

 Eskom	Instruction	Hendrina Power Station
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1. INTRODUCTION

This document defines the contract works to be executed by the successful bidder, of which is evaluated and selected using the open tender process. The Scope of Work (SOW) for this contract entails the tiling for the milling plant and related components at Hendrina Power Station.

2. SUPPORTING CLAUSES

2.1 SCOPE

The scope comprises of, but is not limited to, tiling of Milling plant components, Casing, Riffle box, coal bunkers and PF pipes

The purpose of this scope of work is to outline the contract work to be performed by the contractor, and the responsibilities of all parties involved. The contract scope of work serves to support the tender technical evaluation process.

2.1.1 Applicability

This document is applicable to Hendrina Power Station.

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] 240-168966153: Generation Tender Technical Evaluation Procedure
- [2] QM-58 Supplier Contract Quality Requirements Specifications
- [3] 240-105691858: Materials Management Safe Work Procedures Transportation Requirements for Material Handling
- [4] 240-56239143: Ceramic Lined Pulverised Fuel Pipework Standard

2.2.2 Informative

- [5] ISO 9001 Quality Management Systems
- [6] 32-1-34 Eskom Procurement Policy

2.3 DEFINITIONS

Term	Definition
Contractor	Service provider contracted for supplying a specific service to Eskom Hendrina Power Station. Used interchangeably with the term <i>Supplier</i> .
Employer	The organization (Eskom) to which the supplier will be contracted for this tender and contracts that may result therefrom
Employer's Premises	Hendrina Power Station
Industrial Storage Facility	Physical space suitable for the storage of the items specified in the scope of work
Returnable	Document submitted by tenderer for evaluation in support of tender bid

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2.3.1 Classification

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

2.4 ABBREVIATIONS

Abbreviation	Description
μ	Micro
BS	British Standard
kPa	Kilopascal
M	Metre
mm	Millimetre
OD	Outer Diameter
OEM	Original Equipment Manufacturer
ID	Inner Diameter
ISO	International Organisation of Standardisation
QCP/QIP	Quality Control Plan / Quality Inspection Plan
PS	Power Station
SABS	South African Bureau of Standards
SOW	Scope of Work
TET	Technical Evaluation Team

2.5 ROLES AND RESPONSIBILITIES

2.5.1 The Employer

The responsibilities of the employer include the following:

- Provide relevant information prior to the works being performed.
- Send a representative to the contractor's premises/workshop if there are any inspection, witness, or hold points.

2.5.2 Contractor

The responsibilities of the contractor include the following:

- Comply with the employer's environmental, health, and safety standards, policies, and procedures.
- Make all repair/refurbishment information available to the employer on request.
- Inform the employer's representative at least 48 hours prior to any hold points that may require the employer.

2.6 PROCESS FOR MONITORING

N/A

2.7 RELATED/SUPPORTING DOCUMENTS

N/A

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3. SCOPE OF WORK

The contractor's scope of work includes but is not limited to the following:

3.1 PRE-JOB PLAN

- 3.1.1** Compile risk assessment and request the permit to work from the relevant Employer's Agent or his delegate as per PSR (Plant Safety Regulation).
- 3.1.2** Quality Controller (QC) must be notified prior to any inspection or work to be carried out.
- 3.1.3** Inform workers about all the risk hazards, precautions in case of emergency or an accident, required PPE (Personal Protective Equipment) and scope of work
- 3.1.4** Confirm the scope of work and completion date and time day before works starts.
- 3.1.5** If required, ensure hot work approval documents/permit has been obtained and a trained fire watcher is available.

3.2 SAFE WORKING PROCEDURE:

- 3.2.1.1 Ensure that all work is done in compliance with Occupational Health and Safety Act of 1993
- 3.2.1.2 Ensure that all dangers/hazards have been identified and explained.
- 3.2.1.3 Wear necessary protective clothing such as hard hat with chin strap, overalls, toe capped safety shoes, leather gloves, eye protection and hearing protection.
- 3.2.1.4 Do not work under crane loads or suspended loads.
- 3.2.1.5 Always use legal tools or equipment or approved and registered hand-made tools.
- 3.2.1.6 Beware of fellow workers and other employees' safety.
- 3.2.1.7 Beware of ultraviolet rays and hot surfaces when welding or grinding work is in progress.
- 3.2.1.8 Beware of sharp edges and falling or rolling objects as per the accepted employer's risk assessment.
- 3.2.1.9 Safety barriers and notices must be erected to prevent unauthorized entry to work area.
- 3.2.1.10 All workers shall stand clear when equipment and parts being lifted or lowered, and rigging shall be done by certified and authorized riggers only.
- 3.2.1.11 Work area must be kept clean at all times. Work area shall be adequately lit and only 32-volt lighting to be used in confine spaces.

