	<b>Scope of Work</b>	<b>Technology</b>
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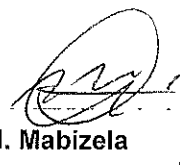


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## **1. Introduction**

Fire Detection System at Kendal Power Station is obsolete and needs to be replaced with a new system that is compliant to Standards and Codes of Practice governing Fire Detection and Protection Systems. The environmental conditions in the plant have also changed and this contributes to a high number of nuisance alarms on the system. The scope for Kendal Fire Detection System Replacement Project covers system design, installation, commissioning and life-cycle management aspect for the project. The scope of the project covers replacement of the existing Fire Detection System (FDS) with a new system that complies with the latest Standards and Codes of Practice governing the Fire Detection Systems and FDS installation in areas that are currently without fire detection.

Kendal Fire Detection System Replacement Project also covers FDS interface to Fire Protection System (FPS), Heating, Ventilation and Air Conditioning (HVAC) System, Lift Controller and Consolidated Building Management System (CBMS). The scope of work does not cover interfaces to the PA (Public Address) System and Access Control System. The FDS shall be designed, signed off and installed by SAQCC certified personnel in accordance with requirements from the Department of Labour.

## **2. Supporting Clauses**

### **2.1 Scope**

#### **2.1.1 Purpose**

This document presents the scope of work for design, installation and commissioning of the fire detection system at Kendal Power Station. The scope of work also covers interface to FPS, HVAC, and Lift Controller.

#### **2.1.2 Applicability**

This document is applicable Kendal 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.

**Note:** No document in this specification supersedes laws and regulations, unless a specific exemption has been obtained from relevant authorities.

#### **2.2.1 Normative**

- [1] ISO 9001 Quality Management Systems
- [2] ISO 13943 Fire Safety Vocabulary

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- [3] Occupational Health and Safety Act 85, of 1993 (OHS Act)
- [4] Eskom Plant Safety Regulations GGR 0092
- [5] National Environmental Management Act, 1998
- [6] EST 32-124 Eskom Fire Risk Management
- [7] 240-54937439 Fire Protection / Detection Assessment Standard
- [8] 240-56737448 Fire Detection and Life Safety Design Standard
- [9] 240-54937450 Fire Protection and Life Safety Design Standard
- [10] 240-53114002 Engineering Change Management Procedure
- [11] 240-53113685 Design Review Procedure
- [12] 240-51999453 Standard Specification for Valve-Regulated Lead-Acid Cells
- [13] 240-56176852 Essential Power Supplies for Power Stations Standard
- [14] 240-56356396 Earthing and Lightning Protection Standard
- [15] 240-56355815 Junction Box and Cable Termination Standard
- [16] 240-56364545 Structural Design and Engineering Standard
- [17] 240-56536505 Hazardous Locations Standard
- [18] 240-76619615 Classification of Battery Rooms in Eskom
- [19] 240-76992014 Project Plant Specific Technical Documents and Records Management Work Instruction
- [20] 240-46977377 Process Control Manual (PCM) for Manage Interfaces
- [21] 240-50317699 Manage Technical Queries Procedure
- [22] 240-53665024 Engineering Quality Manual
- [23] Fire Protection/ Detection Assessment Report Kendal Power Station (\*474-11058)
- [24] 379-KEN-AABZ28-SP0008-1 Stakeholder Requirements Definition for Kendal Fire Detection System Replacement Project
- [25] 379-KEN-BAAC-D00132-1 Concept Design Report for Kendal Fire Detection System Replacement Project
- [26] Inspection Report on Fire Detection System, Report No 1521, Sensor Special Risks Fire Detection and Protection, January 2015

## **2.2.2 Informative**

### **2.2.2.1 South African National Standard**

- [27] SANS 10139 Fire Detection and Alarm Systems for Buildings – System Design, Installation and Servicing
- [28] SANS 10400 National Building Regulations
- [29] SANS 246 Code of Practice for Fire Protection for Electronic Equipment Installations

