

TRANSNET PROJECTS

STANDARD SPECIFICATIONS FOR

AUTOMATIC FIRE ALARM AND SMOKE DETECTION

SYSTEM

REVISIONS		
REV	DATE	APPROVED



STANDARD TECHNICAL SPECIFICATION FOR AN AUTOMATIC FIRE ALARM AND SMOKE DETECTION INSTALLATION

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STANDARD TECHNICAL SPECIFICATION
FOR AN
AUTOMATIC FIRE ALARM INSTALLATION

1 INTRODUCTION

This Standard Technical Specification forms part of, and shall be read with, the Conditions of Contract, Supplementary Specification, schedules, drawings and other parts that form part of the tender / contract documents.

1.1 SCOPE

1.1.1 This Standard Technical Specification covers the general technical requirements for automatic fire/smoke detection systems and installations. The following aspects are covered:

- System requirements
- Equipment requirements
- Installation methods and materials
- Commissioning and handing over
- Documentation and drawings

1.1.2 The Supplementary Specification, drawings and schedules will take precedence over this Standard Technical Specification.

1.1.3 The Supplementary Specification, drawings and schedules shall be referred to for the specific requirements for the system.

1.2 DEFINITIONS

See also the definitions in EN 54-1, BS 5 839- 1 and SANS 10139.

Analogue Addressable System

In an analogue addressable system the control equipment receives analogue signals from the sensing devices in the system and knows with which sensing device it is communicating by reading the address of each sensing device.

Analogue

The term analogue refers to an electronic signal, which can represent a large number (e.g.256) of values. This signal can be in the form of a current level, pulses, frequency or any combination of these.

Addressable Device

A device is addressable if the control equipment can communicate with the device, or select such device by sending an address to it.

Approved

Approved shall mean accepted by Transnet Projects for a specific installation. Transnet Projects does not keep a list of approved equipment, and equipment accepted for a specific installation does not necessarily imply approval or acceptance for another installation.

Access Levels

The levels of access applicable to the control panel. (These definitions modify those of BS 58384 in that level 4 is added and level 1 allows the silence function).

- | | |
|------------------------------|---|
| Level 1: No password or key: | Access by members of the general public. In addition silence & function shall be accessible or operational. |
| Level 2: Password or key | Access by the person responsible for the system and trained on the system, and for system maintenance. |
| Level 3: Password or key | Access by persons trained to reconfigure the system. |
| Level 4: Password or key | (a) Access by persons authorised by the system owner to allocate passwords to levels 2 and 3. |

- (b) Access by persons trained and authorised by the manufacturer to repair, or to alter the firmware, thereby changing its basic mode of operation.

Conventional System

A system is conventional if the control equipment determines the status of the zone wiring as follows:

- Fault : low or no current
- Normal : current within limits
- Fire : high current
- Short circuit : abnormally high current

Control Equipment, Unit, or Panel

The control equipment receives information from the field devices and displays information as described in BS 5839-4 or EN 54-2.

The following references have the same meaning: Control equipment:

- Control unit
- Control panel
- Fire panel
- Fire alarm panel

Detector

That part of an automatic fire detection system which constantly, or at frequent intervals, monitors suitable phenomena, such as smoke, fire, heat, etc.

Detectors are also field devices.

1.3 STANDARDS AND REGULATIONS

The following is list of the applicable standards. In all cases the most recent amendments, of the standards, shall apply.

1.3.1 The completed system and its components shall be in accordance with the following

regulations :

- The wiring of code (SANS 10142-1)
- Occupational Health and Safety Act (Act 85, 1993)
- Local municipal by-laws and regulations
- Local fire regulations
- Regulations of Telkom
- Regulations of the local electrical and gas supply authorities

National Building Regulations Act No 103 of 1977 (SANS 0400)

1.3.2 The design of an automatic fire detection system, the equipment supplied for the system, and the installation of such equipment shall be in accordance with the Standards listed below. The equipment and components shall be deemed to have been tested and approved by a reputable and recognised international test laboratory to prove compliance with at least one or more of these Standards. Copies of test certificates shall be provided by tenderers with their tenders:

EN 54	:	Components of automatic fire detection systems
BS 5445	:	Components of automatic fire detection systems
SANS 10139	:	Fire detection and alarm systems for buildings

1.3.3 Material for which an SABS specification exists, shall be in accordance with such a specification, and shall bear the SABS mark.

1.3.4 All equipment used shall originate from suppliers which have been certified in accordance with SABS ISO 9001 (ISO 9001) or SABS ISO 9002 (ISO 9002) for Quality assurance. Copies of certificates of approval shall be provided by the tenderers with their tenders.

1.3.5 Equipment designed to BS 5446, Fire systems for residential premises, or similar other standards, are not acceptable.



1.4 DESIGN

- 1.4.1 Any uncertainty which may exist in regard to the specification requirements shall be submitted to Transnet Projects in writing.
- 1.4.2 The requirements and design standards of the specification shall be adhered to unless otherwise approved by the Transnet Projects or the representative in writing.
- 1.4.3 Small items of equipment forming part of a system are not covered by this specification. However, Transnet Projects still requires that the total system shall comply with the highest standard of the design and fire protection practice.

1.5 MATERIALS

- 1.5.1 All materials used on the contract shall be new and of the very best of their respective types and kind.
- 1.5.2 No equipment or parts older than 2 years, at the commencement of the contract, shall be installed in this system.
- 1.5.3 All equipment and parts used in a particular system shall originate from one supplier as far as practicable.

