUN GEARBOX OVERHAUL	INSTRUCTION
HSIPMM556	HITACHI GEARBOX OVERHAUL	INSTRUCTION
HSIPMM557	DAVID BROWN MILL GEARBOX MILLS 1 - 7	INSTRUCTION
HSIPIM394	DUCTINGS AND DAMPERS	INSTRUCTION
HSIPMM558	BALL CHANGE OR ADDITION BOILERS 1 - 7	INSTRUCTION
HSIPMM560	MILL BASE REPAIR	INSTRUCTION

HSIPMM559	PHI MILL ROLLER ASSEMBLY - OVERHAUL	INSTRUCTION
HSIPMM561	BOILER 8 - 10 PHI MILLS ROLLER ASSEMBLIES BEARING CLEAN	INSTRUCTION
HSIPMM562	MOTOR ALIGNMENT - MILLS 8 -10	INSTRUCTION
HSIPMM563	MILL ALIGNMENT MILLS 1 - 7	INSTRUCTION
HSIPMM060	FEEDER PLOUGH RENEWAL BOILERS 1 - 10	INSTRUCTION
HSIPMM074	BABCOCK AND WILCOX MILL OVERHAUL	INSTRUCTION
HSIPMM051	MILL FEEDER GEARBOX GREASE BOILERS 1-10	INSTRUCTION
HSIPMM064	COAL FEEDER OVERHAUL	INSTRUCTION
HSIPMM068	NOZZLE RING CHANGE	INSTRUCTION
HSIPIM085	PHI MILLS - SERVICE AND REPAIR	INSTRUCTION
HSIPIM082	MILL BASE BOLTS CHECK	INSTRUCTION
HSIPIM380	MILLS MOBILE EQUIPMENT FORK LIFTS DAILY INSPECTION	INSTRUCTION
HSIPIM087	MILL LUBRICATION OIL SYSTEM BOILERS 1 - 7 AND 8 - 10	INSTRUCTION
HSIPMM066	RIFFLE BOX CHANGE AND OVERHAUL - BOILERS 6 - 10	INSTRUCTION
HSIPMM048	MOTOR UNCOUPLE AND RECOUPLE - BOILERS 1-10	INSTRUCTION
HSIPMM057	FENNER FLEX COUPLING INSTALLATION	INSTRUCTION
HSPPM037	MILL GROUP MOTOR UNCOUPLING AND RE-COUPLE	PROCEDURE
HSPPM039	MILL MOTOR ALIGNMENT BOILERS 1-7	PROCEDURE
HSPPM040	MILL MOTOR ALIGNMENT BOILERS 8-10	PROCEDURE
HSPPM043	MILL FEEDER COAL GATE CHANGE AND OVERHAUL	PROCEDURE
HSPPM044	MILL PARTS CHANGE	PROCEDURE
HSPPM046	MILL OIL LUBRICATION SYSTEMS	PROCEDURE
HSPPM050	MILL CLASSIFIER OVERHAUL - BOILERS 1-10	PROCEDURE

**APPENDIX B:**

- Mechanical fitter (Level 5) and semi-skilled minimum tool list.

**STANDARD ARTISAN & SEMI SKILLED MINIMUM TOOLS LIST**

<b><u>NO.</u></b>	<b><u>TOOL DESCRIPTION</u></b>	<b><u>QUANTITY</u></b>
1	Tool box and pad lock	1
2	Socket set 8- 32mm	1
3	Combination spanners 10 - 32	1
4	17mm combination spanner - Forms part of the combination set	2
5	19mm combination spanner - Forms part of the combination set	2
6	24mm combination spanner - Forms part of the combination set	2
7	4 pounds hammer	1
8	2 pounds hammer	1
9	450mm pipe wrench	1
10	Hack saw and blade	1
11	Stanley knife	1
12	Tin snip	1
12	137mm vice grap	1
13	300mm chisel	1
14	450mm hand file - smooth	1
15	Tommy bar	1
16	Scraper	1
17	Punch (big)	1
18	Punch (small)	1
19	Packing extractor	1
20	Torch	1
21	Measuring tape (0 - 5 metre)	1

22	150mm Venier	1
23	Outside calliper - small	1
24	Inside calliper - small	1
25	Ellen keys - set	1
26	Engineering square	1