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- [30] SANS 369-1 Code of Practice for the Operation of Fire Protection Measures – Part 1 Electrical Actuation of Gaseous Total Flooding Extinguishing Systems
- [31] SANS 1411-5 Materials of Insulated Electric Cables and Flexible Cords Part 5 Halogen-free, Flame-retardant Materials
- [32] SANS 50054-2 Fire Detection and Fire Alarm Systems – Part 2 Control and Indicating Equipment
- [33] SANS 50054-3 Fire Detection and Fire Alarm Systems – Part 3 Fire Alarm Devices Sounders
- [34] SANS 50054-4 Fire Detection and Fire Alarm Systems – Part 4 Power Supply Equipment
- [35] SANS 50054-5 Fire Detection and Fire Alarm Systems – Part 5 Heat Detectors – Point Detectors
- [36] SANS 50054-7 Fire Detection and Fire Alarm Systems – Part 7 Smoke Detectors – Point Detectors Using Scattered Light, Transmitted Light or Ionization
- [37] SANS 50054-11 Fire Detection and Fire Alarm Systems – Part 11 Manual Call Points
- [38] SANS 50054-20 Fire Detection and Fire Alarm Systems – Part 20 Aspirating Smoke Detectors
- [39] SANS 50200 Method of Test for Resistance to Fire for Unprotected Small Cables for Use in Emergency Circuits
- [40] SANS 60079-10 Electrical Apparatus for Explosive Gas Atmospheres
- [41] SANS 60849 Sound Systems for Emergency Purposes
- [42] SANS 10108 The Classification of Hazardous Locations and the Selection of Equipment for Use in Such Locations
- [43] SANS 10142 South African Code of Practice for all Low Voltage Wiring within Buildings

#### **2.2.2.2 National Fire Protection Association**

- [44] NFPA 72 National Fire Alarm and Signalling Code
- [45] NFPA 850 Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations

#### **2.2.2.3 Others**

- [46] EN 54-18 Fire Detection and Fire Alarm Systems Part 18 Input / Output Devices
- [47] EN 54-22 Part 22 Fire Detection and Fire Alarm Systems Line Type Heat Detectors
- [48] EN 54-23 Fire Detection and Fire Alarm System Fire Alarm Devices – Visual Alarm Devices
- [49] IEC 60529 IP Rating (Ingress Protection)
- [50] IEC 61000-4-8 Power Frequency Magnetic Field Immunity Test

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[51] IEC 61000-4-11 Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests

[52] IEC 62040-1 Uninterruptible Power System (UPS) – Part 1 General and Safety Requirements for UPS

## 2.3 Definitions

Definition	Description
Addressable System	System in which signals from detectors, manual call points, or any other devices are individually identified at the control and indicating equipment
Alarm Zone	Geographical subdivision of the protected premises, in which the fire alarm warning can be given separately, and independently, of a fire alarm warning in any other alarm zone
Cable schedules	Schedules outlining the correct connection and distribution of cabling within a system, including termination on terminal blocks, patch fields, panels etc
Controlled disclosure, Classification	Controlled disclosure to external parties (either enforced by law, or discretionary)
Conventional System	A system where devices are not assigned individual addresses and are not distinguishable from each other. Devices are looped, and activation of any device on a loop produces an output associated with the loop at the Control and Indicating Equipment (CIE)
Detection Zone	Subdivision of the protected premises such that the occurrence of a fire within it will be indicated by a fire alarm system separately from an indication of fire in any other subdivision Note: A detection zone will usually consist of an area protected by several manual call points and/or detectors
Failsafe	Capable of preserving safety in the case of failure
Fire Detection	The term fire detection and alarm systems includes systems that range from those comprising only one or two manual call points and sounders to complex networked systems that incorporate a large number of automatic fire detectors, manual call points and sounders, connected to numerous inter-communicating control and indicating panels
Fire Detection Control Panel	Analogue addressable fire detection and alarm control system components that monitor inputs and controls outputs through various types of circuits
Functional System	A fully integrated working system which meets the safety, reliability and operability criteria and performs all detection algorithms, alarming, safety functions and supervisory functions
Installation drawings	Installation drawings include any line drawings, system schematics and rack layout drawings drawn up by the Contractor that are required to install the systems as per the specification

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IP Rating	Classification of the degrees of protection provided against the intrusion of solid objects (including body parts like hands and fingers), dust, accidental contact, and water in electrical enclosures (IEC 60529)
Manual Call Point	Component of a fire detection and alarm system which is used for the manual initiation of an alarm
Manual System	A system which relies on persons detecting a fire and using a manually operating device to initiate a fire alarm signal to raise awareness to all in the building
Smoke Detector	A type of detector which can detect a fire by the identification of the presence of smoke particles in the air