2 SYSTEM REQUIREMENTS

2.1 REMOTE INDICATOR LIGHTS

- 2.1.1 Detectors mounted in hidden areas, or areas which may be kept locked for specific reasons, shall each be provided with a permanently marked remote indicator LED light mounted in a conspicuous position on the wall outside the area and close to the point of entry into such areas. The method and equipment used to mount the remote LED shall be acceptable to Transnet Projects.

2.2 SOFTWARE (NOT APPLICABLE)

- 2.2.1 The requirements stipulated hereunder in connection with the availability and the usage of software for computer based equipment (not fire control panels) which is to be supplied to Transnet Projects in terms of the contract shall be adhered to:
 - a. Computer based systems shall not become unserviceable due to the loss of, or damage to software.



b. It shall be possible to reinstate software after maintenance or after possible damage to the software. Full back-ups must therefore be available on site.

2.2.2 Software shall be loaded when so required, even if the time at which the software is to be loaded, does not suit the supplier of the software.

2.2.3 The Department shall also be able to reload software on systems without the assistance of the supplier or contractor.

2.2.4 The Department will only be interested in reloading of software into a system for which the software was originally written, and not in the copying of software from one system to another.

2.2.5 Back-ups of software shall be supplied to the Department for future use.

2.2.6 The Department will use the original contractor or supplier of the system to reload software, whenever possible or practicable.

2.3 SCADA SOFTWARE (NOT APPLICABLE)

Software to be used for monitoring and reporting, or SCADA (Supervisory Control and Data Acquisition) application, shall comply with the following requirements:

2.3.1 The software shall be able to run on an MS-DOS based PC computer.

2.3.3 Software packages shall be approved by Transnet Projects for the installation.

2.3.3 The software shall not be system specific, i.e. it shall be compatible with a number of control panels on the market.

2.3.4 The software shall be available from a supplier other than the manufacturer of the equipment.

2.3.5 Upgrading of the software shall be possible at a later stage without changing the system configuration.

2.4 FIRE ZONES

Devices shall be grouped into zones as follows, unless the zones are indicated on the drawings and / or Supplementary Specification:



- 2.4.1 A zone shall not have more than 20 field devices.
- 2.4.2 Each building shall have separate zones.
- 2.4.3 The roof space shall be on a separate zone or zones.
- 2.4.4 The floor area of a single zone shall not exceed 2000 **M2**
- 2.4.5 Every floor of a building larger than 300 **M2** shall be on a separate zone.
- 2.4.6 Every area enclosed by fire walls shall be on a separate zone.
- 2.4.7 In analogue addressable systems, each zone shall be enclosed by 2 line isolators.

2.5 SPARE CAPACITY

- 2.5.1 20% spare capacity shall be allowed in the design of the control panels, loops, zones, etc.
- 2.5.2 The control panel shall have facilities to accommodate a further two detector circuits, additional to the required number of zones, without having to replace or add additional cabinets (extensions) to the control panel unless specified otherwise.

3 EQUIPMENT REQUIREMENTS

3.1 QUALITY OF EQUIPMENT

Only equipment complying with the following shall be used:

- 3.1.1 The equipment required under any contract shall be of the latest manufactured equipment of its kind on the market.
- 3.1.2 The equipment shall preferably be manufactured in the RSA, and equivalent or replacement equipment shall also be available in the RSA.
- 3.1.3 Replacement units shall be available for the equipment and the complete maintenance of equipment shall be undertaken in the RSA.
- 3.1.4 Equipment shall have been installed in the RSA in a similar installation as the one specified in the Supplementary Specification and shall have operated reliably and satisfactorily for at least 1 year.



- 3.1.5 Equipment shall exist of completely enclosed units and the units shall be verinin-proof.
- 3.1.6 All items of equipment shall be fitted with nameplates containing information, such as serial numbers, model numbers, type numbers, manufactures name, etc. This information, together with the description of each and every piece of equipment, shall be listed in the Maintenance Manual.
- 3.1.7 All components and PC boards shall also be marked with type numbers and descriptions and this information shall be contained in the Maintenance Manual.
- 3.1.8 No equipment without detailed specifications and testing results will be allowed.
- 3.1.9 All components of the system offered and installed, shall be available for a period of at least 15 years from the onset of the contract. A certificate of guarantee to this effect shall be submitted by the supplier of such components.

3.2 FIRE ALARM PANELS (CONTROL PANELS)

- 3.2.1 Control panels shall conform to BS 5839 part 4 or EN 54-2. See clause 1.3.2.
- 3.2.2 A control panel shall be able to function as a stand-alone unit, together with its own power supplies, and shall not be dependent on external control equipment, such as computers, for functioning.
- 3.2.3 Provision in the form of suitable terminals, connectors, or ports, shall be made on the control panel for the connection of peripheral equipment, such as computers, printers and interface equipment, to enable the accumulation of data generated by detectors and the control panel, to be used for future reference, or for the relaying thereof to remote monitor or control equipment.
- 3.2.4 Control panels shall be constructed for minimum power usage in both battery and mains power supply modes.
- 3.2.5 The control panel shall be of the wall mounted type, and shall also be suitable for mounting flush in a console, if so required in the Supplementary Specification.
- 3.2.6 Battery charging equipment mounted in the control panel, or elsewhere, shall be mounted in such a way that 230 Volt terminals and wiring and other mains voltage

equipment are shielded against accidental contact. All shields shall be marked "230 VOLT".