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3.3 RISK/ PRECAUTIONS:

3.3.1 The mill is a confined space, gas test certificate must be issued

3.3.2 There must be sufficient light and ventilation

3.3.2 A person cleaning around the mill must wear a dust mask to prevent dust inhalation, which will affect a person's health, and dispose of the pulverized fuel at the correct area.

3.3.2 The area is noisy and dusty; earmuffs and dust mask must be used at all times.

3.3.2 Beware of hot plant and working at heights.

3.3.2 Do not use compressed air for external cleaning.

3.3.2 Adhere to the accepted employer's risk assessment controls.

3.4 SHEQR REQUIREMENT:

A Quality Inspection Plan should be followed to ensure quality work.

3.5 WORKS

In this document, protective lining shall mean engineered refractory tiles made from high resistant wear ceramic material for lining or protecting wear surfaces of the Combustion plant or its subsystem or components, where raw coal and/or pulverized fuel (PF) coal pass during plant operation in such components.

These include locations such as PF Burners, PF pipework, coal bunkers and the Milling plant. Ceramic tile(s) which have wear and erosion resistant properties and that can withstand high temperatures above 1000 degrees are preferred while the word "engineered" shall mean pre-fabricated and profiled or customized to fit properly without the need for cutting or breaking the tile during installation on the specific plant component referred.

This is to say, such tiles are tailor made to fit the profile of geometries found in the components herein described.

During installation, such tiles shall be bonded to the steel components with adhesive(s) or epoxy of high wear resistance to abrasive coal that has properties that tolerate high temperature operation but also complying with Eskom standard (240-56239143: Ceramic Lined Pulverised Fuel Pipework Standard), in relation to health, safety and operation.

The assumption therefore, is that the coal is inherently abrasive in nature or has a high abrasive index and that the adhesive to be used will NOT compromise the plant by allowing the detaching of ceramic tiles prematurely or cause or render the tiles to fall off while the plant is in operation. This alone cannot be acceptable to Eskom at any level of consideration or circumstance and as such has the potential to negatively impact contractual obligations and thus should be readily born in mind henceforth.

The SOW covers the installation of ceramic tiles on pulverised fuel (PF) pipework between the Mill classifier outlet, including the PF Burners. It also includes among other components but not limited to, the coal bunkers and cones, burner boxes, transition pieces and pipe bends. Furthermore, the supplier is expected to supply the station with the appropriate adhesive or epoxy grout for bonding the tile to the steel pipework. The adhesive or epoxy grout must have properties that tolerate high temperature operation and high wear resistance to abrasive coal.

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3.5.1 Lining Method for PF Pipework

1. Linings shall be in the form of ceramic key pieces built up to form a ring such that a complete ring is self-supporting when fitted inside the steel casing.
2. The ceramic tiles shall be chamfered where necessary so that each tile is in intimate contact with adjacent tiles.
3. Gaps between tiles, caused by tolerances on the casing or tiles, shall be a maximum of one 1 mm, provided that such tiles are in intimate contact at at least one point and such adjacent tiles parallel to each other along the contacting faces.
4. Joints in the direction of pulverized fuel flow shall be staggered.
5. Tile edges, including weld-on tile plugs, shall not protrude into the pulverized fuel flow, and shall be a maximum of 1 mm below adjacent tiles downstream of the pulverized fuel flow.
6. The use of "weld-on" ceramic tiles shall not be permitted in pulverized fuel pipe bends of round section.

