

	SOW	CAMDEN POWER STATION
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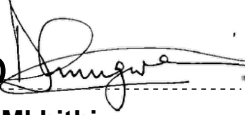
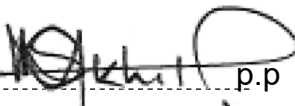
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Compiled by	Supported by	Functional Responsibility	Authorized by
			
T Thebe	A Botshe	S Mkhithi	M Mathabatha
C&I Engineer	C&I Maintenance Manager	C&I Engineering Manager	Engineering Group Manager
Date:	Date:	Date:	Date:
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1. Introduction

Camden Power Station requires that its Fire Detection System be maintained with the intention of preventing failures and addressing any failures which might arise during system operation. The maintenance of these systems must be done by competent persons possessing sufficient knowledge and experience with the fire detection system installed at Camden and generic fire detection systems. With this requirement in mind, Camden is looking for a suitable contractor in the open market to perform the maintenance work. The duties and responsibilities, i.e activities, falling upon the successful contractor are given in this document. All activities in this document shall be assumed to be the duty of the Contractor unless otherwise specified.

2. Supporting Clauses

2.1 Scope

The technical duties and responsibilities which will be assumed by the successful Contractor regarding the maintenance of the fire detection system are given here. Administrative duties and responsibilities, partly derived from SANS10139, are also included. The duties and responsibilities cover the entire fire detection system including its interfaces to external systems (e.g HVAC, Fire suppression e.t.c). The three principal sections of the fire detection system (Sigmasys M, Sinteso, Cerberus) along with their field components, network systems, interface devices, software, computers and work stations all fall under the scope of the duties and responsibilities. The aspirating smoke detection (ASD) system as well as the gaseous fire suppression systems all require maintenance as described in this document and it is the Contractor's duty to perform this maintenance.

2.1.1 Purpose

To define the roles, duties and responsibilities which must be assumed and executed by the successful contractor when maintaining the fire detection system at Camden Power Station. Sufficient detail is given concerning the duties and responsibilities and the processes which must be followed when performing work under the contract. The routine, non-routine activities and possible emergency interventions which the Contractor may need to perform are given.

2.1.2 Applicability

This document shall apply to Camden Power Station.

2.1.3 Effective date

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.

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2.2.1 Normative

- [1] ISO 9001 Quality Management Systems (Camden specific document needed)
- [2] 240-76932321 Maintenance Execution Strategy for Fire Detection System
- [3] 240-56737654 Inspection, Testing and Maintenance of Fire Detection Systems Standard
- [4] SANS 10139: Fire detection and alarm systems for buildings - System design, installation and servicing
- [5] Camden Power Station Safety, Health and Environment Specification – Doc No 004/4830

2.2.2 Informative

- [6] None

2.3 Definitions

Not applicable

2.4 Abbreviations

Abbreviation	Explanation
C&I	Control and Instrumentation
BD	Beam Detector
BR	Beam Reflector
BOP	Balance Of Plant
BR	Beam Reflector
EOD	Electrical Operating Desk
FD	Flame Detector
FDS	Fire Detection System
HD	Heat Detector
HMI	Human Machine Interface
HVAC	Heating Ventilation and Air Conditioning
IF	Interface
JB	Junction Box
MCP	Manual Call Point
PS	Pressure Switch
SANS	South African National Standards
SB	Siren Beacon
SD	Smoke Detector
SOW	Scope of Work
TRP	Transponder

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2.5 Roles and Responsibilities

C&I Engineering

Are the Custodians of the document, ensuring the accuracy, validity and completeness of the document for the purpose of establishing a maintenance contract.

C&I Maintenance

Provide input into the document's content and ensure that it meets practicability and maintainability requirements. Ensure that the appointed Contractor performs work according to the technical, safety, health and environmental requirements described and implied in this document. The latter is done by acting as the Contract Manager of the contract to be put in place between Camden Power Station and the Contractor to be appointed to render the Services.

Operating Department

Amongst other duties, provide input and ensure that the interface requirements between Contractor and Operating department are well defined and are aligned with the Operating procedures which control operation of the fire detection system and its interfacing systems (e.g HVAC, fire suppression e.t.c).

