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Electronic Services Technical Specification

SANSA

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Document prepared by:

Zutari Africa
Registration number
1 Century Drive
Waterford Precinct
Century City

T +27 526 9400
F +27 526 9500
E connect@zutari.com

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Taariq Essa		Bryan Devenish	
Electrical Technologist		Associate Electrical	

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Executive summary

This electronic systems specification document relates to the South African National Space Agency based in Hermanus. This document forms part of the electronic services relating to the development and shall be read in conjunction with all project documentation and drawings.

This specification document addresses the following items:

Table 1. Scope of work

Tender Portion	Description
Portion A	Fire detection system
	Access control system
	Video surveillance system
	Perimeter Infrastructure (Including Electric Fencing)

A 5-year maintenance, extended guarantee and support after completion of the initial 12-month guarantee and maintenance period shall be included as part of the tender for each portion.

This document is a technical specification and does not define contractual matters.

1 Project introduction

1.1 Introduction

1.1.1 This specification document outlines the minimum performance specifications and requirements of the electronic systems required for this installation. The Main Objective of the Integrated Security Management System (ISMS) and BMS system is to get the SANSA Site to align with National Key Point (NKP) Standards, this is to be achieved during this and future phases to this project.

1.1.2 The scope of work shall be for the design, supply, installation, programming, commissioning and maintenance of the required systems as outlined in this document and layout drawings.

1.1.3 Where specific brands are mentioned in this specification, an equivalent brand may be offered as well with equal required functions and performance.

1.2 Project overview

1.2.1 This installation consists of a new build as well as upgrading of existing.

1.2.2 The project is in Hermanus, South Africa.

1.3 Scope of work

1.3.1 The scope of work shall include:

- Fire detection system
- Access control system
- Video surveillance system
- Perimeter Infrastructure (Including Electric Fencing)

2 General

2.1 Site conditions

- 2.1.1 The contractor shall familiarise themselves with the site conditions prior to undertaking or providing cost estimates for any work. Specific conditions to be observed include, but are not limited to, the main contractor's site access and entry requirements, OHS requirements, qualification and identification of personnel.

2.2 Advice

- 2.2.1 The contractor shall advise the main contractor and gain approval before undertaking any work that may or will result in any services disruption or downtime. Any work that may result in such down time will require scheduling with the main contractor.

2.3 Time elapsed

- 2.3.1 Due to the time elapsing between the release of this specification and the installation and construction works, it is anticipated that some of the equipment proposed will be superseded by later models by construction time. The contractor is to review products and confirm the models of all equipment and products proposed with the engineer one month prior to the procurement and installation of the equipment, interfaces to the other equipment and systems.

2.4 System design

- 1.1. This specification calls for the supply, installation, and commissioning of a complete ISMS in accordance with appropriate local and international standards and the technical and performance criteria set out in this document.
- 1.2. The system is to be supplied with all equipment, hardware, software, cabling, and ancillary services as required to provide an ISMS complete and functional in all respects. The tenderers are to familiarise themselves with all matters related to such requirements and to account for such in the tendered price.
- 1.3. Other security system components not included in this specification shall be fully integrated with this ISMS.
- 1.4. It is the responsibility of the tenderer to obtain clarification of all matters in which doubt exists as to the exact intent of this document or in which a conflict appears to have arisen. Such information must be obtained prior to the closing and lodging of tenders.
- 1.5. The response shall clearly detail all pricing for components, cabling, installation, engineering, training, commissioning, setting to work, and a 12-month comprehensive warranty

- 2.4.1 Ancillary works to be carried out by the contractor shall include, but not be limited to.
- Project management of the scope of work.
 - Project coordination with other services trades to ensure timely and successful completion of the scope of work including on-site and off-site project meetings as required.
 - Project documentation.
 - User training
 - Maintenance during the Defects Liability Period
- 2.4.2 The supply, construction, programming, testing, commissioning and maintenance of the installation shall comply with all relevant Statutory Regulations, and the latest editions (current at the time of Tender) of all applicable standards as listed in the specification.
- 2.4.3 The contractor shall operate an auditable quality assurance procedure covering the supply, construction, inspection and testing of the installation.
- 2.4.4 The contractor shall provide all materials and equipment not explicitly mentioned in this specification but which is obviously needed for the completion of the scope of work. This is not limited to the system only, but also includes all tools, equipment for testing, safety equipment, working platforms, scaffolding, ancillary materials, etc., needed to complete the design, supply, installation, programming, commissioning and maintenance of the system.
- 2.4.5 The contractor shall make due allowance as per the schedule of quantities for the configuration of graphics, report, staff training, etc. related to the system.
- 2.4.6 The operation of the system shall be configurable per the client's requirements

2.5 System requirements

- 2.5.1 The various system requirements shall be as detailed for each section.
- 2.5.2 All equipment installed under this contract shall comply with the requirements of IEC 61000 Parts 1 to 6 ELECTROMAGNETIC COMPATIBILITY (EMC).
- 2.5.3 Any equipment found producing Electromagnetic interference subsequent to commissioning, shall be suppressed or replaced to the satisfaction of the Engineer without any cost to the Employer.

2.6 Functional Overview

2.6.1 The ISMS shall allow multi-site configuration and be able to be managed by one or more of the connected sites.

2.6.2 The ISMS shall include in the core product code (but not be limited to) the following:

- access control,
- alarm management,
- personnel management,
- CCTV integration,
- visitor management,
- Fire Detection Integration,
- perimeter deterrent and detection.

- 2.6.3 The ISMS shall provide a means to control access through nominated doors having electric locking door status monitoring and token or Mobile Credential Readers. Access rights associated with a presented access token or Mobile identifier shall be checked for validity based on token or identifier, access area, access time and any other access management function defined in this specification. All validity criteria shall be stored at the IFC. Access shall be granted or denied dependent on the access privilege. Access privileges shall be programmed in a variety of ways to allow flexibility as defined elsewhere in this specification.
- 2.6.4 The ISMS shall monitor the condition of inputs. The ISMS shall be able to be programmed to apply a variety of conditions to the way in which these inputs are monitored and shall enunciate the condition of such inputs in accordance with such programming.
- 2.6.5 The ISMS shall provide a fully functional intruder alarm system including entry and exit delays where intruder detection sensors are connected to system inputs. The intruder alarm ISMS component shall be fully integrated with the access control aspects of the system. It shall be possible to set (secure) or unset (unsecure) areas from any access control reader associated with an area, access control reader with keypad, AMT, or as required from defined central control locations.
- 2.6.6 Connection between ISMS servers and IFCs shall be achieved using cabling supporting the TCP/IP protocol. The network connection must be on-board the IFC. Interface transceiver units (Ethernet to RS485, RS232 etc) are not acceptable.
- 2.6.7 The ISMS shall have IPv6 address support for all TCP/IP network devices.
- 2.6.8 Remote IFCs not permanently connected to the network can be connected via a PSTN service, using TCP/IP protocols.
- 2.6.9 Connection from a remote IFC to the server shall be either via dialup to an Internet Service Provider (ISP) using encrypted TCP/IP, and then via an approved firewall through into the IT environment or via dialup directly to a RAS connection on the Server.
- 2.6.10 All system software upgrades shall be transmissible through the network to the IFC, readers, and I/O devices.
- 2.6.11 IFCs must support peer to peer communications for input and output communications between IFCs. Systems that require a server for communications between panels are unacceptable.
- 2.6.12 All data communication between the ISMS and IFCs shall use an industry standard asymmetric encryption algorithm for mutual authentication and session key negotiation. This algorithm shall be equivalent to ECC P-384 or stronger. Session keys shall be re-negotiated on a regular basis at intervals no longer than 30 hours.
- 2.6.13 All data communication between the ISMS and IFCs shall be encrypted using an industry standard symmetric encryption algorithm equivalent to AES-256 or stronger.
- 2.6.14 All data communication between IFCs shall use an industry standard asymmetric encryption algorithm for mutual authentication and session key negotiation. This algorithm shall be equivalent to ECC P-384 or stronger. Session keys shall be re-negotiated on a regular basis at intervals no longer than 30 hours.
- 2.6.15 All data communication between IFCs shall be encrypted using an industry standard symmetric encryption algorithm equivalent to AES-256 or stronger.

- 2.6.16 All data communication between IFCs and intelligent edge devices such as readers and I/O devices shall use an industry standard asymmetric encryption algorithm for mutual authentication and session key negotiation. This algorithm shall be equivalent to ECC P-256 or stronger. Session keys shall be re-negotiated on a regular basis at intervals no longer than 30 hours.
- 2.6.17 All data communication between IFCs and intelligent edge devices such as readers and I/O modules shall be encrypted using an industry standard symmetric encryption algorithm equivalent to AES-128 or stronger.
- 2.6.18 All dry contact type input to field I/O modules must support four state monitoring with the ability to configure the resistance values of the state changes.
- 2.6.19 The ISMS shall report all events to the operator(s) as configured and shall produce and maintain a log of all system events, alarms, and operator actions.
- 2.6.20 The ISMS shall provide a means for an operator to extract information relative to the event log and system configuration and produce this information in the form of printed reports, emailed reports directly from the ISMS itself, screen displays, or exported files.
- 2.6.21 The ISMS shall provide for a GUI with site plans and interactive icons representing the location and real-time status of all monitored hardware within the ISMS.
- 2.6.22 The ISMS shall provide emergency evacuation reporting.
- 2.6.23 The ISMS shall be designed and manufactured by a company who shall be certified under the ISO 9001:2008 (or later) quality procedures.
- 2.6.24 Where applicable, equipment shall have the following approvals:
- 2.6.24.1 FCC Part 15,
 - 2.6.24.2 CE approval BS EN 50130-4 Alarm Systems Electromagnetic Compatibility (Immunity),
 - 2.6.24.3 CE approval BS EN 55022 Emissions,
 - 2.6.24.4 UL294 Access Control,
 - 2.6.24.5 UL1076 Burglar Alarms,
 - 2.6.24.6 ULC-ORD-C1076.
- 2.6.25 Encoders and readers shall also meet:
- CE ETS 300 683 Short Range Devices,
 - C-Tick AS/NZS 4251 Generic Emission Standard,
 - C-Tick RFS29.
- 2.6.26 The ISMS software shall be written in a fully structured, fully validated, and commercially available language that provides a strictly controlled development environment.
- 2.6.27 Comprehensive backup and archiving facilities shall be incorporated as an integral part of the ISMS.
- 2.6.28 The ISMS shall include partitioning suitable for multi-tenanted buildings. Users shall only be able to access those parts of the system which fall within their partition.

2.7 Components and equipment

- 2.7.1 In addition to section specific requirements the following general component and equipment requirements shall be adhered to.
- 2.7.2 All materials, equipment and components shall be new, of good quality and fit for purpose. The contractor shall not provide without written approval products that are obsolete, discontinued or about to be discontinued.
- 2.7.3 The contractor shall provide equipment and associated accessories which are the products of established manufacturers regularly engaged in the manufacture of such equipment applicable to the system.
- 2.7.4 All equipment and materials used in these works shall be standard components that are regularly manufactured and utilised in the manufacturers' system.
- 2.7.5 Attic stock of the main components of the installed system shall be required. The final quantities and items shall be agreed with the engineer during construction.
- 2.7.6 All system components shall operate reliably within the range of -10 degrees to +55 degrees and 98% non-condensing humidity.
- 2.7.7 To ensure the long-term dependability of the system, the contractor shall provide all system components with appropriate environmental protections including (as appropriate);
- Protective enclosures.
 - Seals.
 - Insulation.
 - Water proofing.
 - Rust proofing.
 - UV protection.

2.7.8 Any modifications to equipment to meet the intent of this specification shall be performed in a way that does not alter the manufacturers' warranty.

2.7.9 The fault current rupturing capacity of all equipment guaranteed by the manufacturers thereof must at least be greater than the unsymmetrical fault level of the system of which it forms a part. Should this not be the case, sufficient back-up protection must be provided by installing correctly sized HRC fuses.

2.8 Interfacing with other systems

2.8.1 System interfacing requirements shall be as detailed for each service required.

2.9 Installation of components and equipment

2.9.1 In addition to section specific requirements the following general installation of components and equipment requirements shall be adhered to.

