

DOCUMENT NO. : KP1/6C/4/1/TSP/09/0093



Kenya Power

**FIRE TRACE, DETECTION AND SUPPRESSION SYSTEM -SPECIFICATION**

A Document of the Kenya Power & Lighting Co. Ltd

January 2017



TITLE:  
**FIRE TRACE, DETECTION AND SUPPRESSION SYSTEM - SPECIFICATION**

Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 2 of 18	

**Contents**

FIRE TRACE, DETECTION AND SUPPRESSION SYSTEM -SPECIFICATION .....1

0.1 Circulation List ..... 3

0.2 Amendment Record ..... 4

FOREWORD ..... 5

1.0 SCOPE ..... 6

2.0 NORMATIVE REFERENCES ..... 6

3.0 TERMS AND DEFINITIONS ..... 7

    3.1 ABBREVIATIONS ..... 7

    CSIRO: Commonwealth Scientific and Industrial Research Organization ..... 7

4.0 REQUIREMENTS ..... 7

    4.1 Service Conditions ..... 7

    4.2 General Requirements ..... 8

        4.2.1 Fire Trace, Detection and Suppression System ..... 8

        4.2.2 Installation ..... 9

        4.2.3 Installation Requirements ..... 9

        4.2.4 Monitoring ..... 10

        4.2.5 Fire Systems Monitoring Parameters ..... 10

        4.2.6 Clean Agent ..... 11

5.0 TESTS, INSPECTION AND TRAINING ..... 12

6.0 MARKING, LABELLING AND PACKING ..... 13

    A. QUALITY MANAGEMENT SYSTEM ..... 14

    B. DOCUMENTATION ..... 14

    C: GUARANTEED TECHNICAL PARTICULARS ..... 16

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TITLE:  
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SUPPRESSION SYSTEM -  
SPECIFICATION**

Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 3 of 18	

**0.1 Circulation List**

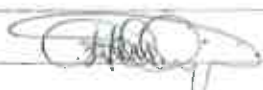
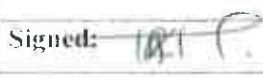
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1	Manager, Standards
Electronic copy (pdf) on KPLC server currently: <a href="http://172.16.1.40/dms/browse.php?fFolderId=23">http://172.16.1.40/dms/browse.php?fFolderId=23</a>	

**REVISION OF KPLC STANDARDS**

In order to keep abreast of progress in the industry, KPLC standards shall be regularly reviewed. Suggestions for improvements to approved standards, addressed to the Manager, Standards department, are welcome.

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Users are reminded that by virtue of section 25 of the Copyright Act, 2001 (Revised 2009) Cap 130 of the Laws of Kenya copyright subsists in all KPLC standards and except as provided under section 26 of this act, no KPLC standard produced by KPLC may be reproduced, stored in retrieval system by any means without prior permission from the Managing Director & CEO, KPLC.

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SUPPRESSION SYSTEM -  
SPECIFICATION**

Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 4 of 18	

**0.2 Amendment Record**

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
Issue	2017-01-25	New Issue	S. Nguli	Dr. Eng. Peter Kimemia

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Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 5 of 18	

**FOREWORD**

This specification has been prepared by the Standards Department of The Kenya Power and Lighting Company Limited (Kenya Power) and it lays down requirements for Comprehensive Fire Suppression system using clean agent. It is intended for use by Kenya Power in purchasing the equipment.

This specification lays out the guidelines for the design, supply, supervised installation, factory testing of major components, certified training, and commissioning of Fire Detection and Suppression system (comprehensive fire system) in Kenya Power substations and other installation.

Bidders shall be required to submit evidence with relevant references of design, supply, installation, testing, training, and commissioning of similar comprehensive fire systems, with an experience span of not less than FIVE years.

This procurement includes the design of the Fire Detection and Suppression system (comprehensive fire system) as per the requirements and standards specified in this document. Therefore ALL bidders shall attend compulsory PRE-BID inspection and assessment, of ALL stations considered, to collect ALL data required in the bidding and design process.

Bidders shall also note that Kenya Power shall conduct compulsory inspection of all major components and accessories at the manufacturer's factory, thereafter post-delivery to selected sites, installation, testing, and commissioning. This testing shall include – but not be limited to, verification of controls, logic, drives, releases, failover functions, monitoring and signaling functions, and so on.

