Eskom	**Specification**	**Medupi Power Station**

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1. Introduction

Medupi Power Station was commissioned between 2015 and 2020 and is situated in Lephalale Local Municipality, in the Waterberg region of Limpopo Province. Medupi is designed to generate approximately 4 800 megawatts (MW) of electricity.

Medupi Power Station has experienced numerous production load losses as well as unit trips as a result of very low coal bunker levels, caused by the inability to supply coal to the Medupi coal stockyard and the terrace coal plant. There are various challenges on the coal stockyard with regards to stacking, bypass and reclaiming performance as well as the performance of the terrace link conveyor that has previously, on occasion, limited the amount of coal that is conveyed to the unit coal bunkers.

The coal stockyard at Medupi was designed with increased storage capacity when compared to the other stations, to serve as a large buffer, instead of additional on-terrace storage. The various load losses have highlighted Medupi's vulnerability on the terrace link system due to the relatively low on-terrace storage capacity. It is therefore crucial for Medupi that the availability of the Terrace link system as well as the supply to the stockyard is maximised to ensure continuous supply and healthy coal bunker levels.

Various transfer chute problems on the stockyard and terrace have been major contributors to conveyor belt misalignment and conveyor damage, resulting in lower availability of the supply stream to the Unit coal bunkers.

To ensure continuous coal supply to the coal stockyard, terrace link and the terrace coal handling plant, problematic chutes need to be corrected.

This document states the required Scope of Work for improvements to problematic coal chutes at Medupi Power Station.

2. Supporting Clauses

2.1 Scope

The SOW is applicable to the improvements to the Medupi Power Station Coal plant chutes and includes the design, manufacturing, construction, and commissioning.

2.1.1 Purpose

The purpose of this document is to give the full scope of work for the the improvements to the Medupi Power Station Coal plant chutes.

2.1.2 Applicability

This document shall apply to the Medupi Power Station.

2.1.3 Effective date

The effective date of this document is the date of authorisation.

2.2 Normative/Informative References

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

2.2.1 Normative

[1] The Constitution of South Africa (Act 108 of 1996)

[2] Occupational Health and Safety Act (Act 85 of 1993) including relevant and applicable regulations and standards.

[3] Environmental Incident Management Procedure - 240-133087117

[4] ESKOM SHEQ Policy 32-727

[5] Life Saving-Rules – 240-62196227

[6] Medupi Power Station - SHE File Evaluation Checklist - 240-97661287

[7] Medupi Power Station Working at Heights Work Instruction - 240-135676724

[8] 10 000 ton silo Bulk Flow Material Testing, Concrete Testing and Analysis 0623R002 rev 0, ConsulTauri Design (Pty) Ltd

[9] Medupi Coal Flocculant test THY-COA-8857 NFTR1 Rev 0, Vietty Slurrytech

[10] Flow Properties of Medupi P/S Coal Conveyor Belt Sample (CON) SA 049-1, Tundra Bulks Solids Africa

[11] Medupi Power Station Coal Handling Plant – Overall schematic diagram for 6 units - 0.84/348 rev 17

2.2.2 Informative

240-53113685 Design Review Procedure

[12] 240-55864503 Belt Conveyor Mechanical Components Standard

[13] 240-55864504 Belt Conveyor Structural Steelwork and Welding Specification

[14] 10 000 ton silo Bulk Flow Material Testing, Concrete Testing and Analysis 0623R002 rev 0, ConsulTauri Design (Pty) Ltd

[15] Medupi Coal Flocculant test THY-COA-8857 NFTR1 Rev 0, Vietty Slurrytech

[16] Flow Properties of Medupi P/S Coal Conveyor Belt Sample (CON) SA 049-1, Tundra Bulks Solids Africa

[17] Medupi Power Station Coal Handling Plant – Overall schematic diagram for 6 units - 0.84/348 rev 17

2.3 Definitions

Definition	Explanation
Contractor	Service provider contracted for supply of spares and various services on the scrapers
Employer	Eskom Medupi Power Station

2.4 Abbreviations

Abbreviation	Explanation
DEM	Discrete Element Modelling
ECM	Engineering Change Management
EDWL	Engineering Design Work Lead
LDE	Lead Design Engineers
QCP	Quality Control Plan
SANS	South African National Standard
SHE	Safety Health and Environmental
SHEQ	Safety Health Environmental and Quality
SOW	Scope of Works
tph	Tons per Hour
UHMWPE	Ultra-High Molecular Weight Polyethylene

2.5 Roles and Responsibilities

- The Lead Design Engineers (LDE's) are responsible for compiling their specific sections within this SOW in line with stakeholder requirements. They must ensure that the Works Information that is derived from this Specification has correctly captured their inputs. This Scope of Work (SOW) however mainly involves mechanical changes.
- The Engineering Design Work Lead (EDWL) will be responsible for ensuring the complete integration of this SOW and ensuring that it meets stakeholder requirements. They must ensure that the necessary reviews to assure the quality translation of this specification to the Works Information takes place and is aligned to necessary Eskom governance.
- The Project Manager is responsible for translating this SOW into the Works Information

2.6 Process for Monitoring

All processes will be monitored as per the ECM process and contracts management processes.

2.7 Related/Supporting Documents

N/A

3. Scope of Work

The scope of this project is for the improvement to specific coal chutes at Medupi Power Station. It mainly involves replacement of existing chute components with redesigned, improved components to ensure enhanced material flow, central loading of downstream belts and minimal coal build-up in chutes. The scope included design, procurement, manufacturing, shipping to site, construction and commissioning of the chutes, bonnets, spoons, and components of the affected chutes.

3.1 Site location

Medupi Power station is situated approximately 20 km West of the Town Lephalale in the Waterberg region of the Limpopo Province and approximately 350 km North of Johannesburg.

3.2 Plant Layout

The work will be conducted on the Medupi Power Station Coal Plant. A schematic of the coal plant layout is shown in Figure 1 below. The areas where chutes require improvements is indicated in the red squares below.

