	Standard	Asset Management
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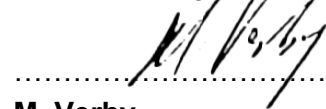
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1. INTRODUCTION

Power Station mill bunkers receive coal from the mine directly and from the stockyard. The feed to the stockyard is accomplished by conveyor, road or rail deliveries or a combination of these. Coal from the coal stockyard is either reclaimed by fully mechanized plant (rail mounted stackers/reclaimers) or by mobile scraper chain feeders. These feeders can be located at any position on the coal stockyard to allow for reclamation of the various coal stockpiles. These are sometimes placed in an integrated truck offloading facility or alternatively used separately wherever required.

This document standardizes the requirement for the Scraper Chain Feeders to be used in Eskom Power Stations.

2. SUPPORTING CLAUSES

2.1 SCOPE

This document describes the technical requirements for scraper chain feeders used in Eskom Power Stations. The user of the document shall specify the required capacity of the feeder in tonnes per hour as well as the on board voltage required.

2.1.1 Purpose

The purpose of the document is to facilitate procurement of scraper chain feeders for Eskom Power Stations. This document is necessary in order to standardize the scraper chain feeders and to ensure that they are fit for purpose.

2.1.2 Applicability

This document shall apply to Group Technology Engineering and Generation Division.

2.2 NORMATIVE/INFORMATIVE REFERENCES

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

2.2.1 Normative

- [1] 240-150642762, Generation Plant Safety Regulations
- [2] 240-114967625, Operating Regulations for High Voltage Systems
- [3] 240-51999453, Standard Specification for Valve Regulated Lead Acid Cells
- [4] 240-54783039 New MV Motor Technical Schedule A&B
- [5] 240-55714363, Coal Fired Power Stations Lighting and Small Power Installation Standard
- [6] 240-56176097 Electrical cable schedule
- [7] 240-56227443, Requirements for Control and Power Cables for Power stations Standard
- [8] 240-56227516, LV Switchgear Control Gear Assembly Associated Equipment for Voltage 1000V AC and 1500V Standard
- [9] 240-56356396, Earthing and Lighting Protection Standard
- [10] 240-56356421 Electrical LV Switchgear Schedule
- [11] 240-56536505, Hazardous Locations Standard
- [12] 240-77100923 New LV Motor Technical Schedule AB

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- [13] 240-77301384 Electrical LV Load Schedule
- [14] 240-77302094 Electrical Termination Schedule
- [15] 240-115583001 LV Switchgear Schedule A and B Template
- [16] 240-106365693 Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings
- [17] 474-11542, Generation Plant General Electrical Specification
- [18] ISO 9001 Quality Management Systems.
- [19] SANS 1652 Battery chargers –Industrial Type
- [20] SANS 62271-202, High-voltage switchgear and controlgear Part 202: High-voltage/low-voltage prefabricated substation
- [21] SANS 60146-1-1 Semiconductor converters

2.2.2 Informative

- [22] 0.00-BMH-MCSC-001, Mobile Chain Scraper Feeder Conveyor for Coal Handling Purposes
- [23] 474-12186 Scraper Chain Feeder Technical Specification

2.3 DEFINITIONS

Definition	Description
VRN	Wear and impact resistant, high strength steel

2.3.1 Disclosure Classification

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

2.4 ABBREVIATIONS

Abbreviation	Description
Abbreviation	Meaning given to the abbreviation
AC	Alternating current
AKZ	Anlagenkennzeichnungssystem
BMH	Bulk Materials Handling
C&I	Control and Instrumentation
CM	Configuration Management
CSY	Coal Stock Yard
DC	Direct Current
GA	General Arrangement
Gx	Generation
IP	Ingress Protection
Hazloc	Hazardous locations

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Abbreviation	Description
ISO	International Organization for Standardization
LV	Low Voltage
KKS	Kraftwerks-Kennzeichen-System
OEM	Original Equipment Manufacturer
SANS	South African National Standards
SCPD	Short Circuit Protective Device
UPS	Uninterrupted Power Supply

2.5 ROLES AND RESPONSIBILITIES

The System Engineer is responsible for specifying the available infrastructure in terms of voltage level and power source when acquiring the new scraper chain feeder.

2.6 PROCESS FOR MONITORING

Not applicable.

2.7 RELATED/SUPPORTING DOCUMENTS

Not applicable.

