

**MOKOLO AND CROCODILE
WATER AUGMENTATION PROJECT
PHASE 2 (MCWAP-2)**

TENDER NO 054/2024/PMID/MCWAP2/RFB

**PART C3.1
SPECIFICATION**

SECTION 43

SECURITY GENERAL

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**SECTION 43
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SECTION 43

SECURITY GENERAL

43.1 SCOPE

43.1.1 Integration approach

The security system design, installation and testing forms part of the Control and Instrumentation Works. From a technical perspective this Section 43 shall be read in conjunction with Section 44 as well as Sections 1, 37, 38, 39, 40, 41 and 48. However, the whole of the modular suit of specification sections remains relevant.

The C&I components of the security system includes the Closed Circuit Television (CCTV) and Access Control Security System. The establishment of the CCTV monitoring and recording system as well as an access control system shall allow the efficient operation and management of security for the Mokolo and Crocodile Water Augmentation Project (MCWAP-2) at the designated access-controlled areas.

43.1.2 Description of this part of the Works

This shall be interpreted as the Employer's requirements with regard to the security system design obligations.

This Contract includes the design, delivery, installation, testing and commissioning of a complete and operational CCTV and Access Control System and all ancillary Plant, as described in this Section, and includes:

- a) An Access Control system for vehicle and pedestrian control with main controller panel, biometric readers, facial and number plate recognition, doors, card readers, sensors, wiring, controllers, etc., complete with all the necessary software and hardware at the new High-Lift Pumping Station guard house as described in this Section. The electric fence to be provided in terms of Section 45 - Non-Lethal Electric Fence System, shall be fully integrated with the control system provided;
- b) An Access Control system for vehicle and pedestrian control with main controller panel, biometric readers, doors, facial and number plate recognition, card readers, sensors, wiring, controllers, etc., complete with all the necessary software and hardware at the new Low-Lift Pumping Station guard house as described in this Section. The electric fence to be provided in terms of Section 45 - Non-Lethal Electric Fence System, shall be fully integrated with the control system provided;
- c) Whisker type switches for access to the Instrument Huts at the BPT, Off-Take A and Off-Take B as described in this Section;
- d) Cameras for the perimeter fencing at the new High-Lift Pumping Station as described in this Section;
- e) Cameras for the perimeter fencing at the new Low-Lift Pumping Station as described in this Section;
- f) Cameras for viewing the entrance / exit areas to the new High-Lift Pumping Station as described in this Section;

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- g) Cameras for viewing the entrance / exit areas to the new Low-Lift Pumping Station as described in the Section;
- h) A Camera installed at entrance to Instrument Huts at the Break Pressure Reservoir, Off-Take A and Off-Take B as described in this Section;
- i) A Network Video Recorder, server, view stations, viewing software, licensing, additional software required, cabling, switches, etc. and all hardware and software required to provide a complete and functional CCTV recording, monitoring and controlling system at the O&CC as described in this Section;
- j) View stations, viewing software, additional software required, cabling, etc. and all hardware and software required to provide a complete and functional CCTV monitoring system at the High-Lift Pumping Station Guard House;
- k) View stations, viewing software, additional software required, cabling, etc. and all hardware and software required to provide a complete and functional CCTV monitoring system at the Low-Lift Pumping Station Guard House; and
- l) Training of designated people as nominated by the Employer.

All requirements for Security Plant are detailed in Section 44 – Security Plant and Installation.

43.2 GENERAL REQUIREMENTS

A security guard house shall be built at the High-Lift Pumping Station and Low-Lift Pumping Station as shown on Drawing numbers 2B-C3-001 and 2E-C3-001 Layout of the Guard House at the High-Lift Pumping Station and Low-Lift Pumping Station. Live digital video shall be displayed in the CCTV viewing room in the Operational and Control Centre (O&CC), built at the High-Lift Pumping Station site. The CCTV footage shall be from the Low-Lift Pumping Station, High-Lift Pumping Station, Break Pressure Reservoir, Off-Take A and Off-Take B sites. The CCTV data shall be transferred over both the primary single mode optical fibre network and secondary broadband wireless network.

The following layout diagrams refer:

- a) CCTV and Access Control – Low-Lift Pumping Station – 2B-E2.4-010;
- b) CCTV and Access Control – High-Lift Pumping Station – 2E-E2.4-010;
- c) CCTV and Access Control – Break Pressure Reservoir – 2G-E2.4-010;
- d) CCTV and Access Control – Off-Take A - 2H-E2.4-010; and
- e) CCTV and Access Control - Off-Take B - 2H-E2.4-011:

Live digital video from these areas shall be presented to the CCTV viewing area in the O&CC on LED viewing screens. Some viewing screens shall show a general overview of all the available cameras. Some viewing screens shall be provided for a Graphical User Interface (GUI). The GUI shall have graphical layouts of each area where cameras are installed.

