

SIDINGULWAZI PRIMARY SCHOOL

ELECTRONIC SERVICE SPECIFICATIONS

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SECTION A: DETAIL TECHNICAL SPECIFICATIONS

A.1 SCOPE OF WORKS

1. GENERAL

This Detail Technical Specification **Section A** of this document shall be read in conjunction with the Specification in **Sections B to G** of this document and shall apply unless otherwise indicated in this section.

Should there be any conflict between any parts of this document then sections shall be considered in the following order of priority:

Detail Specification
Drawings
Bill of Quantities
Standard Specification

2. SITE LOCATIONS AND CONDITIONS

The site is situated in the uMbulwane Township, outside of Ladysmith, in the Alfred Duma Local Municipality within the Kwazulu-Natal province.

The site is subjected to the following prevailing conditions:

Maximum ambient temperature	-	35° C
Minimum ambient temperature	-	0° C
Relative humidity	-	81 % at maximum temperature
Altitude	-	±1010m above MSL

Equipment shall be rated for site ambient conditions, as heating and air-conditioning is not necessarily installed.

3. SCOPE OF WORK

Supply, delivery, installation and commissioning of the complete service as specified in this document.

Electronic Services include the following installations:

- Fire Detection and Evacuation

- Public Address
- Security & Intrusion Detection
- TV Reticulation
- ICT infrastructure
- CCTV

4. CO-ORDINATION

The contractor shall familiarise himself with the requirements of the other trades and shall examine the plant and specification covering each of these sections.

The space requirements shall be carefully checked with the other trades to ensure that the equipment can be installed in the proper sequence in the space allocated.

5. TEST CERTIFICATES AND INSPECTIONS

The following tests are to be carried out:

- (a) After completion of the works and before first delivery is taken, a full test will be carried out on the installation for a period of sufficient duration to determine the satisfactory working thereof. During this period the installation will be inspected and the contractor shall make good, to the satisfaction of the Engineer, any defects which may arise.
- (b) The Contractor shall provide all instruments and equipment required for testing and any water, power and fuel required for the commissioning and testing of the installation at completion.
- (c) Test reports of both tests as specified under (a) and (b) are to be submitted to the Department.

6. GUARANTEE AND MAINTENANCE

The Contractor shall guarantee the complete installation for a period of twelfth months after first delivery has taken place.

If during this period the plant is not in working order, or not working satisfactorily owing to faulty material, design or workmanship, the Contractor will be notified and immediate steps shall be taken by him to rectify the defects and/or replace the affected parts on site at his own expense.

The Contractor shall maintain the installation in good working condition for the full twelfth month period to the final delivery of the installation. However, should the Contractor fail to hand over the installation

in good working order on the expiry of the specified twelfth months, the Contractor shall be responsible for further monthly maintenance until final delivery is taken.

During this period the contractor will undertake to arrange that the installation be inspected at regular intervals (whatever number of visits the contractor deems necessary to fully maintain the equipment) by a qualified member of his staff who shall: -

- (a) Check the mechanical soundness of all parts
- (b) Check and adjust all the output and control values of the system
- (c) Take control measurements on the major system components and record these measurements.
- (d) Replace all defective components.
- (e) Service batteries.
- (f) Clean all equipment as required.
- (g) Provide 24 hour standby maintenance and repair service at all times, including statutory holidays.

Note: At each visit, which shall be arranged in advance with the client's representative, a record of maintenance carried out shall be kept. The time and date of visits shall be entered in a logbook, which shall be kept at Reception.

7. MATERIALS AND WORKMANSHIP

- (a) The work throughout shall be executed to the highest standards and to the entire satisfaction of the Engineer who shall interpret the meaning of the Contract Document and shall have the authority to reject any work and materials, which, in his judgement, are not in full accordance therewith. All condemned material and workmanship shall be replaced or rectified as directed and approved by the Engineer.
- (b) All work shall be executed in a first-class manner by qualified tradesman.
- (c) The Contractor shall warrant that the materials and workmanship shall be of the highest grade, that the equipment shall be installed in a practical and first-class manner in accordance with the best practices and ready and complete for full operation. It is specifically intended that all material or labour which is usually provided as part of such equipment as is called for and which is necessary for its proper completion and operation shall be provided without additional cost whether or not shown or described in the Contract Document.
- (d) The Contractor shall thoroughly acquaint himself with the work involved and shall verify on site all measurements necessary for proper installation work. The Contractor shall also be prepared to promptly furnish any information relating to his own work as may be necessary for the proper installation work and shall co-operate with and co-ordinate the work of others as may be applicable.

- (e) All components and their respective adjustment, which do not form part of the equipment installation work, but influence the optimum and safe operation of the equipment shall be considered to form part of, and shall be included in the Contractor's scope of works.
- (f) All control equipment and serviceable items shall be installed and positioned such that they will be accessible and maintainable.
- (g) The Contractor shall make sure that all safety regulations and measures are applied and enforced during the installation and guarantee periods to ensure the safety of the public and the User Client.
- (h) The Contractor is to include for all scaffolding required to complete the work required.

8. SUBMITTALS

The following information must accompany the tender documents.

- (a) The information requested in the schedule of information.
- (b) If alternative systems are offered, a clear description of the operating characteristics and special features of the equipment along with a motivation for offering the alternative.

The following information may be required for the tender evaluation, and tenderers shall submit the information if asked.

- (c) A paragraph by paragraph schedule of compliance with detailed description of any deviations from this specification.
- (d) Descriptive and illustrated brochures and other information.
- (e) Installation and wiring diagrams.
- (f) Any additional information requested.
- (g) a list of successful installations completed in the Republic of South Africa.

9. DRAWINGS AND VERIFICATION OF POSITIONS

The drawings generally show the scope and extent of the proposed work and shall not be held as showing every minute detail of the work to be executed. The position of all items of electrical equipment indicated on the drawings shall therefore be taken as approximate.