- 3.2.7 No 230 Volt terminals shall be located directly next to other terminals containing wiring at other voltages.
- 3.2.8 Reset of the control panel shall only be possible at access level 2.
- 3.2.9 Terminals shall be clearly grouped and marked with a label strip for identification, so as to simplify installation and connection of wires on site by installation personnel. All outgoing and incoming terminals, and all other equipment in the control panel, shall be suitably labelled to simplify maintenance and installation, and all panel mounted equipment shall likewise be labelled. Outgoing and incoming power and field wiring shall be individually, and correspondingly, numbered at each point of termination.
- 3.2.10 The control panel shall have knockouts in the bottom plate thereof to terminate conducting for all power cabling, and knockouts in the top plate thereof to terminate conducting for signal and other electronic cabling / wiring. Holes drilled on site for this purpose will not be acceptable.
- 3.2.11 All identification labels, as well as wire terminal numbers shall be clearly shown on all wiring diagrams in the Maintenance Manual.
- 3.2.12 It shall be possible to silence the audible alarms without influencing the visual alarms or alarm transmissions to the Fire Brigade. This shall be possible at access level 1.

3.3 CONVENTIONAL FIRE ALARM PANELS (CONTROL PANELS)

- 3.3.1 Conventional Control panels shall be conform to BS 5839-4 or EN 54-2. See clause 1.3.2
- 3.3.2 The control panel shall be suitable to operate in conjunction with conventional detector heads or detector bases.
- 3.3.3 The control panel shall further have the facilities to execute the following functions:
 - a. Transmission of a general fire alarm to the Fire Brigade. Transmitting equipment shall however not be supplied with the control panels specifically specified in the Supplementary Specification.

- b. Switching off of air conditioning equipment in case of a general fire alarm.
- c. Closing of dampers over ventilation openings in case of a general fire alarm.
- d. The connection of an external repeater panel for remote indication of fire and fault alarms.
- e. A maintenance mode or one man test facility' for routine testing shall be possible where the control panel resets a fault or alarm condition a short time after the event. This will allow easy testing of the field devices. The control panel shall give a warning when it is in this mode.

3.4 **ANALOGUE ADDRESSABLE FIRE ALARM PANELS (CONTROL PANELS)**

3.4.1 Analogue Addressable Control panels shall conform to BS 5839-4 or EN 54-2. See clause 1.3.2.

3.4.2 Type of System

- a. An analogue addressable system consists of a control panel connected to analogue addressable field devices.

The control panel continuously monitors a number of parameters of the field devices, and takes actions based on the information received.

- b. Sensing devices shall not switch into an alarm state. All decisions shall be taken by the control panel only.
- c. To enable the system to be tailored to suit the protected building and to permit future changes, the alarm management shall be configurable from the control panel via a keypad. This configuration shall be maintained under power failure conditions in non-volatile memory.
- d. The front panel of the control panel shall comprise a keyboard, alpha numeric display, text and indicator LEDs, etc. The occurrence and location of an event shall be displayed on the screen.
- e. Outputs for communicating with devices such as remote text display units, graphic display units, computers, printers and intelligent mimic panels shall be, provided where necessary.



- f. Control panels shall incorporate facilities for operating as stand-alone units, or as part of a network with full communication capability.
- g. Control panels shall be supplied complete with printout facilities. Only connections (a printer port and 24 Vdc power connector) for a portable printer shall be required, unless otherwise specified.
- h. The control panel shall further have the facilities to execute the following functions:
- Transmission of a general fire alarm to the Fire Brigade. Transmitting equipment shall not be supplied with the control pane unless specified in the Supplementary Specification.
 - Monitored switching off of air conditioning equipment in case of a general fire alarm.
 - Monitored closing of dampers over ventilation openings. switching on of stairwell pressure fans. etc. in case of a general fire alarm.
 - Monitored alarm outputs, e.g. sirens.
 - Monitored outputs and inputs for gas control panels.
- i. Consecutive alarms shall be stored by the control panel in chronological order and shall have the ability to determine the priority order of alarms by means of repetitive receipt of data from detectors.
- j. The transmission of all data shall be via a two-wire system, which shall carry both the supply voltage and the data.
- k. The type of wire or cable used shall be suitable for the speed of data transmission so that signals can be carried over without losses or corrupted data. Wiring shall meet the requirements of the detection system manufacturer, which requirements shall be published in a formal wiring specification.



3.4.3 Ring (loop) Wiring

- a. Wiring shall to be arranged in a return loop (ring), in such a manner that, in the event of an open circuit or a short occurring on the line, the control panel communicates with the detectors from both sides of the loop.
- b. The arrangement shall be such that during an open or short circuit no more than 20 detectors shall be deactivated. To enable this, line isolators shall be provided on the line on each side of each zone.

3.4.4 Master Control Panel

- a. The purpose of a master control panel will be to communicate with more than one satellite fire control panel, to simplify the central monitoring and control of the other satellite panels.
- b. A master control panel will be required when two or more control panels are to be linked. This master control panel shall conform to all the requirements of the other control panels and shall be of the same manufacture as the other control panels.
- c. The master control panel shall have its own battery back-up system.
- d. All communication to computers, the Fire Brigade, etc. shall be handled by the master control panel.
- e. All communication between satellite and central panels, as well as between satellite panels, shall utilise a protocol which verifies the receipt and accuracy of each message sent. Receipt of all messages shall be acknowledged by the receiving panel, and messages shall be re-transmitted by the sending panel in the event of failure to receive such an acknowledgment. An industry standard method, such as a CRC check sum technique, or similar, shall be used to verify the accuracy of each message received. Messages received incorrectly shall be retransmitted by the sending panel. Re-transmission shall continue until the receiving panel acknowledges receipt of a correctly received message. If, after a number of transmission attempts, the transmitting panel still does not receive an acknowledgment from the receiving panel, it shall register a fault signal.