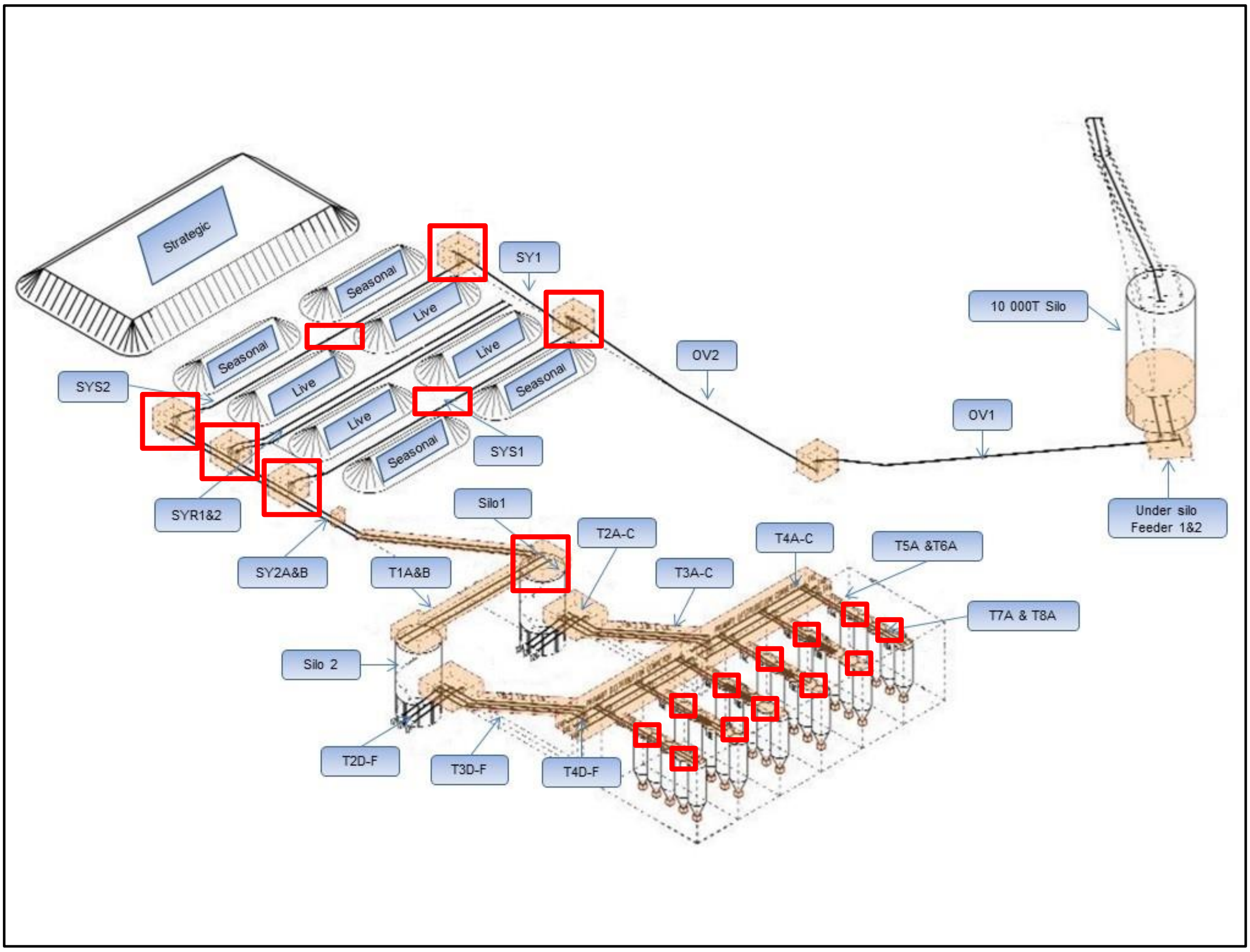

Figure 1: Medupi Coal Plant Overview Schematic

3.3 Conveyor Belt Capacities

The conveyor belt capacities, speeds, lengths and widths for the Medupi Coal conveyors are indicated in **Table 1** below.

Table 1: Medupi Coal Conveyor Belt Technical Data

Conveyor Description	Conv No.	Conveyor capacity [tph]	Conveyor Speed [m/s]	Conveyor belt speed range [%]	Conveying length [m]	Conveyor Belt Class	Belt Width [mm]
Under Silo Feeders	BF1&2	4000	1.25	12.5 - 100	22.3	1600 4-ply	2400
Overland Conveyor 1	OV1	4000	3.1	30 - 100	4220	ST 1600	2100
Overland Conveyor 2	OV2	4000	3.1	30 - 100	1171	ST 1000	2100
Stacking / Bypass Link Conveyor	SY1	4000	2.86	30 - 100	126.9	ST 500	2100
Stockpile Stacking Conveyors 1&2	SYS1&2	4000	2.86	30 - 100	932.2	ST 1000	2100
Live Stockpile Reclaim Conveyors 1&2	SYR1&2	3400	3.35	30 - 100	822.5	ST 800	1800
Terrace Link Conveyors	SY2A&B	3400	3.35	30 - 100	680.6	ST 1000	1800
Over Silo Conveyors	T1A&B	3400	3.35	30 - 100	339.4	ST 500	1800
Under Silo Shuttle Feeders	T2A-F	1150	0.87	0 - 100	24	1000 4-ply	1800
Incline Conveyors	T3A-F	1150	2.8	15-100%	338.6	ST 800	1200
Primary Distribution Conveyors	T4A-F	1150	2.8	15-100%	250	500 3-ply	1200
Secondary Distribution Conveyors	T5/6A-F	1150	2.8	15-100%	60	500 3-ply	1200
Reversible Shuttle Conveyors	T7/8A-F	1150	2.8	15-100%	21	500 3-ply	1200

3.4 Scope of Work

3.4.1 General Requirements for the Works

1. Increase availability and reliability of coal supply by doing improvements to specific coal chutes on the stockyard, terrace, and terrace-link conveyors.
2. Detailed designs and manufacturing drawings of the chute improvements to be supplied to Medupi.
3. Design, manufacturing, construction, and commissioning of the chute improvements/replacement parts using new materials.
4. The improved chute components to be integrated into the existing chute structures and to be bolted in or on in a relatively short time, when the plants are down for normal maintenance. The aim is to minimise supply disruption during implementation of the changes.
5. Where the weight of new components to be installed has significantly increased (compared to the existing components) because of the changes, structural calculations and verification will be required to ensure compliance with SANS specifications for structural design. If required, strengthening of structures needs to be done as part of the implementation process. These structural improvements, where required, should comply to SANS specifications for structural design.
6. The chute bonnets and spoons should ensure guided flow of the coal, ensuring central loading of the receiving belts under all conveyor speeds and material loading conditions. Central loading

means that no receiving conveyor/s directly downstream of the modified chute will misalign as a resulting of the loading profile from the new chute components, onto the receiving belt.

7. The guided flow chutes should be self-cleaning during normal operation and should not require regular cleaning of build-up in the chutes.
8. A defect correction period of 12 months will be required on all chute changes implemented.

3.4.2 OV2 Split Feed Requirements to SYS1 & SY1 and SYS2 receiving chute

1. Design, manufacture and install a new bonnet for OV2 moveable head chute, indicated in ‘blue’ in **Figure 2** below. The bonnet shall have a continuous smooth curve and shall be lined with smooth ceramic tiles. The redesign shall include increased structural stiffening on the bonnet to ensure that tiles do not come loose due to impact loading and flexing of the bonnet under any condition.
2. Design, manufacture and install a hydraulic cylinder on the bonnet of OV2 head with hand a operated power pack. The cylinder would take the place of the spindle nut to enable horizontal adjustment of the bottom section of the bonnet. Operation of the powerpack should adjust the bottom of the bonnet to enable adjustment of the split ratio to SYS1 and SY1, by operating the hydraulic cylinder, when the moving head is in the split position as indicated in **Figure 2**.
3. The spilt ratio should be adjustable from 80%:20% up to 20%:80% to both receiving chutes and a manual position indication should be installed to indicate the approximate split position.
4. The hydraulic cylinder should have a safety factor of 20, to ensure a long service life under high impact loading. The attachment points of the cylinder to the chute as well as to the bonnet shall also be reinforced to ensure that it does not break under impact loading.
5. When the hydraulic cylinder is fully extended, the bottom of the bonnet should not interfere with any of the stationary structures below during moving of the head or the primary scraper.
6. Design, manufacture and install a replaceable ceramic lined peak for the SYS1/SY1 split chute (Indicated in ‘yellow’ in figure **Figure 2** below) that can be bolted on and off the existing structure for easy replacement. The current split peak is welded in and will have to be cut out for the replacement.
7. Design, manufacture and install bolt-on chutes with easily replaceable bolt-on sections (at high wear and impact area) for SYS1, SY1 and SYS2 top fixed spoon of the receiving chute (indicated in ‘red’ in **Figure 2**). The spoons shall have a continuous smooth curve and shall be lined with smooth ceramic tiles. Drawing 0.84/10183 shows the general arrangement of these chutes in the transfer house.
8. Design, manufacture and install a new spoon chute for SYS1 and SYS2 bottom receiving adjustable spoon chute. The chutes are indicated in ‘green’ in **Figure 2** below. The spoon shall have a continuous smooth curve and shall be lined with smooth ceramic tiles. It shall ensure central loading of SYS1 and SYS2 under all load conditions, including low material flow conditions.
9. Replace skirting rubbers brackets on SYS1 and SYS2 receiving chutes to lower skirting rubber position on the belt. See Figure 3 below for the current arrangement.
10. Design, manufacture and install brackets at skirting rear end to ensure rubber skirting is self-readjusting after possible slipping out of position due to conveyor belt excessive misalignment.
11. Design, manufacture and install a new western side chute plate for the top section of the chute to SY1 receiving chute (indicated in ‘purple’ in **Figure 2** below). The plate shall be bolt-on with increased structural stiffening. The plate should be lined with smooth ceramic tiles in the impact and flow area.
12. Supply a spare cylinder and replaceable peak.