Sidingulwazi Primary School **SECTION A**

All positions of electronic services outlets are shown on the lighting and power layouts. The position of outlet that may be influenced by built-in furniture must be established on site, prior to these items being built in.

The Contractor shall ensure that the positions of items do not conflict with other equipment and/or fixtures and, if in doubt, decisions shall be obtained from the Department's representative.

The following drawings are issued with these Bills of Quantities for pricing purposes.

Site Layouts	
DNA-E--ST-02	SITE Lightning Protection
DNA-E--ST-03	SITE Lighting and Electronic Services
DNA-E--ST-04	SITE Solar PV Installation
Plan Electrical Layouts	
DNA-E--LP-01	Block A – Ground Floor & First Floor: Lighting and Power Layout
DNA-E--LP-02	Blocks B, C & D – Ground Floor: Lighting and Power Layout
DNA-E--LP-03	Blocks B, C & D – First Floor: Lighting and Power Layout
DNA-E--LP-04	Block E: Lighting and Power Layout
DNA-E--LP-05	Blocks F, G & P: Lighting and Power Layout
DNA-E--LP-06	Block H: Lighting and Power Layout
DNA-E--LP-07	Blocks J & K: Lighting and Power Layout
DNA-E--LP-08	Blocks L, M & N: Lighting and Power Layout

Where reference is made in the Bills of Quantities to respective drawings, the drawings shall be taken and read together with the particular bill items concerned and the rates and prices shall include for providing all labour, materials, equipment, services and for performing all operations required for the complete installation of the items described and shown on the drawings.

10. PHASING OF WORK

The work shall be carried out in Phases as follows:

- Phase 1: The construction of the new Classroom Blocks, namely Blocks A, B, C, D, E, F and G.
- Phase 2A: The school will move into the newly constructed buildings, and the existing prefab buildings and Grade R ablutions will be demolished or moved off site.
- Phase 2B: The construction of the Grade R classrooms (Blocks L and M) and the ancillary buildings, including the Admin Block (Block K), the SNP Kitchen (Block J), Team Teaching (Block H) and the gatehouse (Block N), refuse area and parking.
- The conversion of the existing Grade R classroom into three standard classrooms, the construction of the play field and landscaping.

11. WORK UNDERTAKEN BY OTHERS

All wireways, trunking, conduit and conduit boxes will be supplied and installed by the electrical subcontractor.

It may be necessary for services to share trunking and junction boxes.

Power points will be provided by the electrical subcontractor. These shall be rated at 230V. All positions are to be verified by the electronic services subcontractor prior to commencement of the project.

12. PROGRAM & COMPLETION TIME

The Electrical installation is required to be commissioned in conjunction with the building contract.

The Sub-Contractor shall be required to work strictly in accordance with the Principal Contractor's Building Program and to ensure that all items and materials are procured timeously.

13. COORDINATION, LIAISON & ATTENDANCE

- a) Care has been taken to avoid clashes between the services in the design stage and the Sub-Contractor shall be required to stay within allocated zones as indicated on the drawing. Should any clashes occur, this shall be immediately brought to the Engineer's attention.
- b) The sub-contractor shall liaise with the electrical sub-contractor with regard to conduit routes and outlet positions.

14. REGISTRATION

The Fire Detection and evacuation sub-contractor, as well as the person overseeing the works, shall be registered with the South African Qualification and Certification Committee for the Fire Industry, and shall provide SAQCC-Fire Detection registration numbers.

The sub-contractor supplying and installing the CCTV systems, Intrusion Detection systems and the Access Control systems shall be registered with PSiRA, and shall provide a registration number. The person overseeing the works shall also be registered, and shall provide a registration number.

B FIRE DETECTION & ALARM**1. OVERVIEW**

The fire alarm system shall be Type **Ziton** or similar and approved

The fire alarm system shall be an analogue addressable type. It shall be designed, installed, tested and subsequently maintained in accordance with British Standard BS5839 Pt 1 by competent fire systems professionals. It is assumed throughout the specification that the equipment is configured to and performs within the requirements and recommendations set out in BS5839 Pt1 and that local codes of practice and regulations are taken into account.

The fire detection system shall consist of one or more fire alarm control panels and multiple fire alarm field devices distributed throughout the protected area. Field devices are connected to panels by 2-wire loops which provide power and enable communication. Field devices include fire detection, fire alarm and control devices.

A fire alarm panel continuously monitors the status of all fire detection and initiating devices and on determining a fire alarm condition shall indicate the source of the fire and automatically initiate pre-programmed alarm and control actions.

All of the fire alarm control panels shall be network capable to enable them to be interconnected to operate as a single fire alarm system. Network functionality must never impair the ability of any panel to operate as a standalone system together with its associated field devices.

The fire alarm control panels and fire detection devices shall all be from a single manufacturer in order to achieve a single source of responsibility for equipment performance and compatibility. Two or more providers of installation, commissioning and maintenance services must be available in addition to (or instead of) the manufacturer and have the full support, training and authorisation of the manufacturer in this respect.

2. COMMUNICATION BETWEEN PANEL AND FIELD DEVICES

Each two-wire circuit shall be configured as a class A closed loop supporting up to 127 devices. Loops shall be monitored for both short circuit and open circuit faults. For the sake of flexibility the system shall support tee-offs with full monitoring.

The control panel shall feed both ends of the loop so that in the case of a single open circuit fault all devices on the loop continue to operate correctly. Loop isolator devices shall be installed such that in the case of a single short circuit fault no more than 20 devices are disabled.

Each device shall have its own unique address on the loop which identifies it to the control panel. There shall be no preset order for addressing the devices on a loop. The devices shall be addressed appropriate to site conditions, not according to their order on the loop.

The control panel shall communicate with every device on its loops not less than once every three seconds. The analogue sensor value of any detector shall be available for a maintenance level operator to view in real time from the control panel.