The Comprehensive Fire Systems shall be designed and implemented in the substations and other installations specified in the tender

**Note:** Station layouts shall be provided, but additional details of the switchyard and substation house layouts may be obtained during the compulsory pre-bid site inspection and assessment exercise, by the bidder.

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Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 6 of 18	

### 1.0 SCOPE

1.1 This specification outlines the requirements for a local application clean agent fire suppression system. The work described in this specification includes all engineering, labour, materials, equipment and service necessary, and required, to complete and test the suppression system.

1.2 The scope covers the fire detection and protection and requirements for substation indoor and outdoor switchgear, marshaling kiosks, power transformers, control panels room, cable pits, battery rooms, auxiliary transformer room, generator room, and any other indoor attachment considered a high level fire risk, based on requirements, and standards provided for in this specification.

### 2.0 NORMATIVE REFERENCES

The following standards contain provisions which, through reference in this text constitute provisions of this specification. Unless otherwise stated, the latest editions (including amendments) apply. Other standards referred to in the clauses of this specification which are not part of the reference list constitute the specifications:

1. National Fire Protection Association (NFPA) Standards:
  - i. NFPA 2001 Clean Agent Fire Extinguishing Systems
  - ii. NFPA 70 National Electric Code
  - iii. NFPA 72 National Fire Alarm Code
  - iv. NFPA 75 Electronic Computer Systems
  - v. NFPA 76 Fire Protection for Telecommunications Systems
2. ISO 9001:2008 & ISO 2001: 2015 Quality Management Systems
3. U.S. Environmental Protection Agency, Protection of Stratospheric Ozone 59 FR 13044 (SNAP)
4. ASIB 11<sup>th</sup> edition regulations for fire protection to transformers.
5. BS 5306-0 Fire extinguishing installations and equipment on premises guide for the selection of installed systems and other fire equipment.
6. BS 5306-2 Fire extinguishing installations and equipment on premises specification for sprinkler systems.
7. BS 5306-6 Section 6.1 Fire extinguishing installations and equipment on premises foam systems specification for low expansion foam systems.
8. BS 5306-6 Section 6.2 Fire extinguishing installations and equipment on premises foam systems specification for medium and high expansion foam systems.
9. BS 5306-1 Code of practice for fire extinguishing installations and equipment on premises Part 1: Hose reels and foam inlets

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Date: 2017-1-25	Date: 2017-1-25





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SUPPRESSION SYSTEM -  
SPECIFICATION**

Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 7 of 18	

The standards listed, as well as all other applicable codes, standards, and good engineering practices, shall be used as "minimum" design standards.

### 3.0 TERMS AND DEFINITIONS

For the purpose of this specification the definitions and abbreviations given in the reference standards shall apply and the following abbreviations:

#### 3.1 ABBREVIATIONS

CSIRO: Commonwealth Scientific and Industrial Research Organization

UL: Underwriters Laboratories

DOT specification: Pressure Limits in cylinders

NICET: National Institute for Certification in Engineering Technologies

Clean Agent: Inert gases and chemical agents to extinguish a fire.

Pre-engineered: Pre-tested to effectively extinguish specific types of fires in special hazard situations.

The other terms and definitions given in the reference standards shall apply.

### 4.0 REQUIREMENTS

#### 4.1 Service Conditions

The comprehensive suppression system shall be suitable for continuous indoor and outdoor operation in tropical areas with the following conditions.

- a) Altitude: up to 2,200m above sea level;
- b) Temperature: average of +30°C with a minimum of -1°C and max +40 °C;
- c) Humidity: up to 95%;
- d) Pollution: Design pollution level to be taken as "Heavy" (Pollution level III) for inland and "Very Heavy" (Pollution level IV) for coastal applications in accordance with IEC 60815.
- e) Isokeraunic level: 180 thunderstorm days per year

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Date: 2017-1-25	Date: 2017-1-25



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Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 8 of 18	