### 2.3.1 Classification

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

### 2.4 Abbreviations

Abbreviation	Description
AGC	Automatic Gain Control
ANSI	American Standard Institute
ASA	Acrylonitrile Styrene Acrylate
BacNet	Building Automation Control Network
B&W	Black and White
CBMS	Consolidated Building Management System
C&I	Control and Instrumentation
CE	Conformité Européene (European Conformity)
CIE	Control and Indicating Equipment
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
CoE	Centre of Excellence
DC	Direct Current
DSP	Digital Signal Processing
ECM	Engineering Change Management
EDWL	Engineering Design Work Lead
EDS	Electronic Data System
EDMS	Electronic Document Management System
EMI	Electromagnetic Interference
EOD	Engineering Operating Desk
EMAP	Engineering Management Plan
EMD	Electrical Maintenance Department

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Abbreviation	Description
AGC	Automatic Gain Control
ANSI	American Standard Institute
ASA	Acrylonitrile Styrene Acrylate
EP	Emergency Preparedness
EU	European Union
FAT	Factory Acceptance Test
FDIA	Fire Detection Installers Association
FDS	Fire Detection System
FM	Factory Mutual
FOV	Field of View
GAS I/F	Gas System Interface (Pressure/ Flow Switch)
FPS	Fire Protection System
HD	Heat Detector
HVAC	Heating, Ventilation and Air Conditioning
I/O Module	Input/ Output Module
IP	Internet Protocol
IP Code	Ingress Protection Rating
kW	Kilowatts
LAN	Local Area Network
LED	Light Emitting Diode
LDE	Lead Discipline Engineer
LHDC	Linear Heat Detection Cable
MCP	Manual Call Point
MMD	Mechanical Maintenance Department
NEC	National Electric Code
NFPA	National Fire Protection Association
nm	Nano metres
OEM	Original Equipment Manufacturer
OHS	Occupational Health and Safety
OPC	Open Platform Communications
OPCR	Outside Plant Control Room
PA	Public Address
POE	Power Over Ethernet
PC	Personal Computer
PPD	Power Plant Department
PS	Power Station
PS I/F	Pressure/ Flow Switch Interface
PSTN	Public Switched Telephone Network
PVC	Polyvinyl Chloride

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Abbreviation	Description
AGC	Automatic Gain Control
ANSI	American Standard Institute
ASA	Acrylonitrile Styrene Acrylate
RBO	Reliability Basis Optimization
SABS	South African Bureau of Standards
SANS	South African National Standards
SAQCC	The South African Qualifications and Certification Committee for the Fire Industry
SD	Smoke Detector
SMS	System Management Server
SRD	Stakeholder Requirement Definition
TCP	Transmission Control Protocol
UL	Underwriters Laboratories
UPS	Uninterruptible Power Supply
VESDA	Very Early Smoke Detection Alarm System
ZMU	Zone Monitoring Unit

## 2.5 Roles and Responsibilities

Not Applicable

## 2.6 Process for Monitoring

Not Applicable

## 2.7 Related/Supporting Documents

Not Applicable

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### **3. Specifications of the Services**

The scope for Kendal Fire Detection System includes

#### **3.1 Cable tunnels and 8 battery rooms**

**3.1.1** The Contractor designs, supply, install, configure, commission the interface of the Linear Heat Detection (LHD) system in the cable tunnels and of a combined Aspirating Smoke Detection (ASD) and Hydrogen Detection System in all 8 Battery Rooms to the existing Stores (Panel 8), Control rooms (Panel 1 to Panel 6), and EOD Airtech fire alarm panels. The Artech fire alarm panel models are FP2864C-99 and FP2864N.

**3.1.2** The Contractor performs design reviews (check and correct) of the provided designs by the Project Manager, supply, manufacture, storage, transport, install and commission the approved design of a Linear Heat Detection (LHD) system in all cable tunnels at Kendal Power Station.

**3.1.3** The Contractor performs design reviews (check and correct) of the provided designs by the Project Manager, supply, manufacture, storage, transport, install and commission the approved design of a combined Aspirating Smoke Detection (ASD) and Hydrogen Detection System in 8 Battery Rooms at Kendal Power Station. All battery room are classified as zone 2.

