PART 5C : DETAIL PROJECT SPECIFICATION
FIRE DETECTION AND EVACUATION INSTALLATIONS

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FIRE DETECTION AND EVACUATION INSTALLATIONS

5.56 SCOPE OF WORK

The scope of work to be covered is for the **NEW PSYCHIATRIC WARD BUILDING PORT SHEPSTONE REGIONAL HOSPITAL,** in summary as follows:

* The Supply and Installation of a NEW Analogue Addressable Fire Detection System for the Building.

* The Supply and Installation of Fire Telephones and Microphone/Speaker Systems.

* The Supply and Installation of all the associated cabling and conductors in conduit for the above systems.

* Ensuring that the existing communication device and link with the local Fire Brigade is in fully functional, and submission of confirmation documentation.

The scope of work will include the Supply, Installation, Training, Commissioning and Guarantees all as described fully as part of this documentation.

5.57 EQUIPMENT AND INSTALLATION REQUIREMENTS

The equipment shall be sourced from an established company and the product shall be of a high standard with a comprehensive full service back up in the RSA.

The control panel analogue devices shall be digital and the complete installation is to SANS 9001standards.

The terminology shall all be in the English language.

Spare capacity of at least 25% must be allowed for with the selection of all equipment indicating the Main Fire Control Panel, Remote Fire Control Panels, Evacuation Equipment, Allocation of Zones and Loop Conductor installations.

All the equipment offered as part of this contract shall be new.

5.58 SYSTEM DESCRIPTION

The system shall consist of a Global repeater panel to be installed at the Security Desk at the Entrance to the Psychiatric Ward Building. The Main Control Panel shall be connected to the Remote Field Devices installed in the separate zones. A Graphic Annunciator Panel shall be installed in order to indicate the condition of the zones. The panel shall be installed at the Entrance Desk, adjacent to the Main Control Panel Refer to the Layout Dwg.No. SL 231– FE2 the proposed arrangement of equipment at the Desk indicated on the Security Office Sheets to be provided.

The Main Control Panel shall be powered from the Essential Power Supply and fully backed up by a dedicated UPS system.

The system shall be provided so that it can be linked to the Fire Brigade office in Port Shepstone.

The complete inter-zone wiring system between the Main Control Panel and Sub Control Panels shall be linked by means of Fire Rated 1,0mm² twisted pair armoured copper cable.

The inter-zone wiring system has been indicated on the layout drawing.

The complete inter-zone wiring system shall consist of a Ring Feed via the Fire Detection Drawboxes (FDD) shown on the drawing.

The zone panels shall be supplied from the buildings by means of Fire Rated cable (FR120) 1,0mm² twisted pair copper cable.

The Control Panel shall be supplied complete with an alarm management system complete with memory backup to enable additions and alterations for future.

The Control Panel shall have a front mounted indicating LED`s keyboard and LCD display as specified.

Data points are to be provided for remote repeaters, panels and computers as required.

Control units shall be modular design with facilities for independent operation or network.

The equipment indicated all as part of the installations shall be installed in the positions shown on the drawings.

The Fire Detection devices to be installed in air conditioning return air ducts and fresh air exhaust outlets shall be installed in the positions shown on the drawings.

The Fire Detection System is to be backed up by means of an Evacuation System installation comprising a Fire Telephone System and Microphone/ Speaker System.

In addition each zone shall incorporate an illuminated Block Diagram Panel suitably engraved. Refer Dwg. No.PE 231 - IBD Zone as an example of the various zones.

The Evacuation Equipment is to be installed into flush mounted enclosures.

The Control unit shall continuously monitor the analogue status of all sensing devices and initiate action when a fire or smoke condition is present. The control panel, should make all decisions regarding the state of the system from the information received from each field device.

The operation of the system shall be field configurable from the control panel via a keypad or Windows based software to suit the specific application and to permit future changes. This configuration shall be maintained under power failure conditions.

The Control unit shall have a front panel compromising the indicating LEDs, control keyboard and backlit LCD display, as described in detail later. The LCD display will give details of any event which occurs in the system.

Data ports are to be provided for communicating with remote LCD repeaters, intelligent mimic panels and graphics computers.

The Fire Panel shall be modular in design and have facilities for operating as stand-alone units, or as part of a network.

5.59 THE MAIN CONTROL PANEL

General Installation

The Main Control Unit is to be installed at the Security Desk at the Ground Level Entrance to the Building in the position shown on Dwg. PE 231 –FE2.

The Panel is to be installed against the wall by means of 4 x 12mm diameter panel bolts at a height of 1400mm above floor level, measured from the bottom of the panel.

The Main Control Panel shall consist of the Main Control Unit and the Main Graphic Annunciator Display Panel.

The Main Control Unit consisting of a standard panel to accommodate up to 14 Zones and 30% upgradeable with capacity to accommodate Zones and detectors/devices.

The Graphic Annunciator Mimic Panels are to consist of engraved stainless steel facias, depicting the Floor Layouts.

Both the Main Control Unit and the Mimic Panels to interact with each other, ie. The Main Panel indicating the zone numbers in numeric order and the Mimic Panels indicating a layout of the zones.

The Control Panel and Mimic Panels to incorporate all the zones indicated.

The Complete Panel comprising both compartments shall be incorporated in a neat frame enclosure with a precisely cut aluminium section.

The design of the panels shall be of modular configuration with easy replacement of faulty circuit boards and components.

The configuration and working mode of the panels must be able to be easily understood and as a result easily operated by hand by trained staff without undue difficulty.

The unit design and method of operation shall be in accordance with BS 5839 Part 4 of 1988 and approved by SANS in respect of telephone and radio/television frequency interference legislation requirements.

The standard panel configuration shall be user friendly, alpha/numeric or graphical display with back light for easy initiation and problem identification.

The panel shall have LED status display giving visual reference to operational status and high quality keypad module for initialising and testing.

The panel shall have EEPROM memory check for permanent storage of initialising programme to avoid loss of information and sequence in the event of power failure.

The panel must incorporate a tamper switch to prevent unauthorised entry.

The panel shall be formatted for two 6 digit high and low level entry codes giving access to initialize, terminate and testing facilities.

Output relays shall be provided consisting of 2 change over relays per loop expanded in future to 16 relays, including 2 sounder change over relays and 5 remote changes over relays.

The panel shall also indicate the following:

Modem Communicator	:	For remote communication
Auto Dialling/Auto Answering	:	For remote communication to reprogramme panel, fault
Telephone Link:	:	Find or remote control via a personal computer.
40 Column Printer::		To enable obtaining hard copy reports on System Status and performance.
Unique Graphical Display:		In order to show graphical display rather than data capture enabling faster interpretation of detectors approaching hazard limits.
RS232 Connection Port	:	Compatibility

Remote Panel		To allow for status to be displayed at a remote location with alarm sound, accept and cancellation and reset buttons.
LED Zone Matrix Display	:	Enabling visual indication of zones in alarm.

The panel shall in addition be equipped with a separate ancillary printer. The main panel provided with a printer port to enable the additional equipment. The printer shall be an HP, Cannon, Epson or equal and approved.