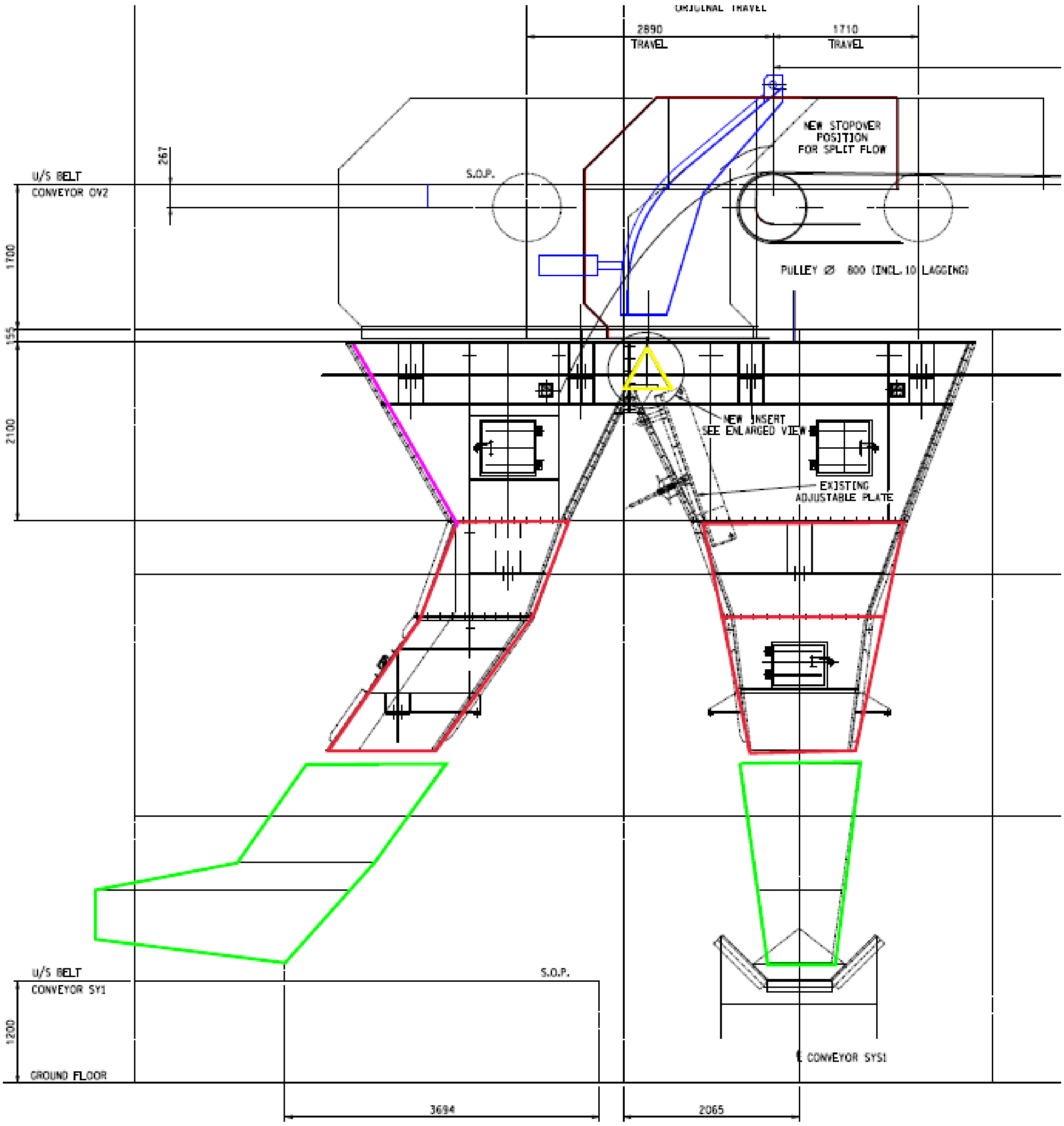

Figure 2: OV2 Feed to SYS1 and SY1

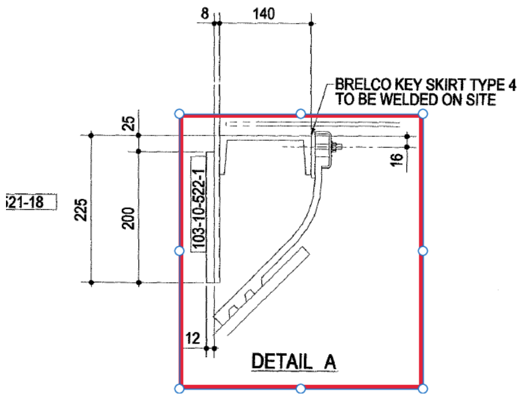

Figure 3: Current skirt detail

3.4.3 SYS1 and SYS2 Stacker Bypass Guided Flow (0.84/10200)

1. Design, manufacture and install new guided flow chute components for the stacker bypass to ensure central loading of SYS1 and SYS2 after the stacker bypass.
2. It is envisaged that the complete chute with bonnet and spoons will have to be redesigned and replaced to allow for proper guide flow chutes to be installed (this shall be confirmed by DEM modelling of the entire chute). See **Figure 4** with the chutes highlighted.
3. Any newly designed sections of the chute shall have sufficient access provided for easily access to any internal part of the chute for cleaning with spades.
4. This is required for both Stacker 1 and Stacker 2.
5. Existing mounting positions of the chute shall be used as far as reasonable.
6. Replace skirting rubbers brackets on the bypass chutes to lower skirting rubber position on the belt.
7. Design, manufacture and install brackets at skirting rear end to ensure rubber skirting is self-readjusting after possible slipping out of position due to conveyor belt excessive misalignment.
8. Install new Brelko key type skirting rubbers (or equivalent).