3. STANDARD

3.1 SPECIFICATION OF SCRAPER CHAIN FEEDERS

3.1.1 Equipment Overview

The feeder shall be used outdoors for mobile truck off-loading as well as for reclaiming the live, seasonal, strategic and emergency stockpiles. Loading onto the feeders shall be done by either front end loaders or road trucks tipping on top of the deck or bulldozer pushing the coal onto the deck.

The feeders consist of a steel frame structure with a chain scraper arrangement that moves and elevates the coal from the horizontal travel to the head end discharge.

The long deck feeder will be designed with a cantilevered head section that will provide for a transfer onto the receiving conveyor. The long deck feeders must be able to be shortened into short deck feeders for flexibility of application.

The feeder shall have on board electrical and control equipment. The electrical and control connections and cabling shall be designed to facilitate connection and disconnection to alternative locations. The electrical connection for point of supply (bulk supply) shall be by means of a Short Circuit Protective Device (SCPD) e.g. Circuit-breaker or Fuse Switch Disconnecter provided by the Employer from the source of supply identified by the Employer. The Contractor sizes the machine's overall power consumption and informs the Employer to provide this power. The length of power cable will suit site specific electrical connection points (kiosks). A site layout shall be provided by the Employer.

The design of the feeder shall include for the handling of coarse as well as a very fine product as described in sections 3.1.2.12 and 3.1.2.13. The return scraper deck shall be designed to ensure that the product does not accumulate at any location that will result in the generation of excessive additional friction and associated performance issues or plant damage. Wherever there is likelihood of this occurring, adequate maintenance access shall be provided.

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The application of the driving effort to the chain scraper conveyor shall include a torque limiting coupling technology that will prevent the system from damage in case of overloading with the ability to return to its normal operating torque after removing the overload condition without the necessity for replacing specific components.

The scraper chain feeder shall be provided with:

- A short deck and shall accommodate an extended deck.
- High wing walls with a minimum width of 2 metres from the edge of the load bed to prevent spillages onto the feeder drive system, transformers, electrical and control panels.
- Extended neck design for the feeder discharge. This allows for the feeder to extend over the stacker/reclaimer machine rails straddling the reclaim conveyors (Refer to figure 1 for the cross-section of the reclaim conveyors).
- On-board (3.3kV or 6.6kV to 400V) prefabricated miniature substation.
- The on-board Motor Control Centre (MCC) shall have two incomers with circuit-breakers interlocked for 1oo2 configuration. This will allow for direct connection to the MCC if the site does not have 3.3kV or 6.6kV.
- The trailing cable and cable reel for power supply.
- Power and control cables on the feeder (machinery).
- Earthing and lightning protection system. Upon commissioning of the machine, the Employer shall provide two earthing points to bond the machine to the station earth mat.
- A facility on the feeder for the storage of cable during transportation of feeder between feeding points.
- Flightbar conveyor chain assembly,
- Headshaft and tailshaft assemblies.
- Dual motorized drive for the conveyor chain assembly.
- Heavy duty chain rollers to guide the conveyor chain assembly.
- Left and right hand hydraulic hand pumps for conveyor chain tension adjustments.
- Auto lubrication system for greasing of the headshaft, tailshaft and chain roller bearings.
- Two speed drive, which must comply with the specific Power Station's Hazloc rating.
- On-board lighting for the feeder working area.
- Interface for inter-locking the feeder with all equipment installed to link to a speed switch on the downstream plant.
- Adequate safety devices to ensure safe operation or emergency stopping of the feeders.
- Rubber lined steel wheels for moving the feeder around the CSY.
- Towing lugs for connecting cables/slings when towing feeder around the CSY.
- Corrosion protection of the machine as per the 240-106365693 Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings (Using CPS 01 inox for protective coatings).
- Detail drawing showing the interface with the receiving conveyor system.
- Minimum of two (2) on-board fire extinguishers or more as determined by the Contractor's risk assessment.
- Mechanical safety device(s) on the drive system for torque limiting purposes.
- Detail design calculation to demonstrate the throughput capacities of the machine.

3.1.2 Design Parameters

3.1.2.1 General

- The design life of the scraper chain feeders shall be 30 years.
- The equipment is utilized continuously for 24 hours per day.
- The equipment shall be of weather-proof construction, suitable for outdoors operation in climatic conditions prevailing at site, without undue maintenance and deterioration. Emphasis is placed on

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the selection of primary devices, control panels, etc. to ensure that unnecessary/spurious trips are eliminated.

