



Generic Scope of Work

Matimba Power Station

Title: **Scope of work for the passive fire protection of the cable spreading area**

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1. INTRODUCTION

Electrical cables in groups are one of the major fire hazards at power plants. Electrical cables present the following hazards:

- The cable insulation is a large source of combustible material.
- Fire can spread quickly along cable routes throughout the power plant.
- Cables exposed to small intensity fires can result in major damage to plant and equipment.
- Exposure to toxic and corrosive gases from electrical cable fires is a risk to life, safety, plant and equipment.
- Electrical cables are a potential source of ignition.

This document focuses on the cable spreading areas in the Matimba Power Station Auxiliary Bay on 7.3- and 13.8-meter level as well as the cables around the 16ml boiler wall.

Typically grouped electrical cable spreading areas are protected with sprinkler systems. Due to the fact that the Matimba cable spreading areas have not originally been designed with a sprinkler system in mind and drainage has not been allowed for, sprinkler protection (or any type of water-based protection) cannot be considered. The added risk with regards to water-based protection is that the equipment and switchgear rooms are located below the cable spreading area and the possibility exists of water flowing into these areas without the appropriate isolations. The scope of this document focuses on passive fire protection of the auxiliary bay cable spreading areas on 7.3- and 13.8-meter level at Matimba Power Station as well as the electrical cables around the 16ml boiler wall.

The high-level scope of work will include but is not limited to the following provisions:

- Partial coating of all grouped cables on cable racks with an ablative fire protective coating.
- Installation of new and repair of existing damaged 2-hour rated fire resistant penetrant seals.
- Modification of existing fire door bases.

2. SUPPORTING CLAUSES

2.1 SCOPE

2.1.1 Purpose

The purpose of this document is to provide a high-level scope of work for the appointment of a *Contractor* for the passive fire protection of the cables in the cable spreading areas and around the boiler walls. The purpose is to prevent the spread of flame along cable runs.

2.1.2 Applicability

This document applies to Matimba Power Station only.

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2.2 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following clauses, including but not limited to:

2.2.1 Normative

- [1] IEC 60332-3-22 Tests on electric and optical fibre cables under fire conditions – Part 3-22: Test for vertical flame spread of vertically mounted bunched wires or cables – Category A.
- [2] ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
- [3] ASTM E814-13a, Standard Test Method for Fire Tests of Penetration Fire Stops.

2.2.2 Informative

- [4] 240 - 56227443 Eskom Requirements for Control and Power Cables for Power Stations Standard.
- [5] 240 - 54937450 Eskom Fire Protection and Life Safety Design Standard.
- [6] SANS 10177-3: Fire testing of materials, components, and elements used in buildings Part 3: Surface fire index of finishing materials.
- [7] ASTM E119-20 Standard Test Methods for Fire Tests of Building Construction and Materials

2.3 DEFINITIONS

Definition	Description
Ablative fire protective coating	refers to the characteristics of the coating to gradually erode when exposed to high temperatures or fire, where this erosion process consumes heat energy from fire, creating a protective barrier or char layer.
Cellulosic fire	are fires that involve cellulose-based materials made from or containing plant fibres such as wood, paper, cotton, and some textiles

2.3.1 Disclosure Classification

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

2.4 ABBREVIATIONS

Table 1: Abbreviations

Abbreviation	Description
DFT	Dry Film Thickness
LV	Low Voltage
MV	Medium Voltage
N/A	Not Applicable

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2.5 ROLES AND RESPONSIBILITIES

Table 2: Roles and responsibilities

Role	Responsibilities
System Engineer	To prepare the Scope of Works document.
Engineering Manager	To review, support and authorise the implementation of the Scope of Works.
Contractor	To implement the Works as per the scope provided.

2.6 PROCESS FOR MONITORING

N/A

2.7 RELATED/SUPPORTING DOCUMENTS

N/A

3. SPECIFICATION AND DESCRIPTION OF WORKS

3.1 PLANT OVERVIEW

Intermediate level cable spreading areas can be found on 7.3-meter level and 13.8-meter level in the Matimba Power Station Auxiliary Bay. These chambers are separated from all other plant areas. The cable spreading areas are divided per unit into fire areas (compartmentalised) by walls and fire doors. Both the 7.3-meter level and 13.8-meter level have a vertical clearance of 1.985m allowing access. The cables are installed in various galvanised steel cable trays that are stacked above one another in different directions, making it difficult to walk freely inside the tunnels. The cable tunnel is considered a commercial building which will be exposed to “Cellulosic” fires.