The panel shall have a dedicated circuit provision to transmit a General Fire Alarm condition to the Fire Brigade, and switch off air-conditioning plant in applicable zones in case of fire.

5.60 SYSTEM OPERATION

The system shall be designed to operate with the minimum of operator training. Basic fire alarm functions shall be completely self-explanatory. The occurrence of a fire or fault alarm shall indicate all relevant test and zone information without operator intervention.

In quiescent condition, the panel will have the Asupply ON indicator illuminated and Processor Running indicator flashing. The LCD display will show time and date as well as the loop alarm status.

The occurrence of a fire or fault signal or a keyboard operation carried out by an operator, shall not inhibit or delay the receipt of additional alarms. Should any port at the system be isolated or placed in a test mode, a LED on the front of the panel must illuminate to indicate the systems abnormal status. This condition must also be indicated on the LCD display. The normal operation of all other devices shall not be affected in this state.

6.60.1 Access Levels

Access to the system shall be protected as follows:

* **Control Key**
  The control key shall be used to enable or disable the keyboard and control keys of the panel.

* **Access Codes**
  Access codes shall be used to prevent unauthorised entry into the programming menus of the panel. Each menu shall be able to have 2 different levels of access.

* **Door Lock**
  The panel door lock shall be used to prevent unauthorised entry into the cabinet.

* **Non-Volatile Memory Switch**
  The non-volatile memory switch shall prevent any unauthorised or accidental changes being made to the system configuration data.

6.60.2 Self-Monitoring

The control panel shall be designed and programmed to perform extensive automatic self-monitoring. If the control panel detects a fault, it shall result in a fault indication being given by means of a common fault amber LED.

The following shall be continuously monitored by the control panel:

* 24V power supply fault (external supply)
* Fire brigade/evacuation open circuit
* Alarm bell open circuit
* Fire Brigade short circuit
* Alarm bell short circuit
* Power failure
* Watchdog time-out
* Low battery
* No battery connected
* Tamper switch
* No printer
* Memory lock unlock
* Event buffer full
* No communication
* Earth fault
* Battery over-voltage
* RAM memory check
* EPROM memory check

5.60.3 Fire Operation

Any fire alarm will cause the following actions to occur immediately:

* The LCD to light up and display the following information:
  - type of alarm
  - loop number
  - zone number
  - sensor address
  - type of sensor
  - event number
  - status
  - number of alarms
  - time and date
  - 2 lines x 40 characters of user programmable text.
* The common fire indicator and appropriate zone fire indicator will illuminate
* The LED on the affected detector(s) will operate
* The event will be logged in memory
* Programmed relays will be triggered

* The fire alarm will override any fault condition that might be present on the display
* Bell & fire brigade/evacuation outputs will become active according to the immediate or delay parameters set
* Sounders and bells will continue to operate (continuous tone) until silenced by inserting the control key and pushing the silence alarm button
* If the bells and fire brigade have been silenced they will become active again for any new fire alarm
* Sounder circuit controllers will be sounded as programmed
* Messages will be sent to the configured data ports and/or printer
* Coincidence, area and adjacent area devices will be operated as programmed
* The programmed I/O will be activated (including inter panel I/O)
* Messages will be sent to the configured repeater panels, mimic panels and graphic packages

5.60.4 Fault Operation

A fault warning will cause the following actions to occur immediately:

* The LCD to light up and display the following information:
  - type of alarm
  - loop number *(if applicable)*
  - zone number *(if applicable)*
  - sensor address *(if applicable)*
  - type of sensor *(if applicable)*
  - event number
  - status
  - number of alarms
  - time and date
  - 40 characters of user programmable text

* The system fault and appropriate zone fault indicator (LED) will illuminate
* The general fault relay will activate
* The panel buzzer will sound intermittently
* Inputs/outputs configured for fault will be operated, if applicable, messages will be sent to the configured repeater panels, mimic drivers and graphics.

5.61 SYSTEM FEATURES

The fire panel electronics shall be completely modular offering easy expansion increments with zone fire and fault indications expandable to 16 zones

Expanding or adding options shall be by means of plug-in modules that are automatically configured by the system.

5.61.1 Panel Capacity

The fire panel shall be able to operate up to eight Zones. Each Zone shall be capable of handling a maximum of 24 addressable devices. These devices may be either detectors or controllers, monitors and input/output units as described below.

5.61.2 Device Types

The panel shall support at least the following types of sensors and monitors:

a **Fire Sensors**
- Ionisation smoke
- Optical smoke
- Heat
- Manual activated and resettable fire alarm unit
- Air-conditioning control switching devices

b **Monitoring Controllers**
- Zone monitoring unit; used to interface a conventional zone of detectors to the analogue addressable system
- Isolator; for short circuit protection
- Sounder circuit controller; used to operate sounders in a zone

c **Input/Output Devices**
- Input/Output Unit; one monitored and one unmonitored opto-coupled input and one loop powered relay
- Output; one loop powered relay
- Switch monitor unit; for monitoring normally open or normally closed contacts
- Switch monitor plus; a standard switch monitor incorporating circuitry to monitor flow switches
- Mini switch monitor; a switch monitor in a 76 x 47mm moulding
- Mini switch monitor (interrupt); a manual call point monitor incorporating an interrupt facility for fast response

d **Gas Units (If applicable)**
- Gas control unit
- Gas status unit
- Gas remote unit

5.61.3 Device Identification

The panel must automatically identify every device on the address line during initial start-up, and record this information in memory. Thereafter the panel should check the device types on every scan and indicate a wrong device fault should a device be changed to an incorrect type.

5.61.4 Device Status

The control panel shall poll all devices attached to the system within 3 (three) seconds. The analogue value must be read and stored in memory on every scan. The status of a device, once polled, must be assessed by the control panel which should indicate the following conditions:

a Fire
b Pre-condition
c Fault
- communication
- wrong device type
- device removed

d Maintenance
e Device statistics shall include:
- maximum and minimum value with data
- average value
- number of alarms
- communication quality

5.61.5 Alarm Threshold

The alarm threshold level of each analogue device shall be individually adjustable from the control panel. Four levels shall be available each having a fixed pre- and fire alarm threshold.

5.61.6 Automatic Compensation

The system shall automatically raise the alarm threshold of all devices as their quiescent analogue value increases as a result of environmental contamination.

When the maximum level of compensation is reached for a sensor, the panel must indicate a Maintenance condition for that specific sensor.

5.61.7 Maintenance Conditions

Maintenance conditions shall be generated either through self-test at pre-programmable times or once maximum level of compensation has been reached.

5.61.8 Alarm Verification

The control panel shall employ methods to eliminate false alarms from occurring. Alarm verification of automatic devices must be programmable on a zone by zone basis. Alarm verification shall be selectable as normal, one detector confirmed or two devices simultaneously in alarm.

Fire alarm response times shall be within the parameters of SANS 50054-2. The reporting of manual call points to the control panel shall be done on an interrupt basis. Once devices are in a pre-condition state, the scan rate shall be increased in order to decrease the reaction time.