2.9.2 The contractor shall be responsible for coordination with the main contractor and with other works and trades including civil, building, electrical, mechanical and security where work is dependent upon or carried out in conjunction with these works. This includes but is not restricted to:

- Use of site and facilities
- Closure of restriction of access to site and facilities
- Scheduling of works and resources
- Segregation of services
- Site reinstatement

2.9.3 Major items requiring coordination are listed as follows:

- Coordinate with other trades to ensure that no conflict occurs between proposed cable, cable tray and ducting routes, pipe runs and air conditioning ductwork, hydraulics pipework and the like.
- Ensure staging of works is to the requirements of the Construction Program

- 2.9.4 The location of all outlets, switches and equipment indicated in the drawings is indicative only and may be relocated within a 3000mm radius to suit coordination with other services, finishes, architectural preference and to meet code requirements. The exact locations are to be determined by reference to architectural plans, sections and details and are to be confirmed with the engineer prior to installation. Architectural room data sheets and room layouts sheets shall also be adhered to.
- 2.9.5 The installation and mounting of all equipment shall ensure that the components remain operational and connected to the structure and to their foundations (if applicable) throughout a seismic event by means of proper installation of all anchors and mounting hardware. The contractor shall issue a seismic compliance certificate at completion.
- 1.1.1 All equipment shall be securely mounted using proprietary fixtures and fittings.
- 2.9.6 The method of equipment installation shall not adversely affect the function or structural integrity of the structure to which the equipment is attached.
- 2.9.7 The method of equipment installation shall not compromise the IP rating of the equipment.
- 2.9.8 Framework and brackets
- Site-fabricated framework and brackets shall not be used.
 - Framework and brackets shall be positioned so as not compromise the removal and replacement of equipment.
 - Where it is necessary to modify on site any pre-fabricated galvanised mild steel framework, the cut edges shall be dressed and treated immediately with an approved cold galvanising paint to prevent corrosion.
 - Fasteners securing equipment to framework and brackets shall be independent of those securing framework and brackets to walls and floors.
- 2.9.9 Positioning of Equipment
- Final positions of equipment shall be agreed on site, prior to installation.
 - Equipment shall be positioned with due regard to the aesthetics of the installation
- 2.9.10 All surface mounted equipment shall be solidly fixed to walls or soffits by means of their back plates.
- 2.9.11 Cables
- Dedicated containment for the system shall be provided by the electrical contractor as per the layout drawings.
 - The cable installation shall comply with the requirements of BS 7671.
 - Cables shall, as far as possible, run parallel with the lines of building construction.
 - Cables and their support systems shall not be fixed to protective barriers, guards or direct to guard-rails.
 - Cables shall be installed strictly per the manufacturers' requirements pertaining to:
 - Maximum tensile or compressive stresses (e.g. due to pinching or squashing).
 - Minimum bending radius.
 - Temperature of installation.

– Operating environment.

- Cable installation in conduit shall conform to BS 7671.
- Conduit shall be debugged and swabbed prior to cables being pulled in.
- The entire conduit system shall be complete prior to installing cables.
- No joints shall be allowed in the cables without the prior approval of the engineer.
- The use of PVC insulation tape shall not be accepted – heat shrink or approved equivalent method shall be used.
- The contractor shall take utmost care whilst pulling conductors through conduit to ensure that the conductors are not kinked, twisted or strained in any manner. Damaged cables shall be replaced in its entirety.
- Care shall furthermore be taken to ensure that conductors do not come into contact with materials or surfaces that may damage or otherwise adversely affect the insulation and durability of the conductor.
- Conductors installed in vertical wire ways shall be secured at intervals not exceeding 400mm to support the weight of the conductors.
- Proprietary or approved clamps shall be supplied and installed in suitable draw-boxes for this purpose.
- The contractor shall allow for the installation of the “last mile” conduit connection/link from the containment infrastructure installed by the electrical contractor, i.e. from trunking/cable basket to device location.
- Cables shall be manufactured strictly in accordance with BS 7835.
- Cables shall be delivered within 12 months of manufacture and shall be delivered to site on cable drums or coiled with protective wrappings.
- Cables shall be delivered, stored and handled in accordance with the manufacturer’s instructions. Where the performance of the cable is likely to be adversely affected by the ingress of moisture, it shall be adequately sealed at both ends.
- The end protruding from the drum shall be protected against mechanical damage

2.9.12 Method of Cable Support

- Fixing of cables to containment shall be via appropriate cable metallic straps, clamps and clips.
- No cable ties shall be used in the installation.
- Cables should be strapped to cable containment or supports every 500mm or as per the manufacturer’s recommendation.
- The methods of cable support should be non-combustible and their installation should not in any way compromise the integrity of the circuit. The cable support material should be of a material that can withstand a similar temperature and duration to that of the fire rated cable while maintaining adequate support.

2.9.13 Terminations

- Connectors recommended by the manufacturer of the cable being terminated shall be used. Terminating equipment must be designed for the connection type and be used in the manner intended by the manufacturer. Connections must be of compression crimp type or similar, such that it is not possible to easily disconnect equipment simply through applying cable tension. All connections

must be located in accessible locations and protected against tampering and environmental risks.

- Spare electrical/optical cores shall be terminated into spare terminals for future connections and proper insulation.

2.9.14 Identification

- All system components shall be suitably identified with labels. Labels shall be located so that they are easily seen from normal access adjacent to the item being marked. Labels shall not be installed on components normally removed or replaced.
- All labels shall be of the engraved type and mechanically fixed. Labels shall be fixed with brass bolts and nuts or rivets. Self-tapping screws, glue, etc. shall not be accepted.
- General labels:
 - Stencil with black or white lettering contrasting with background.
 - For indoor applications only, engraved two-colour laminated plastic, black lettering on white background.
 - Engraved and black filled lettering on stainless steel or brass, minimum thickness 1mm.
- Warning labels and markings:
 - Danger and warning labels, fire and safety equipment labels: White lettering on red background.
- Pipes, conduits and ducts
 - Identification of the contents of pipes, conduits and ducts.
- Wiring and terminal strips
 - Identify wiring with numbered ferrules at both ends.
 - Number each terminal of terminal strips.
 - Numbering system: To match electrical and control shop drawings.
- Equipment identification
 - Identify each item by name and identification number.
 - Contents: Match terminology and numbering system of the contract documents. Number multiple items individually.
- Minimum lettering heights:
 - Equipment nameplates: 40mm
 - Danger, warning and caution notices: 10mm for heading 5mm for text.
 - Warning notices: 7mm.
 - Minor lettering: 3mm
- Lettering style:
 - Helvetica medium.

2.10 Samples, drawings and documentation

- 2.10.1 In addition to section specific requirements the following general samples, drawings and documentation requirements shall be adhered to.
- 2.10.2 All drawings, information, and documentation shall be in English, and each item shall be identified with the client's name and project / scheme / contract reference title and numbers, the Employer's representative's name and reference numbers, and the Manufacturer's works / contract / order references
- 2.10.3 Shop drawings, samples, product data submission and connection diagrams of the system configurations shall be provided by the contractor for approval by the engineer prior to equipment ordering.
- 2.10.4 Shop drawings
- Shop drawings shall be submitted by the contractor for approval by the engineer prior to any equipment ordering or installation.
 - The tender drawings are schematic and do not show the exact dimensions or positions of equipment. Contractors must satisfy themselves that the equipment offered by them will fit in the available space and can be positioned so that access for maintenance, repair or removal is not encumbered.
 - Not later than the time stated in the contract document (typically 1 week) after access to site or receiving verbal instruction, the successful contractor shall submit to the engineer, two copies of the detailed working drawings showing the required conduits, conduit boxes, position of equipment, cable trays, ducts etc., should extras be required. It must also be ensured that the complete installation is according to the specification and standards.
 - Approval by the engineer of these drawings submitted by the contractor shall not relieve him of his liability to carry out the work in accordance with the requirements of the contract documents.
 - NOTE: Final dimensions must be taken on site before any equipment or materials is either purchased or manufactured.
 - The following documentation and drawings shall be submitted to the engineer prior to the installation of cables and wire ways and before civil construction have started on the areas where cable routes are required:
 - Cable route layout drawings showing
 - Type of wire ways
 - Trenching
 - Cable junction boxes
- 2.10.5 Sample submissions
- The contractor shall submit one sample of each designated item with copies of its supporting documentation.
 - The contractor shall submit a range of samples if choice of colour or finish is required.
 - The contractor shall also reselect and resubmit samples which are not approved
 - The contractor shall keep the approved samples in good condition on site, until practical completion. The approved samples shall be checked against the installed products at Practical Completion and will not be returned.

2.10.6 Product data submissions

- The contractor shall submit manufacturer's data for all equipment, materials components and systems to be provided including the following as applicable:
 - Technical specifications and datasheets
 - Evidence of compliance with specified product certification schemes
 - Drawings, showing size, arrangement, operating and maintenance clearances
 - Schematic layout, piping, wiring and control drawings
 - Operating weight and support loadings
 - Lifting points
 - Control details
 - Recommendations for installation and maintenance

2.10.7 Submissions Schedule

- The contractor shall maintain and submit a monthly schedule of submissions to identify all proposed submissions designated with the following information:
 - Submission number, description, date and revision number
 - Status
 - Accepted
 - Submitted awaiting acceptance
 - Not yet submitted
 - To be corrected and re-submitted

2.10.8 All documentation shall be detailed and be written to enable any supplier or maintenance organization to maintain the system.

2.10.9 As-built drawings shall be provided by the contractor for the completed installation.

- "As-built" drawings shall be computer generated through a recognised CAD software package. Drawings submitted for acceptance shall be provided on A3 paper size.
- Final "As-built" drawings shall be submitted in A0 paper format, PDF and CAD format, on CD. Paper copies are to be neatly folded and placed in a perspex cover sleeve.
- The contractor shall supply laminated A3 layouts of the "As-built" drawings for the main control room.
- The detailed "As-built" drawings shall be provided by the Contractor showing positions of the following.
 - Equipment
 - Wire ways
 - Cable Routes.

- 2.10.10 Comprehensive operating and maintenance manuals (hard and soft copy) shall be provided by the Contractor prior to the commissioning stage. This shall include all duly completed certificates.
- 2.10.11 A draft copy shall be provided to the engineer for approval prior to final handover.
- 2.10.12 The operating and maintenance manuals shall include at least the following:
- A schedule of all components in the installations with the following information provided:
 - Manufacturers name and contact details
 - Function
 - Full description and details of design capacity and design criteria for each item of equipment and each product.
 - Detailed description of the function of all operator controls.
 - Operator training manuals and operation procedures:
 - Safety procedures for protection against electrical, mechanical, and any other hazards.
 - Clear instructions for setting up and configuring the system.
 - Complete software configuration and physical connection information.
 - Safe starting up, operating and shutting down procedures for the systems.
 - Drawings and technical data as necessary for the efficient operation and maintenance of the systems.
 - Project-specific Administrator's Guide that must detail all the functions available to the Administrator. It must also provide a detailed record of all the system configuration and programming settings for all programmable parameters. It must also contain all the administrator passwords that have been programmed into the system
 - Procedures for fault finding.
 - Maintenance instructions for all components, including frequency, repair, overhaul, change-out and installation procedures. Including:
 - Emergency maintenance procedures, including telephone numbers for emergency services and after hour's contacts for suppliers and contractors.
 - Detailed recommendations for preventative maintenance procedures, which should be adopted to ensure the most efficient operation of the systems installed.
 - Inspection, testing and maintenance programme in tabular form showing frequency and level of routine checks for each item.
 - Trouble shooting checklists and simple diagnostic analysis.
 - Schedule of normal consumable items, local sources of supply, and expected replacement intervals.
 - Schedule of recommended spare parts
 - Commissioning procedures.
 - "As-built" drawings.

- Copies of Software Licenses
- Manufacturer's Manuals, Warranties and Certificates

2.11 End-user training

- 2.11.1 In addition to section specific requirements the following general end-user training requirements shall be adhered to.
- 2.11.2 The contractor shall provide training to two separate groups of users, namely System Administrators and System Operators. In general, the training shall include presentations, informal discussions, demonstrations and hand-on activities on the actual system.
- 2.11.3 Training for System Operators shall cover all the functions and activities that the operators need to carry out on a daily basis.
- 2.11.4 The training for the System Administrations shall include that provided for the System Operators and additional training specific to system administration. Further, the System Administrators training shall also include training on how to teach other staff members by way of a 'train the trainers' approach.
- 2.11.5 The System Administrators' training shall be provided for up to 10 personnel. The training shall be carried out up to 2 sessions with 1 or more personnel per session.
- 2.11.6 The System Operators training shall be provided for up to 10 personnel. The training shall be carried out up to 2 sessions with 2 or more personnel per session.
- 2.11.7 Refresher training shall be provided after client occupation – typically 3 to 6 months following completion
- 2.11.8 The timing of the training shall be agreed between the contractor and the users, but must be completed prior to the handing over of the live system to the user. The contractor shall make provision for training of users on multiple work shifts.
- 2.11.9 Training Plan and Course Materials
- Training plan and course materials shall be submitted to the engineer at least two weeks prior to the commencement of the training for approval. The contractor shall provide all course materials, all support equipment (e.g. computer, projector, whiteboard, flipchart, etc.). The venue for the training shall be on the project site.
 - A training feedback form shall also be provided for all trainees to fill out at the conclusion of every training session to evaluate the effectiveness of the training and for future improvement.
- 2.11.10 Training Records and Certificates
- The contractor shall maintain a complete record of the training. The record shall include:
 - Date and time of training session.
 - Name of trainer.
 - Name of all trainees.
 - Names of trainees issued with a completion certificate.
 - Training feedback forms.

- All trainees who have successfully completed the training shall be issued with a certificate signed by the trainer.