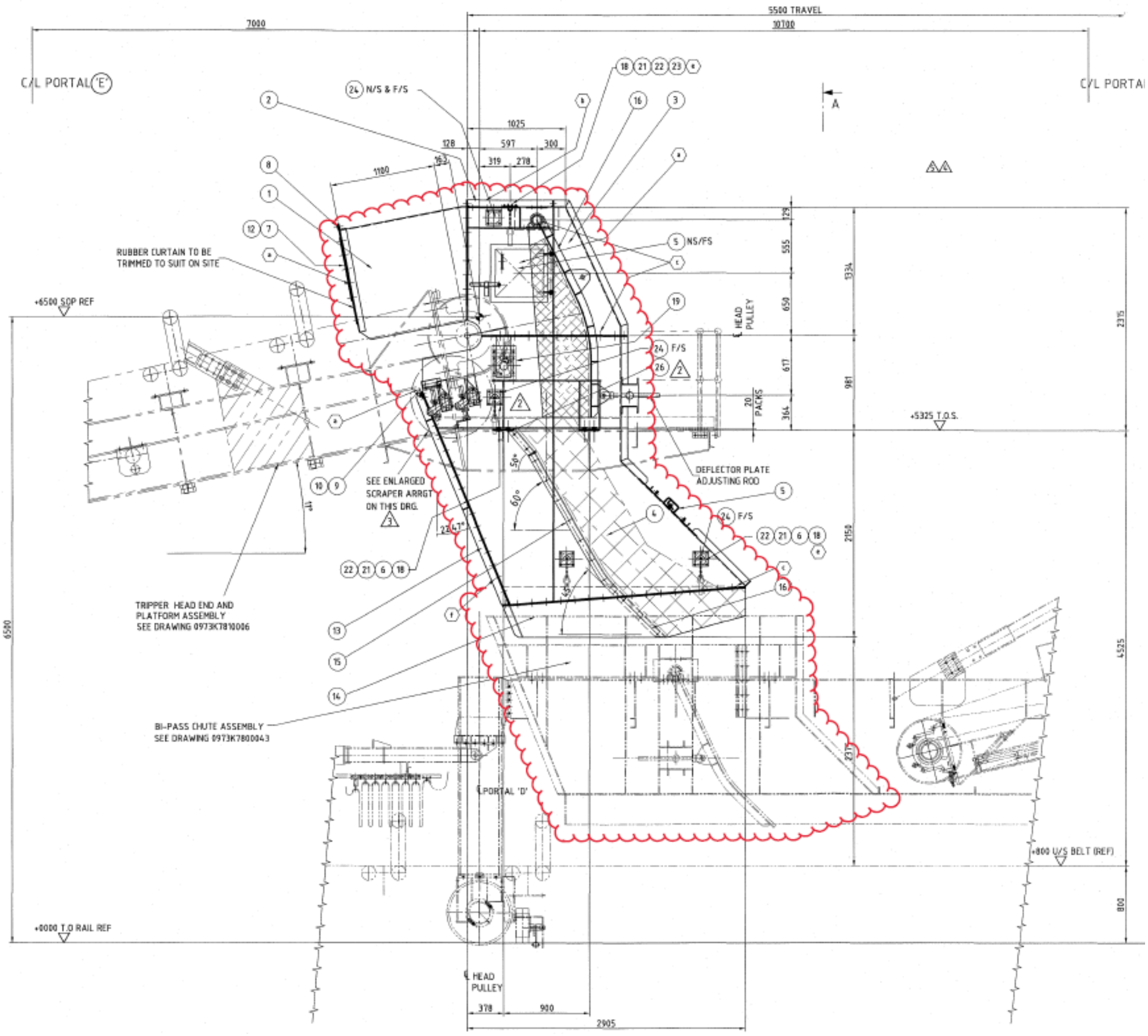

Figure 4: Stacker rear tripper in bypass position

3.4.4 SY2A and B Guided Flow Chutes (0.84/10501 sht. 11, 12&13, 0.8410233 sht. 8)

1. Design, manufacture and install new guided flow chutes for the 8 receiving chutes from the stockyard conveyors onto SY2A and B to ensure central loading of SY2A and B. There are currently no spoons on the stationary receiving chutes which result in the skew loading of the conveyor as the speeds on the feeding belts change. See Figure 5 below.
2. It is envisaged that the feeding chutes with bonnets will have to be redesigned and replaced to allow for proper guide flow within the chute (this shall be confirmed by DEM modelling). See Figure 5 with the material flow at the currently installed bonnets in red and blue.
3. Replace skirting rubbers brackets on all SY2A and B receiving chutes to lower skirting rubber position on the belt. See Figure 3 above for the current arrangement.
4. Install new Brelko key type skirting (or equivalent) on all receiving chutes on SY2A and B.
5. Design, manufacture and install brackets at skirting rear end to ensure rubber skirting is self-readjusting after possible slipping out of position due to conveyor belt excessive misalignment.

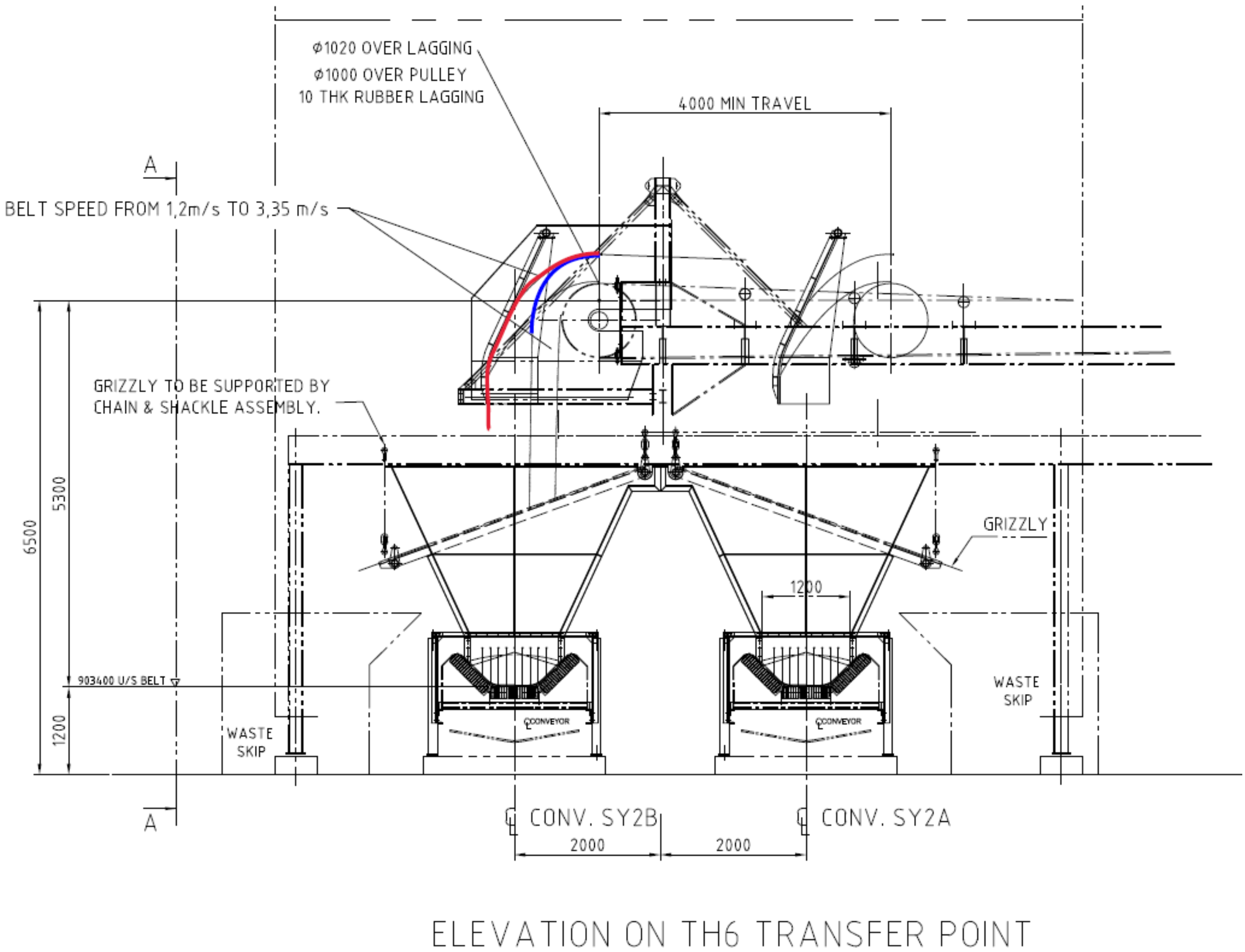

Figure 5: SY2A & B receiving chutes.