5.61.9 Line Monitoring

The control panel shall monitor the loops for short-circuit, open circuit and physical removal of devices from the system. Faults of this nature shall be indicated visibly and audibly within the time period specified in SANS 50054-2.

5.61.10 Memory Allocation

The control panel shall allow for the allocation of system memory to suit individual site applications. For this purpose system memory shall be able to be allocated to the following functions:

* Input/output programming, including Boolean logic
* Text
* Event buffer

5.62 SIGNALLING AND ANNUNCIATION

Fire alarms and fault warnings shall be indicated visibly and audibly on the control unit. All visible indicators shall be LED=s. The following colours shall be used for visible indicators.

* **Red for indications of**
  - Fire alarms
  - The transmission of signals to fire alarm routing equipment
  - The transmission of signals to controls for automatic fire protection equipment

* **Yellow for indications of**
  - Fault warnings
  - Disable conditions
  - Zones in the test state
  - The transmission of signals to fault warning routing equipment

* **Green for the indication of**
  - Correct operation of power supply and microprocessor

Audible fire and fault signals shall be differentiated as follows:

* **Fire**
  - Continuous tone
* **Fault**
  - Intermittent tone

5.62.1 Panel Indicators

All panel indicators shall be as specified in SANS 50054-2.
The control panel shall have as minimum the following LED's:

* **General Indicators**
  - Dual Common Fire
  - Common Fault
  - Disable
  - Supply Fault
  - System Fault
  - Processor Running
  - Supply ON

* **Control Indicators**
  - Silence Buzzer
  - Disable
  - Test

* **Sounder Indicators**
  - Sound
  - Delay ON
  - Delay OFF
  - Fault/Disable
  - Silence

* **Fire Brigade Indicators**
  - Signal
  - Delay ON
  - Delay OFF
  - Fault/Disable
  - Stop Fire Brigade

The panel shall as a minimum have 16 zones fire and fault indication. This shall be expandable up to 64.

5.62.2 Panel Display

The control panel shall contain a 8 x 40 character backlit alphanumeric LCD display. Up to 2 lines x 40 character text shall be provided for field devices. Up to 40 characters only will be provided for zones, areas and inputs/outputs.

The panel display shall be as specified in SANS 50054-2.

5.62.3 Panel Controls

The control panel shall have the following control keys as maximum:
* Alpha/numeric keypad with scroll and arrow keys

a Silence Buzzer
b Disable Function
c Test Function
d Reset
e Test 3rd Source

Sounder

a Sound Alarms
b Delay ON/OFF Toggle
c Fault/Disable
d Silence

Fire Brigade

a Call Fire Brigade
b Delay ON/OFF Toggle
c Fault/Disable
d Stop Fire Brigade

5.62.4 General Outputs

The control panel shall provide, as a minimum, the following general outputs:

a Common Fire Relay
b Common Fault Relay
c Supervised Alarm Bell Relay
d Supervised Fire Brigade/Evacuation Relay

All relay ratings shall be 2A @ 24V DC

5.62.5 Programmable Outputs

A minimum of 4 programmable output relays shall be provided internally to the panel. It shall be possible to expand this via a current loop connecting to remote firemans panels which will provide either 8, 16, 32 or 64 open collector outputs. These outputs may be programmed as zone fire/fault outputs or normal freely programmable outputs.

Programmable outputs shall also be able to be added at any point in the loop taking up one address.

5.62.6 Data Outputs

The following data outputs shall be provided by the control panel:

* Two RS232 ports which can be assigned to text, graphics, external printer or modem
* Single or Dual RS485 ports available for networking of up to 31 control panels
* Current loop to drive up to a combination of 15 firemans panels and repeaters

5.62.7 Programmable Inputs

It shall be possible to programme inputs and outputs from any of the following sources:

a Panel Inputs
b Panel Relays
c Field I/O devices
d System I/O devices
e Inter-panel I/O by means of networking

Programming facilities shall include the use of Boolean algebra.

5.62.8 Panel Printer

External Printer
The external printer shall be connected to the panel by means of a RS232 port. The printer shall be assigned to be either event or report printing depending on information required.

5.62.9 Networking

The networking capabilities of the system shall be such that up to 32 control panels may be connected via RS485 medium or optical medium. The system shall ensure rugged, reliable and peerless operation in that no master panel shall be required for the system to operate. It shall be possible to remove and add to the network to allow for easy expansion of the system.

The network shall use an industry standard protocol such a ARCNET or ETHERNET to ensure that no data is corrupted.

The network shall be able to provide:

a Inter-panel Input/Output Programming
b Remote Uploading/Downloading of System Configurations to individual panels
c Remote Maintenance Features
d RS232 Nodes for connection to Graphics Packages, Building Management Systems and modems
e Global Repeater Panel
f LCD Repeaters

5.63 AUXILIARY PANELS

A full range of compatible auxiliary panels and devices shall be available for connection to the main system control panel.

The auxiliary panels and equipment to be as follows:

5.63.1 Global Repeater Panel

A global repeater panel shall be provided to display all data, and to provide control of all the control panels on the network at a central point. From the global repeater panel it shall be possible to upload/download and configure any control panel connected to the network.

5.63.2 Local Repeater Panels

Two types of local repeater panels shall be available:

a Full Repeater Panel
b LCD Repeater Panel

The full repeater panel shall look identical in appearance to the control panel and shall provide all LCD display data and zone fire and fault indications. All the controls of the associated control panel shall also be available. The repeater shall connect directly to the RS485 or optical network.

The LCD repeater shall be used only to repeat the LCD data of the main control panel. No zone indication LED to fire and fault will be available, however, all the controls of the associated control panels will be available. The repeater shall connect directly to the RS485 or optical network.

5.63.3 Conventional Repeaters

A complete line of conventional repeater panels shall also be available. The repeaters shall be available as 8, 24 or 32 zone repeaters each having the following outputs:

a Alarm and Fault LED indication per zone
b Common Fire
c Common Fault
d In Service/Processor Running
e Communications Failure

The following inputs shall also be available:

a Sound Alarms
b Silence Bells
c Silence Buzzer
d LED Test

The conventional repeaters shall connect directly to the current loop of the control panel.

5.63.4 Graphic Zone Annunciators

The Graphic Zone Annunciators shall be as per specification installed as follows:

(a) Limited to the main Panel Only

The units shall be approximately 900 x 600mm and 80mm deep of stainless steel construction indicating the complete New Building and separate zones as per the Layouts for the three Levels

The annunciators shall incorporate LED's and switches for zone indication and control of the system.

Each zone shall have two parallel *Red* zone indicating LEDs, two parallel *Orange* fault indicating lights and zone isolator.

Note: The panels shall in addition have the following:

Green Power On Indicating Light
Green System On Indicating Light
Red System Off Indicating Light
Orange Zone Card Revised Indicating Light
Orange Fault Indicating Light

The panels shall also incorporate Push Buttons as follows:

Blue Silence Audible Alarms
Blue Reset

5.63.5 Illuminated Block Diagrams

Allow to supply and install an Illuminated Block Diagrams adjacent to each Fire Telephone Station, i.e. 6 required.