2.12 Testing and commissioning

- 2.12.1 In addition to section specific requirements the following general testing and commissioning requirements shall be adhered to.
- 2.12.2 Comprehensive testing and commissioning of the system shall be required. The contractor shall provide qualified personnel for the supervision of all inspection and testing activities.
- 2.12.3 A test plan and programme shall be submitted by the contractor for approval by the engineer before any tests are conducted.
- 2.12.4 The test plans shall be developed to unambiguously demonstrate the correct operation of the installed equipment. The contractor shall identify any testing that may impact on critical operations and seek direction from the engineer.
- 2.12.5 At minimum, the test plan shall include the following
- Details of the equipment to be tested.
 - Configuration (e.g. memory, I/O cards, power supplies) of equipment to be tested.
 - Software and/or firmware versions of equipment to be tested.
 - Major software configuration parameters.
 - System diagram showing how equipment is logically arranged.
 - Details of any interfaces to third party equipment, both high level and low level.
 - Cause and effect matrix detailing all input/output relationships/results.
 - Pass or fail criteria to be specified within test documentation.
- 2.12.6 The test programme shall be developed providing the sequence of testing to be conducted. As a minimum, the test programme shall indicate the relative start and finish dates for the following:
- System Commissioning Tests
 - System Acceptance Tests
- 2.12.7 System Commissioning Tests
- Upon receiving approval for the test plan and programme from the engineer, the contractor shall conduct unsupervised System Commissioning Tests in accordance with the test plan and within the dates defined in the programme.
 - Any defects shall be rectified immediately by the contractor and the system re-tested. Tests shall be repeated until the contractor is able to complete all approved tests successfully without any defects. Upon successful completion, the contractor shall formally advise the engineer in writing of such, and that they are ready for the System Acceptance Tests.
 - The engineer is not required to witness the system commissioning tests but may choose to do so.

2.12.8 System Acceptance Tests

- The contractor shall demonstrate the functionality of the system using the approved test plan. System Acceptance Tests shall be witnessed and signed off by the engineer or his representatives. The contractor shall provide two-way radio communications and all equipment required for the testing.
- If the System Commissioning Tests have been properly carried out, the systems acceptance tests should be straight forward and no defects should arise. In any case, should there still be defects; the systems acceptance tests shall be repeated. The contractor shall bear all costs incurred by the engineer or his/her representatives in attending system acceptance re-testing.
- Report of all the test event transactions shall be provided in both soft and hardcopy. Softcopy shall be in in the Microsoft Office Excel format for easy analysis.

2.12.9 The Contractor shall provide all necessary safety equipment and test instruments. All test instruments shall be covered by a current test and calibration certificate.

2.12.10 All inspection and test results shall be recorded using proforma documentation (test certificates and schedules) complying with applicable standard (e.g. SANS 10139) – all test results shall be included in the handover documentation.

2.12.11 All certificates to be issued once final commissioning has been completed shall be submitted to the engineer for approval before being issued.

2.12.12 The Contractor shall make provision for all inspection and testing activities to be witnessed by the engineer. Unless otherwise specified, the period of notice for witness testing shall be 10 working days.

2.12.13 Unless otherwise agreed by the engineer, no part of the installation shall be commissioned until all defects or omissions revealed by inspection and testing have been rectified. Where a defect or omission renders all or part of the installation unsafe for use, the contractor shall take approved precautions to ensure that no part of the installation can be commissioned.

2.12.14 Before testing and commissioning, inspections shall be performed to verify:

- All equipment and material is of the correct type and complies with applicable SANS/BS standards.
- All parts of the installation are correctly installed.
- No part of the installation is visibly damaged or otherwise defective.
- The installation is suitable for the environmental conditions.
- The installation complies with this Specification.

2.12.15 On satisfactory completion of the inspections the following tests shall be performed in the sequence listed:

- A power failure shall be simulated to test the standby power supply.
- If required by the applicable standard, or requested by the engineer, cables and wiring shall be insulation tested at 500V after they are installed. The insulation resistance to earth and between conductors shall comply with the requirements of SANS 10142-1. Because 500V can damage electrical and electronic equipment, the insulation test shall be carried out before equipment is connected to the cables or wire. The completed installation shall be tested at a lower voltage, as recommended by the manufacturer.

- Earth continuity should be tested in accordance to SANS 10142-1
- Each system component dynamically tested to ensure that they work satisfactorily, and that the correct indications and responses are given by the fire control panel.
- Annunciating devices shall be tested to ensure that the correct sound levels are achieved throughout the building.
- All signals from the system to ancillary systems shall be checked to ensure that the correct actions or responses are achieved.
- After individually testing the components and equipment, system simulation tests shall be done to commission the system and to indicate that the system is working.

2.13 Maintenance during defects liability period

2.13.1 In addition to section specific requirements the following general maintenance requirements shall be adhered to.

2.13.2 Comprehensive maintenance shall be provided during the twelve months Defects Liability Period. The defect period shall commence upon successful completion of system acceptance testing and the issue of the certificate of completion.

2.13.3 Comprehensive maintenance shall comprise of:

- Half-yearly preventative maintenance for all installed items.
- Ad-hoc corrective maintenance for reported faults.
- Keeping a maintenance register.

2.13.4 Half-yearly preventative maintenance

- The maintenance to be carried shall include but not be limited to the following activities:
 - Consultation with user on any problems encountered and adjustment required (e.g. adjustment of programming of system behaviour, etc.).
 - Check the operation of all system components for correct operation
 - Check for correct system reporting of faults, alarms and errors.
 - Check the operation of all annunciators
 - Check and confirm interfacing with other connected systems
 - Check operation of user interfaces (GUI, workstations, etc.)
 - Check the physical conditions of the installation including mechanical fixing, evidence of corrosion to any part, signs of overheating, abrasion or physical damage.
 - Check all data, control signal and power connections and terminations.
 - Check the conditions of all batteries connected to the system. Clean batteries; recoat terminal posts with an approved coating.
 - Check all labels and signage.

- Install software updates and upgrades including patches, firmware, updates and upgrades.
- Check time and date on system clock.

2.13.5 Ad-hoc Corrective Maintenance

- Ad-hoc maintenance shall be carried upon the user reporting a fault.

2.13.6 Maintenance Register

- A comprehensive maintenance register shall be kept by the maintenance service provider. The maintenance register shall include the following minimum information:
 - Name of person reporting or discovering fault.
 - Date and time of fault reported or discovered.
 - Nature of fault.
 - Date and time technician arrived on site.
 - Name of technician attended to fault.
 - Date and time fault is resolved.
 - Details of the action taken to resolve the issue including any parts being replaced.
- The maintenance register shall be an electronic register such a Microsoft Office Excel or Access database file. The electronic maintenance register shall be the property of the user and shall be handed over to the user at the end of the maintenance contract. Hard copy reports shall be updated and submitted to the user following any changes to the register.

2.13.7 Quality of service

- Quality of service shall be based on the key performance indicators as per the Contractual document.

3 Fire detection system

3.1 System design

- 3.1.1 Refer to section 2.4 for additional system design requirements
- 3.1.2 The fire detection system shall be a Category L1 system and shall comply with SANS 10139. The system shall be similar or equal approved to the Ziton ZP2 range as per the layout drawings.
- 3.1.3 Several fire alarm control panels shall be required. One panel shall serve as repeater panel in the security room. The remainder shall be installed in the server room(s).
- 3.1.4 The fire detection system and associated equipment shall be EN54 certified and sourced from the same manufacturer. If the manufacturer of the fire alarm control panel does not manufacture a necessary piece of equipment, then that piece of equipment shall be certified by the manufacturer of the fire panel as compatible and according to the applicable standards.
- 3.1.5 The contractor shall act as both the designer and installer as defined in SANS 10139.

3.2 Scope of work

Due to Budget Prioritisation in the first phase of this project, it was decided to utilise the existing Analogue Panels and Devices already in place.

An addressable panel will be installed in the Control Room and will act as the interface to the BMS via a MODBUS Interface.

Each of the 7 (seven) Existing Analogue Panels will be connected to the Addressable Panel with a PH30 Loop.

Each of the Analogue Panels will be outfitted with a minimum of 2 x Input Units, 1 for each of its respective loops, thus creating 14 Zones.

Each of these zones will be monitored by the BMS for Fire and Fault.

Upgrade from Analogue to Addressable for both the Panels and Field devices will be part of future Phase

3.3 Specification for existing

- 3.3.1 Addressable Fire Panel
ZP2-F2-99 Ziton ZP2 Fire Panel 2 Loop standard controls no Zone LEDS
- 3.3.2 Modbus Interface
Ziton 2010-2-PAK-RMMB enables the Modbus protocol over Ethernet.
The fire panel allows for its capabilities to be extended by use of USB dongle.
- 3.3.3 Network Card
Ziton 2010-2-NB Network card for ZP2/2X panel

- 3.3.4 Fire Cable
WFA00210L Fire Retardant Cable 2 X 1mm.sq. - PH30
- 3.3.5 Input Unit
Ziton A45E-2 Addressable Interface Module

3.4 System requirements

- 3.4.1 Refer to section 2.5 for additional system requirements
- 3.4.2 The system shall be a networked analogue addressable fire detection system capable of communicating with multiple external systems such as fire extinguishing systems, smoke detection and extraction system, HVAC system, lifts, access control system, via logical programmable input/output units. The system architecture shall be modular to allow for future expansion.
- 3.4.3 All the addressable units shall be wired in a closed loop with no spurs i.e. all the units shall continue to function even if there is a short circuit or open circuit anywhere in the cabling.
- 3.4.4 The fire detection control unit shall monitor the status of field devices on a continuous basis
- 3.4.5 Based on the information gathered from the field devices, the control unit will report any fault and alarm conditions and initiate the appropriate actions.
- 3.4.6 The system shall be field configurable from the control panel via a keypad or via a computer workstation. Final configuration should be maintained under power failure conditions.
- 3.4.7 The system shall have a minimum of four access levels e.g. operator, supervisor, maintenance technician and administrator. The system shall be password protected
- 3.4.8 The system and all field devices shall be protected against over voltage and transient currents.
- 3.4.9 The control unit shall be modular in design and have facilities to operate as a stand-alone unit or as part of a network, consisting of multiple control units.
- 3.4.10 All equipment that requires operation, attendance, cleaning or maintenance in service shall be positioned and installed to allow adequate and safe means of access for such activities. Similarly, the positioning of equipment shall not impede access to any other equipment or services which require operation and maintenance activities
- 3.4.11 At least 20% spare capacity shall be allowed on each address loop i.e. it shall be possible to add 20% more devices without overloading the loop or panel.

3.5 Components and equipment

- 3.5.1 Refer to section 2.7 for additional component and equipment requirements
- 3.5.2 Fire detection control panel(s)
- The control panels shall be modular in design and have facilities to operate as a stand-alone unit or as part of a network, consisting of multiple control units.
 - The control panel shall have a front panel comprising of a LCD screen, control keyboard and indicating LED's.
 - The control panel shall be a 24Vdc analogue addressable unit and be able to communicate with various field devices.
 - The control panel will not only read the address of each individual unit, but also receive their true analogue values.

- The control panel will be equipped with a minimum of 2 loops and a minimum 64 zone capacity and be upgradeable to allow for future expansion.
- Each loop shall consist of a 2-wire cable. These 2 wires will power the field devices and carry data to and from these field devices. Each loop will allow for a minimum of 127 addresses.
- The fire panel will not have any pre-set configuration of field device addresses. Address configuration will be determined during commissioning.
- The fire panel shall be able to determine the type of device located at each address to protect against incorrect programming.

3.5.3 Annunciation

- LED indicators shall show faults and fire alarms by zones.
- The following conditions will be clearly displayed on the LCD text display along with an audible alarm and where applicable the LED indicators:
 - Fire alarms by zone
 - Pre-alarms
 - System faults
 - Maintenance indication level
 - Device or zone that has been disabled
 - Total number alarm events

3.5.4 Fire alarms shall take priority on the LCD display

3.5.5 On manual request, it shall be possible to view field devices, along with their analogue addresses and current status.

3.5.6 Different types of alarm conditions shall be clearly distinguishable.

3.5.7 The control panel shall provide communication outputs for network capabilities, audible alarms, control functions, remote mimics, a printer and a computer workstation.

3.5.8 The control panel shall be able to receive and transmit various inputs and outputs to and from e.g. sprinkler systems, air conditioning installations, lifts etc. as required.

3.5.9 Power supply

- Each panel shall be provided with its own standby battery supply that forms part of the system. The battery size shall be capable of maintaining the system in normal operation for at least 24 hours.
- The control panel(s) shall be fed from the 230 VAC emergency standby generator power supply.
- The power supply to be fed from the nearest distribution board via a dedicated isolator. The isolator shall be permanently and clearly labelled:
“ FIRE ALARM CONTROL PANEL – DO NOT SWITCH OFF”

3.5.10 Repeater panels

- Repeater fire alarm repeater panels shall be networked and configurable for system display or control purposes.