3.4.5 Remote Display / Mimic Panels

- a. Remote display / mimic panels, or fireman's panels, shall communicate with the control panel. No "hard wiring" to these panels will be allowed.
- b. Remote panels shall function completely independently of the control panels, and shall not affect the functioning of the control panels.

3.4.6 Programmability

- a. The control panel shall be fully programmable through the keypad on the front of the panel, and through an RS 232 port by using a separate computer.
- b. It shall be possible to make back-ups of the programmed data onto separate magnetic media by means of an external computer linked to an RS 232 port on the control panel.

3.4.7 Communications

- a. Communications with other equipment, such as computers, shall be achieved through RS 232 ports using a fully documented public domain protocol. The protocol documentation shall also be included in the Maintenance Manual so that it will be possible for another party to communicate with the control panel without the approval of the control panel manufacturer.
- b. All communications with other equipment shall be bi-directional, and at least the functions and displays available on the front of the control panel shall be possible through the communications port. Programming of the control panel by means of other equipment is not required (except as described earlier).

3.4.8 Local Printer

- a. A printer shall be available as an option.
- b. The printer shall provide a hard copy of the following:



- Alarms
- Faults
- Maintenance data
- Control panel operations
- Outputs Operated
- Configuration report
- Status report

c. The printer shall print out the following information for each alarm or signal:

- Type of Alarm or Fault
- Device Type
- Device Number
- Zone Number
- User message
- Day
- Date
- Time

d. It shall be possible to set the printer to print out alarms, faults, control panel operations, and outputs operated, either individually or in any combination.

3.4.9 Device Addresses

- a. Each sensing device shall be numbered individually and uniquely to correspond with its address on the control panel.
- b. If a detector head is moved from its base to another base, the address of such a detector **shall remain** at its original location indicated on the control panel.
- c. The address of each device shall be manually set to the desired value.

3.4.10 Display

- a. The control panel shall be equipped with an alpha numeric display capable of displaying at least 80 characters.

- b. A message of at least 40 characters long per device shall be programmable and displayable on the display.
- c. The display of the following reports 1 information shall be possible:
 - Device information
 - List of devices isolated
 - List of devices that need maintenance.
 - List of the most recent events
 - I/O mapping
 - Device messages

With reference to 3.4.9(b), the following will also be acceptable to the Department:

"If a detector head is removed from its base to another base, and this results in the address being moved to another zone. then an alarm shall be generated in the control panel. This alarm can only be cancelled by replacing the head in its original zone.

3.4.11 Device Status

Addressable devices shall be polled by the control panel and the equipment condition and analogue status shall be read and stored in the control panel.

The varying status of each device shall be assessed by software algorithms and the control panel shall indicate the following conditions:

- a. Analogue Detectors
 - Detector removed
 - Incorrect type of Detector
 - Detector failed
 - Detector contaminated
 - Pre-alarm
 - Fire Alarm
 - Detector healthy
- b. Interface to contacts
 - Fire Alarm



Interface removed
Interface faulty
Contact wiring open circuit
Contact wiring short circuit
Contacts normal

3.5 POWER SUPPLY

- 3.5.1 Power supplies shall conform to BS 5839-4 or EN 54-4. See clause 1.3.2.
- 3.5.2 The Power pack of the control panel shall be able to accept an incoming 230 Volt single phase supply and shall be equipped with transformers, rectifiers, inverters, condensers, and integrated circuits for the supply of stabilised power to the control panel equipment and detector circuits.
- 3.5.3 The power supply unit shall be equipped with over voltage protection and spike arresters to prevent damage to the equipment by lightning or other spikes, or damage due to over voltages.
- 3.5.4 The battery charger shall be able to deliver the full charging current to discharged batteries, and thereafter the charger shall automatically vary the charging current to the batteries as may be required by battery voltage conditions.
- 3.5.5 Batteries shall not be subjected to overcharging.
- 3.5.6 The battery charger shall be protected against reverse polarity and short circuits on the DC supply side.
- 3.5.7 The power pack of the control panel shall regulate the supply voltage to detectors so that detectors or bases are operated in their nominal supply voltage range.
- 3.5.8 on loss of mains power, the power supply unit shall automatically revert to battery power, where after the system shall remain fully operational for a period of 24 hours and shall be able to operate the total alarm load for a further period of 1 hour. The unit shall automatically revert back to mains power upon mains power restoration and manual resetting of the unit shall not be necessary.
- 3.5.9 The power supply shall be equipped with the following indications on the front of the unit:
- | | | |
|----|-----------------|-----------|
| a. | "Mains On" | Green LED |
| b. | "Charger Fault" | Amber LED |



- 3.5.10 Batteries shall be mounted in a separate ventilated pad-lockable cubicle. Batteries shall be mounted in such a way that contamination of other equipment by batteries cannot take place. Batteries shall be in a special plastic container to contain any possible spillage.
- 3.5.11 Any supply fault, charging fault or low battery voltage shall be transmitted to the control panel so that an alarm can be generated.
- 3.5.12 No fuses or switches shall be accessible on the front of the 12V power supply unit without removing the door.
- 3.5.13 Batteries shall be of the sealed lead acid type and the sizes of the batteries to be used shall be indicated on a label in the battery cubicle..
- 3.5.14 Batteries shall be charged to 85% of their capacity within 24 hours.