The Illuminated Block diagrams shall be manufactured in accordance with the Detail on Dwg. SL231 – FE2.

Allow to upgrade the Existing Site Plans presently installed in the 24Hr Room at the Main Entrance to the Hospital and The Main Entrance Security Building.

The Block diagrams shall be permanently illuminated at all times from the Essential Power Supply mains.

The engraving on the front cover shall indicate the basic outline of the zone, single line walls, ie. thicker line indicating the outside walls and thinner line the internal walls. The name of each facility, ie. Corridor Store Room Consulting Room, etc. to be engraved together with the Fire Detection device and number of the device - the number derived from the zone and loop allocation relating back to the Main Fire Detection Control Panel.

The illuminated Block Diagrams are to be installed onto an aluminum framework and fixed to walls each by means of 4 x 8mm diameter rawl bolts.
The wiring shall be by means of 1,5mm5 silicone conductors. The wiring accessible from 75mm diameter conduit outlets and 20mm diameter galvanised conduit.

5.63.6 Firemans Panel

The Firemans Panel PC board is to be provided as an open collector repeater in order to accommodate mimic panels and to provide remote zone fire and fault outputs or remote freely programmable outputs. Each output will drive at least 10mA.
The repeater will have the following outputs:

* Either 8, 16, 32 or 64 freely programmable open collector outputs
* General alarm
* General fault
* In service/Processor running
* Communication failure

This board will have inputs for local silence buzzer and LED test. The firemans PCB will connect directly to the current loop of the control panel.

5.63.7 Graphics Terminals

The system shall be capable of operating with colour graphic packages residing on personal computers. The personal computer shall connect directly to the control panel via a RS232 port or to the network via a RS232 node.

5.64 PROGRAMMING

Programming will be possible from the keypad at the front of the panel or by down loading data from a PC. All programming will be menu-driven and protected by access codes and memory lock. The programming will allow for at least the following functions:

* Programming Output Relays
* Programming Detectors
* Programming Inputs/Outputs
* Uploading/Downloading of configuration data

It will be possible to programme all the above also from a PC by down loading the information to the panel. This will allow the installer/user to have a copy of the complete systems programme in magnetic medium.

One way of programming will not exclude the other.
It will be possible at all times to upload the stored programme to a PC in order to maintain updates.

5.65 MAINTENANCE FUNCTIONS

The control panel shall provide extensive facilities to help with the general use and maintenance of the system. As a minimum the following maintenance facilities shall be available:

5.65.1 Automatic Monitoring

Every addressable device shall be continuously monitored by the control panel for the following:

a Removal of Device
b Quiescent Value
c Contamination
d Circuit Failure
e Device Type
f Communication Quality
g Short Circuit
h Open Circuit

Should any of the above parameters be out of specification the panel shall give a fault indication visually and audibly.

A description of the nature of the fault as well as the location of the faulty device shall also be displayed.

The control panel shall also monitor all loops for earth faults which shall be reported as described above.

5.65.2 Visual Monitors

It shall be possible to visually monitor, on a real time basis, the status of each device connected to the system.

Furthermore graphics screens shall be available for zones and individual sensors where the following may be visually monitored:

a Actual Value
b Average Value
c Maximum and minimum Values
d Contamination Levels
e Communication Quality

Each of the above screens shall be able to be printed on demand by means of a print screen facility.

5.65.3 Archive Facility

The control panel shall have an archive facility capable of storing the last 999 events. The events shall be stored on a first in, first out basis. It shall be possible to print these events selectively as follows:

a All Events
b Fire Events Only
c Fault Events Only
d Conditions/Maintenance Events Only
e Soak Test Results
f Actions (i.e. Reset/Sound Bells, etc.)
g Last *x* Events From a Given Date/Time

5.65.4 Statistics

The system shall be able to supply the following statistics per device:

a Maximum and Minimum Value with Data
b Average Value
c Number of Alarms
d Communication Quality

5.65.5 System Maintenance Reports

The following system maintenance reports shall be available on demand:

a Event Buffer Data
b Soak Test Results
c Test Reports
d Exception Reports

5.65.6 Service/Commission Mode

A service/commission mode switch shall be available to assist the installer with the commissioning and servicing of the system. In the service/commission mode all panel outputs shall be disabled in order to prevent false alarms from being raised during the servicing/commissioning of the system.

5.65.7 Zone Test Mode

The control panel shall be able to enter a test mode which will allow a one person walk test for up to 4 zones simultaneously. When in this mode, the control panel shall not operate any relays or alarms based on the data received from the zones in test. However, the panel will log all alarms occurring in these zones in order to generate a report at the end of the test period.

Should an alarm occur in any zone other than those being tested, then the panel is to respond to the alarm in the normal manner.

5.65.8 Sensor Test

A self-test feature shall be incorporated in all analogue sensors. The control panel shall initiate the self-test for each sensor and monitor the results obtained from each sensor. After the test is complete the control panel will evaluate the results and pass or fail each respective sensor. A printout of all sensors failing the test shall be provided.

5.65.9 Soak Test

Should problems be experienced with a particular sensor, it shall be possible to put that specific sensor into a soak test mode. The soak test feature shall provide the facility to monitor and log, at programmable intervals, all data received from the sensor under test for analysis at a later stage. In this mode the control panel shall not generate any alarms or faults based on the data received from a sensor in soak test mode.

5.65.10 Remote Maintenance

Remote maintenance of the system shall be able to be performed via modem connection to the network. All control panels on the network shall be able to be accessed remotely via the modem. Entry into the system shall be password protected and it shall be impossible to change any site configurable data without operator intervention at the respective control panel.
It shall be possible once connected to the site to:

a) Emulate any panel as if the operator were standing at the panel;
b) Upload/Download the site configuration;
c) Selectively retrieve all or parts of the event buffer.

The system shall also operate in Acentral station≅ mode whereby the panels may dial to a central station for fires, faults and conditions. The telephone numbers for the central stations must be configured in the panel. It shall be possible to dial different stations for fires and faults.

5.66 DETECTORS AND LOOP DEVICES

All automatic detectors must be formally approved by at least two (2) of the internationally recognised testing laboratories listed below:

* Underwriters Laboratories, USA (U.L.)
* Verband der Schass Versekerer, Germany (VDS)
* British Standards, Great Britain (BS)
* Loss Prevention Certificate Board, Great Britain (LPC)
* Underwriters Laboratories, Canada (ULC)

The detectors shall be suitable for connecting to a two-wire 24V central system and operate satisfactorily within the supply voltage range of 17V - 28V DC, and shall be polarity insensitive.

A *Red* indicator LED shall be provided on the detector which illuminates when the detector has reached a pre-set alarm level. The indicator shall be operated independently of the detector from the central control panel. The indicator shall illuminate when there is a fire in the building.

For detectors in false/suspended ceilings/ roof spaces/ airconditioning ducts, a remote *Red* indicating LED must be installed below the ceiling so that the condition of the detector can be monitored from below.