- Full accessibility shall be provided for maintenance and replacement of component parts on all equipment. Jacking points shall be provided to facilitate replacement of components, if necessary.
- The deck extension/shortening mechanism shall facilitate a fast turnaround time (8 hours or less).
- The system, including all components, shall be of proven design.
- All components whose mass exceeds 50 kg shall be fitted with lifting lugs.
- The plant shall be designed using a systematic approach to ensure satisfactory matching and performance of all its systems, sub-systems and components. Unless otherwise specified, the equipment shall have all electrical equipment necessary for the safe and efficient operation. This includes local control panels, instrumentation, interface cabling, motors, actuators, heaters, switchgear, transformers, earthing, lightning protection, lighting and any other electrical auxiliary equipment as is necessary for the proper operation of the plant. The equipment shall be IP65 rating or as determined from the Hazloc report, whichever is the more stringent requirement. The scope of work shall be in accordance with the 474-11542, General Electrical Specification unless specified as well as the Eskom standards listed in Section 2.2.1. Should the Eskom standards not cover certain aspects, appropriate SANS standards shall be complied with and referenced.
- The Contractor complies with 240-150642762, Generation Plant Safety Regulations for all Electrical Works.

3.1.2.2 Loading Deck

- Short deck length shall be minimum 8m.
- Long deck extension length shall be minimum 10m.
- The deck shall have low horizontal profile to enable easy feed onto the deck when used in conjunction with a bulldozer. The height of the deck from the floor shall be no more than 50cm (Refer to 0.00-BMH-MCSC-001, Mobile Chain Scraper Feeder Conveyor for Coal Handling Purposes).

3.1.2.3 Drive Assembly (Motor and controller)

- The feeder shall be supplied with a scraper chain drive assembly complete with a motor, high speed coupling, bevel helical gearbox and low speed coupling. The drive assembly shall enable two set feed rates. Couplings supplied shall allow for easy dismantling.
- The motor and controller shall be selected for outdoor use to a minimum of IP 65 rating or as determined by the Hazloc classification whichever is the more stringent of the two.

3.1.2.4 Electrical Requirements for all On-board Equipment

Note: Additional Electrical requirements, standards and guidelines are contained in Section 2.2.1.

a. Low Voltage Switchgear and Controlgear Assembly (Motor Control Centre)

The Contractor:

- Utilizes the existing voltage levels at the Coal Stockyard for the new plant, and designs and constructs LV Switchgear and Controlgear Assembly (MCC) in accordance with Eskom standard 240-56227516.
- These voltages vary from site to site and the ranges are 3.3kV or 6.6kV to 400V on the LV side. If the available voltages are 3.3kV or 6.6kV, the Contractor provides on-board prefabricated substation in accordance with SANS 62271-202. The output voltage of the prefabricated substation shall be 400V.
- Populates the list of switchgear signals required by the modes of operation together with interposing relays for C&I requirements.
- Provides all equipment and components required for the Works.
- Ensure that the Works are implemented as prescribed in the corresponding standards included in Section 2.2.1.

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- Produces all documentation and drawings including populated 'AS BUILT' templates in 2.2.1, for the Works.
- Provides all equipment to ensure protection settings are implemented including signals to trip when downstream plant trips.

b. Cable, Racking and Routing

The Contractor:

- Ensures interfacing with all the other system requirements of the plant/installation.
- Ensures that the Works are implemented as prescribed in the corresponding standards included in Section 2.2.1.
- Populates the relevant templates as in Section 2.2.1.
- Tests all cables and provides certificates.
- Develops, finalizes and implements the optimised cable routing.
- Produces exact cable routing designs of all the cables.
- Caters for cable servitudes and cable racking.
- Implements all cable routing designs as approved.
- Implements all cable terminations.
- Produces all documentation and drawings.
- Complies with 240-56227443 Requirements for Control and Power Cables for Power stations Standard

c. Lighting and Small Power

The Contractor:

- Provides welding plugs on each side of each feeder.
- Provides adequate lighting mounted on the feeders.
- Provides construction lighting if required.
- Confirms compliance of the proposed layout with the SANS 10114-1 and SANS 10142-1 requirements.
- Provides all equipment and components.
- Ensures interfacing with all the other system requirements of the plant/installation.
- Ensures that the Works are implemented as prescribed in the corresponding standards included in Section 2.2.1.
- Produces all documentation and drawings as well as populated templates in Section 2.2.1.
- Complies with 240-55714363 Coal Fired Power Stations Lighting and Small Power Installation Standard.