Loop devices shall draw power for operation from the loop. The loops shall provide sufficient power to operate at least 40 loop powered sounders. A loop load calculator tool shall be provided for checking that the devices connected to a loop do not exceed the permitted load.

2. FIRE ALARM CONTROL PANEL

The Fire Alarm panel shall be type ***Ziton ZP3 2 Loop analogue control panel***, 230V, or similar and approved.

The fire alarm panel shall comply with the standard EN54-2 and be certified as such by the Loss Prevention Certification Board (LPCB) in the UK or an equivalent European national testing laboratory. The certificate shall include the options with requirements: 7.8, 7.9, 7.10, 7.11, 7.12, 7.13, 8.3, 8.9, 9.5, 10.0, and 11.0.

The fire alarm control panel shall be microprocessor controlled and be capable of supporting up to 4 loops of 127 devices as a minimum. It shall have as standard a display, keypad and LED indications for at least 50 zones. Fire indication shall initially be by zone and shall be shown by red LED's and on the display.

When indicating alarms the panel shall initially show the first and last zone of alarm, the alarm type, the number of alarms and the time and date. Fire alarms take priority but the user shall be able to select display of other alarm types such as faults or disablements. It shall also be possible for the user to select that alarms be displayed by zone or by device and to scroll through all the active alarms. Each device and zone shall have up to 40 characters of text at least to describe its location. The capacity of the display shall be at least 160 characters to effectively display this information.

The control panel alarm management configuration and panel firmware shall be fully programmable on site and shall be maintained in a non volatile re-writable memory. Modification of site configuration data must be possible both through the control panel keypad and through a laptop PC configuration software tool.

In addition to the standard controls required by EN54-2 the panel shall have a help function through a dedicated "help" button which provides pre-programmed user instructions on the panel display.

It shall be possible to configure multiple inputs and outputs at the control panel through the use of accessory boards by use of multi-way input and output accessory boards. The boards shall be mounted either internally to the panel chassis or in an accessory cabinet alongside the main control panel. Versions shall be available for monitored alarm circuits, voltage free relays, open transistor LED drivers and custom key switch control inputs. At least 750 individually addressed outputs, including all loop output devices, shall be supported.

A twenty-four column printer shall be available as an option, able to be installed into the panel, visible and accessible from the front. An optional facility shall be provided for connecting the panel to an 80-column desktop printer. The printer shall provide hard copy of alarms, faults, disablements and panel operations together with date and time stamps. Operation of the printer shall not inhibit or delay the functioning of the panel in any way.

The control panel shall support the option of a monitored serial port for connecting to remote repeater control panels. The repeater panels shall be connected by a monitored, screened, 2-wire data cable. Up to 64 repeater panels may be connected along the repeater driver circuit, each with its own unique identification address.

The repeater panels shall as standard duplicate the display, main operator controls and LED's of the main control panel (including the "help" button). Repeater panels shall support connection of the control panel optional input and output boards.

It shall be possible to configure the operation of any control panel output individually. Output activation can be triggered from a fire condition from one of any specified devices. Input activations or other state changes of devices (for example fault or pre-alarm conditions) shall also be supported as input triggers. A co-incidence feature shall be available whereby the output shall be switched only when more than one of its possible input triggers are activated.

Output activation shall be configurable as "silencing" or "non-silencing" for each output. In silencing mode the output shall be deactivated when an "alarm accept" or a "reset" operation is performed by the panel operator. In non-silencing mode the output shall be deactivated only when a "reset" operation is performed by the panel operator.

A time delay shall be assignable for each output. On activation of its input trigger a timer shall be initiated and the output shall be switched after the specified time. If the output is deactivated while in its countdown phase then the countdown is cancelled. The time delay period shall be specified in one second increments. The maximum time delay period shall be at least 10 minutes.

3. PANEL NETWORKING

The control panels in the fire alarm system shall have all the required software and hardware available as standard to connect up to 256 of them all in a single system network. In its simplest form the panels

shall be connected by a serial 2-wire circuit of up to 2km in length. It shall however be possible to configure the network connection as a secure closed loop and to support radio links, fibre-optic cable and other communication gateways as part of the network infrastructure.

A panel network shall be a true peer-to-peer system where all main control panels in the network are of the same type with identical software and hardware capabilities. Every panel can access all the features that the whole network has to offer. A network with a central master panel which controls the network or where only certain panels can display network events or access network functions is not acceptable.

It shall be possible to display and indicate any system events, (fire, fault non-fire, or other) simultaneously across all panels in the network. Event filters shall be configurable for each panel such that a particular panel can display only a subset of system wide events including showing none. Panels will always display their own events.

It shall be possible to cascade operator controls of “evacuate” “silence” and “reset” from any network control panel to all panels in the network so that a system wide command can be issued from a single panel. Control button filters shall be configurable for each panel so that a particular panel can react to a subset of these commands, including none. Panels will always respond to their own local controls.

The network communications protocol shall be specifically designed for integrity and responsiveness in carrying life safety alarm events. It shall be high speed and low overhead with the ability to cope with large amounts of fire and non fire event traffic. In particular fire alarm events shall be prioritised so that they are rapidly propagated throughout the network.

The propagation and display of a fire event across the entire network of control panels shall take no longer than 8 seconds. The propagation and display of a fault event across the entire network of control panels shall take no longer than 100 seconds.

Network events shall be valid input triggers at any panel on the network. This shall enable site configurable cause and effect control of outputs across the network in the same fashion as within a stand alone panel system.

A secure network ring configuration shall use network loop modules which are stand-alone controllers connected in a ring. Each control panel to be networked shall be connected to one network loop module and communicate using the standard network protocol across the ring of network loop modules.