## 4.2 General Requirements

### 4.2.1 Fire Trace, Detection and Suppression System

- 4.2.1.1 The Suppression system installation shall be made in accordance with the drawings, specifications, and applicable standards. Should a conflict occur between the drawings and specifications, the specifications shall prevail.
- 4.2.1.2 The Suppression System shall be CSIRO approved.
- 4.2.1.3 The Suppression System shall be of the pre-engineered variety.
- 4.2.1.4 Suppression system shall extinguish the fire hazard by directly applying the fire suppression media to the hazard area at the point of ignition and detection.
- 4.2.1.5 Suppression System shall utilize a clean agent.
- 4.2.1.6 The system shall provide an agent fluid minimum design concentration of 4.2% by volume for Class A, 4.7% for Class C hazards, and a minimum of 5.85% (Heptane) by volume for Class B hazards (for additional Class B fuel hazards refer to NFPA 2001).
- 4.2.1.7 Suppression System shall operate through out a -1° C to +40°C temperature range
- 4.2.1.8 Fire trace suppression system shall be passively activated by a fire trace detection tube - UL listed heat sensitive, pressurized, thermoplastic heat detector shall provide the sole means of agent application to the ignition source within the hazard area.
- 4.2.1.9 A heat sensitive, pressurized, thermoplastic heat detector shall be routed through the protected enclosure such that any components which pose a combustible hazard are within 6 inches of the heat detector.
- 4.2.1.10 Automatic operation of each protected area shall be initiated by a heat sensitive, pressurized, thermoplastic heat detector
- 4.2.1.11 Suppression System shall automatically detect any ignition within the protected enclosure.
- 4.2.1.12 Suppression system shall be actuated by a heat sensitive, pressurized thermoplastic heat detector.
- 4.2.1.13 Detection, activation, and agent distribution networks shall be contained within the same component, or shall be considered one in the same.
- 4.2.1.14 All Suppression System shall be equipped with:
  - i. DOT specification cylinders
  - ii. Pressure relief device
  - iii. UL listed heat detection system
  - iv. A ¼ turn arm/disarm valve used for service and activation purposes

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Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 9 of 18	

4.2.1.15 The system shall be complete including mechanical and electrical installation, all detection and control equipment, agent storage containers, agent, discharge nozzles, plumbing and fittings, functional checkout and testing, training and any other operations necessary for operation of a passive automatic detecting clean agent fire suppression system.

#### 4.2.2 Installation

4.2.2.1 The installing contractor shall be trained by the supplier to design, install, test, and maintain fire suppression systems.

4.2.2.2 When possible, the installing contractor shall employ a NICET certified special hazard designer, Level II or above or a professional engineer, who will be responsible for this project.

4.2.2.3 The installing contractor must have a minimum of five (5) years' experience in the design, installation, and testing of clean agent, or similar fire suppression systems. A list of systems of a similar nature and scope shall be provided on request.

4.2.2.4 The installing contractor shall maintain, or have access to, a clean agent recharging station. The installing contractor shall provide proof of his ability to recharge the largest clean agent system within 24 hours after a discharge. Include the amount of bulk agent storage available.

4.2.2.5 The installing contractor shall be an authorized stocking distributor of the clean agent system equipment so that immediate replacement parts are available from inventory.

4.2.2.6 The installing contractor shall show proof of emergency service available on a twenty-four-hour-seven day-a-week basis.

#### 4.2.3 Installation Requirements

4.2.3.1 The installing contractor shall submit the following design information and drawings for approval prior to starting work on this project:

- (i) Field installation layout drawings having a scale of 1:100
- (ii) The location of all agent storage tanks, nozzles, pipe runs,
- (iii) Pipe sizes and lengths,
- (iv) Control panel(s), detectors, manual pull stations,
- (v) Abort stations, audible and visual alarms, etc.

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Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 10 of 18	

- 4.2.3.2 Auxiliary details and information such as maintenance panels, door holders, special sealing requirements, and equipment shutdown.
- 4.2.3.3 Separate layouts, or drawings, shall be provided for each level, i.e. room, sub floor, and for mechanical and electrical work.
- 4.2.3.4 Electrical layout drawings shall show the location of all devices and include point-to-point conduit runs and a description of the method(s) used for detector mounting.
- 4.2.3.5 Provide an internal control panel wiring diagram which shall include power supply requirements and field wiring termination points. Separate drawing providing symbol legend and identifying all symbols used.
- 4.2.3.6 Annunciation wiring schematics and dimensioned display panel shall be provided.
- 4.2.3.7 A complete sequence of operation shall be submitted detailing all alarm devices, shut down functions, remote signalling, damper operation, time delay, and agent discharge for each zone or system
- 4.2.3.8 Submit drawings, calculations, and system components sheets for approval to the local fire prevention agency, owners' insurance underwriter, and all other authorities having jurisdiction before starting installation
- 4.2.3.9 Submit approval plans to end user for recordkeeping purposes.
- 4.2.3.10 Signs shall be provided to comply with NFPA 2001 and the recommendations of the fire trace International equipment provider.
- 4.2.3.11 Entrance sign shall be required at each entrance to a protected space.
- 4.2.3.12 Manual discharge sign shall be required at each manual release station.
- 4.2.3.13 Flashing light sign shall be required at each flashing light over each exit from a protected space.