3.5.11 Detectors (General)

- All detectors shall be of the analogue addressable type. Each detector shall be assigned with a unique address. It shall be possible to set individual addresses in the field.
- Detectors shall be suitable for connecting to a two-wire 24Vdc circuit and operate within the supply voltage range of 17 - 28Vdc. The detectors shall also be polarity insensitive.
- A red indicator LED shall be provided on each of the detectors, the LED will illuminate when a pre-set alarm level has been reached.
- Provision shall be made for a remote indicator output on each detector.
- All detectors are to be supplied complete, fully tested and calibrated.
- Detectors shall be capable of being remotely tested from the fire panel via transmission of a test code. A healthy response will indicate that that detector has exceeded its alarm threshold and is now in alarm mode.
- The detector shall be capable of operating within the following environmental range:
 - Temperature range: -20°C to 60°C.
 - Humidity range: 0% to 95%.
 - Ingress Protection rating: IP 43.

3.5.12 Detector bases

- Separate mounting bases shall be required to enable easy removal of devices for maintenance and replacement purposes.
- Insertion and removal of field devices shall be through a twist operation of the device.

3.5.13 Optical smoke detectors

- The optical smoke detectors shall be suitable for detecting visible smoke such as produced by smouldering fires including burning PVC.
- It shall be of the light scattering type using a pulsed internal LED light source and a photocell sensor.
- The construction of the detector shall be of self-extinguishing ABS plastic. Circuitry shall be protected against moisture. Smoke entry points must be protected against dust and insects. The detector covers shall remain on during construction to prevent dust contamination and shall only be removed prior to testing and commissioning.
- Detectors maximum mounting ceiling height shall be 12.5 m.
- The contamination level of a detector's photo-optical chamber will cause the detector output signal to gradually change.
- The control panel shall be capable of monitoring this change in signal and indicate when a level is reached that requires servicing of the detector.

3.5.14 Heat detectors

- All heat detectors shall have both rates of temperature rise and maximum temperature level detection capabilities.

- The detector shall monitor ambient temperature by means of an exposed transistor.
- The construction of the detector shall be of self-extinguishing ABS plastic. Circuitry shall be protected against moisture.
- Detectors maximum mounting ceiling height shall be 7.5 m.

3.5.15 Manual call points

- Resettable Type A manual call points with built in short circuit isolators shall be installed as per the layout drawings
- The construction of the unit shall be of red self-extinguishing polycarbonate plastic.
- The unit shall be operated by breaking the plastic insert, and the alarm condition shall be maintained until the insert has been reset.
- A red indicator LED shall be provided on each of the units; the LED will illuminate when the insert is broken and indicate the alarm status.
- The insert shall be resettable using a re-settable tool.
- It shall be possible to test each unit by inserting a test tool at the bottom of the unit. This test tool shall simulate an alarm condition, without “breaking” the insert
- The unit shall be fitted with a cover and seal to eliminate tampering. The latter shall be noted in the contractor’s design certificate as a deviation.

3.5.16 Zone or Loop Isolator

- The isolator shall be able to connect into the loop circuit and monitor the loop for short circuits.
- In the event of a short circuit, the isolator on each side of the short circuit is to disconnect and isolate the short circuit. This will enable the remainder of the system to function normally.
- A red indicator LED shall be provided on each of the units, the LED will illuminate when the isolator is in the open position.

3.5.17 Input / output units

- The input and output units shall be addressable and connected to the same loop as the detectors.
- The devices shall report individual input statuses and faults to the panel under a single address for any one of the inputs.
- A red indicator LED shall be provided on each unit, the LED will illuminate when any fault condition occurs at the I/O unit.
- The Input / output units shall be supplied complete with enclosure.
- I/O units shall be wired fail-secured.

3.5.18 Annunciation devices (strobe, siren or combination sounder-strobe units)

- All audible and visual alarm units shall be loop powered and addressable units.
- All sounders shall be of the same tone and frequency throughout the building.
- Annunciation devices shall be available in strobe light, sounder or combination strobe and sounder unit configuration.

- Where required base sounder-strobe units shall be provided as per the layout drawings. Note requirement for sounders in each room. The contractor shall ensure loop currents are not exceeded.
- The annunciation devices shall be available in IP41 and IP65 for internal and external applications respectively.

3.5.19 System cabling

The contractor shall take note of the requirement for two cable classification types.

- Loop cabling shall meet the meet the PH 30 classification when tested in accordance with BS EN 50200 and additionally the 30-minute survival time when tested in accordance with Annex E of that standard

3.5.20 All testing and commissioning equipment shall be provided by the contractor, including but not limited to:

- Smoke detection test spray
- Heat detector test kit
- Alignment tools

The testing equipment shall be handed to the client following completion of the project to enable onsite testing by the client.

3.6 Interfacing with other systems

The fire detection system shall be linked to the following systems.

3.6.1 HVAC

- The fire detection system shall provide fire alarm outputs in the event of a fire alarm condition to the following HVAC systems:
 - Air handling units
 - Stair pressurisation fans
 - Smoke extract system
- Addressable output relays shall be provided adjacent to each system control panel. It shall be the responsibility of the HVAC contractor to connect his system to the relays. The feedback status of the controlled equipment of each unit shall be monitored.

3.6.2 Fire protection system

- The fire alarm system shall monitor alarms from the following fire protection systems
 - Alarm control valve chamber control valves
 - Pump house alarm annunciator
 - Fire water tank level: low

3.6.3 230 VAC power

- The Electrical contractor will provide 230 VAC power outlets in close proximity to the equipment. The contractor shall coordinate the final location and number of points required.

- The contractor shall reticulate all power requirements for the system from the point provided onward.
- The contractor shall perform all power reticulation from the power outlet to all required

3.7 Installation of components and equipment

3.7.1 Refer to section 2.9 for additional installation requirements.

3.7.2 Unless otherwise specified, mounting heights shall be as follows.

Description	Mounting height
I/O units	Underside 2200 mm above finished floor level
Manual Call Points	Underside 1200 mm above finished floor level
Aspirating detector units	Underside 1200 mm above finished floor level

3.7.3 The detectors and detector bases shall always be installed in such a way that the indicator tag and LED alarm indicator is easily seen from the point of access to that area.

3.7.4 Loops supplied from different fire control panels shall not be installed in the same conduit.

3.7.5 A loop-in wiring system where conductors are looped from outlet to outlet shall be employed.

3.8 Samples, drawings and documentation

3.8.1 Refer to section 2.10 for samples, drawings and documentation requirements.

3.9 End-user training

3.9.1 Refer to section 2.11 for end-user training requirement.

3.10 Testing and commissioning

3.10.1 Refer to section 2.12 for additional testing and commissioning requirements.

3.10.2 As a minimum, the test plan shall detail the following:

- Details of the equipment to be tested.
- Configuration (e.g. memory, I/O cards, power supplies) of equipment to be tested.
- Software and/or firmware versions of equipment to be tested.
- Major software configuration parameters.
- System diagram showing how equipment is logically arranged.
- Details of any interfaces to third party equipment, both high level and low level.
- Cause and effect matrix detailing all input/output relationships/results.

- Pass or fail criteria to be specified within test documentation.
- The tests to be carried out shall include but not be limited to:
 - Zoning – created according to Client's requirements
 - User groups – user groups created according to Client's requirements
 - Time zones – time zone created according to Client's requirements
 - Graphics, icons and texts
 - Site maps and floor plans.
 - Meaningful icons and their behaviour for different events.
 - Active Icon creation and addition to graphics.
 - Meaningful text descriptions of locations, devices, events, instructions, etc.
- Communication link between:
 - Server and operator workstation
 - Server and control panels
 - Control panel and field devices
- Fire alarm panel event
 - Fault
 - Alarm
 - Error
- Manual controls
- The operations of all tamper circuit.
- The operation of all intruder detection sensors.
- The operation of all the sounders and indicator lights.
- Breakglass activation
- Door release on fire trip.
- The interfaces to third party system such as CCTV system, lift system, access control system, motorised portals, etc.
- Report generation
 - Standard.
 - Custom – creation and run.
- Control panel battery backup time.
- Operation of all operator workstation
- Verify time and date on system clock.
- Verify all labels and signage are correctly installed.
- Verify all alarms/messages and normal conditions are received at the monitoring station.

3.11 Maintenance during defects liability period

3.11.1 Refer to section 2.13 for maintenance during defects liability period requirements.

4 Internal Access control and alarm system

4.1 System design

4.1.1 Refer to section 2.4 for additional system design requirements

4.1.2 The Electronic Access Control and Alarm System (EACAS) shall be an integrated IP-based enterprise solution, and supplied complete with appliances, controllers and software. The system shall be fully scalable to allow for future expansion.

4.1.3 The access control and alarm system shall provide card access control and alarm functionality. The alarm functionality shall include intrusion alarms and duress alarms.

4.1.4 The Electronic Access Control and Alarm System (EACAS) designs shown on the indicative schematics are based around the SALTO control system. Alternate solutions may be proposed for consideration provided they achieve and exceed that of the documented design.

4.1.5 The access control and alarm system will consist of the following, but not limited to:

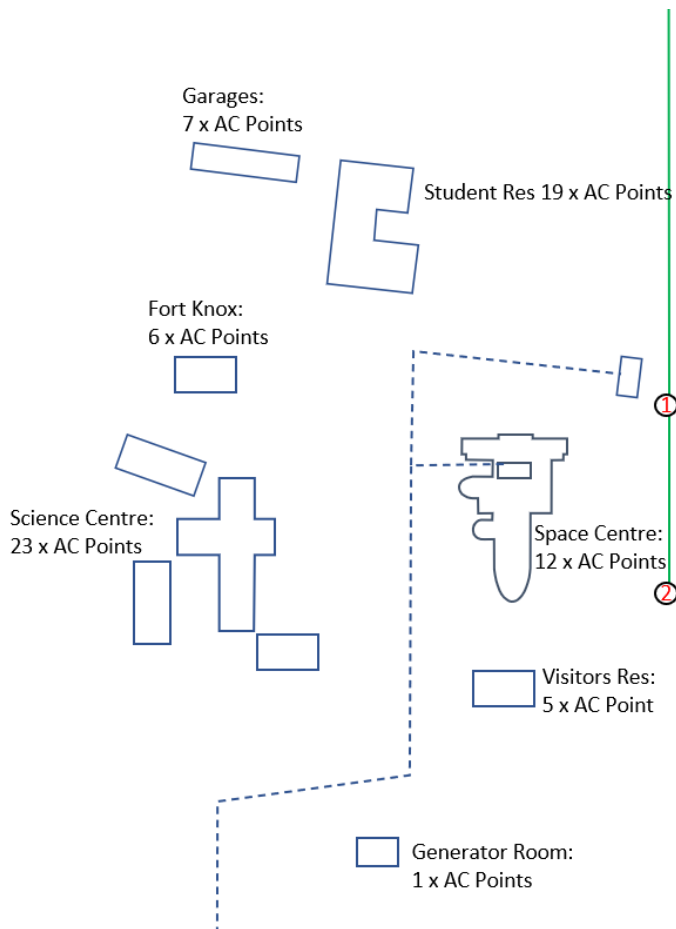
- Electronic access and alarm control system headend and workstations
- System control panels located in communication rooms or ceiling voids above access controlled doors.
- Biometric fingerprint and contactless smartcard access card readers
- Electromagnetic locks - 300kg breaking force
- Emergency door release units
- Magnetic reed switches
- Programmable audible alarm devices
- Interfacing to third party systems such as CCTV, lifts, Fire detection system and motorised portals etc, as required.

4.2 System requirements

4.2.1 Refer to section 2.5 for additional system requirements

4.2.2 The integrated access and alarm system shall be installed with the following minimum requirements:

Gallagher Access Control will be required at the locations indicated below



Each of the Buildings will have one or more 6000 Controller(s) dependant on the amount of associated doors and will be housed in a Dual Cabinet complete with 8Ah PSU.

The Main Entry Point(s) of each building will be installed with a Gallagher T20 Reader which will function as both the Access Control Credential Reader as well as the Alarm Keypad for the Specific building.

All other doors will be installed with a Gallagher T15 Reader using Mobile Credentials as the identifier.

Each of the Doors will be installed with a S/Steel RTE Pushbutton, Green Break-glass Unit, 300Kg Monitored Magnetic Lock and Door Closer as standard.

All Routing, sleeving, trays and backboxes to be provided by others.

4.3 Reader Technology – Bluetooth and NFC Credentials (Mobile Connect)

The system shall have the capability to use a mobile device as an access credential in place of a traditional access control card.

Connectivity between the mobile device and access control reader shall be via BLE communication or NFC technology (subject to the capability of the mobile device).

In addition to BLE and NFC support, the access control reader must support multiple card and communication technologies to allow for scenarios where a mobile device may not be available. The reader shall support the following:

- Proximity 125 kHz,
- Mifare Classic,
- Mifare Plus,
- MIFARE DESFire EV1,
- MIFARE DESFire EV2.

Any communication between the ISMS and a cloud server shall be limited to those initiated by outbound requests from the ISMS only to ensure system security.

It shall be possible to configure the Bluetooth functionality of the reader via the ISMS.

The options for configuration shall include:

- enable/disable reader BLE functionality,
- enable/disable second factor authentication whereby the user must present their mobile device and enter a PIN or biometric identification,
- enable/disable the ability of the reader to advertise its name via BLE,
- adjust the overall transmit power of the reader,
- enable/disable the ability for the mobile device to automatically connect to the access control reader,
- adjust the signal strength threshold for auto connection to the access control reader,
- enable/disable the ability for the mobile device to manually connect to the access control reader,
- adjust the read range for manual connection to the access control reader.