3.6 DETECTORS AND DETECTOR BASES IN GENERAL

- 3.6.1 Ionisation smoke detectors, optical smoke detectors and heat detectors are covered under this heading.
- 3.6.2 The detector base shall be such that the detector head is held firmly in the base by means of an insert and twist (bayonet) action.
- 3.6.3 Reverse polarity or faulty circuit wiring shall not cause damage to the detector head or base.
- 3.6.4 The detector base shall be suitable for surface mounting on a ceiling and shall fit on a 65 mm Ø standard C-type electrical outlet box with fixing holes at 50 mm centres. Fixing lugs or holes in the base shall be substantial and shall withstand repeated insertion and removal of the head without damage.
- 3.6.5 The base shall be provided with wire terminals suitable for wire sizes up to 1,5 MM².
- 3.6.6 The wiring terminals of the unit shall be able to accept wiring lugs and shall be of the screw and clamp plate type to hold a lug firmly pressed against its contact surface. Spring-loaded push-in contacts will **not** be acceptable.
- 3.6.7 Terminals for circuit wiring shall be clearly marked.



- 3.6.8 The base shall be suitable for the connection of a remote indicator LED.
- 3.6.9 The detector or base shall be fitted with a local indication LED which shall flash illuminate under an alarm condition.

3.7 CONVENTIONAL DETECTORS AND DETECTOR BASES

- 3.7.1 Conventional detectors and bases shall conform to BS 5445 or EN 54 or BS 5839. See clause 1.3.2.
- 3.7.2 It shall be possible to reset detectors from an alarm condition to normal by disconnecting the supply voltage to the unit.
- 3.7.3 Upon removal of a detector head, the control panel shall indicate that a head has been removed and also the zone where the head has been removed.
- 3.7.4 The base at end of circuit, in the case of radial circuits, shall be suitable to accept a termination resistor/ circuit.

3.8 ANALOGUE ADDRESSABLE DETECTORS AND BASES

- 3.8.1 Analogue addressable detectors and bases shall conform to BS 5445 or EN 54 or BS 5839. See clause 1.3.2.
- 3.8.2 The removal of a detector from the base shall not affect the operation of other detectors on the line.
- 3.8.3 The control panel shall indicate when a detector head has been removed and also the address where it has been removed. Likewise it shall indicate when a wrong type of head is inserted in a base as well as its address.
- 3.8.4 The detector shall be suitable to operate on a two-wire system carrying both power and signals for the operation of each and every detector in the system.
- 3.8.5 The detector shall be able to receive and decode signals transmitted to it by the control panel. Upon receipt of a signal directed at its particular address, the detector shall transmit data back to the control panel for processing and storage thereof by the control panel. Such data transmitted shall represent the analogue values present in the electronic circuits of the detector head / base combination at that point of time.
- 3.8.6 The detector, when "addressed" by the control panel, shall transmit data to enable the control panel to deduce the following basic information:

- a. The type of head generating the data (i.e. ionisation, optical, heat, etc.)
- b. The address of the detector
- c. The reference limits of calibration of the detector
- d. The % visible or invisible combustion particles per meter present in the detector chambers at that point in time, or the temperature measured at the detector.

3.9 MANUAL CALL POINTS (BREAK GLASS UNITS)

- 3.9.1 Manual call point units shall be in accordance with BS 5839-2, except that it shall be resettable i.e. the front face of the unit shall not be a frangible element.
- 3.9.2 The unit shall be finished in RED.
- 3.9.3 The unit shall be large enough to cover a 65 mm Ø conduit draw box when the unit is surface mounted.
- 3.9.4 Flush mounted units shall be provided with a special flush mounting box which can accept electrical conduit terminations.
- 3.9.5 Surface mounted units shall be deep enough to terminate 20 mm Ø conduits into the unit, and shall be mounted solidly on the wall by means of their back plates.
- 3.9.6 Addressable manual call point units shall be fitted with an address card which will enable communication with the control panel.
- 3.9.7 The wiring terminals of the unit shall be able to accept wiring lugs, and shall be of the screw and clamp plate type to hold a lug firmly pressed against its contact surface. Spring-loaded push-in contacts will not be acceptable.

3.10 AUDIBLE ALARMS (SOUNDERS)

- 3.10.1 Sounders shall conform to BS 5839 part 1 and part 4.
- 3.10.2 The sounders shall operate off a 24 volt DC supply. Electronic sounders will be preferable.



3.10.3 The sound level for sounders and audible alarms shall be as follows:

- Audible indications (e.g. in the control panel) - 65 dB(A) at 1 m
- Evacuation sounders - at least 103 dB(A) at 1 m
- Outdoor sirens - 112 dB(A) at 1 m

3.10.4 The frequency, or major frequency in a two tone alarm, shall lie in the range of 500 to 1000 Hz.

3.11 FIRE BRIGADE SIGNALLING FACILITIES

3.11.1 The transmitting equipment, when required for the transmission of a general fire alarm to the local Fire Brigade, shall form an integral part of the fire control panel.

3.11.2 The transmitting equipment shall be fully compatible with the receiving equipment already installed at the Fire Brigade. Any facilities necessary to accomplish this be included in the transmitting equipment.

3.11.3 The output to the Fire Brigade shall be a monitored output.

3.11.4 The transmitting equipment shall not be supplied, & unless specifically specified in the Supplementary Specification.