**4.2.4 Monitoring**

Fire detection systems at substations shall be linked back to the control center on the electrical SCADA system.

**4.2.5 Fire Systems Monitoring Parameters**

**4.2.5.1 General**

Fire suppression and detection systems require ongoing inspection, testing and maintenance to ensure their continued functionality. Technical Maintenance Plans including tasks for inspection, testing and maintenance of fire systems incorporated into substations shall be developed in accordance with the Manufacturers Maintenance Requirements and based on requirements, and standards provided for in this specification. All scheduling monitored on the common control panel mimic on the main control module panel and the SCADA system.

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Date: 2017-1-25	Date: 2017-1-25



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Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 11 of 18	

#### 4.2.5.2 Indications

Indication devices shall be provided which indicate the activation or deactivation of any of the comprehensive fire systems, in form of siren, beacon, and any other appropriate modes, plus the scheduled maintenance, inspection and testing requirements.

#### 4.2.5.3 Control, Detection and Monitoring Equipment

Each control panel shall be equipped with control units, whose status shall be monitored either independently or collectively from the SCADA system as well as from the main control module panel mimic.

The mentioned mimic diagram, all instruments, switches, push buttons, alarms, etc. shall be mounted on the front of this panel.

#### 4.2.5.4 Control Panel

The control panel(s) pertaining to each comprehensive fire system shall be integrated with and be of the same quality in respect of wiring and manufacturing as indicated in the relevant sections of the Control and Protection System.

#### 4.2.5.5 Control and Indication

Care shall be exercised in the design and fitting of these indicators to ensure that the indicating device and associated apparatus does not interfere with the correct operation of the comprehensive fire systems.

Each comprehensive fire systems shall be provided with the necessary auxiliary contacts and internal wiring to facilitate indication, which may take the form of two indicating lamps and a discrepancy control switch.

#### 4.2.6 Clean Agent

4.2.6.1 The clean agent shall be electrically nonconductive, non-corrosive, no damage to electronics and delicate mechanical devices, volatile, or gaseous fire extinguishant that does not leave a residue upon evaporation.

4.2.6.2 This shall be used to protect critical assets such as IT systems, data storage rooms and electrical equipment, or irreplaceable items like customer/client records, and intellectual property.

4.2.6.3 The preferred clean agents shall of Approved Protection Systems. These shall be either Novec 1230, FM-200 or Argonite.

**This requirement shall be specified in the tender**

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Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 12 of 18	

- 4.2.6.4 The Clean Agent systems shall reach extinguishing levels in 10seconds or less and shall provide a wide margin of human safety – they shall be safe to use where people are present.
- 4.2.6.5 The Clean Agents shall be non-ozone depleting and have a short atmospheric lifetime.

### 5.0 TESTS, INSPECTION AND TRAINING

5.1 The equipment shall be inspected and tested at the factory in accordance with NFPA 2001 Clean Agent Fire Extinguishing Systems and other relevant standard(s) and upon delivery to Kenya Power Stores (where applicable) and during commissioning in the respective substations.

**Note:** Any component or the entire system, not considered to be of the required standard shall be rejected at any stage of the procurement, and shall be replaced by the supplier at no cost to KPLC.

### 5.2 Works Testing and Training

After design approval and manufacture of the comprehensive fire systems, the main components shall be sample assembled in the factory, then factory tested together with training of the Kenya Power engineers.

In the event of award of each substation to different bidders, the same instructions of Works Testing, Inspection and Training shall apply, either independently or collectively.

### 5.3 FAT, Routine tests, and training

The following are the minimum requirements for routine tests and training that shall be carried out by the contractor on the comprehensive fire system.

- a. The tests shall establish – but not be limited to - the configuration, zoning, controls, releases, interlocking functions, activation, monitoring function, data relay, and so on, of the fire system.
- b. The training shall provide – but not be limited to - the full certification of attendants on Installations, Configuration, Commissioning, Maintenance, Functions, Operations, Recommended handling, and other sectors, of the fire system.

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SUPPRESSION SYSTEM -  
SPECIFICATION**

Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 13 of 18	

These tests and training shall be done in accordance with standards provided for in this specification and other approved standards for the operation of comprehensive fire system.