3.4.5 T1A and B Receiving Chutes

1. Align the impact idlers section to ensure that they are all on the same horizontal plane at the tail of T1A and B (0.84/10321 sht. 48)
2. Design, manufacture and install steel skirting that slightly opens up in clearance between the belt towards the discharge to ensure that coal does not spill when feeding the North silo and the belt simultaneously (tail chute overflows). The skirt shall be adjustable to accommodate for wear on the skirts. Install additional rubber or any other measure deemed necessary to prevent spilling during simultaneous feed, if required. (0.84/10322 sht. 17, extract in Figure 6 below)
3. Modify the adjusting gates (4 off) to reduce the open area and position it closer to the belt to ensure the throughput is reduced to 30% of the total capacity when the belt is running at minimum speed of 30% and a maximum of 100 % when the belt is running at full speed. (0.84/10183 sht 3, Figure 7 & Figure 8 below)
4. Install new, stronger hooking points on the adjusting gates.
5. Commission T1A&B simultaneous feed to confirm full range of throughput and split feed is achievable.

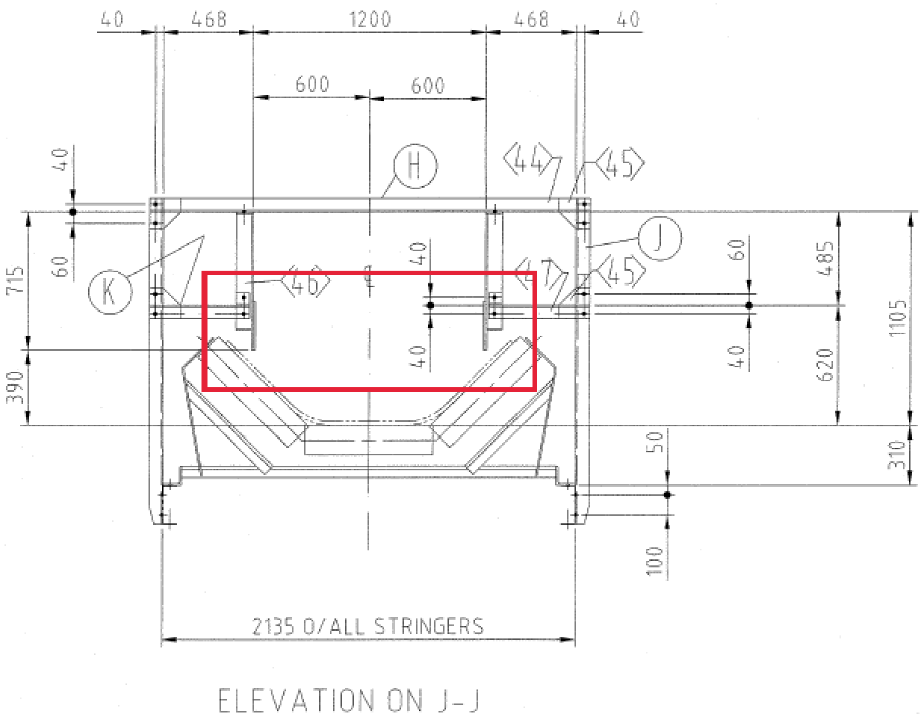

Figure 6: T1A & B current steel skirts

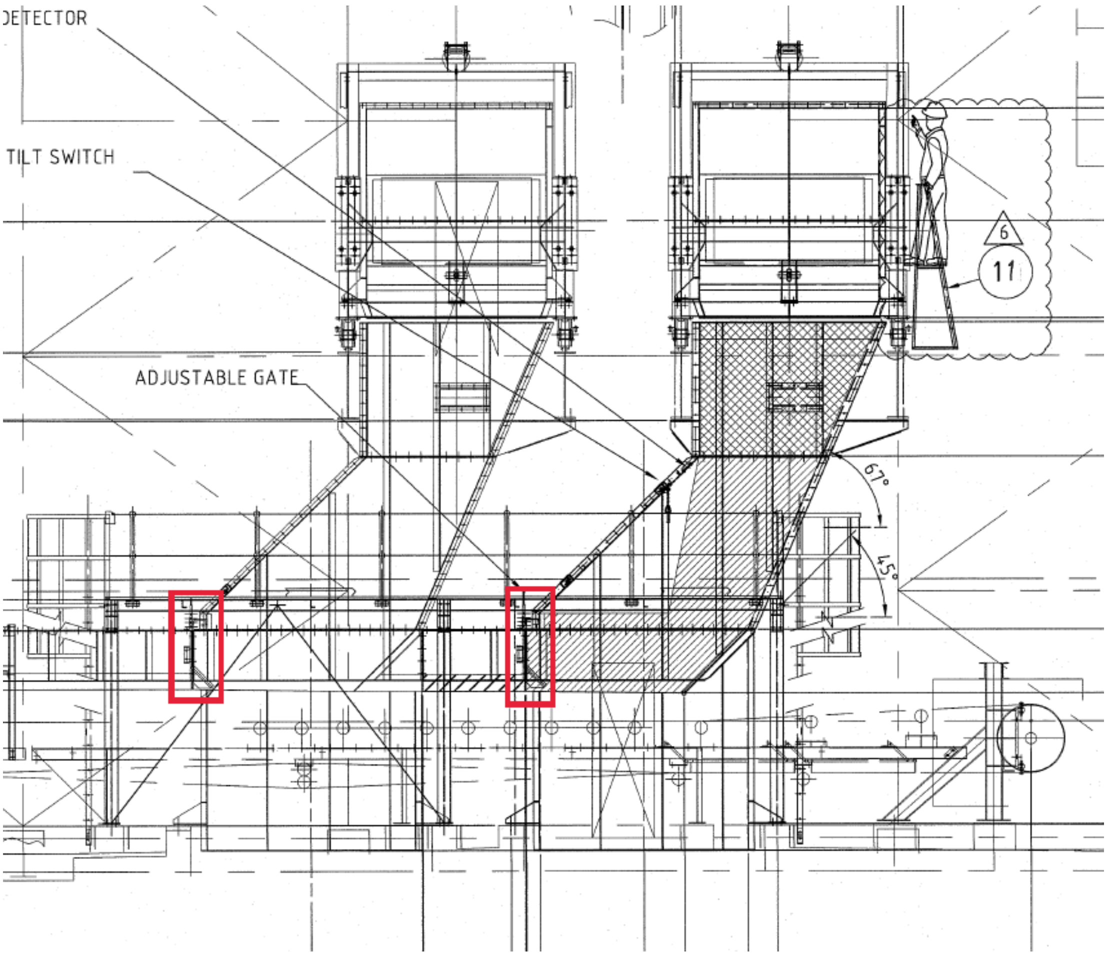

Figure 7: Position of T1A & B adjusting gates

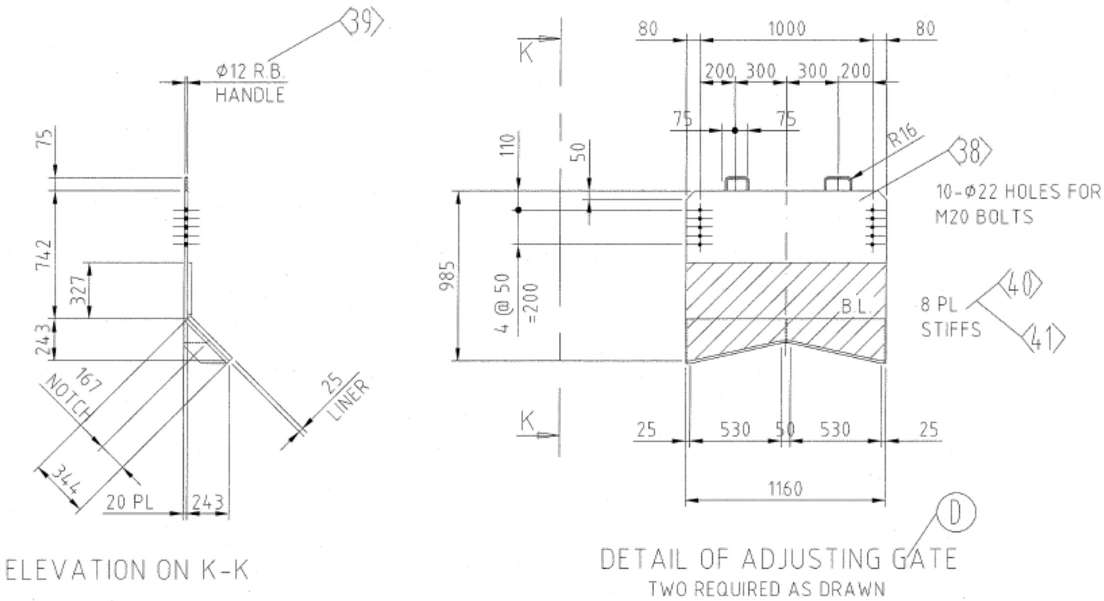

Figure 8: Current adjusting gate on T1A & B

3.4.6 T7 and T8 head and tail chutes

1. Remove the 4 zippers (pontoon like skirting opening devices) on each head and tail chute of the T7/8 conveyor (12 off). Indicated in ‘red clouds’ in Figure 9 below.
2. Remove the front section of the head and tail chute where the material impacts. Indicated in pink in Figure 9.
3. Also cut out the edges of the V-section at the rear section of the chutes, to enable the removal of the split section in the middle of the head and tail chutes.
4. Design, manufacture and install an extension to the front of the head and tail chutes. Indicated in ‘blue’ in Figure 9. The extension should endeavour to minimise material impacting the front part of the chutes, the possible impact area shall be lined with ceramic tiles.
5. The extension chute shall be designed stiff enough to prevent tiles and linings dislodging due to excessive impact loading or pressure from chute blockages under all conditions.
6. The top open section and extension should be enclosed with plates. The enclosure should also have an angled section in the front with a large inspection door, hinged at the top. The complete angled section should also be bolted on to allow for removal, to enable large objects stuck on the grizzlies to be removed by unbolting of the angled section.