3.11.5 Even if the transmitting equipment is not specified in the Supplementary Specification, a appropriate port, or ports, shall be provided on the control panel for connecting any future transmitting equipment.

3.12 FLAME DETECTORS

All flame detectors designed to detect hydrocarbon fires shall comply with at least the following requirements, in addition to the specified standards:

3.12.1 Flaming fires shall be detected by the flame detector by detecting infra-red and 1 or ultraviolet radiation emitted from the flames.

3.12.2 Detectors that monitor only ultraviolet radiation will not be acceptable.



- 3.12.3 At least two different radiation frequencies shall be detected and analysed by the flame detector in order to increase the reliability of the detector in the presence of following:
- Artificial light sources
 - Sunlight
 - Hot vibrating bodies
 - Arc welding
 - Lightning
- 3.12.4 Flame detectors shall be fitted with automatic self test circuits which will simulate a fire condition by generating artificial radiation through the lenses. Dirty lenses shall, therefore, also generate a fault.
- 3.12.5 The flame detector shall be able to detect a 0,1 M2 petrol fire at a distance of 14 m.
- 3.12.6 Detection integration time shall be adjustable up to 30 seconds.
- 3.12.7 The detector shall have at least a 50% sensitivity at a horizontal angle of 45° from the centre line.

4 INSTALLATION METHODS AND MATERIAL

4.1 DEVICES

- 4.1.1 The base of a detector shall always be mounted in the area which it protects so that the indicator LED can be seen from the doorway which normally provides access to the room. The indicator LED shall face towards the main entrance or lobby or side of main approach in the passage. See also clause 2. 1. 1.
- 4.1.2 Bases shall be provided with dust caps to protect the base against dust and dirt whilst construction work is in progress. This is only applicable to bases that contain electronic components.
- 4.1.3 Surface mounted units shall be solidly fixed to the wall by means of their back plates.
- 4.1.4 Manual call point units shall be mounted at 1,4m above finished floor level, unless otherwise specified in the Supplementary Specification.



4.2 CIRCUIT WIRING

- 4.2.1 The following methods are acceptable for the wiring of detector circuits:
- a. Steel conduit and conduit accessories cast into, or built into, the building structure and wired with insulated conductors of a type which complies with the requirements of this specification.
 - b. Steel conduit and conduit accessories, surface mounted in building structures and wired with insulated conductors of a type approved by the Department.
- 4.2.2 Wires and cables may also be installed in wiring trunking and armoured cable may also be installed on cable racks, all as specified further herein.
- 4.2.3 Cables with stranded wires shall be terminated by the crimping on of lugs. No stranded wires without lugs will be accepted.
- 4.2.4 T - Junctions shall be made only in approved draw boxes at detector outlets.
- 4.2.5 Separate wiring installations for detector circuits, evacuation communication wiring, audible alarms, electrical lock wiring, card reader wiring, AC and DC power circuits, remote control circuits and monitor wiring, video cables, computer cables, etc., shall all be done in separate conduits or trunking installations. Detector wiring shall not be installed together with any other wires in wire-ways.
- 4.2.6 Detector wiring may share the same draw boxes or expansion joint boxes with other fire fighting system wiring or security system wiring, but the boxes shall be subdivided by means of steel plates,
- 4.2.7 All electrical work and wiring associated with "FIRE DETECTION SYSTEMS" shall be carried out in compliance with the requirements of the "SPECIFICATION FOR ELECTRICAL INSTALLATIONS TO BUILDING OTHER THAN DWELLING HOUSES".
- 4.2.8 No wiring shall be installed vertically for more than 1,5 m. Cables installed over vertical distances of more than 1,5 m, shall be properly supported at intervals of less than 1,5 m.

4.3 ARMOURED CABLES

- 4.3.1 Armoured cables shall be used in sleeves, in cable tunnels and on cable racks or trays.



4.3.2 Armoured cables shall have twisted pairs and / or screens if so required in the wiring specification of the manufacturer of the equipment.

4.4 CONDUIT AND CONDUIT ACCESSORIES

4.4.1 The Contractor for the fire detection system shall be responsible for the supply and installation of all conduits, conduit accessories, wiring trunking and cable trays, as may be necessary or required for the system, Unless specified otherwise in the Supplementary Specification.

4.4.2 PVC conduit and conduit accessories shall be cast in, or built into, the building structure in new buildings. No surface mounting will be acceptable in new buildings or structures.

4.4.3 Surface mounted conduit and conduit accessory work will be allowed only in existing buildings or as approved by the Project Manager.

4.4.4 PVC conduit and conduit accessories surface mounted on building structures, steelwork and woodwork, shall be done neatly and in straight lines and shall be saddled at 1 m centres with spacer saddles.

4.4.5 M4 machine screws shall be used for fixing of spacer saddles onto steelwork. Suitable holes shall be drilled and tapped in the steelwork for this purpose.

4.4.6 PVC conduit and conduit accessories, surface mounted in roof spaces of buildings or structures with pitch roofs, shall follow the roof structural elements.

4.4.7 The quality of materials and the methods of installation of steel conduit and conduit accessories shall be carried out in compliance with the requirements of the "SPECIFICATION FOR ELECTRICAL INSTALLATIONS TO BUILDINGS OTHER THAN DWELLING HOUSES." and SANS 10142-1.

4.4.8 Conduit installations shall be done in such a way that detector circuit wiring can be done without interruption and without T-joints.

4.4.9 Round draw boxes for detectors shall be mounted hard against the ceiling in the case of false ceilings or ceilings of pitch roof buildings and detector bases shall be mounted against boxes so that no open wiring occurs anywhere in a conduit and wiring system.