**3.1.4** The Contractor extends, supply, storage, transport, install, configure, commission the number of fire alarm loops of the existing fire alarm panel that are required to execute the works. In the case where extension is not feasible, the contractor supplies, install and commissioning a latest model of Artech fire alarm panel. The existing numbers of loops on the Artech fire panel are as follows:

- a) Panel 1 4 loops
- b) Panel 2 4 loops
- c) Panel 3 4 loops
- d) Panel 4 4 loops
- e) Panel 5 4 loops
- f) Panel 6 4 loops
- g) Panel 8 8 loops

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**3.1.5** The Contractor performs all factory acceptance tests, site integration testing, and site acceptance tests according to the testing requirements outlined in the Works Information and as guided by SANS 10139 fire system inspection and testing

**3.1.6** The Contractor decommissions the existing fire detection system in the cable tunnels and its loops and configurations in the local FP2864C-99 Airtech fire alarm panels (Store) and EOD fire alarm panel. It is the responsibility of the Contractor to decommission the existing system only after the new system is installed, commissioned, proven to be meeting the works requirements and acceptance tests

**3.1.7** *The Contractor complies with the Employers' decommissioning standards and requirements*

**3.1.8** The Contractor compiles and submits documentation as per the Vendor Document Submission Schedule (VDSS) to the Project Manager for acceptance

**3.1.9** The Contractor packages and supplies all Equipment, Plant and Materials, needed for the works and its transport, storage, and delivery to Site

**3.1.10** The Contractor stores and secure all Equipment, Plant and Materials on Site

**3.1.11** The Contractor performs quality control and assurance throughout all phases of works

**3.1.12** The Contractor corrects all Defects of the works

**3.1.13** The Contractor generates information where information is not available and validates and then implements such information to enable them to meet the requirements of the works

**3.1.14** The Contractor complies with all design, installation, cabling and commissioning and decommissioning requirements in line with Employers and SANS standards outlined in the design standard and code section of this Works Information, to deliver a compliant fire detection design that performs optimally in the environmental conditions of the Employer

**3.1.15** It is the responsibility of the Contractor to ensure all required design standards are complied with including those that the Employer might have omitted in design standard and code section of this Works Information

**3.1.16** The following accreditation and skills are a mandatory requirement for executing the works

- a) SAQCC accreditation at Designer level
- b) SAQCC accreditation at Cabler level
- c) SAQCC accreditation at Installation level
- d) SAQCC accreditation at Commissioning level

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### 3.2 Chemical Services Building

**3.2.1** The Contractor design, supply, manufacture, storage, transport, install and commission the approved and SANS 10139 compliant design of a Fire Detection System at the New Chemical Services Building at Kendal Power Station

**3.2.2** The Contractor design, supply, manufacture, storage, transport, install, configure, and commission the approved design of a local Aritech fire alarm panel at the New Chemical Services Building at Kendal Power Station The Aritech fire alarm panel models must be latest addressable panel

**3.2.3** The Contractor design, manufacture, storage, transport, supply, install, configure, commission the interface of the local Aritech fire alarm panel at the new Chemical Services Building to the OPCR Aritech fire alarm panel

**3.2.4** The Contractor design, manufacture, storage, transport, supply, install, configure, commission the interface of the Fire Detection System to the new Chemical Services Building HVAC system

**3.2.5** The Contractor ensures that all proposed designs are supported by the OEM for at least 10 years or more from time of implementation

**3.2.6** The following accreditation and skills are a mandatory requirement for executing the works

- e) SAQCC accreditation at Designer level
- f) SAQCC accreditation at Cabler level
- g) SAQCC accreditation at Installation level
- h) SAQCC accreditation at Commissioning level

### 3.3 System Identification

The fire detection systems in Table 1 will be replaced as part of the scope for this project, the new FDS does not necessarily need to be the same technology as the existing one An overview of fire detection areas around the station is shown in Appendix A

**Table 1: Existing FDS Technologies at Kendal Power Station**

System Name	Location	Year of Installation
• Optical Detectors With Addressable Aritech panels	8 Battery rooms	1995
	Cable tunnels	