Allow to supply and install the visible alarm strobe lights in positions to be determined. The visible alarm strobe lights are to interact with the internal sounders and positioned as determined by the equipment offered.

The visible alarm strobe lights shall incorporate fire rated internal cones, typically *Mylar* cone or equal and approved type.

Provision shall be made for an output from the detector suitable for operating a remote indicator or other device with a current limitation of 4 milli amps. The output shall be operated independently of the smoke detector from the central control panel.

Data transmission to and from the control panel from the detector shall be via communications circuitry which is factory fitted to the detector by the original detector manufacturer and forms a complete and integral part of the detector.

The detector shall be supplied complete and fully tested and calibrated. All detectors shall come standard with a locking mechanism.

Separate mounting bases shall be required which enable ready removal of the detectors for maintenance. The fitting of a detector into a base shall be a simple one-hand operation without risk of damage to the base or detector. The detector shall click home clearly which will also be an indication that the detector is fitted correctly. The address of a base shall remain undisturbed and unchanged by the removal or replacement of a detector. The base shall be electronics free.

Each base shall be provided with a durable tag on which a number or mark is displayed which shall identify the address of the monitor. The bases shall be fitted with dual finger steel receptacles.

The unique address of the detector shall be set by the installer by means of a coded plastic card fitted to the detector base. The base shall be electronics free.

The detector shall be capable of being remotely tested from the control panel by the transmission of a 3-bit code. The control panel will raise a maintenance alarm should this test fail.

5.66.1 Ionisation Type Smoke Detector

The ionisation smoke detectors shall be suitable for detecting invisible products of combustion as well as visible smoke and be of the dual chamber single-sided source type to provide good stability in changing environmental conditions.
The radioactive source shall be Americium 241 mounted in such a way that it is mechanically secure. The device shall have been certified by the Atomic Energy Board or a similar board if so required.

The detector shall be capable of operating within the following environmental limits:
Temperature operating range: -20 degrees Celsius to +60 degrees Celsius
Humidity operating range: 0% to 95% RH (no condensation)
Wind resistance: Up to 10 metres per second

The construction of the detector and bases shall be in white self-extinguishing polycarbonate plastic. All circuitry must be protected against moisture and fungus. Smoke entry points must be protected against dust and insect ingress by corrosion resistant gauze. The detectors must be unobtrusive when installed, having a dimension not exceeding 50mm x 100mm diameter maximum including the mounting base. The detector shall be capable of protecting an area up to 100m5 at a height of up to 12m. The installation and siting of the detectors must conform to BS 5839 1988 or similar standards.

5.66.2 Optical Smoke Detector

The photoelectric (optical) smoke detectors shall be suitable for detecting visible smoke such as is produced by slow smouldering fires including burning PVC.
They shall be of the light scattering type using a pulsed internal LED light source and a photo-diode sensor.

The detector shall be capable of operating within the following environmental limits:
Temperature operating range: -20 degrees Celsius to +60 degrees Celsius
Humidity operating range: 0% to 95% RH (no condensation)
Wind: Not affected

The construction of the detector and bases shall be white self-extinguishing polycarbonate plastic. All circuitry must be protected against moisture and fungus. Smoke entry points must be protected against dust and insect ingress by corrosion resistant gauze. The optical chamber must be of conductive plastic and have a snap-lock fit for ease of removal when cleaning. The detectors must be unobtrusive when installed, having a dimension not exceeding 50mm x 100mm diameter maximum including the mounting base.
The detector shall be capable of protecting an area up to 100 sq. meters at a height of up to 12m. The installation and siting of the detectors must conform to SANS 10139 or similar standards.

5.66.3 Heat Detectors

The device shall monitor ambient temperature by means of an NTC thermistor.
The detector shall be capable of operating within the following environmental limits.

Temperature operating range: -200C to + 600C
Humidity operating range: 0% to 95% RH (no condensation)
Wind resistance: Unaffected

The construction of the detector and bases shall be in white self-extinguishing polycarbonate plastic. Full circuitry must be protected against moisture and fungus. The detectors must be unobtrusive when installed, having a dimension not exceeding 50mm x 100mm diameter maximum including the mounting base.
Each detector shall be suitable for protecting an area up to 50m5 at a height of up to 7,5m. The installation and siting of the detectors must conform to SANS 10139.

5.66.4 Manual Call Points

The call point shall be manufactured from self-extinguishing red polycarbonate plastic.

The overall size of the call point shall not exceed 87mm x 87mm x 52mm.

The call point shall be based upon a standard product manufactured by a reputable call point manufacturer. The manual call point shall then be modified by the manufacturer of the heat and smoke detectors to incorporate a communications module within the call point. No external alterations to the call point shall be made other than the fixing of a flush mounted LED to be located to the right of the word *Fire*, which shall appear in black letters across the top of the call point on the vertical face. The LED shall be red in colour.

The LED shall illuminate when the call point is activated. However, the illumination of the LED will be by command from the control panel.

Manual call point units shall be protected against ingress of dust and water to IP65, if so required. A unit mounted outside buildings shall be provided with a hood mounted over the unit.
A call point shall be addressable and compatible with the central control panel. The unit shall be provided with a means of testing. It shall be capable of responding when polled by the fire panel by transmitting its address and status code. It shall be capable of handling the central control panel poll rate.
The call point shall be polarity insensitive and shall be capable of operating by means of a 2-wire looped system.
The communication module will incorporate a special interrupt facility, which shall override any other data transmissions taking place in order to inform the central panel that the manual call point has been activated.

5.66.5 Loop Isolators

The loop isolator shall be designed to connect into the loop circuit and monitor the loop for short circuit. In the event of a short circuit occurring the loop isolators on each side of the short circuit are to disconnect and isolate that portion of loop from the system enabling the remainder of the system to function normally.

A light emitting diode (LED) must illuminate when an isolator is in an open condition.

5.66.6 Additional Auxiliary Units

Provision of the following additional auxiliary units shall be made for possible connection to the system:

5.66.6.1 Input/Output Unit

The input/output unit shall provide a programmable voltage-free, single pole, change-over relay output; a single, monitored switch input and an unmonitored, non-polarised opto-coupled input.

The unit shall be loop-powered and operated at between 14-28 VDC.

The output relay rating shall be 1Amp at 30 VAC or DC maximum.

A flush mount and surface mount version shall be available with maximum dimensions 150x90x48mm.

5.66.6.2 Output Unit

The unit shall be loop powered and operated between 14-28 VDC

A flush mount and surface mount version shall be available with maximum dimensions 150x90x48mm.

5.66.6.3 Switch Monitor Unit

5.66.6.4 Switch Monitor Plus Unit

5.66.6.5 Mini Switch Monitor Unit

5.66.6.6 Mini Switch Monitor (Interrupt)

5.66.6.7 Sounder Control Unit

5.66.6.8 Loop Powered Sounder

5.66.6.9 Gas Discharge Control Units

5.67 SOFTWARE CONTROL

In order to ensure the reliability of the system, the following requirements for software design shall apply:

* The software shall have a modular structure.
* Measures shall be included in the programme to prevent the occurrence of a deadlock in the system.
* The execution of the programme shall be monitored.
* The memory contents containing programme and configuration data shall be checked automatically at intervals not exceeding 1 hour.