Power cables present in the cable spreading areas include:

- For LV power cable 600/1000 V rated voltage, copper-stranded conductors PVC insulation cables.
- For single or three core MV power cable rated voltage copper or aluminium stranded conductors; triple extruded cross linked polyethylene (XLPE) insulation cables.
- Cable type BVXnnCM: Multi-core insulated thermoplastic cables, 600/1000V voltage rating, current rating varies with conductor size, minimum size is 1.5mm².
- Cable type UVGnnACM: thermoplastic insulated overall screened twisted pair, 300/500V voltage rating, 0.5mm² conductor areas, 1A current rating.
- Cable type BVSnnCM: Multi-core thermoplastic insulated overall screened (not armoured).

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3.2 COATING OF CABLES

The purpose of coating the cables is to prevent flame spread. All cables that must be coated are situated within cable spreading tunnels and the boiler facility. Cables are exposed to high levels of coal and ash dust.

3.2.1 Surface preparation

The *Contractor* shall be responsible for the surface preparation and cleaning of all cables and cable racks that will be coated. No coating shall be applied to any surface containing traces of grit, grease, oil, loose rust, mill scale, surface contaminants (i.e., dust), chemical fall-out, salt deposits or corrosion products of any kind. The *Contractor's* proposed method of cleaning shall be indicated in his/her method statement which shall be submitted together with tender documentation.

3.2.2 Cable coating

To reduce flame spread over cables, an ablative fire protection coating shall be applied onto cables at all cable entries through fire barriers or building walls. Cables shall be coated as follows:

- The coating shall be applied over a distance of five meters from both sides of the fire barrier or wall.
- Coating shall be applied as far as reasonably practical. Where cable rack congestion makes application in-practical the *Project Manager* shall be informed thereof.
- Coating shall include the cable tray/rack on which the cable is routed.
- The selected coating must be water based and free of asbestos.
- The coating material and the application rate specified should not affect the performance characteristics of the cables and not cause overheating of cables due to heat build-up.
- The material should be compatible with the cable insulation, have good adhesion and be free of volatiles which could adversely affect these materials.
- The coating material shall be applied in accordance with the manufacturer's recommendations. The *Client's* preferred method of application is by spray, but the *Contractor* is not limited to this method.
- The selected product must be approved for outdoor use.
- The coating system should consist of a single layer and not necessitate a primer or protective topcoat.
- The minimum wet and Dry Film Thickness (DFT) specified by the product manufacturer shall be adhered to. The *Applicator* shall be equipped with a "wet comb" and frequently monitor the wet film thickness throughout application. The range of DFTs of each coat shall be as follows; 90% of random readings shall be equal to or greater than the minimum specified DFT. No individual reading shall be less than 80% of the specified DFT.
- Paint boundaries shall have straight lines.

3.2.3 Performance and Test Data

The selected ablative fire protective coating must adhere to the following performance requirements under the specific test methods.

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Table 3: Performance and Test Data (Coating of Cables)

Test Method	Result
ASTM E84 Surface Burning	Class A
IEC 60332-3-22 Flame Propagation	2 Hours

Test certificates shall not be older than five years.

Note: Equivalent test methods from recognised standards can be proposed.

3.3 FIRE BARRIERS

Fire rated penetration barriers shall be installed wherever cables, pipes or ducts pass through walls, floors or soffits which are boundary elements for a specified fire area. Any damage to existing fire barriers will be repaired. The fire barrier should limit the spread of fire and reduce its effects on plant equipment and personnel.

The *Contractor* is required to seal all gaps with a suitable product based on the size of the opening to be sealed. **All fire barriers shall have a 2-hour rating in terms of Integrity (E) and Insulation (I).**

3.3.1 Surface Preparation and Removal of Damaged Barriers

The *Contractor* shall be responsible for the surface preparation and removal and disposal of damaged fire barriers. No fire barriers shall be applied to any surface containing traces of grit, grease, oil, loose rust, mill scale, surface contaminants (i.e., dust), chemical fall-out, salt deposits or corrosion products of any kind. The *Contractor's* proposed method of cleaning shall be indicated in his/her method statement which shall be submitted together with tender documentation.