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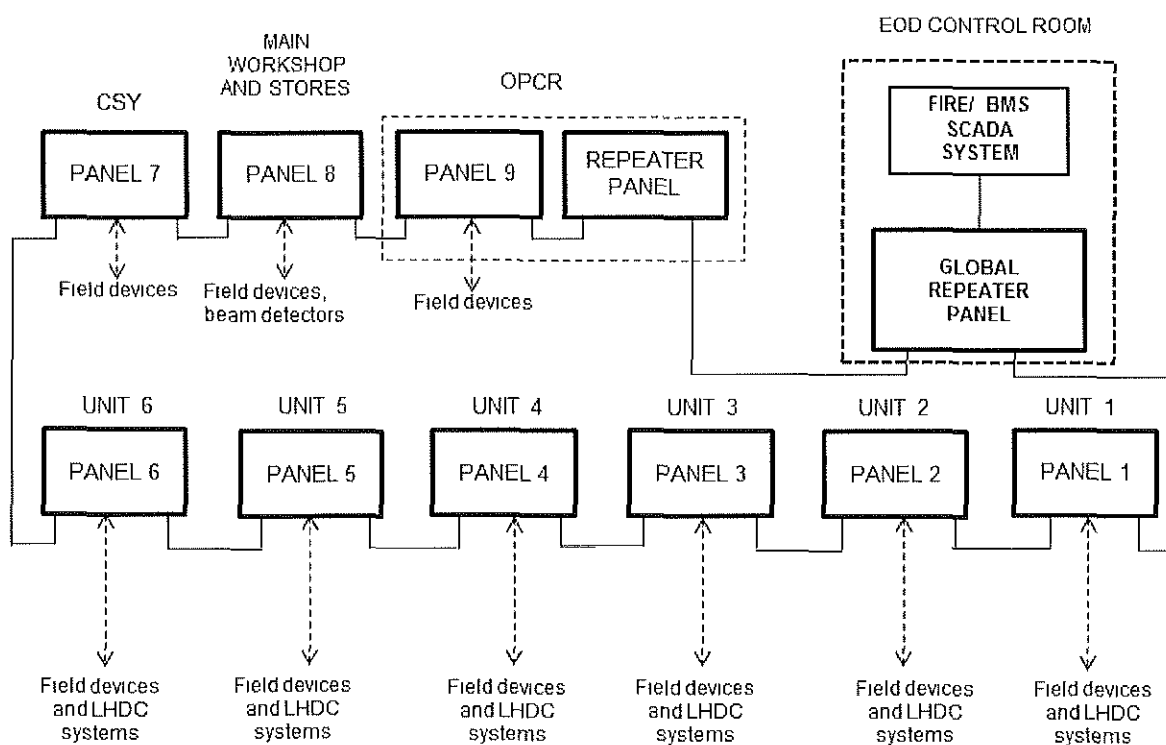
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none	New Chemical building	n/a
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The primary purpose of the FDS is to provide early fire warning and notify the Operators and the Fire Station in case of a fire event. The secondary purpose of the FDS is to monitor activation of fire protection systems and send a fire alarm signal to HVAC controllers.

### 3.4 System Overview

There are currently different FDS technologies at Kendal Power Station. The main Artech Fire System monitors over 3200 points throughout the station and consists of 9 Panels, 1 Global and 1 Local Repeater. These points consist of Switch Monitors (Water and Air Pressure Switches), Zone Monitors (Spindles and Conventional Detectors – Optical and Ionization) and Detectors (Addressable Ionization and Optical). The system architecture for the existing main Artech fire system at Kendal is indicated in Figure 1.



**Figure 1: Existing Kendal FDS Architecture (main Artech fire system)**

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### 3.5 System Definition

#### 3.5.1 Fire Detection Types/ Technology

This section presents FDS technology that will be used for different areas around the station. The latest technology shall be used for all the selected FDS types. All FDS listed in this section must communicate with at least one fire alarm panel. Ceiling voids and false floors must be taken into consideration in the detailed design.

##### 3.5.1.1 Detection for Office Buildings

Office buildings areas (Chemical building) include

- a) Office spaces
- b) Kitchen areas
- c) printer rooms
- d) Passages
- e) Exits/ Escape routes

##### A. Office Areas

Optical Smoke Detectors shall be used for office areas, boardrooms, and printer rooms in accordance with SANS 10139. Multi-sensor detectors must be considered in dusty office areas.

Optical smoke detectors shall comply with SANS 50054-7. Optical smoke detectors should be designed to have high resistance to contamination and corrosion.

**NOTE:** Use of ionization detectors is not allowed.

##### B. Kitchen Areas

Point type heat detectors with a fixed temperature sensor shall be used in all kitchens in accordance with SANS 10139. The fixed temperature required to activate the detector shall be determined at the detailed design phase post a fire risk assessment.

Point type heat detectors shall also comply with SANS 50054-5.

##### C. Passages

Optical smoke detectors shall be installed in all passages in the office buildings as per SANS 10139. Point type smoke detectors shall comply with SANS 50054-7. Multi-sensor detectors must be considered in dusty areas.

#### 3.5.1.2 Detection for Battery Rooms

Battery rooms are classified as a zone 2 explosive area (Locations where the operation concerned with flammable or explosive gases or vapours are so well controlled that an explosive or ignitable concentration is only likely to occur under abnormal conditions) according to SANS 60079.