#### 5.4 Test Certificates

Certified copies of type test certificates – for each classification of comprehensive fire system, in English shall be submitted together with the bid / submission. Note that test certificates from a certified independent test facility are required.

Copies of routine and inspections test certificates in English – witnessed by the appointed Kenya Power representative shall be submitted – for each comprehensive fire system, on completion of the work testing.

#### 6.0 MARKING, LABELLING AND PACKING

- 6.1 The comprehensive fire suppression system associated components shall be packed in a manner as to protect them from any damage in transportation, handling and storage.
- 6.2 The comprehensive fire suppression system shall be dispatched fully assembled, oil filled and complete with surge arrester mounting brackets fitted.
- 6.3 Each assembly and package of items associated with the comprehensive fire suppression system shall be suitably marked with the following:
  - (i) Property of KPLC
  - (ii) Substation Name and Ref No
  - (iii) Year/Month of Manufacture
  - (iv) Manufacture identity
  - (v) Serial No.

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Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25

Page 14 of 18

## Appendices

### A. QUALITY MANAGEMENT SYSTEM

- A1 The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the comprehensive fire suppression system design, material, workmanship, tests, service capability, maintenance and documentation, will fulfill the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2008 or ISO 9001:2015.
- A2 The Manufacturer's Declaration of Conformity to reference standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2008 or ISO 9001:2015 certificate shall be submitted with the tender for evaluation.
- A3 The bidder shall indicate the delivery time of the comprehensive fire suppression system, manufacturer's monthly & annual production capacity and experience in the production of the system being offered. A detailed list & contact addresses (including e-mail) of the manufacturer's previous customers outside the country of manufacture for exact or similar units sold in the last five years together with four customer reference letters shall be submitted with the tender for evaluation.

### B. DOCUMENTATION

- B1 The bidder shall submit its tender complete with technical documents required by Appendix C (Guaranteed Technical Particulars) for tender evaluation. The documents to be submitted (all in English language) for tender evaluation shall include the following:
- Guaranteed Technical Particulars fully filled and signed by the manufacturer;
  - Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
  - Sales records for previous five years and reference letters from at least four of the customers;
  - Details of manufacturing capacity and the manufacturer's experience;
  - Copies of required type test certificates and type test reports by a third party testing laboratory accredited to ISO/IEC 17025;
  - Copy of accreditation certificate to ISO/IEC 17025 for the testing laboratory;
  - Manufacturer's warranty and guarantee, subject to 24 months from date of delivery to KPLC stores or 18 months from the date of commissioning, whichever period expires earlier.
  - Manufacturer's letter of authorization, copy of the manufacturer's ISO 9001:2008 or ISO 9001:2015 certificate and other technical documents required in the tender.

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Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 15 of 18	

- B2 The successful bidder (supplier) shall submit the following documents/details (from the manufacturer as per tender) to The Kenya Power & Lighting Company for approval before manufacture:
- a) Guaranteed Technical Particulars fully filled and signed by the manufacturer;
  - b) Quality assurance plan (QAP) that will be used to ensure that the design, material, workmanship, tests, service capability, maintenance and documentation will fulfill the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2008 or ISO 9001:2015;
  - c) Test Program to be used after manufacture;
  - d) Marking details and method to be used in marking the systems
  - e) Manufacturer's undertaking to ensure adequacy of the design, adherence to applicable standards/specification, good workmanship and good engineering practice in the manufacture of the transformers for The Kenya Power and Lighting Company Limited;
  - f) Packaging details (including packaging materials and marking and identification of component packages).

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Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 16 of 18	

**C: GUARANTEED TECHNICAL PARTICULARS**

**FOR OFFERED COMPREHENSIVE FIRE SUPPRESSION SYSTEMS**

*(to be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records for past five years, four customer reference letters, details of manufacturing capacity, the manufacturer's experience, copies of complete type test reports and accreditation certificate to ISO/IEC 17025 for the third party testing laboratory for tender evaluation, all in English Language)*