d. Prefabricated Substation

The Contractor:

- Provides all equipment and components required.
- Utilizes existing voltage levels for the equipment (3.3kV or 6.6kV).
- Specifies the secondary voltage based on the loads requirements (400V)
- Ensures interfacing with all the other system requirements of the plant/installation.
- Ensures that the Works are implemented as prescribed in the corresponding standards included in section 2.2.1.
- Produces all documentation and drawings.
- Populates the relevant requirements of the technical schedules supplied by the Employer and as in the SANS 62271-202.
- Complies with SANS 62271-202.

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e. Earthing and Lightning Protection

The Contractor:

- Performs earth resistance and earth continuity tests of the earthing point identified at the CSY.
- Tests new earthing tied into the existing earth mat.
- Proposes and implements lightning protection interventions.
- Provides all equipment and components required.
- Ensures interfacing with all the other system requirements of the plant/installation.
- Produces all documentation and drawings as well as populated templates in Section 2.2.1.
- Complies with 240-56356396 Earthing and Lighting Protection Standard.

f. DC Power and Uninterruptable Power Supply (UPS), if applicable

The Contractor:

- Provides all equipment and components required.
- Ensures interfacing with all the other system requirements of the plant / installation.
- Ensure that the Works are implemented as prescribed in the corresponding standards included in section 2.2.1.
- Valve regulated batteries reserves shall comply with 240-51999453, Standard Specification for Valve Regulated Lead Acid Cells. The converters shall as a minimum comply to SANS 60146-1-1 Semiconductor converters and SANS 1652 Battery chargers – Industrial Type.
- Produces all documentation and drawings.
- Populates the relevant requirements of the technical schedules supplied by the Employer.

g. Motors and Drives

The Contractor:

- Provides starting currents and philosophy.
- Provides all equipment and components including base plates required.
- Ensures interfacing with all the other system requirements of the plant/installation.
- Ensures that the Works are implemented as prescribed in the corresponding standards included in Section 2.2.1.
- Produces all documentation and populates the relevant requirements of the technical schedule as well as templates supplied by the Employer.
- Complies with 240-57617975 New Low Voltage Motors Procurement Standard.
- Complies with SANS 61800 - 2, Adjustable speed electrical power drive systems.
- Provides all equipment to ensure protection settings are implemented including signals to trip when downstream plant trips.

3.1.2.5 Safety Features

The feeder is provided with the following safety features:

- A mechanism to trip the machine in the event that personnel are pulled into the incline feed section of the scraper chain feeder.
- An emergency stop button on both sides of the feeder.
- A facility to stop the machine in emergency from any position on the machine.
- A start up siren as well as a strobe or flashing light with the strobe light indicating that the feeder in operation.
- Motor switchgear that is lockable in the off position using a 40mm padlock.
- An interface to a centrifugal belt speed switch on the receiving conveyor to allow for interlocking the feeders operation. If the receiving belt trips the feeder should stop.

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- Machine protection hardwired to the switchgear.

3.1.2.6 Discharge

- It should be noted that the reclaim conveyors are straddled by rail mounted stacker reclaim machines. Figure 1 illustrates the typical cross-section of the reclaim conveyor indicating the rail location relative to the reclaim conveyor. This will require an extended neck design for the scraper chain feeders. The rail is approximately 2.5m from the conveyor centre line; however the *Supplier* validates the site specific conditions.