Fire Department

Amongst other duties, ensure that the activities required by the SOW are not a duplication due to the work already being done by the Fire department and that the clear separation of duties, roles and responsibilities between Fire department and the Contractor is done.

2.6 Process for Monitoring

Adherence of all participants to the document's contents will be monitored and controlled by the terms stated in the maintenance contract to be put in place. Review of the document will be done before transferring content to the contract documentation.

2.7 Related/Supporting Documents

Not applicable.

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3. Fire Detection System Maintenance Scope of Work

The technical and administrative requirements for the maintenance of the fire detection system are detailed in this section.

3.1 Fire Detection System Synopsis

A Siemens SIGMASYS-M fire detection and alarm system is installed at Camden Power Station to monitor the power islands and the section of the BOP close to the power islands. A Siemens Sinteso system is installed in some sections of the ash handling plant. The third section of the FDS is installed at the Training and Emergency Preparedness Centre and its main panel is a Cerberus FC722 panel. These systems are connected together in a fibre ring and are visualised at the EOD computer.

3.1.1 Sigmasys M

At Camden the SIGMASYS M panels are mounted in housings, one in the Station Control Equipment Room for the Administration Building and Common Plant Areas and one in each Unit Equipment Room. These communicate in a ring formation to each other via a fibre cable utilising RS232-to-Fibre converters.

The main components of the Sigmasys M Fire Detection System are listed below

- The Sigmasys M Control Panel (This is a 19" Modular Panel (X1 on the panel layout drawings) consisting of the following components)
 - SOC Module
 - SAC Module with two connection plates
 - MPC Module with a connection plate
- SPF5200 Relay Module
- Power Supplies (24 V/150 W)
- SIGMANET Operating Panel
- SIGMANET Mobile Operating Panel
- SIGMADIAG D100 Software
- Field Devices/Elements
 - o Smoke detectors
 - o Heat Detectors
 - o Flame Detectors
 - o Transponder with flame/ linear beam detectors
 - o Contact Couplers for monitoring pressure switches
 - o Manual Call Points
 - o Sirens\Beacons
 - o Pressure Switches

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3.1.2 Sinteso System

This system is installed at parts of the Ash Handling Plant

3.1.3 Cerberus System

Installed at the Training and EP Centre

3.1.4 Installed Component Models

The table below indicates the different models of installed fire detection system components.

Component	Model 1	Model 2	Model 3
Smoke Detector	SDF1200 (older)	OP 720 (new)	
Heat Detector	SDT 2100 (older)	HI 720 (new)	
Interface Module	SPF5300		
Pressure Switch	Potter PS20		
Manual Call Point	SMF 3120 (older)	FDM 223 (new)	
Transponder	SPF 3500		
Flame Detector	DF 1192		
Beam Detector	DLA 1191		
Beam Reflector	DLR 1191		
Siren-Beacon	FDS 229 -R		
Fire Detection Panel	Sigmatys SIGMANET	Cerberus FC722	Sinteso FC2020 Sinteso FC2040 Sinteso FT2040

Table 1. Lists the different types of installed fire detection equipment as well as the model of each component

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3.1.5 FDS Component Count

Area	SD	HD	IF	PS	MCP	TRP	FD	BD	BR	JB	SB
Training Centre and Emergency Preparedness Centre	47	3			7						7
Canteen	11	4			4						4
Common Plant	302	10	25	33	2	6	6	6	6	25	
Unit 01	18		6	10						6	
Unit 02	18		6	10						6	
Unit 03	18		6	10						6	
Unit 04	18		6	10						6	
Unit 05	18		6	10						6	
Unit 06	18		6	10						6	
Unit 07	18		6	10						6	
Unit 08	18		6	10						6	
Totals											

Table 1. Lists areas where field FDS equipment is installed and indicates types of equipment installed and quantity of each type. Different models exist for some types of equipment

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3.2 Description of Maintenance Works

The duties which the Contractor shall perform are listed below

Perform maintenance of the fire detection system according to SANS 10139 [4] and Eskom standard [

3.2.1 Component Specific Maintenance Activities

The different types of components each require different types of maintenance interventions on a routine and/or non-routine basis depending on the specific component. The components are listed below and the interventions/activity and associated frequencies are described. Refer to table 2 for the quantities of each type of