5.67.1 Operating Programmes

All executable code and data shall be held in memory which is capable of continuous, reliable, maintenance free operation, for a period of at least 10 years. The programme shall be held in non-volatile memory which can only be written to at access level 4.

5.67.2 Configuration Data

The site-specific data shall be protected against power loss by a back-up energy source which can only be separated from the memory at access level 4. The back-up battery shall be capable of maintaining the memory contents for at least 5 years.

5.68 POWER SUPPLY AND CHARGER UNIT

The power supply and charger unit shall form an integral part of the control unit and shall operate from mains power of 230V ± 10%.
Each power supply and charge unit shall contain over-voltage protection to prevent any malfunction or damage due to power line surges.

In the event of a failure of the normal mains supply to the central panel, there shall be an automatic switch-over to the standby battery supply without disturbing the sound operation of the fire detection system.
The control panel shall be able to house the standby battery of nominally 24V DC rated to maintain operation for a minimum of 24 hours of which at least 1 hour is at alarm status.

The standby battery shall be automatically maintained in a charged condition by the charger unit.
When the AC power is restored the power supply shall automatically revert to battery power and the system shall remain fully operational.
The power supply and charger unit, including all fuses, shall be entirely supervised. Any malfunction or blown fuse shall result in a fault indication on the control panel.

5.69 THE EVACUATION INSTALLATION GENERAL SPECIFICATION

The Evacuation Installation shall consist of a Fire Telephone System supported by a general Microphone / Fire Speaker System (PA System) and communicate direct to the 24Hr room Fire Telephone installed in the Existing Main Entrance to the Hospital (ERR Room)

Generally the Evacuation Installation shall be fire rated to the same specification level as the Fire Detection Installation. The installations shall be wired with fire retardant conductors throughout consisting of armoured cable and conductors in conduit, etc.

The Fire Telephone installation shall consist of ***Red*** Fire communication devices as supplied by Messrs AIPHONE INTERCOM or equal and approved type and manufacture. The Main Master Control Unit has been in the ERR Room, and separate intercom handsets installed in the positions shown.

The Microphone / Fire Speaker System shall consist of the Main Microphone System Amplifier, Zone Selector Panel, Tape Deck and Microphone installed in the ERR Room and Microphone Sets with Sub Amplifier and Speakers installed in the various zones comprising the Existing West Block

The provisional position of equipment to be installed in the ER Room has been shown on drawing SL 231 – FESP1.

The Fire Telephone and Microphone/Sub Amplifier sets to be installed in positions in the buildings shall be housed in flush mounted enclosures as per specification.

5.69.1 The Fire Telephone Installation

Allow to supply and install ***Red*** telephone sets consisting of the Main Master communication devices at the Entrance to the Psychiatric Building and for each Zone ie 8 x zones. Refer Layout Drawings SL 231 – FE1, FE2 and FE3

The device shall be a 20-Call Master unit comprising the Main Intercom System unit made up of primary and add on selection modules as required.
The device to be installed at the entrance shall consist of the instrument chassis and body shell with telephone microphone handset on a coil cord, built-in speaker unit, tone, LED call in and transfer button for connecting direct to the set in the ERR.

The sub fire station sets shall be wall mounted ***Red*** case Fire Alarm Hand Sets complete with built-in speaker connecting central push-buttons to master set and microphone handset on a coiled cord.

5.69.1.1 Sub Fire Station Enclosure

To be installed in the ERR Room at the Entrance to the Psychiatric Building.

Note: Housing both the Field Fire Telephones and the Microphone/Amplifier Zone set.

The sub fire station enclosure is to be flush-wall-mounted as specified, housing sub fire telephone and adjacent mounted microphone /amplifier set. Refer detail drawing SL 231 – FE2

The approximate provisional dimensions of the enclosure is 400mm wide x 400mm high x 200mm deep.

The enclosure is to be installed with in accordance with the information indicated on the Room data sheets.

The enclosure shall be arranged with Fire Telephone set on the left and Microphone /Amplifier set equipment on the right.

The enclosure shall be manufactured from 3CR12 metal, derusted, primer coated and painted with two coats of high gloss enamel paint - Fire Red in colour.

The Fire Telephone sections of the enclosures shall be provided with a resettable unit and Suitably engraved.

5.69.1.2 Fire Telephone Communication Network and Wiring

Fire Telephone communication wiring shall consist of Fire Retardant Armoured cable installed on cable tray routed from the Main Master Fire Phone set to the separate telephone station and fire retardant cable in conduits in the building.

The cable shall be 1,0mm² 10 pair multicore fire retardant armoured cable.
Cable in conduits shall be 1,0mm² 4 pair fire retardant cable.

The sub station shall be connected to the master station by means of two separate conductors.

5.69.1.3 Power Supply to Fire Telephone System

Allow to supply and install a power supply module for the Fire Telephone System.

The power supply module shall provide AC or DC power at the required system voltage, sized with 25% spare capacity at maximum working load.

The power supply shall be connected to the Essential Power supply.

5.69.2 Fire Evacuation System Installation

Allow to supply and install the System as specified.

The System installation shall consist of the equipment installed at the Entrance to the Building and at each of the Main Zone Call Stations

The equipment to be installed at the Entrance to the Building to consist of the Main System Amplifier, desk mounted Microphone set, Zone Selector unit, Flash Drive Reader and Power Supply module.

The Evacuation System shall be used in conjunction with the fire telephones during fire conditions.

The Microphone sets in zones shall share the dual purpose enclosures, as specified for the installation of Fire Phone sets.

5.69.2.1 The Main Evacuation System Amplifier

The Amplifier shall be installed in a suitable enclosure at the Entrance to the Building Room.The Amplifier shall be of modular design installed in a wall mounted enclosure.

The Controls of the Amplifier shall all be on the front face with power supply, input and output connections on the back of the unit.

The Amplifier shall be rated so that it can be used to drive eventually all the speakers in the Building. Allow for 20 Speakers and the Fire Microphone/Speaker System complete with all the auxiliary equipment.

The Amplifier shall be a 100 Volt line supply unit.
The Amplifier shall have a frequency response of 20 Hz - 20 kHz.

The distortion shall be less than 1% at the rated output of 1000 Hz and sound to noise ratio of less than 60 dB.

The output of the Amplifier shall be protected by means of a rated fuse cartridge installed in a fuse cartridge holder, easily accessible in the event if replacement is necessary.
The output circuit should not be damaged if the output load is changed either open circuited, short circuited or if one of the output conductors are earthed.
The Amplifier shall be provided with inputs for Microphone, Pre-recorded message communication from the Flash Drive Reader and Fire Siren Signal.

The Amplifier must support an All Call Fire Message to all zones and future separate selection via the zone selector unit.