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Aspirating Smoke Detection System should be installed in all battery rooms and must comply with SANS 50054-20/10139

Hydrogen Gas Detection System should also be installed in all battery rooms and must comply with SANS 10108, 10139, & 369

All hazardous locations installations shall be issued with Certificate of Compliance (COC) by a person registered as a Master Installation Electrician in terms of Regulation 11(2) of Electrical Installation Regulations in OHS Act. A combination of Aspirating Smoke Detection System and Hydrogen Gas Detection System shall be used in battery rooms

### 3.5.1.3 Detection for Cable Tunnels

Linear Heat Detection System shall be used for cable tunnels because of the environmental conditions in the plant and also taking into consideration installation and maintenance costs. Rational Fire Engineering Design Approach shall be followed for the design of linear heat detection system for cable tunnels

Requirements for Linear Heat Detection System

- Linear heat detection system shall be installed in cable tunnels to provide early fire warning as per NFPA 850
- Linear Heat Detection System should have the capability to measure and discriminate temperature for cables over long distances
- Linear heat detectors shall comply with SANS 50054-22
- Digital signal processing system
- Interface to the fire alarm panel and user interface capable of automatic visual signalling, with automatic audible signalling
- Each VSFD camera must be connected through a Local Area Network (LAN) to a Network Video Recorder (NVR) that communicates to remote monitoring software
- Self-cleaning mechanism for the lenses
- Video smoke detection systems should be capable of detecting smoke reliably in the absence of the normal lighting in the building and the absence of a mains power supply to any lighting provided specifically to aid the detection of smoke

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### **3.5.2 Main Fire Alarm Panel**

The main fire alarm panel is classified at the fire alarm panel located in the control rooms

The fire alarm panel shall comply with the functional requirements for fire detection control and indicating equipment in accordance with SANS 50054-2

The following events must be included under the alarm category and should appear on the fire alarm panel

- a) Fire alarm condition
- b) Device/ system fault warning condition
- c) Device/ system disablement condition
- d) Power supply failure
- e) Test condition
- f) Manual break glass unit (MCP) activation
- g) Activation of mechanical fire protection

The fire alarm panel should have the capabilities to display a combination of the above listed events simultaneously

The colour of all indications from light emitting diodes on the fire alarm panel must adhere to SANS 50054-2

The fire alarm panel should have the capabilities to indicate the following system faults

- a) Input fault
- b) Output fault
- c) Panel down fault
- d) Configuration fault
- e) Internal memory failure
- f) Clock failure
- g) Logic error
- h) Hardware test fault
- i) Tamper switch
- j) Time, date wrong
- k) Protected memory overwritten
- l) Supervisory switch

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### 3.5.3 Other requirements

#### 3.5.3.1 Cabling Requirements

- PH 30 cabling shall be used for office areas and PH 120 cabling shall be used for other FDS areas. Enhanced fire cable (PH 120) should be used for inter-panel communication as per SANS 10139. PH 30 and PH 120 cabling should meet the following requirements:
  - a) SANS 50200
  - b) Halogen free
  - c) Fire retardant
  - d) Compliance to IEC 60092-359 (SHF1) and SANS 1411-5
- PH 30 and PH120 cables that provide 30 minutes and 120 minutes fire resistance respectively as tested to EN 50200 should be used
- Cables may be installed firmly fixed direct to the surface or be installed in conduits for extra mechanical protection. Conduits should be steel
- Conduits may be PVC as long as the conduit supports are non-combustible (steel) and be fixed at a maximum of 500 mm apart

#### 3.5.3.2 Interface to Station LAN

- Provision should be made to support connection to the Kendal Station LAN. Network cards supporting a minimum of 1 Gigabit network speed should be included. Provision should be made for interface and system configuration at all control rooms
- An Ethernet TCP/IP connection should be provided to enable system back-ups, system configuration, process data, alarm and event data to the Station LAN. This will allow users to view or download data from the Production folder database for the Employers use. This connection provides full security and integrity of data in the SMS database, such as security against external influences, viruses and other sources of code corruption

#### 3.5.3.3 External Interfaces

- The FDS shall be interfaced to the following systems:
  - a) Fire Protection System (FPS)
  - b) Heat, Ventilation and Air Conditioning (HVAC) System

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### **3.5.4 FPS Interface**

A list of fire protection areas that need to be interfaced to the FDS is presented in Table 3 FDS/FPS interface covers existing and new fire protection systems