3.2.1.1 Fire Detection Control Panel

Component	Sub-Component	Task	Frequency
Sigmasys M Control Panel	Batteries	Inspection and clean	1M
	Batteries	Test	1Y
	Power Supply	Inspection and clean	1M
	Power Supply	Test	3M

Detailed Task Description

Power Supply – Inspection and Clean	Power Supply - Test
1) Inspect Power Supply for any signs of physical damage, dirt or dust accumulation. 2) Vacuum off dust if necessary 3) Check tightness of screws and connectors. 4) Inspect visible portions of cables and associated conduits. 5) Check for burnt, loose or chafed wiring and circuitry	1) Measure Output Voltage, DC component and AC ripple under both mains and battery supply. 2) Simulate typical (non-destructive) power supply faults and check that each fault is registered at the immediate (Fire Panel) and the highest (HMI at EOD) supervision level

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Batteries – Inspection and Clean	Batteries - Test
1) Inspect battery for any signs of physical damage, wear or leakage 2) Clean the outside of the Battery 3) Check tightness of screws, caps, cable glands and connectors. 4) Inspect visible portions of cables and associated conduits. 5) Check for corrosion on terminals 6) Check for deformity of the battery 7) Verify month and year of manufacture are present and visible on the battery	1) Perform Charge/Discharge test according to approved procedure. Procedure to be developed by contractor and accepted by Employer before being used. 2) Measure system standby time and maximum alarm currents. Compare to calculated standby time and alarm currents. 3) Calculate required battery capacity based on alarm currents and compare to test result 4) Remove battery from panel and test battery capacity to provide required voltage at rated current

3.2.1.2 Smoke Detectors

Component	Sub-Component	Task	Frequency
Smoke Detectors	-	Inspection and clean	3M
	-	Test	1Y

Detailed Task Description

Smoke Detector – Inspection and Clean	Smoke Detector - Test
1) Inspect Smoke Sensor for any signs of physical damage. 2) Clean outside of the Sensor, ensuring that smoke admission ports are free of obstruction. No dust or debris over the detector 3) Check tightness of screws, caps and connectors. 4) Inspect visible portions of cables and associated conduits. 5) Check for floor standing obstructions around vicinity of the smoke detector	1) Simulate smoke condition with the Smoke Detector In-situ 2) Check Response at the Fire Detection Panel and higher-level supervision system at EOD

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6) Check whether detector is properly secured	
7) Check whether plant labelling in good condition	
8) Check that no water is flowing or flowed over the detector	
9) Check that new building conditions (civil works) have not affected the function or effectiveness of the detector	

3.2.1.3 Gas Suppression Panels

Component	Sub-Component	Task	Frequency
Gas Suppression Control Panel	Panel	Inspection	1M
	Occupant Warning Indications	Test	1M
	Discharge Switch Inhibit	Test	6M
	Manual Switch Activation	Test	6M
	Fault Visual Warning Devices	Test	6M
	System Logic	Test	6M
	Extinguishant Release Actuator	Test	6M
	Instrumentation	Calibrate	1Y
	Suppression System Directional Valves	Test	1Y
	Discharge Time Delay	Test	1Y
	Extinguishant Release Detector	Test	1Y
	Gas Cylinders	Weighing	3M
	Gas Cylinders	Replacement	As and when required

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Detailed Task Description

Gas Discharge Panel – Inspection and Clean	Occupant Warning System - Test
<ul style="list-style-type: none">1) Inspect Panel for any signs of physical damage, particulate and water ingress2) Clean outside of the Panel ensuring visibility of components inside the panel, where applicable3) Check tightness of screws, glands, caps and connectors.4) Inspect visible portions of cables and associated conduits.5) Ensure doors are properly locked, locking mechanism in good condition and door seal are also in good condition6) Ensure status lights are in good condition and interfaces to external systems in good condition	<ul style="list-style-type: none">1) Initiate condition which will activate Occupant Warning System2) Check that system functions as required