7. Manufacture and weld in a V-shaped section with bottom flange at the rear plate of the head and tail chutes, where the spilt section was cut out.
8. Remove the zipper skirting guides on the sides of the head and tail chutes which are not used anymore, indicated in green in the figure.

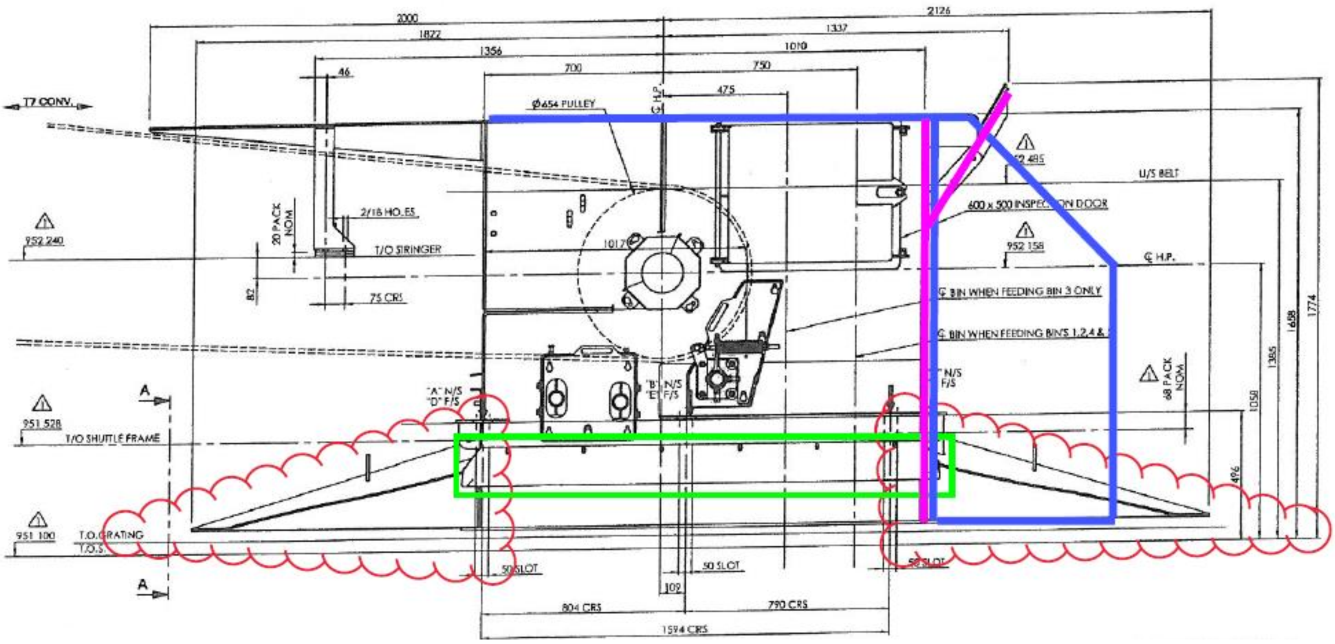

Figure 9: T7&8 head and tail chutes

3.5 Coal properties

The Medupi Coal is characterised by high fines and relatively high moisture and ash content. This make the coal flow challenging and it is relatively cohesive throughout it's as-received condition from the mine. The Contractual Coal quality specification is indicated in Table 2 below.

Table 2: Medupi contractual coal quality specification

Quality Parameter	Unit	Measurement Period	Measurement Basis	Expected Quality	Distress Point	Rejection Point	Impact Coefficient (% per unit)
Calorific Value	MJ/kg	24h	Dry	20.5	19	18	0.474
Ash Content	% by weight	24h	Dry	35	37.5	39	0.169
Abrasive Index	mg Fe/kg	24h	Dry	315	475	625	0.02
Total Moisture (low)	% by weight	8h	AR	11	5	3	0.2
Total Moisture (high)	% by weight	8h	AR	11	12	13.5	0.2
Total Moisture (peak)	% by weight	1h	AR			14	None
Hardgrove Index		24h	Dry	52	45	35	None
Ash Initial Deformation Temp (reducing atmosphere)	° C	24h	Dry	1350	1270	1250	None
Volatile Matter (low)	% by weight	24h	Dry	22-28	20.5	20	None
Volatile Matter (high)	% by weight	24h	Dry	22-28	30	32.5	None
Sulphur Content	% by weight	24h	Dry	1.3	1.8	2.2	None
Size >45mm	% by weight	24h	Dry	5	7	10	None
Size< 6.7mm	% by weight	24h	Dry	60	65	75	None

Medupi also has actual contractual Coal qualities recorded per shift for the past 10 years and this information will be provided.

Various tests were also conducted on Medupi Coal for various investigations and these include:

- Bulk Solids flow testing in August 2015 for ConsulTauri Design (Pty) Ltd using Greentechnical (Pty) Ltd [8].
- Flocculant Investigation for ThyssenKrupp using Vietty Slurrytech in October 2020 [9]
- Flow Properties of Medupi P/S Coal for Thussynkrupp using Tundra Bulk Solids Africa [10]

These test reports will be provided.

The contractors can also request samples from Eskom Medupi Power Station for they own testing and analysis, if required.

3.6 Design Requirements

All drawings shall comply to the Engineering Drawing Standard – Common Requirements 240-86973501

The Contractor shall include the Employer's drawing number in the drawing title block. Drawing numbers shall be assigned by the Employer as drawings are developed.

All drawing cross references on drawings shall use the Employer's drawing numbers.

The Contractor shall submit all drawings, including manufacturing drawings, in PDF and DGN format.