Minimum requirements for fire protection interface

- New flow and pressure switches shall be used to interface fire suppression systems to the fire detection system
- Pressure switches and flow switches shall be located on every fixed fire protection system to allow for alarming in the control room when the fixed fire protection systems are actuated, in accordance with Eskom Fire Protection and Life Safety Design Standard
- Pressure switches shall be used for interfacing the deluge system to the fire detection system
- Flow switches shall be used for interfacing sprinkler systems to the fire detection system
- In addition to pressure and flow switches, level transducers and alarm devices should be provided to monitor the water levels within any storage tank and this level must be indicated in the control room

**Table 2: Fire Protection Areas**

<b>Existing Fire Protection Areas</b>	<b>Current Upgrade Fire Protection Areas</b>
Potable extinguishers	Chemical building
Inergen Gas Suppression System Main Building	Battery rooms
Inergen Gas Suppression System Main Building	Cable Tunnels

### **3.5.5 HVAC Interface**

The current hard-wired interface between FDS and HVAC will remain as is and be re-commissioned  
The current HVAC Operating and Control Philosophy will be retained

Provision shall be made on the FDS for a bus interface to HVAC for the purpose of information sharing

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### **3.5.6 Lift Controller Interface**

The FDS in the lift motor room shall be interfaced to the lift controller in accordance with NFPA 72 for recalling the lift in case of a fire event. The FDS shall send a signal to the lift controller in the event of a fire in the lift motor room and the function of recalling the lift shall be carried out by the lift controller.

FDS/Lift Controller interfaces shall adhere to Section 8.1 of Eskom Fire Detection and Life Safety Design Standard. The FDS in the lift motor room shall be interfaced to the lift controller using a hardwired I/O. The lift controller shall receive a hardwired signal from the FDS panel in case of a fire event, and an action of recalling the lift must follow the principle of zoning such that if a fire is detected in a certain zone, only the lift in the affected zone is recalled.

Cabling infrastructure shall be provided between the FDS and the Lift Controller and the signals commissioned between the two systems.

### **3.5.7 Power Supply Requirements**

All fire alarm panels shall be powered with a 220V AC power and have a back-up power supply of 24V DC. Back-up power supply shall be batteries local to each panel. The power supply shall comply with SANS 50054-4.

Existing fire alarm panels power supplies shall be maintained as far as possible, dependent on load requirements.

#### **3.5.7.1 Main Power Supply**

The power supply shall comply with SANS 50054-4.

- A mains supply through a dedicated circuit breaker shall be provided. This may be obtained from a distribution board.
- Moulded case circuit breakers should comply with IEC 60947-2.
- All load circuit breakers should be provided with auxiliary contacts for alarm purposes indicating position of the breakers.
- Circuit breakers shall be mounted inside the cubicle. Operation of the circuit breaker should be able to isolate all phases.
- Only circuit breakers with the required IEC stated DC rating shall be used on DC circuits.
- The circuit breaker must be labelled "Fire System – Do not switch off".
- The circuit breaker shall not be used for any other service but only for the fire detection system.
- Fire alarm panels must not be connected to a power socket outlet.
- Labelling on the circuit breaker shall be in accordance with SANS 50054-4.

#### **3.5.7.2 Standby Power Supply**

- The standby power supply/ uninterruptible power supply (UPS) must consist of a rechargeable battery with an automatic charger with a life span of at least four years.

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- The uninterruptible power supplies shall be fully compliant to IEC 60146-1 Semiconductor convertors,
- General requirements and line commutated converters and SANS 1652 Battery Chargers - Industrial Type and IEC 62040 - Uninterruptible power systems (UPS)
- The battery capacity should be sufficient to keep the system in operation for 24 hours plus an "Evacuate" signal for 30 minutes for manual and life safety systems
- The UPS performance classification shall be VFI-SS-111 as specified in IEC 62040-3 "Uninterruptible power systems (UPS) Part 3 Method of specifying the performance and test requirements" at  $\pm 25\%$  input voltage
- The UPS shall be fully compliant with the Eskom Standard for Thyristor and Switch Mode Chargers, AC/DC to DC/AC Converters and Uninterruptible Power Supplies (240-53114248)

### **3.5.8 System Function and Performance Requirements**

#### **3.5.8.1 FDS Operating Concept**

- The required operating philosophy of the new fire detection system should be as follows
- In the event of fire, the smoke or fire detectors must be able to detect gas, smoke or fire and activate an alarm
- The alarm generated in the fire detection system must be displayed on the fire alarm panels and on the new fire detection HMI that will be located at EOD
- Once an alarm is detected, it must remain visible on the fire detection HMI until the fault has been fixed
- When there is an alarm on the fire detection system an audio alarm signal must be triggered on the fire alarm panel
- Once an audio alarm is triggered, it must remain 'on' until the alarm is acknowledged or cleared
- The fire alarm panel must display the alarms on the LCDs and LEDs until the fault or fire condition is cleared on the panel The following events must be included under the alarm category
  - Fire alarm condition
  - Device/ system fault warning condition
  - Device/ system disablement condition
  - Test condition
  - Manual break glass unit (MCP) activation
  - Activation of mechanical fire protection