3.3.2 Repairs of Existing and Installation of New Fire Barriers

The installation of the fire rated penetration barriers should conform to the following:

- The sealant material and the application rate specified should not affect the performance characteristics of the cables and not cause overheating of cables due to heat build-up.
- The fire penetration seal should be capable of withstanding the penetration of water, including firefighting water jets directed at the seals. The sealing material shall be water resistant and provide a barrier for smoke and toxic fumes.
- Horizontal seals should be applied to a height just above floor level and dome shaped to prevent the accumulation of oil or water around the penetration.
- The fire penetration seal should be capable of carrying loads where necessary. Any reinforcing required for this purpose should be subject to Eskom's approval.
- The performance of fire penetration seals should not be downgraded by normal ageing, vibration or other environmental conditions associated with the plant or facility.
- The fire penetration sealant material should not crack when the sealant dries or shrinks. If it is necessary for additional sealant to be used on the seal, sufficient curing time should be allowed before its application.
- Fire penetration sealant material should be asbestos free, non-toxic, and resistant to chemical attack where specified.

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- Fire penetration sealant material should be compatible with the cable insulation or other penetration materials, have good adhesion and be free of volatiles which could adversely affect these materials.
- Fire penetration sealant material may be of the intumescent type capable of expansion under heat to seal voids, cracks or fissures which may exist due to application defects and cable configurations.

Installation of the material should be subject to the manufacturer's requirements. The following points should be adhered to during installation:

- Horizontal barriers for vertical penetrations should be sealed on the floor side only.
- Vertical barriers for horizontal penetrations should be sealed on both sides of the barrier to withstand the effects of fire and to ensure that an acceptable finished coating/seal is achieved.
- All tools or equipment used in and around cable penetrations for the application of sealant material should be rounded to prevent damage to the cable insulation. Extra care shall be taken by the *Contractor* not to damage any cables.
- Where cables have not been evenly laid and spaced, a sealant material capable of being applied under pressure should be utilised to effect penetration between the cables in the fire barrier.
- The use of coating materials as fillers will only be approved if the effectiveness of the application is proven and if the fire rating is maintained.
- Combustible or toxic materials used for shuttering during installation should be removed on completion of the seal.
- Mineral wool, ceramic fibre board or other materials with similar properties may be utilized to fill large voids.
- Openings to be sealed should be properly prepared. Oil and excess water should be removed before installation of sealants begins.
- The manufacturer's specified curing time should be allowed during the application process.
- Thickness and volumes for the sealant material applied should be strictly in accordance with the manufacturer's requirements and tests.
- All seals should be provided with a final layer or coat to provide a smooth finish.
- The sealant material utilised should allow for the replacement of cables or additional cables or any other penetration component to be installed without disturbing the major portion of the seal.
- If the sealant material utilised is subject to excessive expansion, steps should be taken to ensure that the bulk of the sealant material remains within the seal when expansion occurs during application.
- Seals may be of the rigid or flexible type.
- If coating of cables is necessary to assist the adhesion of the sealant material, or if sections of cables need to be coated on either side of the seal, this should only be done with Eskom's approval.
- If reinforcing of the seals is necessary, the type, pattern and anchoring of the reinforcing should be approved by Eskom.
- The method of application and materials utilised should be approved by Eskom.

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3.3.3 Performance and Test Data

The selected fire barriers must adhere to the following performance requirements under the specific test methods:

Table 4: Performance and Test Data (Fire Barriers)

Test Method	Result
ASTM E814-13a, Standard Test Method for Fire Tests of Penetration Fire Stops	As Per <i>Clause 10</i> requirements.

Test certificates shall not be older than five years.

Note: Equivalent test methods from recognised standards can be proposed.

3.4 MODIFICATION OF EXISTING FIRE DOOR BASIS

The existing fire doors separating the cable chambers of the different units do not form a fire seal with the concrete floor as there is a 40mm vertical gap. The *Contractor* is required to construct a ramp consisting of a non-shrink grout under each fire door to prevent fire spreading underneath the door. The exiting concrete surface where the ramp is to be constructed will require surface preparation and the use of a suitable primer/bonding agent to ensure sufficient adhesion of the grout and prevent future cracking. In addition, all doors need to be fitted with heavy duty door closers to ensure that fire doors always remain closed.