**TENDER NO. ....BIDDER'S NAME & ADDRESS .....**

Clause Number	Description	BIDDER'S OFFER
	Name and address of the Manufacturer	
	Country of manufacture	
	Manufacturer's Letter of Authorization	
	Model/Type Reference No. of the offered Comprehensive Fire Suppression System	
	Drawing Reference Number	
	Manufacturer's warranty and guarantee certificate for the offered Comprehensive Fire Suppression System	
2	Applicable Standards	
3	Terms and Definitions	
4.1.1	Operating Service Conditions: <i>indicate altitude, temperature range, humidity, pollution and isokeraamic level)</i>	
<b>4.2</b>	<b>General Requirements</b>	
4.2.1.1	Design drawings to be done as per specifications	
4.2.1.2	Approval by CSIRO ( provide evidence)	
4.2.1.3 - 4	Mode of operation	
4.2.1.5	Specify the quenching clean agent to be used	
4.2.1.6	State the designation, class and standard of manufacture of the clean agent	
4.2.1.7	Specify the temperature operating range	
4.2.1.8	Specify mode of detection and actuation of the system	
4.2.1.9 - 13	Specify mode of operation	
4.2.1.14	State elements of the suppression system	

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Kenya Power

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1

Revision No.

0

Date of Issue

2017-01-25

Page 17 of 18

Clause Number	Description	BIDDER'S OFFER
4.2.1.15	Completion of design	
	<b>Installation</b>	
4.2.2.1	Contractors certification and experience(if different from bidder) Contractors' company profile(Attach copy)	
4.2.2.2	Designer	
4.2.2.3	Contractor experience	
4.2.2.4	Availability of clean agent station	
4.2.2.5	Authority of stock distributorship	
4.2.2.6	Proof of 24hr after sales service availability	
	<b>Installation Requirements</b>	
4.2.3.1	Design information and drawings to be provided for approval before installation	
4.2.3.2	Auxiliary details to be provided	
4.2.3.4- 4.2.3.6	Electrical and annunciation schematics (point to point) drawings provided	
4.2.3.7	Specify the operation sequence	
4.2.3.9	As build in drawings submitted for safe housekeeping	
4.2.3.10	Specify signs to installed and locations	
4.2.3.11	Entrance sign	
4.2.3.12	Manual discharge	
4.2.3.13	Flashing light sign	
4.2.4	Specify monitoring and SCADA synchronization	
4.2.5	Fire Systems Monitoring Parameters	
4.2.5.1	Specify maintenance schedules and procedures	
4.2.5.2	Specify indications provided	
4.2.5.3	State control units provide and panel mimics	
4.2.5.4	Specify control panel(s) pertaining to each comprehensive fire system and integration	
4.2.5.5	Specify interference levels of the control indicators	
4.2.6	State the clean agent to be used	
4.2.6.1	Properties	
4.2.6.2	State its advantages	
4.2.6.3	Preferred clean agents	
4.2.6.4	Extinguishing levels	

Issued by: Head of Section, Standards Development

Signed:

Date: 2017-1-25

Authorized by: Head of Department, Standards

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Date: 2017-1-25




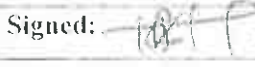
Kenya Power

**TITLE:**  
**FIRE TRACE, DETECTION AND SUPPRESSION SYSTEM - SPECIFICATION**

Doc. No.	KP1/6C.1/13/ TSP/09/093
Issue No.	1
Revision No.	0
Date of Issue	2017-01-25
Page 18 of 18	

Clause Number	Description	BIDDER'S OFFER
4.2.6.5	Non-ozone depleting, short atmospheric lifetime	
5.	<b>TESTS, INSPECTION AND TRAINING</b>	
5.1	Test Standard and responsibility of testing & manufacturer's capability to carry out specified tests	
5.2	Testing and Training for Kenya Power Engineers	
5.3	FAT, List routine tests and trainings to be carried out	
5.4	List Certified Copies of type tests submitted with tender for evaluation	
	Contact details for testing authority	
	Complete test reports for approval before shipment	
	Inspection or test by KPLC during delivery before acceptance to stores	
6.	<b>Marking, Labeling &amp; Packing</b>	
6.1	Packing	
6.2	Assemble & package of items suitably marked	
6.4	Permanent Rating & Diagram plate indelibly marked	
6.5	Content of marking	
A	<b>Quality Management System</b>	
A1	Quality Assurance Plan to be based on ISO 9001:2008 or 2015	
A2	Declaration of conformity to NFPA 2001	
	Copy of ISO 9001:2008 or 2015 certificate submitted	
A3	Monthly & annual production capacity	
	List of previous customers	
	Reference letters from at least four previous customers	
B1	Tender submitted with all technical documents	
B2	Successful bidder to submit documents/details for approval before manufacture	
	Deviations from tender specifications (indicate supporting documents submitted)	

.....  
**Manufacturer's Name, Signature, Stamp and Date**

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Signed: 	Signed: 
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