Failure of any control panel shall not affect the integrity the secure network ring. In the case of a single open circuit condition anywhere on the secure network ring the system shall indicate a fault and network operation shall continue unaffected. In the case of a short circuit condition on a single segment of the secure loop the network loop modules on either side of the segment shall isolate that

segment from the rest of the secure loop. A fault condition shall be reported and network operation shall continue unaffected. In the case of multiple open circuit or short circuit conditions across several segments of the secure loop the network loop modules shall isolate all short circuits and then reconfigure themselves such that each intact section of the network loop operates as a fully functioning sub network of connected panels.

A comprehensive PC based software package shall be available to provide a complete system overview and alarm management through a graphical user interface. The PC alarm system shall be connected directly on the control panel network and shall communicate in a peer-to-peer fashion with all panels in the network. A solution where the PC alarm system communicates through a single control panel to the network is not acceptable. It shall be possible to connect the PC alarm system to a network loop module to form an integral part of a secure loop network.

It shall be possible to add a network gateway to a standard network or a secure loop network. The network gateway shall be an independent piece of hardware complete with software which provides an external communications link to third party software interfaces and communicates with panels on the network in a peer-to-peer fashion. Third party software interfaces may include radio pager systems, manned alarm centre signalling and data interfaces or integration software with multi discipline alarm management systems (fire, security, CCTV, etc). In addition to allowing external systems to receive full event reporting from the fire alarm panel network the gateway shall also provide comprehensive control features. These shall include requesting and receiving device status reports, enabling and disabling of devices in the network and activation of panel outputs.

It shall be possible to configure a remote connection to the panel network by means of an optional modem installed in one of the networked control panels. This will enable multiple fire alarm systems to be regularly and efficiently monitored by suitable maintenance staff prior to attending site. Diagnostic functions shall include access to event logs of all network panels, real time device status reports and reports of devices in service condition.

5. SMOKE AND HEAT DETECTORS

The following analogue addressable point fire sensors shall be available. They shall conform fully to their product standards shown and carry approval certificates to these standards issued by the Loss Prevention Certification Board (LPCB) in the UK or an equivalent European national testing laboratory.

Multisensor optical smoke and heat detector. Product standards EN54-5 and EN54-7.

Dual sensor optical smoke and heat detector. Product standards EN54-5 and EN54-7.

Optical smoke detector. Product standard EN54-5.

Heat detector. Product standard EN54-7. Class A1 performance approval required.

All detectors shall have a unique address set using high integrity sealed dipswitches.

Smoke detectors shall have not less than four sensitivity levels that can be selected as part of the site configuration data. The default sensitivity level shall be between 2% and 3% obscuration per metre. Heat detectors shall have not less than four sensitivity levels that can be selected as part of the site configuration data.

Every detector must have the facility to optionally verify the validity of an alarm condition over a 20 second period, before initiating an alarm signal. The alarm verification function shall be enabled or disabled, on a device by device basis, from the control panel as part of the site configuration data.

Detectors shall be monitored for contamination and the system shall adjust their alarm thresholds to compensate for contamination over time. When the alarm threshold can no longer be adjusted the panel shall indicate a "maintenance required" signal for the particular detector. This must be separate to a "pre-alarm" signal. The use of a combined signal for "pre-alarm/maintenance" is not acceptable.

Detectors shall plug into separate mounting bases with a twist-lock action. The bases shall be fitted with corrosion resistant connector springs and terminal screws with captive clamping plates. The terminals shall be sufficiently large and robust to reliably connect 2.5mm diameter MICC cables. Detector line continuity shall be maintained when a detector is removed from its base.

There shall be a facility on the mounting base for attaching a label indicating the address of that detector. A similar facility shall be available on the detector, enabling the fitting of a label indicating its address. When the detector is fitted to its base, both the detector and base address labels shall be visible, and aligned adjacent to each other.

In the case of smoke detectors smoke entry points must be protected against insect ingress by corrosion resistant mesh.

All detectors shall possess a self test feature that checks the ability of a detector to effect an alarm at the control panel through the communications protocol. In the case of optical smoke detectors they must also test the correct functioning of the smoke chamber and smoke sensors. On triggering a self test a healthy detector transmits back smoke and thermal values in excess of the recommended fire alarm threshold. In the case of optical smoke detectors this must be done by increasing the brightness of the transmitter LED until it is sufficient to simulate the effect of light scatter in a smoke filled chamber.

The detectors self test feature shall be triggered automatically from the control panel not less than once every 24 hours. It shall also be possible to trigger a self test of a detector manually from the control panel. The control panel will recognise detector tests as such and will not raise an alarm, but if the detector fails to communicate fire level reading then the panel shall raise a "self test fail" condition for that detector.

Multisensor detectors shall combine both smoke and heat sensor responses to determine an overall fire condition. It shall also be software selectable to operate as a dual sensing device with independent

smoke and heat detectors in a single device. The multisensor shall have a single loop address. The smoke and thermal element states must however be reported independently to the control panel.

Dual sensor optical/heat detectors shall operate as two distinct detectors, one heat and one smoke. They shall have a single loop address but the smoke and thermal element states must be reported independently to the control panel. When a fire alarm is generated from the dual sensor detector the control panel shall be aware which element, smoke or heat, is responsible for the alarm and be able to trigger different output activations and alarm sequences for each. It shall be possible to disable the smoke and heat sensing components of the detector independently of one another. It shall also be possible to configure the dual detector so that both heat only detection is available in day time mode (no smoke detection) but both heat and smoke sensing are available in night time mode.

In addition to the point fire detectors already described the following fully addressable fire detection devices shall be available for specialised applications. They shall conform fully to the product standards shown and carry approval certificates to these standards issued by the Loss Prevention Certification Board (LPCB) in the UK or an equivalent European national testing laboratory.

Linear beam detector. Product standard EN45-12.

Aspirated High Sensitivity Smoke Detector (HSSD). Product standard EN54-20.

Linear heat sensitive cable fire detector. Product standard EN54-22.

Linear beam detectors shall measure smoke obscuration of an infrared beam between two points from 8m-100m apart. They shall be a reflective type requiring active electronics at only one end of the beam with a passive reflector at the other end. It shall be possible to power beam detectors directly from the address loop.