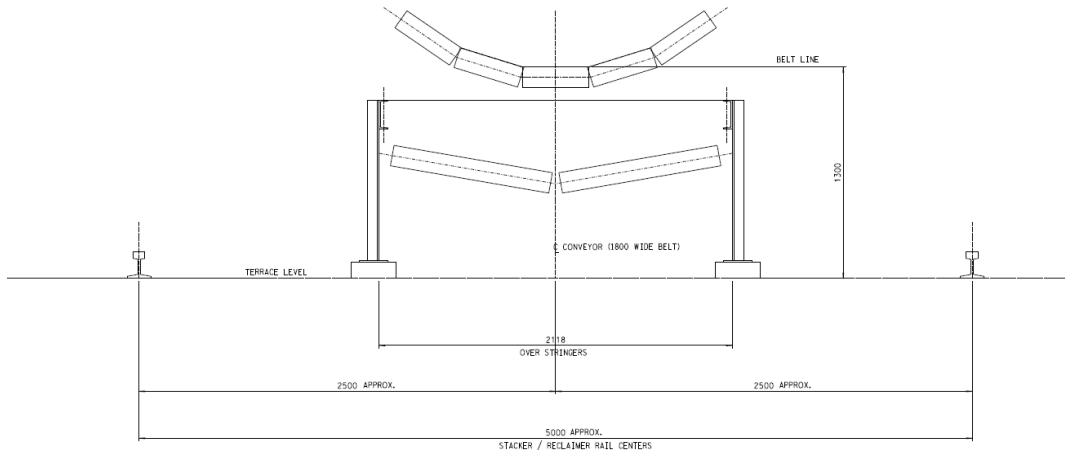


Figure 1: Cross section of reclaim conveyor

- Coal discharge capacities shall be site specific.
- The coal discharge shall be via a chute.
- The chute shall be infinitely adjustable through 180 degrees to allow for the discharge conveyor to run in both directions perpendicular to the feeder as well as direct in line (See Figure 2: Chute Top View)
- The feeder shall have a maintenance access door to allow for access in the event of any blockage.
- This design shall ensure efficient transfer of coal onto the conveyor without spillages, and shall minimize wear on all moving and stationary parts.
- The minimum height clearance for the scraper chain feeder discharge point shall be at least 1.8m (See Figure 3: Chute Side View).

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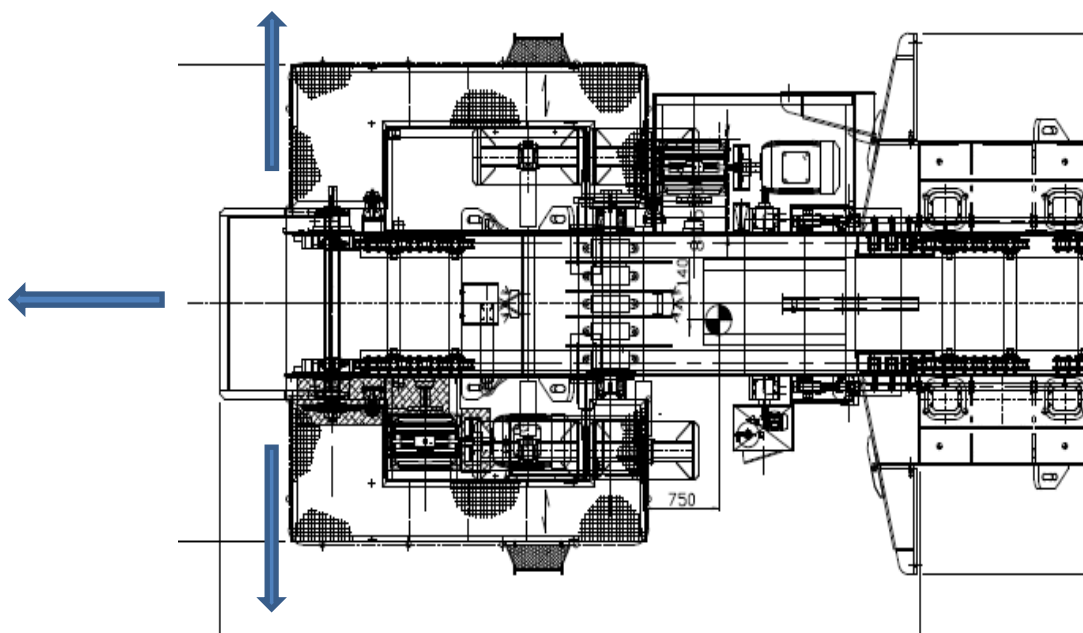