Discharge Inhibit Switch – Test	Manual Activation Switch - Test
<ul style="list-style-type: none">1) Test operation of each inhibit or auto/manual switch2) Confirm it prevents automatic discharge of suppression system3) Confirm it stops and resets normal system discharge sequence4) Confirm it causes the illumination of a visual indicator at the gas releasing panel5) Confirm it causes an audible indication6) Confirm it does not override the manual discharge switch	<ul style="list-style-type: none">1) Test operation of the manual suppression activation switch2) Confirm normal discharge sequence followed (including fire and evacuation alarms)3) Check interfacing equipment shutdowns happen as expected4) Check that it overrides the inhibit (auto/manual) switch

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Fault Visual Warning Devices– Test	System Logic- Test
1) Test service switch and confirm visual warning device operates 2) Simulate fault with discharge actuator circuit and confirm visual warning device operates 3) Check that the operation of the auto inhibit switch is indicated by the visual warning devices 4) Ensure that isolations or faults of the fire detection or suppression system controls which can prevent operation of the suppression system are indicated by the visual warning system	1) Test the system logic (e.g double detector or dependency on more than one alarm) and confirm that the operation is according to design. The following should be noted a) Visual Warning Devices b) audible Alarms c) Direction Valve signal/output d) Equipment fire mode signal/output e) HVAC fire mode signal/output f) System Discharge Actuator g) Door and damper release h) Ancillary controls

Extinguishant Release Actuator - Test	Instrumentation- Calibrate
1) Test each supervised actuator circuit to ensure a fault is registered at the Panel 2) Test the function of each actuator and ensure that each actuator operates correctly	1) Calibrate instrumentation

Suppression System Directional Valves - Test	Discharge Time Delay- Test
1) Simulate the system operation and confirm that each electrical directional valve operates according to the approved design.	1) Test and record the system discharge sequence and confirm the time delay period is in accordance with the approved design

Extinguishant Release Detector - Test	Gas Cylinders – Weigh and Replacement
1) Test the extinguishant release detecting device and confirm that it relays this information to the Panel	Inspect Cylinders to determine physical condition, valves in proper positions, pressures ok 2) Weigh cylinders and confirm weight in acceptable range. Refill/Replace if necessary 3) Refill/Replace cylinders if gas discharged.

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3.2.1.4 Heat Detectors

Component	Sub-Component	Task	Frequency
Heat Detectors	-	Inspection and clean	3M
	-	Test	1Y

Detailed Task Description

Heat Detector – Inspection and Clean	Heat Detector - Test
1) Inspect detector for any signs of physical damage. 2) Clean outside of the detector, ensuring that admission ports are free of obstruction, dust or debris 3) Check tightness of screws, caps and connectors 4) Inspect visible portions of cables and associated conduits. 5) Check for floor standing obstructions around vicinity of the detector 6) Check for plant labelling condition 7) Building conditions (civil works) have not affected functionality or effectiveness of the device 9) Check that new building conditions (civil works) have not affected the function or effectiveness of the detector	1) Simulate heat with the Detector In-situ 2) Check Response at the Fire Detection Panel and higher-level supervision system at EOD

3.2.1.5 Flame Detectors

Component	Sub-Component	Task	Frequency
Flame Detectors	-	Inspection and clean	1M
	-	Test	1Y

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Detailed Task Description

Flame Detector – Inspection and Clean	Flame Detector - Test
<ul style="list-style-type: none">1) Check that there are no physical obstructions between the detectors and the area being protected.2) Clean outside of the detector, clearing dust, debris or contaminants. Lenses should be left clean.3) Confirm the orientation of the detector against the original drawing and that it is directed towards the area being protected4) Check for plant labelling condition	<ul style="list-style-type: none">1) Simulate triggering condition using Flame Simulator Test lamp2) Check Response at the Fire Detection Panel and higher-level supervision system at EOD.3) Check response of Sounders/Strobe in the area

3.2.1.6 Transponders

Component	Sub-Component	Task	Frequency
Transponders	-	Inspection and clean	3M

Detailed Task Description

Transponder – Inspection and Clean
<ul style="list-style-type: none">1) Inspect Transponder for any signs of physical damage.2) Clean outside of Transponder3) Check tightness of screws and connectors.4) Inspect visible portions of cables and associated conduits.