**APPENDIX C:****MAINTENANCE TACKLE SHOP ADDITIONAL LIFTING EQUIPMENT**



ITEM	DESCRIPTION
1	SHACKLE-BOW 3.25 TON
2	AIRWINCH -3TON C/W WIRE ROPE 100 M
3	SHACKLE-BOW 25 TON
4	LIFT CHAIN BLOCK - 6 METRE,2 TON
5	CHAIN BLOCK 3 TON 15 METRE LIFT
6	CHAIN SLING 2 METRE LONG 8.2 TON
7	LIFT RATCHET LEVER HOIST/PULL LIFT 1.5 TON 1.5/3 METRE
8	WIRE ROPE SLING 13MM THICK x 2 MET
9	SHACKLE-BOW 12 TON
10	LIFT RATCHET LEVER HOIST/PULL LIFT 3 TON 1.5/3 METRE
11	WIRE ROPE SLING 20MM THICK x 3 MET
12	BEAM CLAMP 2 TON
13	WIRE ROPE SLING 13MM THICK x 1 MET
14	SAFETY HARNESS - DOUBLE LANYARD
15	CHAIN BLOCK 2 TON 8 METRE LIFT
16	SNATCH BLOCK 3 TON
17	WIRE ROPE TIRFOR C/W 30 METRE 3 T
18	BEAM CLAMP 10 TON
19	LIFT RATCHET LEVER HOIST/PULL LIFT 6 TON 1.5/3METRE
20	CHAIN BLOCK 5 TON 10 METRE LIFT

**APPENDIX G:**

<b>MILLING PLANT ADDITIONAL ASSETS</b>				
<b>ITEM</b>	<b>ASSET NUMBER</b>	<b>ASSET CLASS</b>	<b>COST CENTER</b>	<b>ASSET DESCRIPTION</b>
1	950001348417	WE801505	327250	DRILLING MACHINE -MAGNETIC BASE 10
2	950001348418	WE801505	327250	DRILLING MACHINE -MAGNETIC BASE 10
3	950001348860	LV8000	327250	ELECTRICAL IMPACT WRENCH 1/2 INCH
4	950001348861	LV8000	327250	ELECTRICAL IMPACT WRENCH 1/2 INCH
5	950001348862	LV8000	327250	ELECTRICAL IMPACT WRENCH 1/2 INCH
6	950001348863	LV8000	327250	ELECTRICAL IMPACT WRENCH 1/2 INCH
7	950001348891	LV8000	327250	GRINDER ELECTRICAL ANGLE --115MM X
9	950001348892	LV8000	327250	GRINDER ELECTRICAL ANGLE --115MM X
10	950001348893	LV8000	327250	GRINDER ELECTRICAL ANGLE --115MM X
11	950001348894	LV8000	327250	GRINDER ELECTRICAL ANGLE --115MM X
12	950001348895	LV8000	327250	GRINDER ELECTRICAL ANGLE --115MM X
13	950001348896	WE801505	327250	AIR COMPRESSOR 380 VOLT X 5.5KW x
14	950001348897	WE801505	327250	AIR COMPRESSOR 380 VOLT X 5.5KW x
15	950001348898	LV8000	327250	GRINDER ELECTRICAL ANGLE -- 230MM
16	950001348899	LV8000	327250	GRINDER ELECTRICAL ANGLE -- 230MM
17	950001348900	LV8000	327250	GRINDER ELECTRICAL ANGLE -- 230MM
18	950001348901	LV8000	327250	GRINDER ELECTRICAL ANGLE -- 230MM
19	950001348902	LV8000	327250	GRINDER ELECTRICAL ANGLE -- 230MM
20	950001348921	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
21	950001348922	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
22	950001348923	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
23	950001348924	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
24	950001348925	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
25	950001348926	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
26	950001348927	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
27	950001348928	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
28	950001348929	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
29	950001348930	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
30	950001348931	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
31	950001348932	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
32	950001348933	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
33	950001348934	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
34	950001348935	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
35	950001348936	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
36	950001348937	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
37	950001348938	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE

38	950001348939	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
39	950001348940	LV8000	327250	LEAD LIGHT 32/220 VOLT x 5 METRE
40	950001348944	LV8000	327250	CABLE SET HEAVY DUTY - 220 VOLT,3
41	950001348945	LV8000	327250	CABLE SET HEAVY DUTY - 220 VOLT,3
42	950001348982	WE801505	327250	INVERTER WELDER - MMA 300/400 AMP
43	950001348983	WE801505	327250	INVERTER WELDER - MMA 300/400 AMP
44	950001349077	WE801505	327250	ELECTRODE DRYING OVEN -55 LITRE X 1
45	950001349222	WE801505	327250	ELECTRODE BAKING OVEN-55 LITRE X10
46	950001349305	LV8000	327250	WELDING CANOPIE/SCREEN
47	950001349306	LV8000	327250	WELDING CANOPIE/SCREEN
48	950001349307	LV8000	327250	WELDING CANOPIE/SCREEN
49	950001349308	LV8000	327250	WELDING CANOPIE/SCREEN
50	950001349309	LV8000	327250	WELDING CANOPIE/SCREEN
51	950001349310	LV8000	327250	WELDING CANOPIE/SCREEN
52	950001349311	LV8000	327250	WELDING CANOPIE/SCREEN
53	950001349312	LV8000	327250	WELDING CANOPIE/SCREEN
54	950001349313	LV8000	327250	WELDING CANOPIE/SCREEN
55	950001349314	LV8000	327250	WELDING CANOPIE/SCREEN
56	950001349330	LV8000	327250	ELECTRODE HOT BOX 220 VOLTS
57	950001349331	LV8000	327250	ELECTRODE HOT BOX 220 VOLTS
58	950001349332	LV8000	327250	ELECTRODE HOT BOX 220 VOLTS
59	950001349333	LV8000	327250	ELECTRODE HOT BOX 220 VOLTS
60	950001349334	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
62	950001349345	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
62	950001349346	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
63	950001349347	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
64	950001349348	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
65	950001349349	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
66	950001349350	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
67	950001349351	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
68	950001349352	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
69	950001349353	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
70	950001349354	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
71	950001349355	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
72	950001349356	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
73	950001349357	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
74	950001349358	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
75	950001349359	LV8000	327250	EXTENSION REEL DOUBLE PLUG -1.5MM
76	950001349360	LV8000	327250	DC INVERTER WELDER MMA 200 AMPS 22
77	950001349361	LV8000	327250	DC INVERTER WELDER MMA 200 AMPS 22
78	950001349416	LV8000	327250	PIGTAIL EARTH CLAMP
79	950001349417	LV8000	327250	PIGTAIL EARTH CLAMP
80	950001349424	LV8000	327250	SNATCH BLOCK 3 TON
81	950001349425	LV8000	327250	SNATCH BLOCK 3 TON
82	950001349429	LV8000	327250	PIGTAIL ELECTRODE HOLDER - 1 METRE

83	950001349430	LV8000	327250	PIGTAIL ELECTRODE HOLDER - 1 METRE
84	950001349466	LV8000	327250	WELDING CABLE EXTENSION SET-35MM X
85	950001349467	LV8000	327250	WELDING CABLE EXTENSION SET-35MM X
86	950001349492	LV8000	327250	GAS CYLINDER,S TROLLEY,DOUBLE TYPE
87	950001349493	LV8000	327250	GAS CYLINDER,S TROLLEY,DOUBLE TYPE
88	950001349494	LV8000	327250	GAS CYLINDER,S TROLLEY,DOUBLE TYPE
89	950001349495	LV8000	327250	GAS CYLINDER,S TROLLEY,DOUBLE TYPE
90	950001349496	LV8000	327250	GAS CYLINDER,S TROLLEY,DOUBLE TYPE
91	950001349498	LV8000	327250	OXYGEN/ACETILYNE CUTTING TORCH SET
92	950001349499	LV8000	327250	OXYGEN/ACETILYNE CUTTING TORCH SET
93	950001349500	LV8000	327250	OXYGEN/ACETILYNE CUTTING TORCH SET
94	950001349501	LV8000	327250	OXYGEN/ACETILYNE CUTTING TORCH SET
95	950001349502	LV8000	327250	OXYGEN/ACETILYNE CUTTING TORCH SET
96	950001349521	LV8000	327250	NECK DIE (PENCIL) GRONDER -6MM LO
97	950001349522	LV8000	327250	NECK DIE (PENCIL) GRONDER -6MM LO
98	950001349530	WE801505	327250	3/4 INCH DRIVE ELECTRICAL IMPACT W
99	950001349531	WE801505	327250	3/4 INCH DRIVE ELECTRICAL IMPACT W
100	950001349532	WE801505	327250	3/4 INCH DRIVE ELECTRICAL IMPACT W
101	950001349533	WE801505	327250	3/4 INCH DRIVE ELECTRICAL IMPACT W
102	950001419941	WE801505	327250	PUMP ENERPAC POWER ZE5310SW
103	950001419942	WE801505	327250	PUMP ENERPAC POWER ZE5310SW
104	950001419946	WE801505	327250	PUMP PNEUMATIC GREASE 20KG CAPACITY
105	950001419947	WE801505	327250	PUMP PNEUMATIC GREASE 20KG CAPACITY
106	950001419950	WE801505	327250	PUMP ULTIMA STEEL HAND p-80
107	950001419951	WE801505	327250	PUMP ULTIMA STEEL HAND p-80

Designation	Compiler	System Engineer	Outages
Name	E. Ebrahim	B. Somwahla	
Signature			
Date	16/05/2022	16/05/2022	