Drawings that the Contractor submits for review and acceptance purposes shall have the compiler(s) and approver(s) signatures.

All drawings submitted for final approval shall be signed by an applicable Professionally Registered Engineer.

The Contractor shall submit all CAD files for the chutes in DWG format.

The Contractor shall use the Medupi Plant Zero Datum for all drawings and 3D models.

The Medupi Plant Zero Datum (Drawing Number 0.84-364) according to the WGS84/L027 World Coordinate Reference System shall be provided to the Contractor.

The Contractor will not mobilise on site until all the designs have been accepted and released for installation by the Employer, and the bulk of the components are manufactured and ready for installation.

3.7 DEM modelling

The Contractor will conduct DEM modelling on the following chutes during the design phase:

- OV2 head chute in split feed to SYS1 and SY1 at:
  - 4000 t/h (100% speed).
  - 3000 tph (100% and 75% speeds).
- OV2 to SYS1 at:
  - 4000 (100% speed).
  - 2400 (60% speed).
  - 1200 tph (100% and 30% speeds).
- Stacker bypass at:
  - 3400 (85% speed).
  - 2400 (60% speed).
  - 1000 tph (at 85% and 30% speeds).
- SYS1/2 chute feeding SY2A/B at:
  - 3400 tph (100% SY2A/B speed and 85% SYS1/2 speed).
  - 2400 tph (100% SY2A/B speed and 60% SYS1/2 speed).
  - 2400 tph (70% SY2A/B speed and 60% SYS1/2 speed).

    - 1200 tph (100% SY2A/B speed and 30% SYS1/2 speed).
- SYR1/2 chute feeding SY2A/B at:
    - 3400 tph (100% speed)
    - 2400 tph (100% SY2A/B speed and 70% SYR1/2 speed).
    - 1000 tph (100% SY2A/B speed and 30% SYR1/2 speed).

This will be used as a design tool from early in the design phase to optimise chute positions and profiles, the initial analyses may be executed with a fairly "rough" element count (as compared to the actual material) to allow rapid and cost-effective modelling during the early phase of the design. The final DEM models shall mimic the actual coal properties (with high fines content and high adhesive and cohesive properties) as far as reasonable and practical. The final designs of these chutes will not be approved without the DEM models illustrating that the flow is guided and that central loading is achieved for all scenarios.

3.8 Design life

The remaining life of the power station is approximately 40. Based on this approximation, the design life for the non-wearing components is therefore 40 years.

3.9 Standardisation and interoperability

The newly installed chute components should be standardized on identical or similar conveyors/chutes to allow for interchangeability and standardization of future spares holding.

The additional chutes and components should, as far as practically possible, be bolted onto the existing structures to allow quick installation and replacement.

3.10 Functional interfaces

- Where existing chutes have blocked chute detectors or other instruments passing through or in close proximity, provision should be made to accommodate or relocate them when new components are designed and installed.
- Where blocked chute detectors or other instruments are in close proximity of new components to be installed, care should be taken to remove these instruments before continuing with removal and installation of chute components.

3.11 Constraints

- The design of the new conveyor chute components that interface with existing plant, should endeavour to minimise the downtime of individual conveyor belts as far as possible and not result in downtown of multiple conveyors.
- Medupi is a production plant and availability of conveyors to affect changes is highly dependent on the availability of standby or redundant plant. Planned downtime of conveyors can be cancelled on short notice if other plant failures are experienced.

3.12 Transfer Chutes and Skirting

3.12.1 Transfer chutes

1. Transfer chutes shall be designed specifically to handle coal with a high fines fraction (approximately 60 % below 6.7 mm) and high moisture content. The chutes shall be designed to ensure no blockages under any and all conditions.
2. Transfer chutes shall be designed to handle the required capacities without any build up and blockages. In the case of an emergency trip on one belt (either feed or receiving belt), the chute shall be self-cleaning on restarting of the system.
3. Transfer chutes shall be fully enclosed, water and dust tight and designed for ease of maintenance with adequate inspection doors to ensure all areas can be easily accessed for cleaning.
4. Transfer chutes shall operate without blockage and shall be designed to load the coal centrally onto the receiving conveyor belt. Guided flow transfer chutes shall be used in all transfer points. Guided flow transfer chutes shall include the following salient features:
    a. A carefully designed deflection plate (bonnet or hood) that will enable the guided transfer of coal from one conveyor to another receiving conveyor in a controlled manner.
    b. The bonnet shall be designed in a manner that will ensure sliding rather than impact, hence minimising further particle degradation and creation of further fugitive dust.
    c. The Bonnet should start as wide as the pulley and then gradually narrow to consolidate the coal towards the centre of the bonnet to ensure that coal that comes in off-centre from the feeding belt, it is centralised when discharging from the bonnet.
    d. The angle of incidence of the incoming stream relative to the bonnet shall be between 3 and 8 degrees. The curvature of the bonnet should be such that this angle is maintained as far as possible within these limits when the belt speed is varied in the range specified in **Table 1.**
    e. In addition to the bonnet, a carefully engineered radial ladle (spoon) shall be installed just above the receiving belt and below the bonnet. The coal shall be placed onto the receiving conveyor via the bottom ladle in a manner that will eliminate any spillage, without causing any misalignment and with a velocity component in the direction of the belt and with a magnitude similar to that of the receiving belt.
    f. The ladle/spoon should also start wide (wider than the discharge of the bonnet/hood from above) and then narrow towards the discharge of the spoon to further consolidate the coal and ensure central loading of the coal onto the receiving belt.
    g. The spoon shall ensure central loading irrespective of the speed and loading profile of the feeding belt.
    h. The bonnet shall be adjustable in both a vertical and horizontal direction to enable careful trimming of the incoming stream. A manual adjusting mechanism shall be provided for adjustment of the lower section of the bonnet. This adjustment will enable positioning the coal stream as high up as possible on the bottom ladle. The bottom adjustment arrangement shall not protrude into the normal access way around the feeding chute.
    i. Both the bonnet and the spoon should be lined with smooth, 92% alumina ceramic tiles and the valleys should be lined with specially engineered (shaped) profiled ceramic tiles,

to suite the curvature and valley angles of the bonnet or spoon. No sharp corners should be present in the valleys.

j. Multotec Mortabond MM701 (or equivalent) shall be used for fixing of any ceramic tiles to any part of the chute.

k. The leading edge of the ceramic tiles should not protrude above the trailing edge of the preceding tile/s. This can be verified by running a business card gently in the direct of flow through the bonnet or spoon. If the business cards gets stuck, the protrusion is too high and needs to be corrected. Similarly there should be no protrusion of the tiles when checked across any horizontal plane in guided flow chutes.