High sensitivity smoke detectors (HSSD) shall be of an aspirated type drawing air from aspirated pipe lengths to a laser based smoke detector capable of sensing smoke down to obscuration levels of 0.0015% obs/m. The fire alarm threshold and two pre-alarm thresholds shall be configurable. All HSSD detectors shall have the facility to adapt their sensitivity automatically to ambient conditions by means of a statistical algorithm that references a normal sensor reading distribution built over time.

6. MANUAL CALL POINTS

Manual call points shall comply with EN54-11 and be certified by LPCB or a European equivalent.

Call points shall be manufactured from red injection moulded plastic. It shall consist of an enclosure, with a captive glass pane, and it shall incorporate an addressable communications module. The glass pane shall be coated with a plastic laminate such that when it breaks sharp edges are not produced, thus protecting the operator from injury. A resettable plastic pane that is approved to EN54-11 shall also be acceptable.

Breaking the glass pane or applying pressure to the resettable plastic element shall initiate an alarm. Activation of a manual call point shall be recorded and acted upon by the control panel within three seconds as required by BS5839 Pt1.

7. ELECTRONIC LOOP SOUNDERS AND BEACONS

Electronic loop sounders shall comply with EN54-3 and be certified by LPCB or a European equivalent.

Loop sounders and beacons shall be powered directly from the device address loops without the need for additional wiring or power. They shall each have their own device address and can be switched on individually by program control from the control panel as an alarm output.

All loop sounders shall be able to produce at least three alarm tone types, continuous, intermittent and two-tone. These alarm tones shall comply with the frequency requirements of BS5839 Pt 1 and applicable local standards. The alarm tones shall be individually selectable by program control from the control panel. All beacons shall have a light output at least equivalent to a 1 Joule red lens xenon element beacon with a flash frequency of 1.1 seconds.

In order to minimise the number of installation points and to provide cost effective sound and light output to BS5839 Pt 1 there shall be several versions and combinations of loop sounders and beacons available, all with compatible tones.

Sounder bases shall enable the installation of an addressable loop sounder and a detector at a single fixing point. The detector and sounder shall operate as two individual devices and have their own addresses. Up to 60 sounder bases shall be supported powered on a 1km length loop cable of at least 1.5mm² diameter. The sound output of the sounder base shall be at least 90dBA at 1 metre. A variant with a visual alarm shall also be available allowing up to 40 per loop.

Room sounders are unobtrusive and suit small areas and bedrooms. Up to 60 room sounders shall be supported powered on a 1km length loop cable of at least 1.5mm² diameter. The sound output of the room sounder shall be at least 90dBA at 1 metre.

Room beacons are unobtrusive and up to 60 per loop shall be supported.

Horn sounders have sufficiently high sound output to be used in general open area coverage. Up to 40 horn sounders shall be supported per loop with a sound output of at least 100dBA at 1 metre. Versions with an integral beacon shall be available with up to 25 per loop. Weatherproof variants shall also be available.

All loop sounders and beacons shall have the facility to connect a 24V power supply feed to provide power in cases where design requirements exceed the number of devices that can be powered directly from the loop.

All loop sounders shall have a self test diagnostic feature which is automatically triggered by the routine alarm tests carried out from the control panel. The sounder self test shall take place when the sounder is activated in an alarm test. A built in microphone circuit shall detect the presence of the physical

sound produced by the sounder. If no physical sound is detected by the microphone then a fault condition is raised for that sounder. If the sound is detected then the sounder has passed the test and no action is taken.

8 INPUT AND OUTPUT DEVICES

Input and output devices shall comply with EN54-18. Each input and output device shall have its own address, such that specific input triggers can be used to control individual output activations.

Interface units shall monitor a single voltage free contact and signal to the control panel when the contact is closed. The interface unit shall monitor the input circuit wiring for short circuit and open circuit faults and report these if detected. The interface unit activation shall be configurable at the control panel as a fire alarm, sprinkler activation, fault, security alert or non-fire event.

Zone interface units shall power and monitor a zone circuit of conventional type (non addressable) fire detectors and call points. They shall also be capable of monitoring intrinsically safe detectors and call points through suitable power limiting safety barriers. The conventional zone circuit shall monitor for activation of fire detectors and call points which will cause a fire event to be generated by the interface unit. Open and short circuit faults are also monitored and reported if present. The zone interface unit shall be powered by the address loop and have an option for connection of an external power supply.

Relay units shall provide single pole, voltage free, change over contacts for control purposes such as door release or emergency shut down of equipment. The switch rating shall be at least 1A at 30V DC.

Alarm circuit units shall provide two monitored sounder outputs suitable for each switching and driving a circuit of electronic sounders or alarm bells. Power for the alarm devices shall be from 24V input to the alarm circuit unit which will be switched to supply the alarm devices on activation.

Mains relay units shall provide double pole voltage free change over contacts suitable for turning on or shutting down local mains supplies to equipment such as extract fans or dampers. Normally open and normally closed contacts shall be provided as standard. The contacts shall be rated at least 5A at 250V AC and 1A at 60V DC. The mains relay unit shall be entirely powered by the address loop without need for an external power supply. It shall incorporate a test switch by which it can be activated and reset without accessing the control panel.

It shall be possible to mount input and output devices as standalone units in a single enclosure or to house them in larger enclosures to construct multi-way input and output units. In particular the interface units, relay units, conventional zone interface units and mains relay units shall all be suitable for mounting on a standard DIN 35 fixing rail. These units shall clip directly onto and off the DIN 35 rail for ease of configuration and maintenance and the terminals shall all be presented for easy access when rail mounted.

9. RADIO LINKED DEVICES

Radio linked devices shall be available for use in areas where providing cabling is not a practical proposition because of physical or commercial constraints.