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3.2.1.7 Linear Beam Detector-Reflector Pairs

Component	Sub-Component	Task	Frequency
Linear beam Detector-Reflector Pairs	-	Inspection and clean	3M
	-	Test	1Y

Detailed Task Description

Linear beam Detector-Reflector Pairs – Inspection and Clean	Linear beam Detector-Reflector Pairs - Test
1) Ensure they are free of mechanical damage 2) Free of water damage 3) Clean of debris and dust. 4) Are properly secured. 5) Verify the beam path is unobstructed. 6) Are not painted over thus inhibiting function. 7) Building conditions i.e. civil changes have not affected the function or effectiveness of the devices. 8) Are not adversely affected by temporary/permanent obstructions typically during constructions or modifications in the surroundings. 9) Incorrect labels, no labels, dirty labels or damaged labels.	1) Simulate the triggering condition 2) Note response at the fire detection panel and higher-level supervision system 3) Note response of sirens/strobes in the protected area

3.2.1.8 Pressure Switches

Component	Sub-Component	Task	Frequency
Pressure Switches	-	Inspection and clean	3M
	-	Test	6M

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Detailed Task Description

Pressure and Flow Switches – Inspection and Clean	Pressure and Flow Switches - Test
1) Inspect Switch for any signs of physical damage and there no leaks, covers are fine and seals are fine. 2) Clean outside of Switch 3) Check tightness of screws, caps and connectors. 4) Inspect visible portions of cables and associated conduits. 5) Check that plant labelling in good condition 6) Check that device is properly secured	1) With the assistance of Operating department, physically create the conditions that will cause the pressure/flow switch to operate. (e.g start or stop pumps or open/close the applicable isolation/relief/drain valves e.t.c)

3.2.1.9 Manual Call Points

Component	Sub-Component	Task	Frequency
Manual Call Point	-	Inspection	1M
	-	Clean	1Y

Detailed Task Description

Manual Call Point – Inspection	Manual Call Point - Clean
1) Inspect MCP for any signs of physical damage. 2) Clean outside of MCP 3) Check tightness of screws and connectors. 4) Inspect visible portions of cables and associated conduits.	1) Vacuum out any dust in the MCP. 2) Inspect Internals for liquid or particulate ingress 2) Clean the outside of the MCP

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3.2.1.10 Sounder/Beacon

Component	Sub-Component	Task	Frequency
Sounder-Beacon	-	Inspection and clean	6M
	-	Test	1Y

Detailed Task Description

Sounder-Beacon – Inspection and Clean	Sounder-Beacon - Test
<ul style="list-style-type: none">1) Inspect Sounder/Beacon for any signs of physical damage.2) Clean outside of the Sounder-Beacon3) Check tightness of screws, caps and connectors.4) Inspect visible portions of cables and associated conduits.5) Inspect plant labelling (KKS or reference numbers) for good condition6) Ensure there are no obstructions in front of the sounder	<ul style="list-style-type: none">1) Simulate condition for sounder-beacon to activate2) Measure sound from sounder-beacon according to approved procedure in the right environmental conditions3) Check response of sounders whether according to standard requirements (min dB level above background noise)

3.2.2 General Requirements

- The Contractor must supply their own consumables necessary to execute the works.
- The spares will be supplied by Employer.
- The Contractor will supply all the test equipment and test gas.
- Replacement gas suppression cylinders shall be supplied by the Contractor.
- Refilling of gas suppression cylinders shall be done by the Contractor.
- The Contractor to clear all faults on each panel.
- Contractor to perform periodic reviews of the entire fire detection system and propose necessary modifications where Contractor deems necessary.
- Contractor partakes in Fire Detection System incident investigations and makes recommendation in-line with Eskom standards and fire related SANS standards
- The Contractor together with Employer performs Fire Detection System assessment annually, in line with Eskom Standard. Contractor draws up a report to detail the assessment results.

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3.2.3 Fire Detection System Interfaces

The FDS transacts with both the fire suppression and the HVAC systems

- Each interface between the fire detection and fire suppression systems shall be tested at least twice a year (see section 3.2.1.8)
- During component testing (see section 3.2.1), some of the tests must be done with the fire detection panel under normal operating condition. This will allow the interfaces to the applicable HVAC systems to also be tested.