Only flexible conduit which is not of the spiral type may be used in special applications.

4.5 WIRING TRUNKING

- 4.5.1 The quality of materials and the methods of installation of wiring trunking shall be carried out in compliance with the requirements of the “SPECIFICATION FOR ELECTRICAL INSTALLATIONS TO BUILDINGS OTHER THAN DWELLING HOUSES”.
- 4.5.2 Trunking shall be fitted throughout with covers.
- 4.5.3 PVC wiring trunking may be used only to house detector circuit wiring, but then only-as specified in the section "CIRCUIT WIRING" in the Specification-and only with the type of cable as specified.
- 4.5.4 NO wiring trunking may be used in microfilm vaults and in high risk areas such as fuel, oil, tyre, paint, wood, Paper, cardboard box storage areas, record-rooms and vaults.

4.6 CABLE RACKS AND LADDERS

- 4.6.1 The quality of materials and the methods of installation of cable racks and ladders shall be carried out in compliance with the requirements of the “SPECIFICATION FOR ELECTRICAL INSTALLATIONS TO BUILDINGS OTHER THAN DWELLING HOUSES”.
- 4.6.2 No cable racks and ladders may be used in microfilm vaults and in high risk areas such PL fuel, oil, tyre, paint, wood, paper, cardboard box storage areas, record rooms and vaults.
- 4.6.3 Only armoured cable may be mounted on cable racks and ladders.
- 4.6.4 The type of wire or cable used shall be suitable for the speed of data transmission, so that signals can be carried over without losses or corrupted data.

4.7 LIGHTNING AND SURGE PROTECTION

- 4.7.1 All wiring going out from and coming into any building shall be fitted with suitable surge absorbers, which have been approved by the manufacturer of the equipment. This includes 230 V supplies, telephone lines and detector lines.



4.7.2 Special attention shall be given to the proper connecting and earthing of the system.

5. COMMISSIONING OF SYSTEMS

5.1 COMMISSIONING AND HANDING OVER TESTS

5.1.1 The testing of the system shall be done in the presence and to the satisfaction of an authorised representative of the Project Manager,

5.1.2 Tests shall include simulation of fire conditions in each zone to prove the efficiency of all aspects of the system to the satisfaction of the Project Manager.

5.1.3 All equipment, material, etc., which may be necessary for these tests shall be supplied by the Contractor, including a suitable smoke generator.

5.1.4 The Contractor shall do his own complete commissioning tests before the actual first take-over tests are done. This is to satisfy himself that everything is working and is in accordance with the specification.

6 DOCUMENTATION, DRAWINGS AND MAINTENANCE

6.1 BLOCK PLAN

6.1.1 An approved block plan, indicating the zones and appropriate zone reference numbers, shall be installed at all control panels and repeater panels.

6.1.2 The block plan shall be discussed with the Project Manager **before** manufacturing takes place.

6.1.3 The block plan shall have a professional appearance. Text shall be in English and at least one other official language to be decided in conjunction with the Department and the User Department. A freehand drawing or badly finished plan **will not** be acceptable.

6.1.4 The block plan shall clearly indicate the position of the zone in which a fire has started, when read together with the displays and indications on the control panel.

6.1.5 Non-fading material shall be used for the artwork. The block plan shall be mounted in a frame behind glass, or shall be covered with a transparent stick-on material, to protect the artwork.



- 6.1.6 The block plan shall be mounted in an approved position at the control panel.
- 6.1.7 For an addressable system, the addresses of all field devices shall be shown on the block plan.
- 6.1.8 The exact requirements of the panel and block plan will be specified in the Supplementary Specification.

6.2 TRAINING PROGRAM

- 6.2.1 Tenderers shall allow in their tender prices for a training course, to train on site at least four (4) persons, as nominated by the User Client from his own operating personnel. The training shall be adequate for the installation, to ensure that operating staff fully understand the system. During this period the personnel shall be made fully conversant with the operation of, and daily maintenance required for, each item of equipment of the system. The training especially on computer equipment and control panels, shall be of such a standard that will enable the User Department to carry out his own in-house training of other personnel.
- 6.2.2 The training course shall start only after first take-over inspection of the system.
- 6.2.3 The training course shall be carried out in the language medium as chosen by the User Department.
- 6.2.4 The Operating Manual of the contract shall include a full description of the contents of the training course, referred to in clause 6.2. 1. above.

6.3 OPERATING INSTRUCTIONS

- 6.3.1 Instruction cards, indicating clearly the procedure to be followed in the event of a "FIRE" alarm, shall be supplied and framed under Perspex in approved teak or non-ferrous material frames. The instruction cards shall be in English and at least one other official language to be decided in conjunction with the Department and the User Department. The frame shall be neatly mounted on the walls alongside the control panel and external indicator panels respectively, where they can be clearly read.
- 6.3.2 In the case of the control panel, the instruction card shall also state clearly the Procedure to be followed in the event of a "FAULT" alarm.