5.69.2.2 Future Zone Selector Unit

Provision for a Future Zone Selector Unit shall be allowed in order to accommodate the equipment for the zone selection of 2 zones.

5.69.2.3 The Desk Mounted Microphone Unit

The Microphone Unit shall be installed adjacent to the Amplifier.
The Microphone shall be desk mounted on a suitable desk bracket.
The Microphone shall have its own switch incorporated with the mounting bracket.
The Microphone unit shall be a paging dynamic uni-directional type, designed for the system application.
The Microphone shall ensure distortion free speech, free from any outside interference.
The Microphone shall be selected so that normal speech via the amplifier to speakers shall be driven to an acceptable audio level.

Take note that although acceptable audio levels are between 70 to 80 dB depending on the level of background noise, additional sound levels will be required.

5.69.2.4 The FLASH DRIVE (FD) Reader Unit

The FD Reader Unit shall be installed adjacent to the Microphone /Amplifier set and communicated direct via appropriate input/output ports.

The FD Reader shall be front loading with all controls on the front face.

The FD Reader shall accept standard 30 to 60 minute Flash Drive..

The FD Reader shall be quick and quiet in operation with Dolby Multi Head System quality, Auto tape tuning, Quartz DD, with Auto tape selector, Auto fade system, Rec. Cancel, Auto mute, Electronic time/tape counter, Micro-computer logic control, Intro scan, Memory auto play, and including all normal features to ensure FD operation, i.e. Lap Top, eject, fast forward and auto reverse to ensure continuous playing of pre-recorded messages and/or music.

The Unit shall also incorporate Random Programme Search system programmable to play back selected sections of the FD Reader.

Normal frequency response shall be within 3 dB for frequencies between 50 - 15000 Hz.

The intercommunication cables shall be concealed so that no exposed wiring is evident.

5.69.2. The Fire Alert Loudspeakers

Allow to supply and install the Fire Alert Loudspeakers in the positions shown on the layout drawings.

The speakers shall be installed on a 110 Volt line system. Each speaker shall be equipped with a high quality 110 Volt line compatible transformer. The transformer shall have tap settings so that a selection of taps will allow the optimum sound pressure level for a given loudspeaker position.

The speakers shall have a fire rating, the cone part of the speaker shall be the *Mylar* type, or similar fire rated type.
The Loudspeakers generally are to be installed on to suspended ceilings.
Where no ceilings exist the speakers are to be installed into surface mounted enclosures.

Loudspeakers in ceilings shall be of the ceiling mounted type installed into openings cut neatly into the tiles. Ceiling mounted speakers shall incorporate a round architrave type overlapping rim so that no side gaps or openings will be visible from bottom looking up to the speaker units.
The visible part of the speaker units shall be approximately a maximum of 200mm in diameter, and made from high impact durable white plastic.

Suspended ceiling mounted speakers shall not protrude more than 200mm deep into the ceiling space.

Surface mounted speakers shall be installed in high quality timber enclosures with speakers of similar appearance to flush mounted speakers.
Surface mounted speakers shall not protrude more than 200mm below the ceiling level.

Horn Speakers may be installed in the maintenance sections of the workshops and plant room areas.
The speakers selected must provide exceptional sound quality with a frequency response of not less than 130 - 12000 Hz.

The minimum allowable Sound Pressure Level shall be 92 dB at 1m.
It must be noted however that depending on the design of speakers, the acoustical design of ceilings, the physical architecture and layouts as a result of client accommodation requests, the best acceptable positions for speakers may vary and that in order to achieve optimum design, re-arrangement of layouts may be necessary and must be made accordingly.

Any variations which may be forthcoming as a result of equipment to be provided must be brought to the attention of the consulting engineer, who is to be advised so that the revision can be implemented prior to installations on site.

The Loudspeakers are under normal circumstances to be driven from the Main Amplifier in the ERR Room and, if required during fire conditions, driven in each zone from individual zone amplifiers.

5.69.3 Microphone/ Amplifier Zone Sets

Allow to supply and install the Microphone/Amplifier zone sets in the positions shown on the layout drawings.

The Microphone/Amplifiers are to be installed into the Sub Fire Station enclosures adjacent to the Fire Telephone sets. Also refer to the Detail Dwg. SL 231 – FE2

It must be noted that the Zone Microphone is to operate independently using the local Zone Amplifier Unit. When the unit is not in use the speakers shall be driven from the Main Amplifier in the ERR Room.

When an individual Zone Microphone is used the spring return switch mechanism on the unit shall allow the Zone Amplifier to drive the Speakers only in that specific zone.

The separate zone amplifiers shall be the same manufacture, standard and technical quality as specified for the Main 24 hr Amplifier Unit.

The size of the unit, to be used as zone amplifiers, shall be as selected for the applicable number of speakers, etc. for each zone.

The Microphone Switching Mechanism is to incorporate the LED indicating lights specified in order to show the in use mode of operation.

Allow to supply and install 2,5mm² 3-core fire rated armoured cable for the distribution of the UPS to individual zones for Microphone/Amplifier Zone sets.

5.70 UNINTERRUPTED POWER SUPPLY (UPS)

Allow to supply and install an Uninterrupted Power Supply Unit (UPS).

The unit is to be installed for the Main Panel in the Security Office, First floor Psychiatric Ward Building

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The unit shall be installed on to a suitable free-standing base 200mm above the floor level.

The free opening below to allow for ventilation and easy cleaning of the floor.
The unit shall be installed adjacent to the Microphone / Fire Speaker System.

The power supply to the UPS shall be by means of a supply from the Energy Standby Generator Set (Essential Power Supply).

The UPS unit shall provide an uninterrupted power supply to the Main Control Panel to be installed in the office and the installation for the following services:

a) The Fire Evacuation Telephone System
b) Fire Loudspeaker/ Strobe Light System

5.70.1 UPS Equipment Specification

The UPS shall consist of a 5 kVA capacity unit (provisionally) rated supply output at 0,7 Ind PF to provide 30 minutes standby at full load.

Depending on the equipment to be installed the above size may be reconsidered before actual installation on site.

The unit shall operate from a Single Phase Input Supply and provide a Single Phase Output Supply to the adjacent equipment.

The input supply shall be 230 Volt 3 Phase 50 Hz.
The rated output voltage shall be 230Volt 50 Hz Single Phase.
The input to output efficiency at full load shall not be less than 90%.

The UPS shall be supplied with maintenance free sealed Lithium Iron batteries with an anticipated life span of not *less* than three years.

5.70.2 Cabinet

The UPS shall be housed in a compact self contained rigid cabinet installed on to suitably selected vibration mountings.

The cabinet shall be structurally sound with no visible distortion while lifting the unit including the internal equipment.

The cabinet shall allow access for ease of maintenance.
The cabinet shall be provided with a digital display panel.

5.70.3 Operation

The operation shall comprise of a conventional double conversion design.

The mains input is to be converted to DC power via a rectifier/charger circuit and the DC in turn converted back to AC via an inverter.

The battery is to be connected to the DC line and kept charged via the rectifier/charger unit.