3.5 LABELLING OF FIRE RATED COATINGS AND BARRIERS

All fire-resistant coatings and fire-resistant barriers will be labelled indicating:

1. Product Name.
2. Date of Installation.
3. Fire Rating.
4. "Fire Seal".

3.6 BILL OF MATERIAL

Item No	Description	Unit	Quantity
1	<u>INTUMESCENT COATING</u>		
1.1	<u>Coating of cables</u>		
1.1.1	Surface preparation/cleaning of cables	m ²	4500
1.1.2	Intumescent coating	m ²	4500
-			
2	<u>FIRE RATED PENETRATION SEALS</u>		
2.1	Openings in floors/walls	m ²	150
3	<u>MODIFICATION OF EXISTING FIRE DOORS</u>		
-			
3.1	Concrete ramp	Each	5
3.2	Door closer	Each	5

3.7 CONSTRUCTION MONITORING

The *Contractor's* supervisor must provide construction supervision throughout the works. Construction monitoring includes but is not limited to:

- Review a sample of each important work procedure and construction material and other technical submissions such as construction method statements, inspection and test plans and quality control and quality assurance plans.
- Attending site meetings and maintain adequate presence on the construction site to review samples of works and important completed work prior to enclosure or on completion as appropriate.
- Provide the *Project Manager* with technical interpretation of the plans and specification when required.
- General inspection of materials and equipment for adherence to National and International standards.
- Conducting a final inspection of the completed works prior to commissioning.

4. GENERAL QUALITY REQUIREMENTS

The *Contractor* shall include provision to ensure compliance to Eskom Quality requirement including as a minimum Eskom Quality management system, Supplier Quality Management Specification, policies, and standards. The *Contractor* shall ensure Quality Control Plan is submitted for accepted by the *Project Manager*. Prior to commencement of works the Method statements and Inspection & Test Plans are submitted for acceptance by the *Project Manager*.

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4.1 INSPECTION AND TESTING

- Before any fire barrier or fire coating is installed or applied a full application plan with the required Quality Control Plans / Inspection and Testing Plans will be in place with the relevant hold and witness points as required by the *Employer*.
- Material application guarantees will be provided as part of the scope.
- All relevant inspection, testing and maintenance requirements for the products supplied as part of the scope must be submitted.

5. PROVISIONS BY EMPLOYER

220V Electricity supply points are available within the cable tunnels and boiler house. The availability and continuation of supply cannot be guaranteed by the *Employer*. There is only limited lighting in the cable tunnels and boiler house.

6. PROVISIONS BY CONTRACTOR

The *Contractor* shall supply all material, tools, equipment, and consumables required for the safe execution of the entire works. This will include, but is not limited to the following:

- All repair and coating material required for the works, including solvents.
- All Personal Protective Equipment required for the works.
- All lighting required.
- Backup power supply and extensions.
- All application and cleaning equipment.
- All ventilation and extraction equipment.
- All testing equipment.
- All access ramps which will be required to cross over cables racks to prevent damage to the cables and the racks.

7. AUTHORISATION

This document has been seen and accepted by:

Table 5: Authorisation

Name	Designation
XXXXXXXXXXXXXXXXXXXX	Corporate Specialist
XXXXXXXXXXXXXXXXXXXX	Fire System Engineer
XXXXXXXXXXXXXXXXXXXX	Civil System Engineer
XXXXXXXXXXXXXXXXXXXX	Civil System Engineer
XXXXXXXXXXXXXXXXXXXX	Senior Technician Civil

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[REDACTED]	Senior Technician Civil
[REDACTED]	Senior Technician Civil
[REDACTED]	Senior Advisor Fire
[REDACTED]	Civil Engineering Manager
[REDACTED]	Engineering Manager
[REDACTED]	Manager Safety and Health
[REDACTED]	Manager Environmental
[REDACTED]	Senior Advisor Quality Engineer
[REDACTED]	Environmental Officer
[REDACTED]	Safety and Health Officer
[REDACTED]	Control and Instrumentation Engineer
[REDACTED]	Electrical Engineer

8. REVISIONS

Table 6: Revisions

Date	Rev	Compiler	Remarks
November 2019	1	[REDACTED]	Approved final document for execution
December 2024	2	[REDACTED]	Approved final document for execution

9. DEVELOPMENT TEAM

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

[REDACTED]
[REDACTED]

10. ACKNOWLEDGEMENTS

- N/A

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