These include the above-mentioned sites. The graphical layouts shall reside on the task bar of the windows menu. When clicked on, the chosen graphical layout shall pop-up into full screen mode. There shall be a minimise button to send the graphical layout to the task bar.

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The cameras shall be placed in the correct positions on the graphical layouts as per their actual installation positions on site. The cameras shown on the graphical layouts shall display on one of the LED viewing screens when clicked on by the mouse pointer. The camera type, description and number shall be displayed on the graphical layout next to the applicable camera. The setup for this view shall be as follows:

- a) Configurable for all cameras on this monitor; and
- b) Executable programs, user-defined alarms and camera control can be invoked on occurrence.

The other LED viewing screens shall be used for the following conditions:

- a) For viewing a specific chosen camera from the general overview;
- b) For alarm conditions when a camera is activated to focus and record on a particular area when receiving an input signal from a security sensory device; and
- c) For detailed viewing of very important areas of concern.

The viewing station software shall also be fully integrated with the Automation, Access Control networks. All requirements for Security Plant are detailed in Section 44 – Security Plant and Installation.

The Server room shall form part of the O&CC building. This Server room shall be temperature controlled to a temperature required according to the specifications of the Plant installed in this server room.

The Server room shall be locked at all times and only authorized personnel will be allowed in. The Server room shall have an indoor type biometric reader outside the door to facilitate access into the Server room. When entering the server room 4k resolution video 5 seconds prior to the entry and 5 seconds after the opening of the door latch must be stored on the NVR. When exiting the Server room, the authorized person shall use the biometric reader situated inside the Server room to exit. No security personnel shall be allowed in this room unless accompanied by an authorized person.

The Plant housed in this Server room shall include, but not limited to the following:

- a) 19-inch equipment racks;
- b) UPS Units;
- c) Control System Server Units;
- d) CCTV System Server Units;
- e) LED Viewing Stations;
- f) Power Supply Units;
- g) Layer 3 Routers;
- h) Layer 2 Switches;
- i) Batteries with Cabinet;
- j) Fiber Optic Patch Panels; and
- k) Spare components.

All requirements for Security Plant are detailed in Section 44 – Security Plant and Installation.

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The air-conditioner shall have a BTU rating applicable for both the size of the server room and the total combined wattage of all the Plant in the server room.

The guard house shall be access controlled. Biometric readers shall be used at the two entrances / exits to the guard house building, positioned as shown on the layout of the guard house.

The biometric readers for the entrances to the guard house shall be of the outdoor type of Biometric readers. The other areas inside the guard house shall be of the indoor type of Biometric readers.

All requirements for Security Plant are detailed in Section 44 – Security Plant and Installation.

43.3 DEFINITIONS, ABBREVIATIONS AND REFERENCES

43.3.1 Definitions

In this Section the word or words:

- a) **“Design”** includes, as applicable, the submission of security system design documentation to obtain approval from the Engineer.
- b) **“Supply”** includes, as applicable, the purchase of materials or goods, manufacture and fabrication, any specified corrosion protection measures and any off-site inspection or testing.
- c) **“Installation”** includes, as applicable, all handling and transport from storage, if necessary, all erection and setting to work.
- d) **“Factory Acceptance Test (FAT)”** shall refer to all tests done on Plant or Plant items at the factory to ensure its functionality.
- e) **“Pre-commissioning”** shall refer to the functional field test done on specific part of Plant on Site. This forms part of Tests on Completion as specified in Section 48.

43.3.2 Abbreviations

The following abbreviations shall have the meanings given:

mA	:	Milliamp
DC	:	Direct Current
EPP/ECP	:	Enhanced Parallel Port
DB	:	Decibel
Nm	:	Nano meter
deg/s	:	Degrees per second
SVGA	:	Super Video Graphics Array
AGP	:	Accelerated Graphics Port
ANSI	:	American National Standards Institute
ATM	:	Asynchronous Transfer Mode
BNC	:	Bayonet Neill – Concelman Connector
CAD	:	Computer Aided Design
CCIR (PAL)	:	International Radio Consultative Committee
CCTV	:	Closed Circuit Television
CE	:	Council of Europe
CPU	:	Central Processing Unit
CSIR	:	Council for Scientific and Industrial Research