Figure 2: Chute Top View

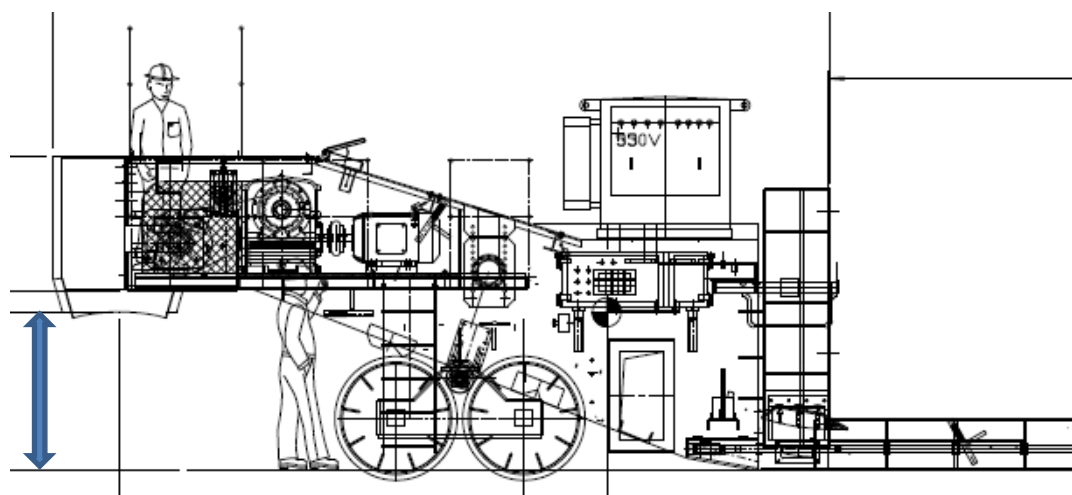


Figure 3: Chute Side View

3.1.2.7 Mobility

- The feeder has rubber lined steel wheels to minimise the ground bearing pressure of the machine to an acceptable level and for easy re-location using dozers or front end loaders.
- At least two (2) towing lugs for slings shall be provided to move the feeder.
- The feeder has space on the machine to accommodate the trailing cable whilst moving the feeder from one area to another.

3.1.2.8 Lubrication System

- The feeder shall have a fully automatic lubrication system.

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- The lubrication system shall be refilled from a central location while the feeder is in service.

3.1.2.9 Materials

- All materials shall be selected for their heavy duty wear resistant properties.
- The following shall be the minimum specifications for the materials that will be subjected to wear:
- The chain is of a heavy duty construction type appropriately sized for the application.
- The top deck is supplied with VRN 400 or equivalent material liners. The centre liner is 25 mm thick and side liners under chain shall be 16 mm thick.
- The bottom deck is supplied with 20 mm thick VRN 400 or equivalent material liners under chain only.
- The discharge chute plates are constructed with 16 mm thick VRN 400 or equivalent material.

3.1.2.10 Protective Coating and Preservation

- Corrosion protection of the works shall comply with the 240-106365693 Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings.
- Equipment shall be adequately protected against physical damage and corrosion during transport and storage.
- All unprotected finished surfaces of ferrous metals, including screw threads that will be exposed while awaiting installation, shall be thoroughly cleaned and given a heavy uniform coating of an approved petroleum soluble rust preventive compound.

3.1.2.11 Testing and Commissioning

The Contractor shall provide:

- Proof of rated throughput capacities during the performance testing and commissioning phase.
- All instrumentation and equipment to validate throughput capacities.
- Adequate notice to the Employer to allow for monitoring of commissioning activities and any quality hold points.

3.1.2.12 Coal Properties

Particle Size Distribution:

- Maximum lump size is 400mm
- The maximum particle size is 50mm
- With 10% greater than 40mm
- And 60% < 3mm

3.1.2.13 Other Properties

- Density for Volume Determination: 850 kg/m³
- Density for Weight Determination: 1200 kg/m³
- Moisture: 8 -12%
- Angle of Repose: 34 - 37° typically, 45° upper limit

3.1.2.14 Employer Drawings and Schematics

All drawings and schematics provided in this standard are for information only and any validation required will be responsibility of the Contractor. Wherever changes are made to the existing infrastructure, it remains the responsibility of the Contractor to update all the existing drawings of those areas to an as built status.

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3.2 PERFORMANCE REQUIREMENTS

The throughput of the scraper chain feeder is to be verified during the commissioning phase over a period of eight (8) hours.

3.3 DOCUMENTATION TO BE SUBMITTED BY *CONTRACTOR*

The *Supplier* of the scraper chain feeder provides a complete data pack including the following:

- Equipment descriptions,
- Maintenance schedule,
- Spares list,
- Electrical single line drawings,
- C&I reticulation drawings, &
- Machine General Arrangement (GA) and component drawings.

3.4 CONFIGURATION MANAGEMENT

A basic Configuration Management (CM) programme will be established and applied throughout the project and shall be compliant to the ISO 9001 Quality Management Systems - Guidelines for CM.