Radio linked devices shall interface with the fire alarm control panel by means of a radio loop module which is connected to a panel address loop. Each radio loop module shall support communication with up to 127 radio linked devices. It shall be possible for a radio device to be monitored by more than one radio loop module.

The following radio linked devices shall be supported as a minimum.

Multi-criteria optical/heat detector, Optical smoke detector, Heat detector, Electronic sounder, Electronic sounder/beacon, Combined electronic sounder/optical smoke detector, Input unit (contact monitor), Relay output unit

The radio loop module shall provide a seamless integration of the radio linked devices into the fire alarm system. They shall appear as detectors, call points, inputs and outputs in the same fashion as the wired equivalents and can be used in the fire alarm system in the same way. The control panel must however distinguish radio linked devices from wired devices - reporting them as wired devices is not acceptable.

All radio linked devices shall be powered by an internal battery pack consisting of easy to source and replace alkaline battery cells. The battery pack shall give the device a operating life of at least three years in normal use before it needs to be replaced. The battery cells shall be divided into two sets to provide backup in case the failure of one set. Each set shall be monitored and reported as a battery fault at the control panel in case of failure. When battery power capacity is low a low battery condition shall be indicated at the control panel allowing at least 30 days for the battery pack to be replaced.

Battery fault and battery low conditions shall be reported as such at the control panel. A general device fault condition is not sufficient.

C VOICE EVACUATION & PUBLIC ADDRESS**1. GENERAL**

The voice evacuation and public address system shall be a basic system. Full compliance is not required, as the fire detection system has a compliant alarm system. However, it should be possible to upgrade to a fully compliant system at a future date.

The system shall be type **Bosch Plena** or similar and approved.

The system shall be used for the school bell system, and shall come complete with a weekly timer and tone generator.

2. CONTROLLER AND AMPLIFIER

The controller shall be type **Bosch Plena Voice Alarm Controller 1990/00** or similar and approved.

The voice alarm system shall be the integrated solution for BGM and EVAC. The voice alarm system shall be designed for public address and emergency evacuation. All the essential EVAC functionality – such as system supervision, spare amplifier switching, loudspeaker line surveillance, digital message management and a fireman's panel interface – shall be combined.

The system shall provide for emergency call (EMG), business call and BGM audio, up to 60 zones, 8 call stations and two remote control panels. The voice alarm system shall be a one channel/two channel system. It shall be compatible with BGM sources and 100 V booster amplifiers. It shall be capable of connecting to EVAC compliant loudspeakers and accessories for an integrated public address and voice alarm solution.

It shall be possible to merge messages to allow even more flexible use of pre-recorded announcements and evacuation messages. It shall be possible for each message to have any length within the total available capacity. The memory shall have a capacity of 16 MB. It shall be possible to upload from a PC via USB into the memory, after which the unit shall operate without PC connection. The standard WAV-format shall be used for the messages and sample rates of 8kHz up to 24kHz with 16-bit word length (linear PCM) shall be supported.

Volume override relay contacts shall be provided for each zone separately for overriding local loudspeaker volume controls. All current override schemes shall be supported (3-wire and 4-wire override schemes i.e. standard 24V and failsafe). Upon a call or an activated trigger input these contacts shall be activated for the appropriate zones, together with an additional voltage free contact (Call Active) for control purposes.

A 24Vdc output shall be available to supply power to external relays, so no external power supply shall be required for that purpose. A LED VU-meter shall allow for monitoring of the master output.

The maximum allowed total cable length between the controller and the last router in the chain shall be 1000 meters. The maximum allowed total cable length between the controller and the last call station in the chain shall be 1000 meters. The maximum allowed total cable length between the controller and the RC panel shall be 1000 meters.

The controller and each connected router shall have 12 trigger inputs to start business and emergency messages. Each shall be configurable for a message consisting of a sequence of up to 8 wave files. It shall be possible for wave files to be used in different combinations with other messages, optimizing flexibility and used storage space.

As the basis of the voice alarm system, the controller shall have all the essential functionality for compliance with IEC 60849 standard, including full system supervision, loudspeaker line impedance supervision, a supervised emergency microphone on the front panel and a supervised message manager. The messages shall be mergable to allow even more flexible use of pre-recorded announcements and evacuation messages. The controller shall be used as a stand-alone system with up to 6 zones or expanded to up to 60 zones using additional 6-zone routers. Up to 8 call stations shall be connectable. Interconnections shall be made using standard RJ45 connectors and CAT5 cable.

It shall be possible to connect 480 watts per router. The audio output shall use standard analog audio 100 V line switching for full compatibility with public address equipment and EVAC-compliant loudspeakers. The system shall be configured using DIP switches for basic functionality and a PC for more advanced functions. It shall be possible to specify 16 priority levels.

A built-in 240 W booster amplifier shall provide the power for the emergency call channel and BGM. It shall be possible to add additional booster amplifiers as spare, to provide two-channel operation or if the total power requirement exceeds 240 W (maximum 480 W per 6 zones). All booster amplifiers shall be supervised.

The maximum/rated output power of the internal booster shall be 360 W / 240 W. max mains inrush current shall be 8A @ 230 Vac / 16A @ 115 Vac

The frequency response shall be 60 Hz – 18 kHz (+1/-3 dB, @ -10 dB ref. rated output). The distortion shall not exceed 1% at the rated output, 1 kHz. The controller shall have tone controls to allow for adjustment of the BGM sound. It shall have separate bass and treble controls. The controller shall have two BGM source inputs and a mic/line input with configurable priority, speech filter, phantom power and selectable VOX activation. It shall be possible to select 16 priority levels for microphone, call stations and trigger inputs for optimum system flexibility. It shall have two connectors to connect the call stations. It shall have 12 input triggers with 6 supervised trigger inputs. Furthermore, it shall have one tape output on cinch connectors. The trigger outputs shall be on floating relays with a rating

of 250V 7A. The controller shall have an emergency active relay, a fault relay and two general purpose relays, for control purposes. The fault relay shall be failsafe.