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CST	:	Computer Simulated Technology or Council for Science and Technology
CSV	:	Comma Separated Values
DDE	:	Dynamic Data Exchange
DDR	:	Double Data Rate
DIP	:	Dual Inline Pin
DVD	:	Digital Video Disk
DVR	:	Digital Video Recorder
DWA	:	Department of Water Affairs
DVI	:	Digital Visual Interface
EPROM	:	Erasable Programmable Read Only Memory
LAN	:	Local Area Network
FEP	:	Front End Processor
FSB	:	Front Side Bus
GPRS	:	General Packet Radio Service
GSM	:	Global System for Mobile Communications
GUI	:	Graphical User Interface
Hz	:	Hertz
ICASA	:	Independent Communications Authority of South Africa
IP	:	Internet Protocol
ISO	:	International Organization for Standardization
LED	:	Light Emitting Diode
MAC	:	Machine Access Code
MBPS	:	Mega bits per second
OLE	:	Object Linking and Embedding
PPP	:	Point to Point Protocol
PLC	:	Programmable Logic Controller
PCI	:	Peripheral Component Interconnect
PIR	:	Passive Infra Red detectors
RAM	:	Random Access Memory
RJ	:	Registered Jack
ROM	:	Read Only Memory
SANS	:	South African National Standards
SDRAM	:	Synchronous Dynamic Random Access Memory
SIRA	:	Private Security Authority
SMS	:	Short Message Service
SP	:	Service Pack
SQL	:	Structured Query Language
SVGA	:	Super Video Graphics Array
TCP/IP	:	Transmission Control Protocol / Internet Protocol
UPS	:	Uninterruptible Power Supply
USB	:	Universal Serial Bus
V	:	Volt
VDU	:	Visual Display Unit
WAN	:	Wide Area Network

43.3.3 References

When reference is made to a Code of Practice, Specification or Standard, the reference shall be taken to mean the latest edition or replacement at time of tender of the Code, Specification or Standard; including addenda, supplements, modifications and revisions thereto. Where a previous version is intentionally used, it will be indicated as such. Where reference is made to a Code, Specification or Standard that has subsequently been withdrawn and not replaced, the intended content will remain relevant unless confirmed otherwise in writing by the Engineer.

43.4 ACCESS CONTROL

43.4.1 General

Access control for vehicles shall be provided at High-Lift Pumping Station and Low-Lift Pumping Station only. The O&CC is built on this site.

At the vehicle entrance gates to the Low-Lift Pumping Station site and High-Lift Pumping Station with O&CC site, the system shall provide for both high and low vehicles and shall therefore offer access and camera viewing at two levels. TPZ cameras with Number plate and Facial recognition capabilities shall be installed at the entrance gates.

The vehicle entrance gate shall be provided with pedestrian gates to allow access to the gate control motors, that can be unlocked, and the gate slid open.

The Access Control System shall be capable of opening and closing doors and gates and to activate the pumping station alarm.

A break glass override shall be provided for the emergency exit door in the new guard house at the Low-Lift Pumping Station and High-Lift Pumping Station.

Refer to the Guard House Layout Drawings under Part B2 and Part E of the Works.

Registered personnel shall have their fingerprints recorded on the System.

43.4.2 Access Control System General Hardware Layout

The security system shall include a Controller that shall be able to function on its own.

Detection of intruders shall either be done with access control sensors situated in a particular area that trigger specific CCTV cameras to record at that specific area or through quiescent monitors that react to quiescent current changes in the pixel rows of the screen and bring up an alarm thus alerting the security guard of the intrusion. These areas are the following:

- a) Low-Lift Pumping Station perimeter fencing;
- b) High-Lift Pump Station perimeter fencing;
- c) Break Pressure Reservoir;
- d) Off-Take A; and
- e) Off-Take B.

43.4.3 High-Lift Pumping Station Security System

The High-Lift Pumping Station is a National Key Point installation. The security requirements for a National Key Point installation are according to the document: *“Manual on Physical Security Measures – Department of Water Affairs”*.

(a) The CCTV and Access Control system is described as follows:

The Layout is shown on the Drawing CCTV and Access Control – High-Lift Pumping Station – 2E-E2.4-010.

The High-Lift Pumping Station shall have a 3-Tier perimeter fence; one outer fence, one middle fence and one inner fence. The middle fence shall be a non-lethal electric fence which shall have proximity detection sensors placed at strategic points around the entire perimeter. The sensors shall be able to detect any movement near the fence of any person trying to penetrate the fence. When a sensor is activated, a camera shall focus in on that area and the images shall be automatically displayed on a screen in the CCTV viewing room of the guard house.

Thermal cameras shall be installed in the MV and VSD rooms of the High-Lift Pumping Station. These cameras shall feature a calibrated thermal image sensor. Thermal radiation measurements made across the entire imaging area shall be used to trigger an event based on the temperature increasing above or decreasing below an individually set trigger level. This event shall typically be a camera alarm, network message or an activation of a signal output that can prevent heat or fire damage to equipment and/or person.

There shall be one entrance point and one exit point for vehicles and one entrance / exit for personnel at the pump station. All shall be controlled. The personnel entrance shall be through the guard house building via a door.