#### **3.5.8.2 FDS and HVAC Interface Operating Concept**

The FDS is only responsible for sending a fire alarm signal to HVAC system, and the HVAC system is responsible for the subsequent action of shutting down fire dampers of the affected zone

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### **3.5.8.3 Operational Technology Strategy**

The FDS technology must be capable of integrating to third party systems using the available protocols. The technology should also allow for expansion and upgrade of the FDS using technologies from multiple vendors.

The system must be flexible to allow for the following:

- RS232, RS485, BacNet, LonWorks
- Ethernet Communication
- Fibre Optic Communication
- Printer Connection
- System Configuration Management/ Programming
- Managing Graphic Maps
- Communication technology must be based on a wired medium. Wireless technologies may be considered in remote areas (i.e. transfer house, terrace bins, etc.)
- The selected technology should be capable of integrating the FDS to the other systems (FPS, HVAC, BMS, CCTV, etc.)
- FDS communication protocols shall conform to the industry best practice. Standardization for network protocol is required for both systems. Provision should be made for future interfaces.

### **3.5.8.4 Documentation**

The following documentation shall be submitted to Eskom prior to commissioning of the system in accordance with Eskom Fire Detection and Life Safety Design Standard:

- Detailed as-built drawings,
- A comprehensive Operation and Maintenance Manual for the entire system,
- Certificates for Design, Installation and Commissioning according to SANS 10139,
- Documentation stating any deviations from SANS 10139 and indication of alternative standards used
- Insurance, guarantee and warranty certificates,
- All programming data, including how the programming was carried out, who was responsible, double knock rules, conditional programming, inputs/outputs, special cause and effect situations, etc.,
- Fire detection philosophy, including detection zones, double-knock rules, etc.
- Alarm philosophy, including alarm management and responses, alarm zones, additional alarms, fire department notification, etc.
- Detailed specifications of all materials and equipment used,
- Electrical Certificate of Completion (COC),
- Log Book, according to SANS 10139,
- Record of agreed variations from the original design specification,

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- Framed zone diagrams adjacent to each control panel,
- Network Architecture Drawings,
- Reliability, Availability and Maintainability (RAM) Study,
- Limits of Supply and Services (LOSS),
- Inspection Test Plan, Factory Acceptance Test, Site Integration Test,
- Commissioning Strategy,
- Virtual Signals List,
- Panel Interface List,
- Instrument List,
- Electrical Consumer List ,
- Electrical Wiring Diagram (Single Lines),
- Mechanical Mounting or Connection Diagrams,
- Cubicle Internal Layouts and Details (Size, Weight, Cable Entry, Heat Load etc ),
- Fire Risk Assessment,
- Cause and Effect Analysis,
- Alarm List and Response Procedure,
- Alarm Rationalisation Philosophy,
- Recommended Spares Holding,
- Earthing, Lightning Protection and Electromagnetic Compliance Details,
- UPS/Battery Back Up Details,
- Cable Schedule,
- Cable Routing Design,
- Document Management Procedure
- Detailed Design with all Engineering Calculations,
- Software List,
- Software Licensing and Certificates

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**Note:** Drawings/designs should be conducted on Micro Station V8 program and should be in accordance with Engineering Drawing Office and Engineering Eskom's Documentation Standard (36-943) Document Quality Management should be in line with the requirements of ISO 9001 2008 and will be managed according to QM58 supplier Contract Quality requirements Designs must be feasible, cost effective, safe, quality and environmental friendly for execution

Eskom shall provide storage for equipment that is removed from the plant In case where there is no enough storage on site, alternative measures shall be considered

#### **4. Acceptance**

This document has been seen and accepted by

<b>Name</b>	<b>Designation</b>
L Ngcobo	Fire Detection System Engineer
M Molefe	C&I Engineering Manager
M Mabizela	Engineering Manager
S Jele	Fire Protection Engineer

#### **5. Development Team**

The following people were involved in the development of this document

- Langa Ngcobo – C&I Engineer (Fire Detection)
- Sazi Jele – Aux Engineer (fire protection)

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