It shall be possible to apply a global setting for all readers.

It shall be possible to apply a setting for individual readers.

It shall be possible to configure and calibrate the BLE functionality of the reader via an application on the mobile device. The configuration and calibration options shall include:

- enable/disable reader BLE functionality,
- enable/disable second factor authentication whereby the user must present their mobile device and enter a PIN or biometric identification,

- enable/disable the ability of the reader to advertise its name via BLE,
- adjust the overall transmit power of the reader,
- enable/disable the ability for the mobile device to automatically connect to the access control reader,
- adjust the signal strength threshold for auto connection to the access control reader by placing the mobile device at the distance where it is required to operate and selecting a calibration button,
- enable/disable the ability for the mobile device to manually connect to the access control reader,
- adjust the read range for manual connection to the access control reader by placing the mobile device at the distance where it is required to operate and selecting a calibration button.

Provisioning of a mobile device to be used as an access credential shall be carried out within the ISMS core software. Obtaining credential details via a third-party application or web site will not be acceptable.

Provisioning of the access credential shall be a two-step process to ensure security.

- An email shall be sent to the user who will confirm acceptance of the access credential on their mobile device.
- After acceptance, a confirmation code of no less than 6 digits shall be sent via SMS to the mobile device, whereby the user will enter this into the mobile device access control application to enable its operation.

The time allowed for the credential to be accepted shall be configurable within the ISMS. After the time has expired, the credential will need to be re-issued.

Systems that use a single step provisioning process are not acceptable. This is to avoid instances where the ISMS operator incorrectly enters an email address or mobile device number and an incorrect person receives the access credential.

It shall be possible to remove authorisation of access credentials via the ISMS should a mobile device be lost.

It shall be possible to re-issue access credentials via the ISMS should a mobile device be replaced.

It shall be possible to re-issue access credentials to another cardholder.

When the mobile device is presented to the reader, the access decision shall be made at the IFC. Systems where the access decision is made at the ISMS server or in the cloud are not acceptable.

In addition to using the mobile device as an access control credential, the following functionality shall be available via the mobile device access control application:

- arm and disarm an alarm zone,
- change the mode of a door from secure to free access, and vice versa,
- change the scheduled access mode of a door,
- activate/deactivate relay outputs anywhere on the system. The relays do not necessarily have to be connected to the access controller which is connected to the Bluetooth reader,
 - receive messages from the ISMS via push notifications.

4.4 Equipment Requirements

4.4.1 Access Control Workstation

Dell Vostro 3888

The ISMS server shall use a Microsoft Windows operating system as defined previously.

4.4.2 24" Monitor

Dell LCD Monitor SE2422H FHD Monitor

4.4.3 Gallagher Command Centre Software

Gallagher Command Centre C201311

4.4.4 Gallagher Door License

Command Centre comes standard with 16 Door Licenses, each of the remaining doors over and above the first 16 doors will require Door Licenses – Total $16 + 58 = 74$ Doors

4.4.5 REST API SAFR TRAKA License

The ISMS shall support a RESTful web API .

The RESTFUL API shall support client certificate pinning for connection security.

The RESTful API shall be authenticated and secured using TLS client certificates (2048-bit RSA).

The RESTFUL API shall support HTTPS for data transfer

4.4.6 GO SANSA Visitor Management Application

Specification to be customised to Clients Requirement – PC Sum

4.4.7 Gallagher Controller 6000

Gallagher Controller 6000 Standard complete C300100

Dual Cabinet and 8Ah PSU

Connected to Local Switch.

4.4.8 Dual Cabinet

Gallagher Dual Cabinet Complete with 8Ah PSU T10862

4.4.9 Gallagher HBUS Door Module

HBUS Module 8 In 2 Out Door Module C300660

- 4.4.10 Gallagher HBUS board
HBUS 8 In Board C300680
- 4.4.11 Gallagher T20 Reader
T20 Multitech Terminal C300460
To be used at a Access Control Reader and Alarm Keypad, to be installed at Main Entrance Points to each building.
- 4.4.12 Gallagher T15 Reader
T15 Multitech Terminal C300480
To be used as an Access Control Reader with Mobile Credentials as the Identifier, fail over identifier will be Mifare Cards.
- 4.4.13 Local Network Switch
Netgear FS728TP-200EUS
24 Port 10/100/1000 Smart Managed Gigabit Switch with 24 Ports PoE+, 4x SFP slots for Fibre Modules.
190W PoE Budget to be used for CCTV
Existing Cabinet and Fibre Routing to be used.

4.5 Gate House Security

The Objective of the Gatehouse Security Setup is to ensure the positive identification of all persons entering the premises whether in vehicle or on foot.

4.5.1 Scope of Work

Additional Spike Barriers for both ingress and egress will be installed to heighten the Security Level for Vehicle Access.

The existing vehicle Booms will be repositioned to create vehicle mantraps, both for entry and for exit, that will prevent tailgating.

Anti-pedestrian curtains will be installed on the existing set of booms to prevent the movement of people through the vehicle area.

A Full Height Turnstile will be installed for pedestrians and vehicle passengers for both ingress and egress to the site.

Access Control of Staff at the Vehicle Booms and at the Turnstile will be by Bluetooth Mobile Credential via personal cellphone.

All Visitors and their respective vehicles will need to be pre-enrolled and pre-authorised for entry to the site, this will be via the Go SANSA application.

4.6 Equipment Specification

4.6.1 Turnstile

Turnstar Titan Turnstile

Type: Single Full Height

Arm Configuration: 3 Arm at 120°

100% corrosion resistant

4.6.2 Vehicle Barriers

Turnstar Velocity Raptor Spike Barrier

Length of Pole: 3.5m

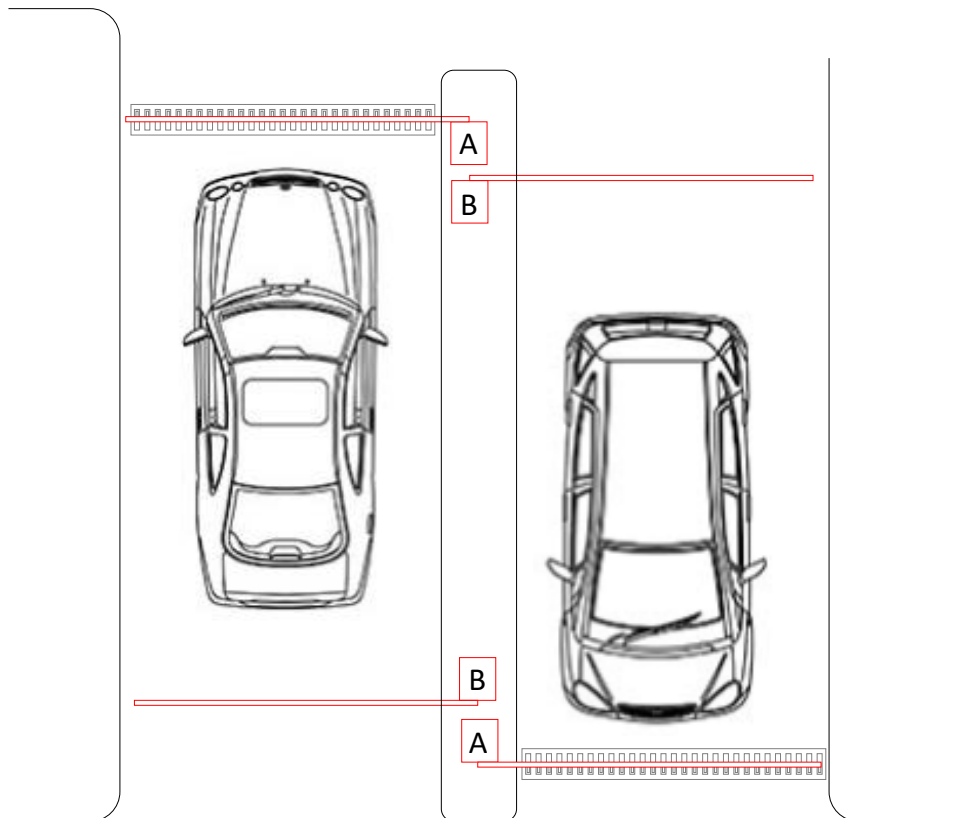
Spike Rack: Surface Mount

Vehicle Barrier Configuration

Vehicle Barrier B (Repositioned existing Barriers) will be auto-opening (inductive Ground Loop) to allow the Vehicle into the “Mantrap”

Vehicle Barrier A will only Open once a. Barrier B is closed, and b. Personal Credentials are presented and accepted.

This Configuration is to ensure no tailgating takes place.



4.6.3 Gallagher Controller 6000
Gallagher Controller 6000 Standard complete with Dual Cabinet and PSU
Connected to Gatehouse Access Switch.

4.6.4 Gallagher HBUS Door Module
HBUS Module 1 – Vehicle Booms Type A 1 and 2
HBUS Module 2 – Turnstile In and Out

- 4.6.5 Gallagher T15 Reader – for use with Mobile Credential
 - Vehicle Boom In – HBUS Module 1
 - Vehicle Boom Exit – HBUS Module 1
 - Turnstile In – HBUS Module 2
 - Turnstile Exit – HBUS Module 2

- 4.6.6 Facial Recognition Cameras at Vehicle Access Entry and Exit Points
 - Axis P3245-LVE IP Camera
 - SAFR Facial Recognition License per Lane
 - Gallagher REST API

- 4.6.7 LPR Camera
 - Axis P3245-LVE IP Camera
 - Camera FF Group License per Lane

- 4.6.8 Facial Recognition Cameras at Turnstile
 - Axis P3245-LVE IP Camera
 - SAFR Facial Recognition License Per Camera
 - Gallagher REST API

- 4.6.9 CCTV General Overview Camera inside the gatehouse
 - Hanwha Techwin QNV6021R IR Dome Camera

- 4.6.10 Facial Recognition Local Server
 - BOXER-8240AI-A2-1010 Nvidi Xavier AGX

4.7 Interfacing with other systems

4.7.1 Video surveillance system

- None

4.7.2 Lift System

- None

4.7.3 Structured cabling installation

- Network outlets shall be provided by the contractor.

4.7.4 Ironmongery and shopfronts (main contractor)

- The access control and alarm contractor shall coordinate with the main contractor to ensure that electronic locking devices supplied by the contractor are properly mated with door ironmongery supplied by the main contractor.

4.7.5 Fire detection system

- The electronic access control and alarm system shall receive inputs from the fire alarm system to automatically unlock doors along nominated fire egress paths upon receipt of a signal from the fire panel.
- The fire alarm panel and fire trip signal shall be provided by the Fire Detection System Contractor.
- The Fire Detection Contractor shall provide one or more voltage-free relay contact outputs at the security panels as indicated by the access control contractor. One voltage-free relay contact output relay shall be provided for each fire evacuation zone.
- The access control contractor shall ensure that the security panel controlling one or more fire evacuation zones has all the corresponding fire trip signals wired to it. The security panel shall unlock doors only within a fire evacuation zone where the fire trip signal has triggered and keep doors in other fire evacuation zones locked. In situations where an access controlled door serves multiple fire evacuation zones (e.g. along a corridor), this door must unlock when a fire trip signal is received for any one of the fire evacuation zones.
- The access control contractor shall terminate the fire trip cable at the access control panels, and coordinate with the Fire detection contractor to test that a fire trip signal is correctly received.
- All I/O units shall be wired fail-secured.

4.7.6 230 VAC power.

- The Electrical contractor will provide 230 VAC power outlets in close proximity to the access control panels. The access control contractor shall coordinate the final location and number of points required.
- The access control contractor shall reticulate all power requirements for the access control and alarm system from this point onward.
- The access control contractor shall perform all power reticulation from the power outlet to all access control panels and from the access control panels to all field devices.
- The access control contractor shall provide separate battery backup for normal operation for a minimum period of 8 hours for access control panels and field devices running on extra low voltage. The backup power provided by the access

control contractor shall be through local batteries housed in the access control panels.

4.8 Installation of components and equipment

4.8.1 Refer to section 2.9 for additional installation requirements.

4.9 Samples, drawings and documentation

4.9.1 Refer to section 2.10 for samples, drawings and documentation requirements.

4.9.2 The shop drawings shall include but not be limited to:

- Network diagram showing all proposed interconnections of the components of the system such as field devices (readers, electromechanical locks, request to exit devices, Breakglass units, etc.), control panels, servers, workstations, network switches, etc.
- Typical mounting details of the field devices for the different type of portals.
- Mounting details of the control panels.