3.2.4 Administrative Tasks

The Contractor to supply the Employer with both a softcopy and hardcopy report detailing the status of the system (alarms, de-activations, faults e.t.c) before and after maintenance. The report is submitted monthly.

- Every fire detection control panel's logbook shall be maintained by the Contractor. Correctness of entries in the logbook, physical condition of the logbook shall be checked monthly and reported in the monthly fire detection system status report.
- All documentation pertaining to the Fire Detection and Alarm System shall be updated regularly by the Contractor.
- The Contractor shall execute engineering work (i.e. Design Modifications) as per Eskom instruction when necessary.
- Contractor creates and maintains a safety file as per Employer's Standards and Procedures regarding 'Health and Safety at Camden Power Station: Camden Power Station Safety, Health and Environment Specification – Doc No 004/4830.
- Contractor maintains a list of simulations and OON conditions applicable to the fire detection. This list is freshly compiled monthly and submitted monthly to the Employer and also immediately when the Contractor becomes aware of any change regarding simulations and OONs.

3.2.5 Quality and Competence Requirements

- Contractor only appoints persons who are competent and have an active proof of competence, issued by SAQCC or FDIA, regarding SANS10139 2012. Servicemen and Commissioner competence required.
- Contractor ensures that certificates of competence are not expired and registration with SAQCC and/or FDIA has not lapsed. Proof of key people's competence shall be provided at tendering stage.
- The fire detection system also covers some areas with a potentially explosive (e.g battery rooms) atmosphere. Work done and tools used in these areas must take this into consideration.

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3.2.6 Plant Visualisation, Configuration and Administration System Requirements

- Monthly physical checks of the EOD Workstation hardware and software health shall be done by Contractor.
- Contractor compiles system disaster recovery procedures for all installed hardware and software.
- On a monthly basis, the Contractor to check the workstation and database and ensure they are in good working condition. Database condition is reported in the monthly report.
- Contractor monthly system status report also includes information regarding the health of OT hardware and software
- Hardware and software faults or failures are listed in the monthly status reports.
- Inventory of installed system software and applications shall be compiled maintained by Contractor during term of contract. Inventory to specify software version numbers, releases (e.g operating systems, word processors, imaging software e.t.c). Patches and updates applied to the software shall be reported as well. This list shall form part of the monthly status report.
- Backups of the system are done by Contractor prior to updating any software or hardware. Backups are also done after updating hardware or software, by Contractor.
- The image(s) of the fire detection system workstation(s) shall be kept on the hard drives. Contractor performs the imaging and safekeeping of the image(s).
- Contractor creates backups of historical databases and configuration databases and area.
- Contractor archives all backups, indicating the dates and times as well as the reasons for the backups.
- Cleaning out of the workstation to remove dust shall be done both routinely (annually) and non-routinely (as needed basis).
- Contractor maintains the cleanliness of the workstation and peripherals (mouse, keyboard, screen e.t.c)

3.2.7 Training Requirements

- Contractor arranges SANS10139 Basic Detection system, Fire Extinguisher, Commissioner training for Employer's Staff.
- Contractor equips (through training) Employer's staff with knowledge and expertise to operate, administer and engineer the HMI system (i.e the Plant Visualisation, Configuration and Administration computer at EOD)
- The training concerning the EOD computer shall be both theoretical and practical. Creating and loading backups
- Contractor provides training to Employer's staff regarding the operation and maintenance of the entire fire detection system including all its sections (Sigmasy M, Cerberus, Sinteso). The training focuses on familiarisation with high-level system, function and use of FDS components, routine and non-routine maintenance activities, use of tools

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3.2.8 Emergencies and Callouts

- The contractor shall be available for clearing of faults/alarms within 24 hours of being notified about the problem.

4. Acceptance

This document has been seen and accepted by:

Name	Designation
S Mabele	Fire Protection System Engineer
J Nyambi	Fire Risk Management Officer
P Maniram	Controller

5. Revisions

Date	Rev.	Compiler	Remarks
July 2024	3	T. Thebe	Updated to new format, added sections
October 2022	2	F. Mthethwa	

6. Development Team

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

- Muzi Nkosi
- Grace Mandlazi
- Mlungisi Nkosi
- Ntokozo Sibiya

7. Acknowledgements

Contributions of all listed under section six are much appreciated.

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