The output section shall have six transformer-isolated 100 V constant voltage outputs for driving 100 V-loudspeakers in six separate zones. All zones shall be individually selectable from the front panel and the BGM output level in each zone shall be individually settable in 6 steps. The BGM output shall be connected to the 70V line, thus it shall be possible to connect a total load of 480 Watts in a two channel system combined with a 480 Watt booster.

The output of the booster shall be also available as a separate output on 100V and 70 V. A separate 100 V Call Only output shall be provided for addressing an area where BGM is not required but where priority announcements are. Six configurable volume override output contacts shall be available for overriding local volume controls during priority calls. A LED VU-meter shall monitor the output.

The voice alarm router shall be an expansion unit adding 6 zones as well as 12 input- and 8 output contacts to the voice alarm system. It shall be able to use the booster built in the voice alarm controller. It shall provide outputs and inputs for one or two boosters in a multi amplifier one- or two-channel system. It shall provide dual channel operation for calls and BGM simultaneously to a maximum of six different zones, using two booster amplifiers. Also single channel operation shall be possible with only one booster.

The router shall have a set of relays for zone-switching the power amplifier output(s) to different loudspeaker groups. Each of the zones shall be switched between the call channel (upon call-station selection or all-call microphone or emergency activation), the BGM channel (upon front panel selection), or off. The zone power handling capacity of the router shall be 480 Watts. The router shall also have 12 input triggers. 6 triggers shall be supervised for EMG purposes.

The 6-zone call station shall be a stylish high quality call station with a stable metal base, a flexible microphone stem and a unidirectional condenser microphone. It shall be intended for making calls to selected zones. The special design shall allow for neatly flush mounting in desk tops. Using dipswitches on the bottom of the call station, the call station ID shall be selectable. The call station shall have selectable gain, speech filter and limiter for improved intelligibility.

On each call station it shall be possible to select 6 zones with the possibility to connect a call station keypad to increase the number of zones or zone groups that can be selected.

It shall have LED indications for zone selection, fault and emergency state. The call station extension shall provide seven additional zone and zone group keys

On each call station it shall be possible to select 6 zones with the possibility to connect up to 8 call station keypads to increase the number of zones or zone groups that can be selected. Selected zones are indicated with LEDs on the call station, three additional LEDs give visible feedback on the active state of the microphone and the system.

Green: indicates microphone active,

Amber: indicates that the system has detected a fault (IEC 80649) and

Red: indicates that the system shall be in the emergency state.

The power supply voltage range shall be 18 – 24V with a current consumption of less than 50 mA. The nominal sensitivity shall be 85 dB SPL (gain preset 0dB). The nominal output level shall be 700 mV. The maximum allowable sound pressure level shall be 110 dBSPL. The microphone shall have a limiter. The distortion shall be less than 0.6% at maximum input. The equivalent input noise level shall be no more than 30 dBSPLA. The frequency range shall be 100Hz – 16kHz. The speech filter shall be a 315 Hz, high-pass, 6 dB/oct filter. The output impedance shall be 200 Ohms. The stem length with microphone shall be 390 mm.

Mains voltage shall be both 230Vac and 115Vac, $\pm 15\%$, 50 / 60Hz (selectable)

Power consumption of the Controller shall not exceed 600 Watts, the router shall not exceed 50Watts. Battery backup provisions shall be implemented, the battery voltage shall be 24Vdc, +20% / -10%. All low level connections and volume override shall be on MC1,5/XX-ST-3,5 type connector blocks. All high level connections except mains shall be on MSTB 2,5 /XX-ST. The input contact shall have supervision based on a series and parallel resistor.

The router and controller shall be rack mountable with removable rack mounts. The router shall be not higher than 2U. The controller shall be not higher than 3U. The rack mounting kit shall be included.

The operating temperature range shall be -10°C to +55°C. The storage temperature range shall be -40°C to +70°C.

The system shall comply to the following standards:

EVAC compliance acc. to IEC 60849

EMC emission acc. to EN 55103-1

EMC immunity acc. to EN 55103-2

Safety acc. to EN 60065

3. CEILING SPEAKERS

The speakers shall be suitable for speech and music reproduction. They shall be suitable for flush mounting in a ceiling or for surface mounting on the soffit of a slab.

The speaker assembly shall consist of a single piece, 6W dual cone loudspeaker and frame, with a 100V matching transformer mounted on the back. A circular metal grille is to be integrated on the front. The colour shall be white.

The loudspeakers shall be able to withstand operating at their rated power for 100 hours, in accordance with IEC 268-5 PHC standards.

4. HORN SPEAKERS

Horn-type loudspeakers shall be suitable for external use, and shall have a IP66 rating. They shall be provided with a bracket, suitable for wall or ceiling installation.

The power rating shall be 15W / 100V, but the power to the speaker shall be limited to 10W.

The casing shall be manufactured from self-extinguishing plastic.

The produced sound shall feature directional characteristics and high verbal understanding.

4. SCHOOL BELL

The system shall be used to produce a school bell chime, and shall be easily programmed to allow for weekly variations. The staff are to be fully trained in the programming of the timer.

5. SUPPLY, DELIVERY, INSTALLATION, MAINTENANCE

Warranty and Support:

The system shall have a South African warranty, and Commercial and technical support has to be available within South African borders.

The warranty has to be maintained for at least one (1) year after handover, plus technical support from the manufacturer to be available for at least the following ten (10) years.

The equipment and individual components shall be available from the manufacturer for at least ten (10) years, and spares and spare parts shall be available for at least seven (7) years after discontinuance of the product range.

D INTRUSION DETECTION AND ALARM SYSTEM**1. GENERAL**

The Intruder alarm system shall monitor the computer and media block (Block E), the Team Teaching block (Block H), the SNP kitchen (Block J) and the Admin block (Block K).