4.10 End-user training

4.10.1 Refer to section 2.11 for end-user training requirement.

4.11 Testing and commissioning

4.11.1 Refer to section 2.12 for testing and commissioning requirements

4.11.2 The tests to be carried out shall include but not be limited to:

- Access groups – access groups created according to Client's requirements
- User groups – user groups created according to Client's requirements
- Time zones – time zone created according to Client's requirements
- Graphics, icons and texts
- Site maps and floor plans.
- Meaningful icons and their behaviour for different events (e.g. door locked, unlocked, alarm, etc).
- Active Icon creation and addition to graphics.
- Meaningful text descriptions of locations, devices, events, instructions, etc.
- Communication link between:
 - Server and operator workstation
 - Server and EACAS panel
 - EACAS panel and field controller
 - Card enrolment and deletion

- Card read range
- Events at controlled portals (doors, gates, barriers, etc)
- Valid card.
- Invalid card.
- Out of time zone.
- Door forced.
- Door open too long.
- Anti-pass-back violation.
- The adequacy of all electromechanical lock "unlocked" and alarm shunt.
- The operation of all the electromechanical locks, ensuring that the lockset is aligned with the keeper and mechanical locks.
- Interlocking of doors – e.g. airlock, traffic flow channelling, etc.
- Manual controls (e.g. open/lock door).
- The operations of all tamper circuit.
- The operation of all intruder detection sensors.
- The operation of all the sounders and indicator lights.
- Breakglass release of portal.
- Request-to-exit devices.
- Door release on fire trip.
- The interfaces to third party system such as CCTV system, lift system, fire indicator panel, motorised portals, etc.
- Report generation
- Standard.
- Custom – creation and run.
- EACAS panel battery backup time.
- Operation of all operator workstation
- Verify time and date on system clock.
- Verify all labels and signage are correctly installed.
- Verify all alarms/messages and normal conditions are received at the monitoring station.

4.12 Maintenance during defects liability period

4.12.1 Refer to section 2.13 for maintenance during defects liability period requirements.

5 Video Surveillance System

5.1 System design

- 5.1.1 Refer to section 2.4 for additional system design requirements
- 5.1.2 The video surveillance system shall be a full digital IP based closed circuit television (CCTV) system that is able to capture, transmit, record and archive video images and have redundant standby server system architecture as per the layout drawings.
- 5.1.3 The CCTV system will operate on a dedicated security network. All network cables and points will be installed by the contractor.
- 5.1.4 The CCTV system shall be configured for remote monitoring from an external site and remote login access for selected users.

System Objective

Internal CCTV is for the General overview of Internal Public Spaces, Critical Areas and to cover all Entry Points into each of the New buildings Only.

The System is to be used to retain and forensically to review Footage.

Existing Buildings will be covered in future phases.

Scope of Work

Supply and Install Overview Cameras in all New buildings, final placements of cameras to be confirmed.

All Routing, sleeving, trays and backboxes to be provided by others.

Open Platform VMS and Server with Recording Retention of 30 Days.

5.2 Equipment Specification - Required

- 5.2.1 CCTV Workstation
Dell Vostro 3888 with Dual Graphics Card and Min Windows 10
- 5.2.2 CCTV Monitor
Dell LCD Monitor SE2422H FHD Monitor
- 5.2.3 VMS Software
Milestone XProtect Professional+ Base Software

- 5.2.4 Device Licenses
Milestone XProtect Professional+ Device License required per Device
- 5.2.5 CCTV Server
Milestone Husky IVO 350R Server c/w Rack Mount Accessories
Quad Core CPU
16GB DDR4 RAM
2 X 3.5" Internal Hard Drives
Integrate PCIe Slots
1U Rack Mount Form Factor
32TB HDD Capacity (2 x 16TB HDD)
- 5.2.6 CCTV Integration
Milestone Gallagher Integration Licence provided by Gallagher
- 5.2.7 Internal CCTV Cameras
QNV-8082R Hanwha Techwin 2Mp Outdoor Dome Network camera
2 Megapixel (1920 x 1080) resolution
3.2 ~ 10mm (3.1x) varifocal lens
Defocus detection, Directional/Virtual Line detection, Motion detection, Enter/Exit, Tampering
IR viewable length 30m
IP66, IK10, PoE/12VDC
- 5.2.8 The CCTV system to be provided by the contractor shall consist of, but not necessarily be limited to, the following:
- Fixed integrated dome IP Power-over-Ethernet (PoE) cameras complete with lenses and mounting brackets
 - PTZ integrated dome IP PoE cameras complete with zoom lenses and mounting brackets
 - Fixed full body IP PoE cameras complete with lenses, housings and mounting brackets
 - Pan-tilt drive units for full body cameras
 - Zoom lenses for full body cameras
 - PoE power injectors
 - Media converters
 - Mounting brackets & accessories.

- Mounting bollards and poles.
- Network switches.
- Network Video Recorder/s.
- Monitor workstations – provided as part of access control system
- Power supplies.
- Equipment racks (cabinets) – provided as part of SCS system
- Interfacing to third party systems.
- Programming to the Client's requirements.

5.2.9 All power to cameras shall be PoE.

5.2.10 The system shall perform the following core functions:

- Concurrent live monitoring and recording of the video streams; and
- Retrieval and playback of recorded video streams.

5.3 System requirements - General

5.3.1 Refer to section 2.5 for additional system requirements

5.3.2 The system shall allow all implied and explicit functions. There shall be provision for at least the following:

- Multiple internal and external cameras
- True open architecture video management system with:
 - The capability to provide access via web browser.
 - Video motion detection with pre and post alarm capabilities
 - When selectable interfaces, including but not limited to, access control, intrusion alarm and intercom events are detected, live CCTV images shall be triggered and be presented to the operator
 - Provide sufficient hard disk capacity for 60 days recording of cameras
 - Event (alarm) recording: 25 images per second per camera including 10 seconds pre-event recording.
 - Motion detection recording: 10 images per second per camera.
 - Background (no activity in field of view) recording: 1 image per second per camera.
 - When the hard disks are full, older recordings shall be overwritten based on first-in-first-out basis, i.e. oldest recording will be overwritten first
- Modular system expansion
- Interface with other services (e.g. access control, fire detection etc.)

5.3.3 All CCTV cameras shall meet or exceed associated performance requirements based on the below table.

Operational Performance	Description	Vertical Pixels
Facial Identification (FI)	Use of the video or still image for positive identification of an individual, for the purposes of supporting an investigation or prosecution. Given a comparative image of equal quality of a known individual, identification shall be beyond reasonable.	80 pixels / face
Facial Recognition (FR)	Use of the video or still image to support recognition of an individual for the purposes of supporting an investigation. A viewer of the image can say with a high degree of certainty that the individual is, or is not, someone they have seen before.	40 pixels / face
Activity Observation (AO)	Use of the video to observe, with a high degree of reliability, the nature of the activity within the field of view.	200 pixels / person
Presence Detection (PD)	Use of the video to establish, with a high degree of certainty, the number, direction and speed of movement of people (or vehicles) within the field of view.	120 pixels / person
Number Plate Recognition (NPR)	Use of the video or still image to accurately identify, with a high degree of certainty, all characters on a vehicle number plate.	30 pixels / number plate characters

5.3.4 Physical and software camera setup shall be performed using an industry standard resolution chart (e.g. IEEE Resolution Chart, CCTV Labs Resolution Chart).

5.3.5 The lens installed on each camera shall achieve the required field of view (FoV) while providing the maximum image resolution possible in terms of pixels per metre of the FoV. The required FoV as detailed on the security drawings is as follows:

Area	Performance	Coverage
Car park entries and exits	NPR	Coverage to enable vehicle license plate recognition at all car park entry/exit points.
Car park area	PD	Coverage of the entire car park area to enable detection of suspicious behavior or vehicle break in.
Building perimeter	AO	Coverage along the ground level building external perimeter to enable intrusion detection and verification.
Fire escapes	FI	External coverage of the fire escape at the discharge level to enable identification of people entering/exiting the fire doors.
Entry lobbies	FI	Coverage to enable identification of persons passing through all doors into and out of the lobby.
Public waiting/circulation area	AO	Coverage to enable monitoring of activities in the public waiting and circulation areas.
Lift lobbies	FR	Coverage to enable recognition of persons in all lift lobbies on all floors.
Inside lift car	FI	Coverage to enable identification of persons entering lift and activities within lift.

Communications rooms	FR	Coverage to enable recognition of personnel entering and leaving the communications room.
Plant rooms	FR	Coverage to enable recognition of personnel entering and leaving the plant room.
Loading docks	FR	Coverage to enable recognition of personnel and activities in the loading docks.

5.3.6 The selected lens shall cause minimal optical aberrations (blur, curvature of the FoV, distortion and the like) in the produced image.

5.4 Components and equipment - General

5.4.1 Refer to section 2.7 for additional component and equipment requirements

5.4.2 The Network Video Recorder/s (NVR) shall have the following key features:

- PC-based with embedded operating system.
- Support for up to 64 IP video streams with simultaneous recording of all streams.
- Support H.264, MPEG-4 and JPEG multi format.
- Minimum of 200 Mbps throughput.
- Support different recording modes including: Manual mode, Time/Day Schedule, and Event which must include pre and post event recording.
- Support camera control such as pan/tilt/zoom, home and pre-set positions, focus, brightness, etc.
- Support camera groupings for ease of viewing of related cameras.
- Flexible playback controls such as jumping to specific time/date, fast forward, rewind, etc.
- Various display modes including full screen, spot, quad, 3x3, 4x4, spot sequence and quad sequence.
- Electronic zooming of live and recorded images, minimum of 2x and 4x zoom.
- Searching by time and date, event type, and camera number.
- Support Video Motion Detection (VMD).
- Enable recorded images to be exported using common video file format such as AVI, MPG, using industry standard codecs for easy playback on computers running common media players.
- Single video frame image export in .jpeg or .bmp formats for easy viewing on computers running common image viewers.
- Alarm input sources shall include 32 terminal inputs and 64 camera alarms.
- Alarm output shall include email notification and terminal output to drive an audio/video alert such as a buzzer or indicator light.
- Built-in network interfaces (100Base-TX / 1000Base-T) for camera recording and remote viewing.
- Support minimum of 4 remote workstations for remote monitoring of live images and viewing of recorded footage.

- Support minimum of 4 programmable user levels authentication, and up to 16 different users. Passwords shall be programmed to ensure only Client-authorised employees can perform functions such as erasing video footage, copying video footage, starting or stopping recording and altering recording or storage settings. All user rights shall be confirmed with the Client during installation.
- Recorded footage shall be encrypted.
- Support a minimum of 8 SATA disk drives on the unit with ability to expand the storage in multiple of at least 8 drives using external storage bays.
- Disk drives shall have at least RAID 5 redundancy and be hot swappable.

5.4.3 Recording requirements

- Provide sufficient hard disk capacity with 20% spare based of the following parameters:
 - Minimum recording period of 60 days for each camera.
 - Event (alarm) recording: 25 images per second per camera including 10 seconds pre-event recording.
 - Motion detection recording: 10 images per second per camera.
 - Background (no activity in the FoV) recording: 1 image per second per camera.
 - The above recording modes are based on:
 - Event (alarm) occurrences – 5% of the time.
 - Video motion in the camera field of view – 35% of the time.
 - Background recording – 60% of the time.
 - When the hard disks are full, older recordings shall be overwritten on a first-in-first-out basis, i.e. oldest recordings will be overwritten first.

5.4.4 CCTV Operator Workstation (as part of access control workstation)

- The CCTV Operator Workstation shall be the main terminal for providing the CCTV control, viewing and administration. Control of cameras and viewing of live and recorded images shall either be through custom software or preferably a commonly available web browser.
- The contractor shall confirm the workstation requirements after appointment but the CCTV Workstations shall include the following as a minimum:
 - CPU: Intel Core i7-920 @ 2.67GHz or faster, 8GB RAM, 2GB of video RAM as or more, as recommended by the NVR manufacturer, whichever is the greater.
 - 500GB Hard Disk Drive; and
 - 2 x Gigabit Network Interface Card.
- Workstation peripherals shall include:
 - Minimum 32 inch, 1080p LCD monitor.
 - Industry standard keyboard;
 - Industry standard optical wheel mouse,

- DVD±RW drive.
- 4 x USB-3 port.