During normal operation the output from the unit is to provide a clean and regulated supply.
During Mains Failure power is to be supplied from the Battery via the inverter providing an uninterrupted power supply.

During Mains Failure Supply conditions, the output shall contain the same characteristics as the normal power supply.
The output voltage during mains failure to remain sinusoidal with minimum harmonic distortion.
At the stage when Mains are restored the system is to return to normal and battery bank recharged.

5.70.4 Bypass Operation

Should UPS failure occur or when the load is measured to beyond the designed and adjusted maximum output a static bypass is to transfer the load back to the Mains Supply without interrupting the critical load.
After switching to bypass operation the UPS system is to automatically monitor the critical load until conditions return to normal and subsequently return to mains operation.
The bypass function shall also operate if the output voltage falls to below a pre-set level by transferring the load back to the Mains.
A manual bypass switch must also be provided to enable isolation of the complete UPS Unit for maintenance purposes.

5.70.5 Protection Circuits

The UPS unit shall be fully protected against internal and external faults by means of circuit breakers and fast acting fuses.
The battery shall be protected against overcharging by a DC detection circuit that isolates the charger circuit should the DC voltage exceed a certain critical safety level.
The following switchgear shall be provided: Input circuit breaker, output isolator, bypass switch and fused isolator for batteries.

5.70.6 Digital Display

The digit display shall consist of a 20 character, 2-line digital display providing simultaneous information for input voltage, output current, output frequency and DC voltage.

The display shall indicate and incorporate an alarm if a fault has been detected.

The alarms to be monitored shall be as follows:

- High - DC shutdown
- UPS Overload
- Battery discharging
- Low DC shutdown
- Battery critical
- Load on bypass
- Over temperature
- Input out of limits

5.70.7 Remote Monitoring

The following voltage free contacts shall be provided for connection to a remote alarm panel: -

- DC shutdown
- UPS overload
- Battery discharging
- Low DC Shutdown
- Battery critical
- Load on bypass
- Over temperature

5.70.8 Maintenance Free Batteries

Maintenance free sealed batteries shall be installed as an integral part of the Cabinet and installation.

The basic battery specification will comprise of the following:

5 kVA	-	16 x 12 Volt Batteries : 96 cells
V Float	-	432 V
V Min	-	336 V
Maximum DC discharge current	-	22.6A
Maximum DC Power	-	7.6kW
Maximum charging	-	2.0A

5.70.9 Lightning Protection

The Lightning Protection Specification shall include that the UPS is designed to withstand standard test pulses of up to 6kV .

5.70.10 Service Manuals

Four complete sets of operating instruction and maintenance manuals must be provided for the UPS, as well as for the Power Supply and backup batteries.

5.70.11 Maintenance

Maintenance instructions for all components of the UPS including trouble shooting guide, part numbers of all replacement items, etc.

5.70.12 Guarantees

The Contractor must allow to service and maintain the UPS installation for a period of 12 Months. During the 12 month guarantee period the Contractor shall make good any defects due to inferior materials and workmanship and maintain all equipment in perfect working order.

5.71 TRAINING

Training of personnel must be undertaken as described in the Description of Works section of this document.

Full training of personnel for the Fire Detection and Evacuation Systems must be provided.

5.72 TEST AND INSPECTIONS

The Contractor shall at his own cost make all necessary arrangements and provide all necessary facilities, tools and equipment, for tests and inspections of the installation by any authorities concerned and by other relevant parties as approved by the Director.

The execution of these tests shall be to the complete satisfaction of the inspecting authorities.

5.73 COMMISSIONING

All systems shall upon completion be thoroughly tested to ensure conformity with the Specification.

Testing and adjustments shall be done by an experienced competent Commissioning Engineer/Technician aux fait with all electrical and mechanical aspects of the works in conjunction with a Commissioning Engineer representing the Fire Detection and Evacuation Equipment Supplier. The same person(s) shall be available on site to demonstrate the correct operation of the systems at take-over and instruct the representatives of the Client in the operating of the system.

Prior to the pre-take-over inspection, the Contractor shall submit to the Engineer copies of such measurements recorded during the commissioning (preliminary tests) of the systems as specified herein or required by the Engineer to satisfy himself that the systems have been properly commissioned. The date on which the measurements were made as well as the name(s) of the person(s) who carried out the test(s) shall be included.

A pre-take-over inspection attended by the Contractor and the Engineer shall be carried out at least one week prior to the official take-over.

The Engineer reserves the right to deduct from the Contract amount, any costs reasonably incurred by himself and/or his agent(s) arising out of any additional pre-take-over and/or take-over visits, needs to repeat inspections cancelled because of defects, incorrect commissioning or non-attendance at appointments properly made for the purpose.

The Engineer will not certify completion of the Contract works until all contractual obligations required in terms of this Contract, excluding those on-going requirements during the guarantee period, have been fulfilled by the Contractor. This includes submission of an approved Operating and Maintenance Manual and Aas-built≅ drawings, these to be handed to the Engineer at least one week prior to official take-over.

5.74 OPERATING MANUALS

Four complete sets of operating manuals shall be supplied by Contractor to the Engineer.

Manuals must be in English and compiled in laymans language.

At least one month before commissioning, two draft copies shall be submitted to the Engineer for comments and approval. Operating manuals as specified shall be supplied to the Engineer prior to first delivery.

Operating Manuals shall give a clear description of the purpose of the installation, and shall contain the following as a minimum:

(a) Complete set of adequate drawings with all wiring diagrams

(b) Detailed description of the different components used in the installation.

(c) On- and off switching procedures.

(d) Routine testing information and requirements

(e) Detailed instructions for procedures to be followed during fire alarms

5.75 MAINTENANCE MANUALS

Four complete sets of maintenance manuals (Technical) prepared in English shall be supplied by the Contractor.
At least one month before commissioning a draft copy shall be submitted to the Engineer for comments and approval.
Maintenance manuals shall consist of the following:

(a) A general description of the system

(b) A general description of the controls

(c) Schedule of equipment installed

(d) Spare parts lists

(e) Detailed monthly, quarterly, semi-annually and annually preventative maintenance procedures.

(f) Copies of final commissioning data

(g) Pamphlets and information relating to the equipment installed, with names of agents and suppliers.

(h) Name, address and telephone number of Contractor and after-hours service

(i) Faults tracing procedures

(j) Wiring diagrams

Manuals shall be bound in a firm hard cover.
The information shall be clear and readable and supplied with an index.
Following approval the abovementioned manuals shall be available at first delivery. Delivery of the installation will not be accepted without the manuals.

5.76 FIRST DELIVERY AND AS BUILT DRAWINGS

Pre-first delivery inspection by the Representative shall commence once all testing and snagging by the Contractor have successfully been completed.

The Contractor shall submit a set of As Built drawings for the completed Fire Detection and Evacuation Installation, certified and signed as correct, when the installation is completed. A set of paper prints will be supplied to the Contractor for this purpose.

All Test Certificates and a completed As Built drawing showing the basic conduit installations shall be handed to the Engineer before First Delivery can be taken.