One alarm panel shall be installed in the computer server room, to serve Blocks E and H, and a second alarm panel shall be installed in the reception office of the Admin block to serve Block J and K. The two panels shall be linked to form a single system.

Each block shall have a LCD keypad to activate / deactivate the alarm for that block.

2. CONTROL PANEL

Each control panel shall have sufficient zones to cater for the following inputs and outputs:

Block E	-	10 x PIR detectors, 1 x keypad, 1 x alarm siren
Block H	-	3 x PIR detectors, 1 x keypad, 1 x alarm siren
Block J	-	4 x PIR detectors, 1 x keypad, 1 x alarm siren
Block K	-	17 x PIR detectors, 1 x keypad, 1 x alarm siren, 1 x remote siren at Block N

The control panel shall be equipped with a transformer and batteries. The batteries shall be rated for a minimum of 12 hours operation.

The control panel shall notify the principal of any alarm condition, by means of a text message. It shall be possible to link the alarm system to an armed response, if required.

False alarm prevention features shall prevent false alarms.

The control panel should give a visual and audible warning for any of the following trouble conditions:

- AC power failure
- Low Battery
- Fail to Communicate
- Module Fault
- Tampering

3. PIR DETECTORS

The Passive Infra-Red detectors shall have a sealed housing and mounting brackets suitable for wall mounting. These shall be mounted at high level, inside the building. The subcontractor shall advise on the best positions for installation. The optic range shall be 20m over a minimum angle of 85°.

The detectors shall be dual technology type, with both quad PIR sensing and K-band microwave detection.

4. WIRING

No surface wiring will be permitted. Conduit and trunking shall be supplied and installed by the electrical sub-contractor.

E TV RETICULATION**1. TV RETICULATION - GENERAL**

A TV signal shall be reticulated to points throughout the building. A TV connected at any of the outlets shall be able to receive any free-to-view channel, or any subscription service with a decoder.

TV outlets are required in each Multi-purpose room, the Media Centre and the Team Teaching room..

Conduit, trunking and conduit boxes with cover plates have been allowed for as part of the electrical subcontract. All conduits will be provided with draw wires.

The installation excludes the supply of any TV sets or decoders.

2. EQUIPMENT

A stainless steel parabolic antenna with Quad LNB (F) shall be installed as part of this contract. The sub-contractor shall allow to test the reception around the building, and shall recommend in writing to the Engineer a suitable place for the installation of the antenna.

Internal wiring shall be RG6 white co-axial cable. External wiring and wiring from the satellite dish to the head end box shall be RG11 UV protected, aluminium sheath co-axial cable.

TV outlets shall be suitable for mounting in a flush wall mounted 100 x 100mm conduit box. The outlets shall suit the cover plates provided. All TV outlets shall be wired back to a 400 x 300 mm draw box in each Block, and then back to a 600 x 600mm drawbox in the Server room in Block E. All splitters, amplifiers, etc, shall be mounted in these draw boxes. A single 16 Amp Switched socket outlet has been allowed for adjacent to the drawbox in Block E..

The installation shall include all splitters, adjustable amplifiers, variable tap TV outlet sockets and wiring for the optimum TV signal to all areas. Should additional larger draw boxes be required to house the equipment, and / or should additional power sources be required, these are to be included in the price for this installation.

The specialist sub-contractor shall allow to test the installation and to tune the equipment, (TV sets) to the correct signal.

F ICT INFRASTRUCTURE**1. GENERAL**

This installation includes the Cat.6a wiring, ethernet socket and cabinets equipment with switches. The final installation of servers, PC's, smartboards, laptops and data projectors will be carried out by the Department's ICT section.

2. CABINETS

Cabinets shall be equipped as listed below.

Switches do not have to be provided for the spare capacity requirements, however the cabinet shall be sized to house additional switches if required.

Block D – GF:

Wall mounted cabinet with

- Rack mounted UPS and batteries for 30 minute back-up
- Fan
- 24-port Ethernet unmanaged switch with fixed 10/100/1000 Base T-ports for 8 x data outlets with spare capacity for 18 x data outlets
- POE switch / POE injectors for 4 x VOIP outlets and 6 x WiFi access points

Block H:

Wall mounted cabinet with

- Rack mounted UPS and batteries for 30 minute back-up
- Fan
- 24-port Ethernet unmanaged switch with fixed 10/100/1000 Base T-ports for 8 x data outlets with spare capacity for 7 x data outlets
- POE switch / POE injectors for 1 x VOIP outlets and 3 x WiFi access points

Block K:

Wall mounted cabinet with

- Rack mounted UPS and batteries for 30 minute back-up
- Fan
- 24-port Ethernet unmanaged switch with fixed 10/100/1000 Base T-ports for 10 x data outlets with spare capacity for 4 x data outlets
- POE switch / POE injectors for 9 x VOIP outlets and 2 x WiFi access points
- Spare capacity for rack for smart interactive board and associated audio-visual equipment.

Block E: (Computer Centre)

Floor mounted cabinet with

- Rack mounted UPS and batteries for 30 minute back-up
- Fan
- 24-port Ethernet unmanaged switch with fixed 10/100/1000 Base T-ports for 46 x data outlets with spare capacity for 23 x data outlets
- POE switch / POE injectors for 4 x VOIP outlets and 6 x WiFi access points
- Spare capacity for the server to be installed.

3. OUTLETS

Outlets shall be connected RJ45 Cat.6 sockets installed in power skirting and wall boxes. The power skirting, wall boxes and cover plates shall be supplied and installed by the electrical subcontractor.

4. WIRING AND WIREWAYS

All wiring shall be Cat.6a, which shall run in conduits and trunking. The wireways and trunking shall be supplied and installed by the electrical subcontractor.

G CCTV**1. GENERAL**

The school has an existing CCTV system. This shall be disconnected before the existing school is demolished, and shall be reinstalled in the new school. The final positions of the CCTV cameras shall be decided by the school Principal. An allowance has been made in the bill of quantities for any cabling required.