5.4.5 Day/Night Camera Performance Requirements

- The IP CCTV cameras shall meet, or exceed, the following essential performance criteria:

Lens	Camera manufacturer recommended varifocal lenses shall be installed. The selected lens shall cause minimal optical aberrations (blur, curvature of the field of view, distortion and the like) in the produced image. The lens on each camera shall achieve the required FoV. For indoor cameras, the horizontal FOV should be at least 65°. In tight spaces, e.g. airlocks and lifts, the horizontal FOV shall be 90°.
Image sensor	1/2.8" progressive scan CMOS.
Minimum Illumination	Colour – 0.1 lux Black & White – 0.05 lux
Day/night	Automatic switching with automatically removable IR filter
Automatic Gain Control	Auto with limit and off
Backlight Compensation	Balanced, Spot and Off
White Balance	Auto/Manual/Indoor/Outdoor/Daylight lamp/Sodium lamp
Electronic shutter	1/10s to 1/10,000s
Image Stabilisation	Stabilise movement of +/- 10 pixels at period of 10Hz for cameras mounted on poles
Wide Dynamic Range	>100dB
Signal to Noise Ratio	>50dB
Video compression	H.264, or JPEG2000
Frame rate	25 fps for all resolution using H.264
Video stream	Minimum dual stream individually configurable in H.264
Digital Video Transmission	Multicast or Unicast, selectable
Video Noise Reduction	Auto and Off
Interface	Built-in 100Base-TX or higher Ethernet network interface with PoE
Digital Video Connector	RJ45 (8P8C)
Network Protocols	TCP/IP, HTTP, DHCP, DNS, RTP/RTCP, RTSP, PPPoE, SMTP, NTP
Digital Video Encryption	SSL

Built-in PTZ	<p>Pan Range: 360° endless rotation, 0.1° pre-set angular resolution;</p> <p>Pan Speed: up to 200°/s;</p> <p>Tilt Range: 180° with auto e-flip, 0.1° pre-set angular resolution;</p> <p>Tilt Speed: up to 200° /s;</p> <p>100 pre-set positions;</p> <p>Adjustable optical zoom speeds;</p> <p>Telemetry Protocol compatible with network video recorder;</p> <p>Automatically controlled pan and tilt speeds in proportion to depth of zoom;</p> <p>and</p> <p>Zoom lens shall be 20x optical zoom</p>
Environmental	<p>Operating humidity: 85% RH non-condensing.</p> <p>Operating temperature: -10°C to 50°C</p>
Casing	<p>Vandal resistant metal casing with polycarbonate transparent cover.</p> <p>IP55 rated for indoor cameras and IP65 rated for outdoor cameras. Outdoor casing shall have built-in fan and heater in order to keep the temperature within the operating limits.</p>

5.4.6 Vari-focal lens

- Aspherical, auto iris, megapixel lens.
- Focal length between 2.7mm and 12mm with approximate horizontal angle of view of between 90° and 20°.
- Max aperture F1.4.
- CS type mounting.
- Lens shall be selected to match the sensor format.

5.4.7 Zoom lens

- Variable focal length: f/1.4 (focal length, 3.4~119 mm).
- Approximate horizontal angle of view: 55° at 3.4 mm wide zoom, and 2° at 119 mm telephoto zoom.
- Automatic iris control with manual override; and
- Automatic focus with manual override.

5.4.8 Housings for full body camera

- External full body camera shall have vandal resistant housing and include a tamper device and tamper resistant fasteners.
- External housings, where indicated such, shall include, fan and heater in order to keep the operating temperature inside the housing within the operating limits specified by the manufacturer.
- Vents in the housing must be fitted with filters in order to prevent the ingress of dust and moisture, to maintain IP65 rating. Camera housings are also to provide adequate ventilation to prevent high temperature build-up;
- Conduit glands shall be fitted to the rear of each housing to seal cable entry points.

5.4.9 Mounting

- Brackets shall be custom selected to permit soffit, wall or pole mounting, depending on the specific camera location and site conditions;
- Mount in accordance with health and safety practice, including any necessary barriers and harness points;
- For areas where cameras are ordinarily accessible (low mounted cameras), housings shall be tamper resistant and locked to prevent intentional damage or disruption of image; and
- Cameras shall be mounted at a height that achieves the required FOV and image quality but not less than 2500mm above finished floor level.
- Purpose-made camera support poles and supports shall be substantial enough to support the camera package and negate the effects of wind or vibration. Maximum deflection shall be 1mm for every metre of pole height. E.g. 5mm deflection for a 5m high pole. Pole deflections are calculated on a wind speed of 100 km/h for a camera sail area of 0.2m² and a camera weight of 30 kg.

5.4.10 If required, equipment racks shall meet the following requirements:

- Built to IEC 297.
- Powder coated.
- Lockable, tinted glass front and metal rear door to facilitate ease of access to the equipment.
- Sufficient airflow.
- Moisture and dust resistance.
- Adjustable rails.
- Cable organisers.
- Left and right hinging doors.
- Supplied complete with all accessories, including fans, PDUs, surge protection, brush and blank panels

5.5 Interfacing with other systems

5.5.1 Active network equipment comprising the data network.

5.5.2 Passive (cabling, patch panels and cabinets) network equipment comprising the data network.

- Passive network equipment comprising the data network shall be provided by the contractor.
- The contractor shall provide a fibre optic routes, media converter, PoE power injector and power cabling for each camera as required

5.5.3 Electronic Access Control and Alarm System high level interface:

- None.

5.5.4 Lift System

- None

5.5.5 Lighting

- Lighting will be provided by the electrical contractor. The contractor shall coordinate with the Electrical contractor to ensure correct positioning of camera to avoid glare. If the camera is sharing lighting pole, coordinate location of camera, power outlet and data equipment.

5.5.6 230VAC power

- The Electrical contractor will provide 230VAC power outlets. The contractor shall provide a power supply unit with surge protection for all outdoor cameras and bollard/pole mounted cameras (fixed and PTZ).
- The contractor shall coordinate with the Electrical contractor to complete this work.

5.6 Installation of components and equipment

5.6.1 Refer to section 2.9 for additional installation requirements.

5.7 Samples, drawings and documentation

5.7.1 Refer to section 2.10 for samples, drawings and documentation requirements

5.7.2 The contractor shall prepare shop drawings that shall include but not be limited to:

- Network diagram showing all proposed interconnections of the components of the system such as cameras, recorder, workstations, network switches, etc.
- Typical mounting details of the different mounting options, e.g. ceiling mounting of dome and full body camera, wall mounting of dome and full body camera, and bollard mounting of full body camera.
- Detailed mechanical drawing of camera pole.
- Mounting details that are non-typical and specific to certain situations.
- Shop drawings must be submitted for approval prior to installation. Shop drawing may be submitted in PDF format.

5.8 End-user training

5.8.1 Refer to section 2.11 for end-user training requirement.

5.9 Testing and commissioning

5.9.1 Refer to section 2.12 for testing and commissioning requirements.

5.9.2 The test plan shall be conducted both during daytime and at night as applicable to the camera use. The tests to be carried out for the CCTV system shall include but may not be limited to the following:

- Verify CCTV coverage (field of view) and image size over distance against the operational requirements and viewing on an Operator monitor
- Verify image quality for brightness, contrast, sharpness and colour balance.
- Verify camera switching, sequencing and selection.

- Verify recording rate under normal, activity detection and alarm condition.
- Verify PTZ operation.
 - Proportional speed capability.
 - Pre-set programming.
 - Pre-programmed tours.
 - Zoom in/zoom out.
- Verify live streaming rate, resolutions and compression parameters.
- Verify recording rate, resolution, compression and storage parameters for each camera.
- Verify operation of all monitors, keyboard and mouse.
- Verify interfacing to third party system such as electronic access control and alarm system.
- Produce a digital recording and a print for each camera tested (both during the day and at night as applicable to the camera concerned) to be used as a commissioning records prior to witness testing.

5.10 Maintenance during defects liability period

5.10.1 Refer to section 2.13 for maintenance during defects liability period requirements.

5.10.2 Half-yearly preventative maintenance

- Check picture quality and field of view of all cameras against reference image.
- Clean air vents and spray insecticides in and around all external/outdoor housings as well as camera lenses and housing covers
- Check operations of PTZ, auto-iris and auto-focus

6 Perimeter Infrastructure for Electric Fence Energizers (Phase 1) and Perimeter CCTV (Phase 2)

6.1 System Objective

To provide suitable underground Communication between the Server Room and Perimeter Switches and Energizers housed in the Field Enclosures.

To Provide a minimum of 30Ah at each Equipment Enclosure.

6.2 Scope of Work

Network: The Perimeter Network will be in a Ring Topology emanating from the Core switch and will pick up the Access Switch at the Gatehouse and the three Field Switches.

The Fibre Optic Cable will be installed at 450mm Depth in the 110mm Sleeve.

OTDR Testing and reports are required in both directions

As per NKP requirements, the Network that the ISMS will function on is to be completely separate from the Site Operations Network.

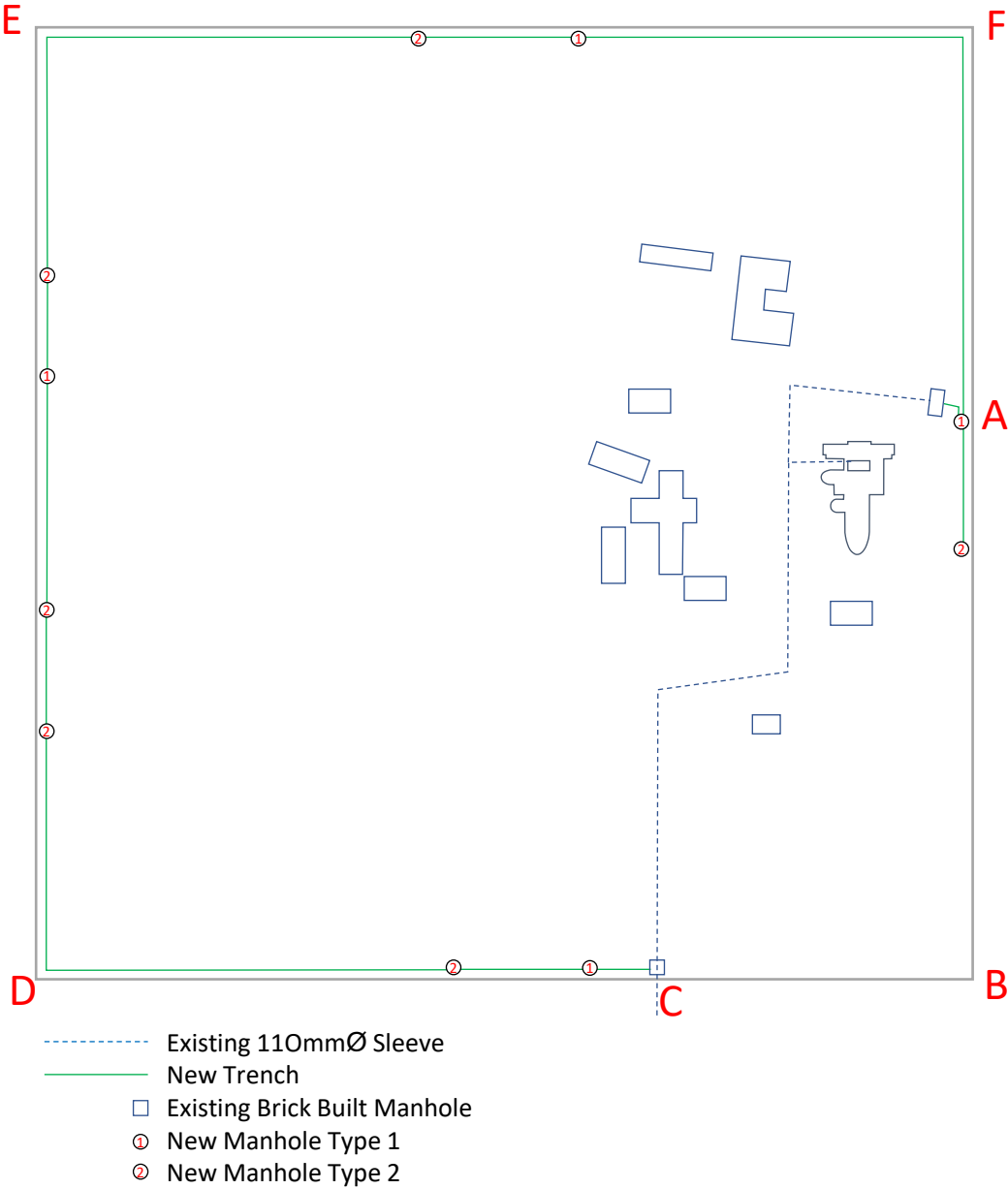
Equipment Enclosures are Dual sided, Side A for Fibre and Power Termination and Side B for the Electric Fence Energizers.

The Energizer will take power directly from a 6Ah MCB and will connect to the Field switch.

The Equipment Enclosure is to be fully Earthed.

Enclosure to be floor mounted on a concrete Plinth with 2 X 110mm and 2 x 50mm Sleeves to centre.

Civil Works: Trenching for Power, Ducting and Fibre Optic Cable will be required from Point C clockwise to Point A, the existing 110mm Sleeves will be used from Point C to the Server Room and from the Server Room to the Gatehouse. A brick-built manhole is already in existence at Point C and will require 2 x Break Ins.



Cabling and Slewing: The 110mm HDPE Duct will be installed at 750mm Depth and will house both the SWA Cable and Fibre Optic Cable.

The 50mm HDPE Duct will be installed at a depth of 450mm and will run from the Equipment Kiosk positions to the Future Camera Positions.