6.4 OPERATING MANUALS

- 6.4.1 Three complete sets of the Operating Manuals, in English, shall be provided to be used by the User's personnel who will operate the system. The Operating Manuals shall be in the form of plastic display binders and shall contain the following:
- a. Complete operating instructions.
 - b. Action to be taken during "FAULT" and "FIRE" conditions.
 - c. Names, telephone and facsimile numbers, and addresses of contact personnel.
 - d. Operating procedures, as contemplated in clause 6.3 hereof.
 - e. Full description of the training course, as stipulated in clause 6.2.1 hereof.
- 6.4.2 The Operating Manuals shall contain no technical information. This shall be included in the Maintenance Manuals.
- 6.4.3 A concept copy of the Operating Manual(s) shall be submitted to the Department's consultant, at least two (2) weeks prior to the anticipated first hand-over of the installation, for scrutiny and possible amendment.
- 6.4.4 First delivery of an installation will not be taken unless acceptable manuals are submitted the installations

6.5 MAINTENANCE MANUALS

- 6.5.1 Three complete sets of the Maintenance Manuals, in English only, shall be provided. The manuals shall contain the following:
- a. A complete set of "as built" drawings of the contract, in a form acceptable to the Department. No drawings shall be smaller than A4 size. Large drawings shall be reduced to A3 or A4 size for inclusion in the manuals, provided they remain legible.
 - b. A complete set of "machine shop" drawings of the contract, showing dimensions, finishes, general arrangements of panels, consoles, computer assemblies, etc.
 - c. A complete set of wiring diagram drawings of all equipment, showing component identification, types and values.



- d. A block diagram drawing for each piece of equipment containing more than one PC board, showing the interconnections of boards, complete with connector and plug numbers, and PC board identification markings.
 - e. A complete list of all equipment containing the following information:
 - i. Name of the equipment (or description thereof).
 - ii. Serial number of equipment.
 - iii. Type number of equipment.
 - iv. Manufacturer of equipment.
 - v. Equivalent replacement model of equipment (where applicable).
 - vi. Names, addresses, telephone and facsimile numbers of firms supplying equipment.
 - f. A complete and comprehensive description of the operation of the system and of each individual piece of equipment.
 - g. A complete and comprehensive description of the maintenance of the system and of each individual piece of equipment in respect of daily, weekly, monthly or annual maintenance.
 - h. Advanced technical information of the system may also be bound into the Maintenance Manuals as additional information. Any literature not in the English language, shall have the English translation attached.
- 6.5.2 A concept copy of the Maintenance Manual(s) shall be submitted to the Department's consultant at least two (2) weeks prior to the anticipated first hand-over of the installation for scrutinising and possible amending.
- 6.5.3 First delivery of the installation will not be taken, unless acceptable manuals are submitted prior to the first hand-over instructions.

6.6 MAINTENANCE



6.6.1 Maintenance and Guarantee

- a. The tenderer for this contract shall allow in his tender price for the maintenance of the complete installation for a period of twelve (12) months, starting from the date of the first take-over of the contract by the Department.
- b. It is a specific requirement of this contract that the Contractor shall allow for **monthly** inspection visits during the 12 month maintenance period, and that he shall submit full reports for each monthly visit. The reports shall contain the status of the system as well as the faults which occurred on the system during the previous month.
- c. A log book shall be supplied by the Contractor. The log book shall be kept on site in charge of the responsible person appointed by the User Department for this purpose. The Contractor shall complete the log book, showing all maintenance done by him, as well as repairs of faults which may have occurred
- d. The log book shall also contain the following information:
 - Date
 - Type of fault reported and by whom
 - Date of fault report
 - Work done
 - Name and signature of person carrying out the work
 - Name and signature of the person in charge of the site.
- e. The log book shall be completed in TRIPLICATE. One copy shall accompany the monthly report to the Regional Representative of the Department, one copy shall be for the Contractor's own use, whilst the third copy shall remain in the log book as a record.
- f. The Contractor shall also allow for a complete maintenance service of the system after every six (6) months. i.e. two such services in the twelve (12) months guarantee period. The log book shall also be filled in and reports submitted for these services to the Regional Representative of the Department.



- g. The reports shall be submitted to the Project Manager within seven (7) days of the service. Serious faults shall immediately be reported to the Regional Representative and the Consulting Engineer by telephone.
- h. No maintenance or repair work shall be done on site without the knowledge, and approval, of the responsible person in charge on the site.

6.6.2 Maintenance Program

- a. The Contractor shall draw up a complete maintenance program document for the system, which shall enable the User Department to maintain the system on a daily basis. This program must be inserted into both the Operating Manuals and Maintenance Manuals.
- b. This document shall be in English and at least one other official language to be decided in conjunction with the Department and User Department, and shall indicate clearly the steps to be taken to prevent failure of the system.
- c. The normal maintenance which is, for example, necessary for the maintenance of batteries in the system, shall be clearly indicated in the documentation in a separate section.



APPENDIX 1

SCOPE OF WORK

1. SCOPE

- 1.1 The contractor shall design, supply and install an automatic fire detection, smoke detection and gas suppression fire alarm system in Substation C&D in the Port Of Richards Bay.

2. GENERAL

- 2.1 The fire detection system shall be designed and installed as specified in Appendix 2, electrical drawings.

APPENDIX 2
ELECTRICAL DRAWINGS

This appendix lists the Transnet Projects Drawings, which shall be read in conjunction with this specification

DRG No.	Description
4221259-1-SUB-E-LA-1001-03-3-TP	Proposed New Area C&D Substation – Fire Detection Layout

SIGNATURE OF TENDERER : _____

DATE : _____

APPENDIX 3

**STATEMENT OF COMPLIANCE
(TO BE COMPLETED BY TENDERER)**

This tender complies with specification TPD: 005-FIRESPEC in all respects.

SIGNATURE : _____ DATE : _____

This tender complies generally with specification TPD: 005-FIRESPEC, but differs from it on the following points.

SIGNATURE : _____ DATE : _____

Transnet Projects