3.4.1 Plant Coding & Labelling

Power stations utilize either the KKS or AKZ coding system. As such, all new equipment installed on the plant will be labelled using either of these systems. Coding shall be applied from the design stage and cross referenced to all arrangement drawings, schematics, wiring diagrams, instructions and manuals and where practical to spare parts lists/manuals.

3.5 SCRAPER CHAIN FEEDER OPERATIONS

The Eskom employees operating the feeder shall ensure that:

- The feeder is loaded from the sides only.
- A concrete block is installed at the back in order to protect the feeder from collision by front end loaders.
- Material is loaded onto the feeder bed in a manner that it does not spill over into the incline section of the feeder. The level of material on the feeder bed shall not exceed the height of the wing walls (Figure 4).
- Yellow plant does not operate on top of the feeder load bed.
- Water flows freely under the incline section of the feeder to prevent ponding in the stockyard during the rains, and if necessary pipes will be laid under the feeder incline section to facilitate movement of water across the feeder to the drains (Figures 4 and 5). Material spilling adjacent the feeder incline section shall be promptly removed.
- The feeder discharge chute is placed centrally with the receiving belt in order to prevent spillages.
- The feeder is operated and maintained according to the OEM Operation and Maintenance Manual.

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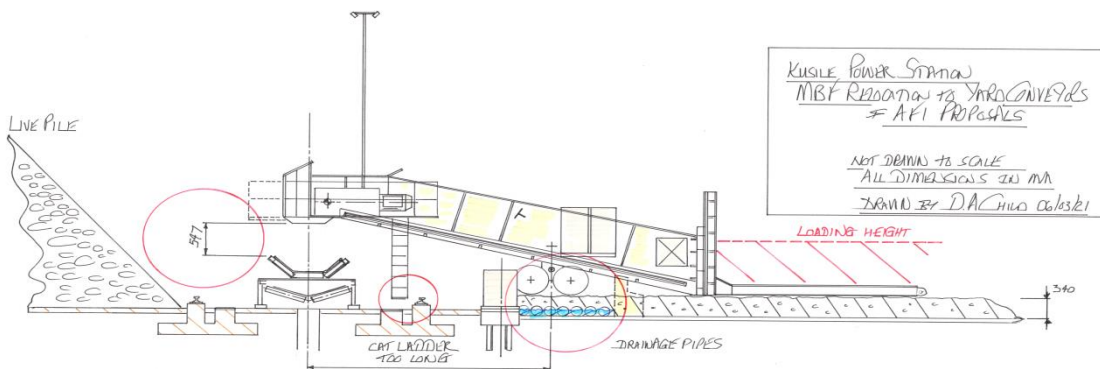


Figure 4: Feeder Loading Height and Drainage Pipes

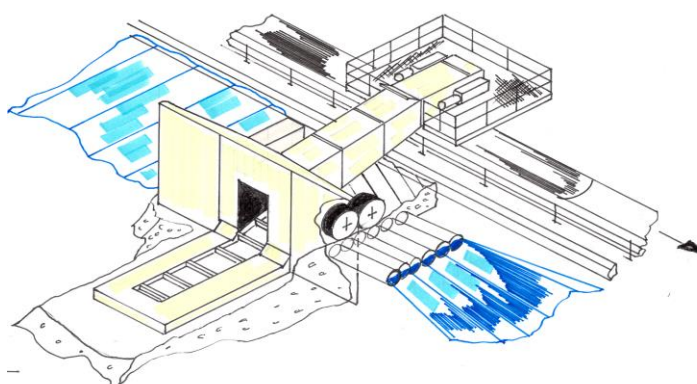


Figure 5: Drainage Pipes under Feeder Incline Section

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4. AUTHORISATION

This document has been seen and accepted by:

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5. REVISIONS

Date	Rev.	Compiler	Remarks
March 2021	0.1	A R Matlala	Draft document compiled to specify requirements for scraper chain feeders for Comments Review Process
April 2021	0.2	A R Matlala	Final Draft document compiled to specify requirements for scraper chain feeders after Comments Review Process
April 2021	0.3	A R Matlala	Additional updates completed
May 2021	0.4	A R Matlala	Final Draft after Additional Updates
May 2021	1	A R Matlala	Final Document for Authorisation and Publication

6. DEVELOPMENT TEAM

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

- Andrew Matlala

7. ACKNOWLEDGEMENTS

- Dyke Monyane
- Dennis Child
- Linda Mahlangu

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