6.3 Equipment Specification

6.3.1 Core Switch (Server Room)

Netgear M4250-26G4F-PoE+

Form Factor: 1U rackmount 440x43.2x257mm

Ports: 24 x Gigabit PoE+ Ports (300W PoE Budget)

2 x Gigabit Ports

4 x SFP Ports (1G)

Fabric Switching: 60Gbps Switching Plane

6.3.2 Access Switch (Gatehouse)

Netgear M4250-26G4F-PoE+

Form Factor: 1U rackmount 440x43.2x257mm

Ports: 24 x Gigabit PoE+ Ports (300W PoE Budget)

2 x Gigabit Ports

4 x SFP Ports (1G)

Fabric Switching: 60Gbps Switching Plane

6.3.3 Field Switches (Type 1)

Aetek H70-044-30 Industrial Network Switch

Ports: 4 x 30W PoE+ (120w PoE Budget)

2 x SFP Ports (1G)

2 x RJ45 L2 Plus Managed

Port Surge Protection: 6Kv per port

Operating Temp: -40°C to +75°C

6.3.4 Field switch (Type 2)

Aetek H70-084-30 Industrial Network Switch

Ports: 8 x 30W PoE+ (240w PoE Budget)

2 x SFP Ports (1G)

2 x RJ45 L2 Plus Managed

Port Surge Protection: 6Kv per port

Operating Temp: -40°C to +75°C

6.3.5 Fibre Optic Cable

Corrugated Steel Tape Optic Fibre

Fibre Count: 4

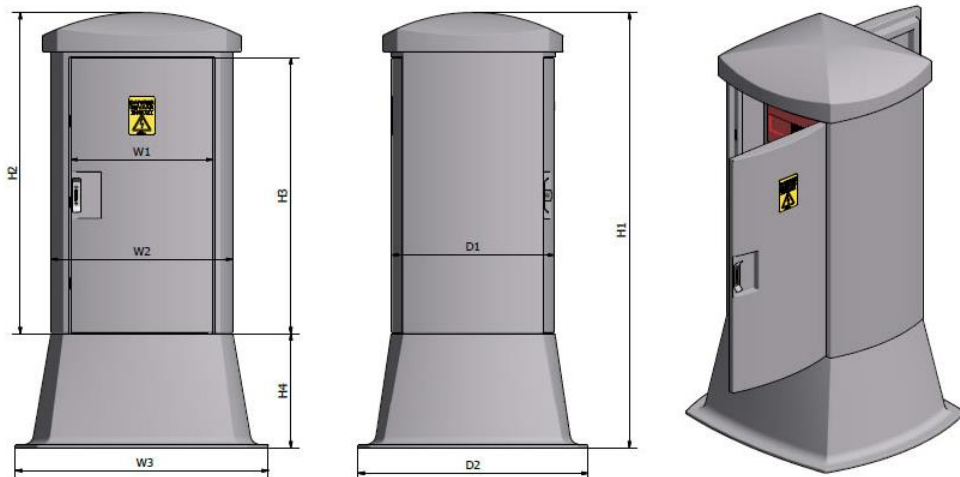
Construction: constructed of fibres inside a single gel filled loose tube. The cable is strengthened by a layer of aramid yarn, PVC bedding, corrugated steel tape and a polyethylene sheath.

6.3.6 Equipment Enclosure

Greenbro Polybox 6 Way

Construction: double skin linear low-density polyethylene, UV stabilized, High impact strength

Dimensions:



6 WAY DOUBLE DOOR KIOSK

H1	H2	H3	H4	W1	W2	W3	D1	D2
1310	980	800	330	400	520	750	480	700

6.3.7 Trenching

Trench to be a minimum of 300mm Wide and to a depth of 800mm, Hand or machine excavated is acceptable.

No trench shall be left open unless properly barricaded

Bedding

All cables shall be laid in a bedding of soft sand or sifted soil stones (it shall be evenly graded between 0,6mm and 19mm), 50mm below and 150mm above the cable. Clay soil will not be accepted as bedding. (the PI should not exceed 12 and compactibility factor should not exceed 0,4).

Laying

50/110mm HDPE Sleeve shall be installed to comply with SANS 1200 LB referring specifically to the requirements for flexible pipes. For a single conduit installation, the width of the trench should not be narrower than the diameter of the conduit plus 200mm to allow for adequate working space and the initial compaction around the conduit. Cable conduits should be laid as straight as possible between manholes and drawpits. The coiled conduits are very flexible and should be anchored with a heap of soil at one end of the trench, pulled in a straight line, and then backfilled.

Laying of duct, sub-duct, hauling of FOC Procedure (SANS 10340-2:2006 & SANS 2001-DP3)

Contractor must use underground sub-ducting for this build, direct buried fibre cable shall not be acceptable. Sub-ducts shall be laid and jointed and shall be evenly supported for their full lengths on the bedding, which shall have been evenly and thoroughly compacted.

If lengths of ducting are jointed along the trench, care shall be taken to avoid straining the joints when the ducting is lowered into the trench. Contractor is encouraged to minimise the number of sub-duct joints along the route, e.g. by procuring full-length duct.

Backfilling

Backfilling after bedding is to be carried out with a proper grading of the material to ensure settling without voids, and the material is to be tamped down after the addition of every 150mm. The surface is to be made good as required.

Protection of cables/Sleeves

- (a) Danger tape to specification shall be placed 350mm below Ground Level and 350mm above all LV cables along the entire length of the trench.
- (b) The danger tape shall be 150mm wide yellow plastic with lightning flash printed onto the tape at intervals.
- (c) The tape shall comply with SANS 1091

6.3.8 Precast Concrete Manhole (1)

Chamber: Dimensions: 750mm Diameter, 850mm Deep

Base: 6-Way Concrete base c/w channelling, benching and starter ring.

Lid: reinforced concrete lid. Material: High strength 40MPa concrete.

2mm thick galvanized steel band around the perimeter

finished with a non slip "check plate" imprint on the top.

6.3.9 Precast Concrete Manhole (2)

Chamber: Dimensions: 750mm Diameter, 500mm Deep

Base: 6-Way Concrete base c/w channelling, benching and starter ring.

Lid: reinforced concrete lid. Material: High strength 40MPa concrete.
2mm thick galvanized steel band around the perimeter
finished with a non slip “check plate” imprint on the top.

6.3.10 50mm Duct

Material: HDPE Corrugated Outer, Smooth Bore Inner

Material Density: g/cm³ < 940 (ISO 1183)

Resistance to Compression: 8kN/m² with 5% deformation of the internal diameter
(SANS 21138-3)

Length: 50m

6.3.11 110mm Duct

Material: HDPE Corrugated Outer, Smooth Bore Inner

Material Density: g/cm³ < 940 (ISO 1183)

Resistance to Compression: 8kN/m² with 5% deformation of the internal diameter
(SANS 21138-3)

Length: 6m

6.3.12 SWA Cable – 4mm 3 Core

Current rating : 42 Amp.

Core identification: 3 core (Brown, Black & Grey)

Bedding: PVC.

Sheath/Jacket: PVC.

Insulation: XLPE.

Colour: Black.

Conductors: Stranded Copper.

Armour/Protection: SWA (Steel wire armour)

Software licensing and renewal

Tenderers to list all software, licensing, renewals etc. that is subject to annual/monthly/periodic renewal. All software and licensing shall be deemed fully included for permanent future use if not listed here explicitly.

LIST ALL THAT APPLY

ITEM	DESCRIPTION	RENEWAL CYCLE	COST
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

SIGNED ON BEHALF OF TENDERER:

DATE :

Appendix: Schedule of quantities

PREAMBLE TO THE SCHEDULE OF QUANTITIES

- (a) For the purpose of this schedule of quantities the following words shall have the meanings hereby assigned to them:

Payment Item	:	This number refers to the relevant clause in the specification that describes the item
Item No	:	This number is for reference only
Description	:	The description clarifies what the item is for
Unit	:	The unit of measurement for each item of work as defined in the standard specifications or the special provisions of contract
Quantity	:	The number of units of work for each item
Rate	:	Payment per unit of work or material at which tenders offer to do the work or supply material
Amount	:	The product of quantity and rate
Lump sum	:	A price tendered for an item, the extent of which is described in the schedule of quantities, the specifications or elsewhere but of which the quantity of work is not measured in any units

- (b) This schedule of quantities forms part of the contract and shall be read in conjunction with all the other documents comprising the contract documents.
- (c) The quantities set out in the schedule of quantities are approximate only and the quantities of work finally accepted and certified for payment, and not the quantities given in the schedule of quantities, shall be used for determining payments to the Contractor.

- (d) The validity of the contract shall in no way be affected by differences between the quantities in the schedule of quantities and the quantities finally certified for payment. Work shall be valued at the rate or lump sum prices tendered, subject only to the provisions of the general conditions of contract and the provisions of paragraphs (k) and (l) of this preamble.

Rates and lump sum prices shall include full compensation for overheads, profits, incidentals, etc, and for the completed items of work as specified. Full compensation for completing, and maintaining during the maintenance period, all the work shown on the drawings and specified in the project specifications and for all the risks, obligations and responsibilities specified in the tender rules, general conditions of contract, special conditions of contract and project specifications shall be considered as provided for collectively in the items of payment given in the schedule of quantities, except in so far as the quantities given in the schedule of quantities are only approximate.

- (e) The Tenderer must fill in a rate or lump sum to each item where provision is made for it, even where no quantities are given. Items against which no rate or lump sum has been entered in the tender will not be paid for when executed, as payment for such work will be regarded as covered by other rates or lump sums in the schedule of quantities.

The Tenderer must fill in a rate opposite all items where the words "rate only" appears in the "Price" column. The intention is that although no work is foreseen under such an item, and no quantities are accordingly given in the "Quantity" column, the tendered rate shall apply in the event of work under this item being actually required. The attention of the Tenderers is directed to the provisions of paragraph (l) of this preamble.

If the Tenderer should group a number of items together and tender one lump sum for such group of items the single tendered lump sum shall apply to that group of items and not to each individual item, or should he indicate against any item that full compensation for such item has been included in another item, the rate for the item included in another item shall be deemed to be nil.

The tendered lump sums and rates shall be valid irrespective of any change in the quantities during the execution of the contract.

- (f) The works as executed will be measured for payment in accordance with the methods described in the contract documents under the various payment items, notwithstanding any custom to the contrary. Except where otherwise specified, the net measurements or mass of

the finished work in place shall be taken for payment but excluding any volume or mass of work in excess of that ordered.

- (g) The quantities of work or material stated in the schedule of quantities shall not be considered as restricting or extending the amount of work to be done or quantity of material to be supplied by the Contractor.
- (h) The quantities of material or work stated in the schedule of quantities shall not be regarded as authorisation for the Contractor to order material or to execute work. The Contractor shall obtain the Engineer's detailed instructions for all work before ordering any materials for or executing work or making arrangements in this regard. Material shall be ordered according to the construction drawing routing, and measurements taken on site.
- (i) The short descriptions given of payment items in the schedule of quantities are only for the purposes of identifying the items and providing specific details. Reference shall be made, *inter alia*, to the drawings, project specifications, general conditions of contract and special conditions of contract for more detailed information regarding the extent of the work entailed under each item.
- (j) Reference shall be made to the general conditions of contract regarding provisional sums.
- (k) Subject to the conditions stated in paragraph (l) below, the rates and lump sums filled in by the Tenderer in the schedule of quantities shall be final and binding and may not be adjusted should there be mistakes in the extensions thereof. Should there be any discrepancies between the correctly extended and totalled schedule of quantities and the tender sum, the Employer shall have the right to make such adjustments to the tender sum as he may deem necessary in order to reconcile the total of the schedule of quantities with the tender sum. In their own interest Tenderers should make doubly sure of the correctness of their tendered rates, the extensions and the tender sum.
- (l) A tender may be rejected if the unit rates or prices for some of the items in the schedule of quantities are, in the opinion of the Employer, unreasonable or out of proportion, and the Tenderer fails, within a period of seven (7) days after having been notified in writing by the Employer to adjust the unit rates or prices of such items, to make such adjustments.
- (m) The units of measurement indicated in the schedule of quantities are metric units. Abbreviations used in the schedule of quantities are as follows:

mm	=	millimetre
m	=	metre
km	=	kilometre
m ²	=	square metre
m ³	=	cubic metre
No	=	number
P.C. sum	=	Prime cost sum
Prov. sum	=	Provisional sum

- (n) The Tenderer's rates shall not include VAT.
VAT shall be added to the total value of the contract in the item specifically allowed for VAT in the calculation of the tender sum.

Note: The main offer must be as per specification; i.e. without qualification. If Tenderers offer alternatives, these can be included in an "alternative bid" under a separate covering letter.

- (o) The "submission" column indicates what tender and pre-installation criteria will be adhered to by the contractor.

Abbreviations used in the schedule of quantities are as follows:

Datasht	=	product or equipment datasheet
Sample	=	Sample of product/equipment required prior to installation
FAT	=	Factory acceptance testing.

To occur after manufacturing, before delivery to site.

Calc = Contractor calculation proof required

Where no guidance is offered in the column, datasheets of the equipment shall be provided at minimum. The engineer reserves the right to request additional equipment information as may be required from the contractor.

The contractor shall prepare an approval tracker spreadsheet as per the specification document listing all systems and the approval status thereof. The spreadsheet shall also be used to track expected delivery dates and actual delivery dates to site.

In diversity there is beauty
and there is strength.

MAYA ANGELOU

Document prepared by:

Zutari Africa

Registration number

1 Century Drive

Waterford Precinct

Century City

T +27 526 9400

F +27 526 9500

E connect@zutari.com

ZUTARI
IMPACT. ENGINEERED.