5. Chute sections that only handle dribble should be lined with Ultra-High Molecular Weight Polyethylene (UHMWPE) liners. Surfaces shall provide a smooth transfer of material. Liners shall be sized to facilitate handling but each segment shall not exceed 20 kg in mass.
6. All chute angles shall be designed in such a manner that will allow for self-purging of the chutes when conveyor system stops.
7. In addition, access at head ends and tail ends of conveyors and other locations of the conveyor where spillage can occur shall be designed to allow spillage to be easily returned onto the conveyor belt.
8. All chutes shall be designed to provide sufficient cross-sectional area to transfer twice the design discharge capacity.
9. The chutes shall be designed in such a manner that will minimise wear to liners, skirting and conveyor belting.
10. Chute plates shall be constructed in flanged sections connected with M16 minimum diameter galvanized bolts. Sections requiring removal for maintenance shall be fitted with lifting eyes or lugs located in convenient positions.
11. The internal surfaces of all chutes shall be free of all welding slag, ledges or other protrusions which may contribute to coal build-up in the chute. Generous fillets and radii shall be used at all corners, and details of these shall be submitted to the Employer. The flanges shall be matched to achieve a smooth internal joint.
12. The minimum valley angle in chutes shall be 65°.
13. Chutes shall be constructed from mild steel plates with a minimum thickness of 8 mm. Dust covers shall be 5 mm minimum thickness. Head frames integral with the chute shall have a minimum plate thickness of 16 mm.
14. Large, hinged inspection doors shall be provided to enable the inspection of bonnets and spoons as well as the cleanout of coal blockages. Similar doors shall be provided adjacent to all belt cleaning devices and chute blockage detectors or other items of plant located inside chutes, for the purpose of inspection and maintenance. The size of inspection door openings shall not be less than 600 mm x 600 mm and those provided for maintenance access or cleanout purposes shall not be less than 800 mm x 500 mm.
15. Doors and covers shall be hinged unless otherwise approved by the Engineer.
16. Access platforms and ladders shall be provided to all inspection doors not accessible from walkway level to the satisfaction of the Engineer.
17. The chute shall be designed in such a manner as to permit easy personnel access into the chute where possible.
18. All access doors shall be securely latched and sealed and capable of being opened, by one person, without the use of tools. Inspection doors, latches or nuts should be attached to the chute to prevent these components from being dropped or getting lost over time.

19. Discharge head boxes shall be fitted with access panels over the full width of the headbox top to allow for inspection and cleaning of the chutes.
20. All doors shall open, close and seal to the satisfaction of the Engineer. Doors or covers shall be of robust construction and free from warping.
21. Detectors shall be provided in the head chute to detect blockage and initiate tripping of the conveyor. The exact location for these detectors shall be determined by the Contractor during commissioning.
22. The external surfaces of the chutes shall be protected against corrosion in accordance with SSZ-45-17 REV.2. The internal surfaces of the chutes shall also be painted with inorganic zinc silicate paint.
23. A rubber dust curtain shall be provided at the point of entry and exit of the chute by coal. The dust curtain shall have split ends to allow unrestricted movement of coal on the belt.
24. Seal rubber used in the chute joints shall not have a shore hardness on the A scale higher than 40-45.
25. Where seal rubber is used, the joining surfaces shall be sand blasted prior to the use of adhesives. The adhesive application procedure for the rubber components shall be submitted to the Engineer.
26. All replaceable liner plates shall have part numbers stamped and numbered as per Contractor's submitted drawings.
27. Where liner plates are welded onto the chutes, the Contractor shall grind the welds, such that a smooth flush surface is produced within the chute. The Contractor shall return all welded surfaces of the bin liners to a 2B finish, including removal of all splatter from the liner plates.
28. Where liners are bolted to a bin or in a chute or hopper, the liner plates shall be installed within an edge tolerance of 2 mm to each other. The liner plates, when installed, shall be staggered such that coal flow cannot run continuously between liner plate edges down the chute.

3.12.2 Skirts

1. The skirt boxes at loading points of all conveyors shall be provided with abrasion resistant steel faces. These abrasion resistant steel faces shall be VRN500 or equivalent.
2. Where applicable, adjustable rubber skirts shall be provided with quick release clamping devices. The Contractor shall submit details of the skirt system offered to the Engineer.
3. Skirts shall extend a minimum of 1000 mm behind the transfer point and a minimum of 4000 mm forward of the transfer point as a minimum.
4. The Contractor shall be responsible for selecting the skirt length to suit the conveyor configuration, speed and coal characteristics. The length of loading skirts shall be sufficient to ensure that the coal stream is settled on the belt and shall prevent any backward running of coal and dust emission behind the loading chute. Any adjustment or modification required during commissioning to attain correct product control shall be carried out by the Contractor.
5. Seal rubber shall be grooved and not be of a durometer higher than 40-45 Shore A scale.
6. The rear of the grooved rubber skirt, where the belt enters the chute should be lifted at least 10 mm off the belt. This is to prevent the rubber skirt from being cut if the belt has misaligned severely and if the skirt is off of the misaligned belt, or in the case of severe belt edge damage.
7. In addition to the above, if there is any joint in the grooved rubber skirting, the skirts should overlap at the joint by at least 40 mm and the skirt at the rear should always be at the bottom

of the front skirt. to prevent skirt damage of the skirt on the front side of the joint in the conditions described above.

8. The distance between the bottom of the skirtboard and the top of the belt shall be so as to prevent large pieces of coal from jamming.
9. All skirt dust covers shall be constructed from 5 mm mild steel plate.

3.13 Tests on Completion

After approval of the design documentation but before installation, the contractor submits a commissioning procedure/s for the chutes which included pre-commissioning activities as well as commissioning and performance testing activities for approval by the Employer. No installation of any chute component will be allowed before the overall commissioning procedure or a commissioning procedure specifically for that chute is approved by the Employer.

3.13.1 Pre-Commissioning

1. After manufacture and erection, the Contractor shall satisfy himself that the equipment is complete in all respects and shall carry out the necessary pre-commissioning inspection on the plant, (supplied by the Contractor).
2. The contractor will ensure that the plant is setup and adjusted to the design positions and further ensure that where applicable the moveable heads stop in the design positions.
3. Where applicable, the Contractor shall request the Employer to move the plant to the desired positions to test and verify that there are no clearance problems with the stationary plant and chutes. The bonnet of OV2 will be moved through its full range to verify the movement and clearance with surrounding chutes and scrapers.
4. During this period the Engineer shall carry out visual inspection on the plant and witness the tests.

3.13.2 Commissioning

1. After the above pre-commissioning and functional tests, the chutes shall be commissioned with material.
2. The chutes shall be tested in the loaded condition at a range of loads, to confirm that the chutes and downstream plant performs according to the specification. The following shall be tested and confirmed:
    a. The central loading of downstream conveyor/s and that no misalignment trips are experienced on the downstream conveyor/s.
    b. No spillages occur around the affected chutes.
    c. No blockages or build ups occur in the affected chutes.
    d. The performance of the OV2 split ratio adjustment system and the repeatability of the results.
    e. The evaluation of conveyor transfer balance when tripped at full capacity and speed (no over spilling at transfer points during conveyor run-down).
    f. The ability of the chute to clear itself after starting up after an emergency stop.
3. The commissioning of each chute shall constitute at least 30 days of continuous unassisted operation of the chutes of which the last 7 days shall be completely trouble free. If the

operation is not trouble free, commissioning shall continue until the plant functions correctly before it is accepted. During this time the chutes shall be monitored for correct functioning and any build-up, in the bonnets and spoon areas.

4. The contractor will conduct inspection with the Employer's chute cleaning personnel twice daily to monitor for spillages and build-up in the chutes during the commissioning period. All build-ups will be reported on a dedicated commissioning communication group.

3.13.3 Acceptance tests

1. In the last week of trouble-free operation as defined in the commissioning section above, the Contractor shall provide a report with recordings of instantaneous tonnage, time stamped photographical evidence of conveyor loading profile on various load conditions as well as time stamped photographical evidence of the chutes and any build-up. The report shall further indicate any chute related issues and stoppages as well as any chute cleaning activities required.
2. During the last 7 days of trouble-free operation, the Engineer should be present as far as practically possible, during the taking of photographical evidence for loading and build-up.
3. This report will be used to confirm that the contractor meets the performance requirements of the chutes, and it will be submitted to the Employer for review and also make provision for the Employer to sign for acceptance, if in agreement.

4. Acceptance

This document has been seen and accepted by

Name	Designation
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5. Revisions

Date	Rev.	Compiler	Remarks
October 2024	1	JF Claassen	New Document Created

6. Development Team

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

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Louis Snyman	Senior Engineer
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