3.5.2 Lining Method for Coal Bunkers

1. Lining of all internal surfaces of the coal tripper car chutes with 92% alumina ceramic tiles.
 - Al₂O₃ content: $\geq 92\%$
 - Hardness: ≥ 9 Mohs scale
 - Specific gravity $\geq 3.60 \text{ g/cm}^3$
 - Compressive strength $\geq 1050 \text{ MPa}$
 - Wear rate: $\leq 0.25 \text{ cm}^3$
2. Tiles shall be arranged to minimize gaps and staggered to avoid continuous joints, shall be a maximum of 1 mm.
3. Bonding of tiles using high-strength epoxy adhesive, ensuring full contact coverage.
4. Use of mechanical anchoring (studs, bolts, or weld mesh) in high-impact areas.
5. Cutting and shaping of tiles to fit curved and complex profiles of the chute.
6. Joint filling with wear-resistant grout/sealant to prevent material ingress

3.5.3 Fixing Method

1. All adhesives and grouts employed in the construction of any ceramic lined assembly shall be non-flammable and capable of withstanding sustained operating temperatures of 120°C or greater.
2. In addition, the fixing method employed in all ceramic lined assemblies shall ensure that the lining remains secure even in the event of a mill fire, or similar occurrence resulting in temperature excursions above 120 °C up to +- 160 °C.
3. Preparation of the component surfaces shall be such that the grout or adhesive is adequate and fulfil the specified requirements of the employer.

3.5.4 Inspections

1. Inspect the old protective lining on the following components for any possible damage: Mill centre pipe, Cones, PF pipework, Primary air tubes, Transition pieces, Burner boxes, Mill outlet pipes and chutes etc.

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2. Assess the wear damage that may have changed the geometric profile of the plant component i.e. erosion pattern, material thinning, missing tiles or loss of adhesion of the tiles and/or brick detachment.
3. In some cases there may be additional foreign material buildup such as clinker like bodies or hard formation which may obscure free flow.

3.5.5 Repairs

1. The damaged lining should be carefully removed and replaced whenever the erosion or mechanical damage or irremovable clinkers bonding will potentially compromise the flow.
2. The damaged lining to be removed over the full length of the tile and over the breadth of the affected area only. It must be removed in such a manner so as to maintain the stability and shape of the geometry the lining and inherently parallel to the attachment interface. This principle generally applies to all components that are exposed to wear erosion.
3. Incorrect removal of the lining can result in the collapse of the lining geometry or the loss of shape resulting in poor combustion problems associated with loose tiles falling off during plant operation resulting blockages which pose serious risk to normal operation.
4. The lining is to be replaced in such a manner that ensures high compaction without the use of any vibratory techniques. Any vibration techniques compromising or deemed to have a potential to compromise the plant while in service will not be permitted.
5. During compaction, no impact must occur on the tiles or the anchor system as this will cause unintended damage.

3.5.6 Replacement of Damaged Quarl Tiles

1. The Quarl tiles to be removed must be removed from the 12-0-clock position working either clockwise or counter clockwise so as to remove or damage as few tiles as possible. All old refractory tiles are to be replaced with the new refractory tile.
2. The tile "back fix anchor rod" system must be removed. The tiles are to be removed from the anchor stud and refractory between the tile and the tile "back fix plate" must be removed. The anchor stud is to be cut from the saddle without damaging or cutting any pressure parts. A new anchor stud is to be fixed to the saddle.
3. Removal of old wear lining shall not constitute damaging or deformation of the metal surfaces or body geometry of components to be lined or weld attachments thereof and that applies as well during installation of new lining.
4. The damaged lining should be removed and replaced whenever erosion or mechanical damage is evident or irremovable clinker build-up is evident and potentially compromising the desired flow.
5. The damaged lining is to be removed over the full length of the lining and the breadth of the affected area. It must be removed in such a manner as to maintain the stability and shape the lining and inherently parallel to the attachment interface. This principle generally applies to all components that are exposed to wear erosion.

4. BILL OF MATERIALS

The scope of work defined above will be executed with the list provided below. It is the responsibility of the contractor to supply the station with both the tiles and silicon as specified in the table below.

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Item No.	Description	Unit	Quantity
1	6mm Thick Plain Tiles: Flat Surfaces	m2	600
	12mm Thick Plain Tiles: Flat Surfaces	m2	1200
	25mm Thick Plain Tiles: Flat Surfaces	m2	600
	50mm Thick Plain Tiles: Flat Surfaces	m2	1100
	6mm Thick Plain Tiles: Straight Pipe Work	m2	400
	12mm Thick Plain Tiles: Straight pipe work	m2	1800
2	25mm Thick Plain Tiles: Straight pipe work	m2	600
	6mm Thick Tiles: Square to rounds	m2	300
	12mm Thick Tiles: Square to rounds	m2	1200
	25mm Thick Tiles: Square to rounds	m2	400
	6mm Thick Plain Tiles: Cone Shapes	m2	300
	12mm Thick Plain Tiles: Cone Shapes	m2	400
	25mm Thick Plain Tiles: Cone Shapes	m2	200
	High Temperature Wear Compound	2.5L Kit	300
	Silicone red Tubes, COMPOUND, SEALING: TYPE: GASKET; COLOR: RED; CONTAINER: CARTRIDGE 280 ML; MATERIAL: RUBBER SI; REFERENCE NO: RTV 736; HIGH TEMPERATURE SILASTIC SEALANT; MATERIAL SAFETY DATA SHEETS WITH ENVIRONMENTAL INFORMATION IN THE 16 POINT FORMAT TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT	Each	5500

All tiles listed above must conform to below:

- GGSS 0667 Revision 4 – Specification for ceramic lined pulverized fuel pipework.
- Ceramic linings shall be alumina based and shall be of the sintered type, containing not less than 89 % alumina.

ALUMINA – AL92EC TYPICAL VALUES

Composition	Al ₂ O ₃	92.0%
	SiO ₂	4.20%
	CaO	0.50%
	MgO	0.30%
	Na ₂ O	0.50%
	K ₂ O	0.05%
	Density	3.58 g/cm3

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Specification / physical properties	Water absorption	0.0%
	Compression strength	N/mm ² ≈1900
	Bending strength	N/mm ² ≈280
	Modulus of elasticity	N/mm ² ≈280000
	Thermal conductivity	W/m ^{°K} ≈16

5. SPECIFICATIONS

Title	Number	Tick if publicly available
Safety, Health and Environmental Specifications for Principal Contractors	HSPHO/058	✓
Supplier control Quality Requirements Specification	MQ - 58	✓
Protective services – access control system procedure	HSPHO/020	✓
The Hendrina power station environmental policy	HSPPPIN005	✓
The identify & update environmental aspects procedure	HSPPIN024	✓
The objectives & targets procedure	HSPPIN026	✓
The environmental emergency preparedness procedure	HSPPIN032	✓
The training, awareness & competence procedure	HSPPIN029	✓
The waste management procedure	HSPPIN003	✓
Ceramic Lined Pulverised Fuel Pipework Standard	240-56239143	✓

6. CONSTRAINTS ON HOW THE CONTRACTOR PROVIDES THE SERVICE

- *Contractor* ensures gate permit access requirements are met before entry to site.
- The *contractor* submits a safety file before an entrance certificate is granted.
- Work is carried out on the mill component in the plant mostly at 40 feet level, above 40 feet level and basement i.e. ground floor.
- *Contractor* ensures plant availability (Permit to Work where Applicable) before proceeding to work in the plant.
- Contractor ensures adherence to hot work procedure and availability of hot work permit and fire watcher before proceeding to do any hot work in the plant.
- *Contractor* works with others in the plant to facilitate the success of the contractor's task order.
- All services offered by the *Employer* to be booked 24hrs in advance.
- All technicians/artisans are authorised and accredited by relevant education authorities and proof is submitted to *Employer's agent* at the start of contract.
- Risk Assessments, scope of work (SOW) and quality inspection plans (QIPs) are submitted to the *Employer's agent* prior to activity of task orders.
- Detailed report of material used to be submitted before assessments and invoicing period.

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7. MATERIAL CERTIFICATES AND GUARANTEES

The following documentation must be supplied to the *Employer's* representative before any item is accepted on site:

- All documentation, but not limited to, quality assurance tests, inspections and documentation of the scope of work above.

7.1 GENERAL REQUIREMENTS

Other tiling related areas not listed in the spares list can and will be required on an as and when needed basis subject to approval by both the *employer* and the *contractor*.

7.1.1 Execution of services

The *contractor* is expected to practice safe techniques during the provision of all services. The *Employer's* representative will not accept responsibility for any damaged items upon delivery.

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