A Biometric Access Reader shall be available at the personnel entrance to the guard house. This reader shall be used by all registered personnel entering the pump station area. All visitors wanting to enter the pump station area shall have to be added to the fingerprint data base of the system. The authority needed to add a person to the fingerprint data base must be given by the scheme manager.

All unregistered persons and/or visitors, shall first have to sign-in at the security window, giving reasons why they require access to the pump station area. Only after the scheme manager has been informed and has given his consent, shall the person's fingerprints be taken and added to the data base of the system. The person shall then be able to access the pump station area using the biometric reader.

When the visitor(s) has completed his/her work in the pump station area, he/she shall immediately leave the area using the biometric reader at the entrance / exit door.

All requirements for Security Plant are detailed in Section 44 – Security Plant and Installation.

(b) The controlled access points for vehicles shall operate as follows:

When a vehicle needs to enter the pump station area, the procedure shall be different for vehicles driven by registered personnel to that for vehicles driven by visitors.

(c) For non-registered personnel and visitors, the procedure shall be as follows:

All visitors wanting to enter the pumping station area shall have to be added to the fingerprint data base of the system. The authority needed to add a person to the fingerprint data base must be given by the scheme manager.

All unregistered persons, visitors, shall first have to sign-in at the security window, giving reasons why they require access to the pumping station area. Only after the scheme manager has been informed and has given his consent, shall the person's fingerprints be taken and added to the data base of the system. The person shall then be able to access the pumping station area using the biometric readers at the vehicle outer entrance / exit gates.

At the outside vehicle gate there shall be two biometric access readers, one mounted above the other, one installed at the appropriate height for a light motor vehicle (approximately 1 metre above ground), the other at a height suitable for a heavy motor vehicle (approximately 2 metres above ground).

When personnel or visitors registered on the fingerprint data base want to enter the pumping station area, they shall press their finger on the biometric reader. They shall then be granted access and the outer gate as well as the electric fence gate shall open. They shall drive through until the inner gate and stop their vehicle.

Under normal circumstances, both the outer fence gate and electric fence gate shall open together and close together. Both outer and inner fence gates shall however have sensor beams across their closing and opening paths. If any vehicle, person or object obstructs the path of these beams the gates shall not close.

The inner fence gate shall never open under normal operating circumstances if the outer fence gate is open. The control philosophy shall be such that the inner and outer fence gate shall always open and close in opposition to each other. This safety measure is to ensure that one gate, either the inner fence gate or outer fence gate, shall be closed whilst the other is open.

When the vehicle reaches the inner gate, it shall stand in front of the inner gate. The access control system Controller shall check to see if the sensor beams of the outer fence gate and electric fence gate are healthy and, if both are healthy, shall close both the outer fence gate and electric fence gate.

If only the sensor beam of the outer gate is healthy then the Controller shall only close the outer fence gate. The electric fence gate shall remain open. The Controller shall then open the inner fence gate only on confirmation that the outer fence gate has closed. When the vehicle drives into the pumping station area, the electric fence gate shall close and the inner fence gate shall also close, both automatically.

The same procedure shall be followed for a vehicle that wants to exit the pumping station area, except that the Control Philosophy shall operate in reverse. The inner fence gate and electric fence gate shall open after the biometric reader has recognised the fingerprint of the driver. The vehicle shall drive through and stand in front of the outer fence gate.

The Controller shall check if the sensor beams of both the inner fence gate and electric fence gate are healthy. If they are, the Controller shall close the gates. If only the inner fence gate is healthy, the Controller shall only close the inner fence gate. After the inner fence gate has closed, the Controller shall open the outer fence gate and the vehicle exits the area. The Controller shall check if both the sensor beams of the electric fence gate and outer fence gate are healthy and, if so close both the gates automatically.

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Specials arrangements need to be made for long vehicles that exceed the distance between the outer fence gate and inner fence gate. A manual override of the system is needed in this case and special authority from the scheme manager of the site is required.

The same procedure shall be used for when the vehicle wants to exit. The scheme manager needs to be informed and his authority needs to be given to manually override the system.

This shall be part of the access control procedure document which shall be written by the scheme manager of the pumping station.

Under normal operation, the “Open/Close” function of the inner fence gate shall be disabled when the outer fence gate is open and vice versa. As this installation has been deemed a National Key Point Installation, the integrity of the access-controlled areas is of the utmost importance and under no circumstance shall the system be able to be bypassed or tampered with outside of the design parameters set out above.

A generator shall be supplied to provide power to the CCTV and Access Control Plant if and when the mains power is unavailable. The scope for the design of this generator falls outside of the scope of work defined in this Section. Please refer to Section 38 – Electrical General.

A break glass override shall be provided for emergency opening of doors in the guard house.

43.4.4 Low-Lift Pumping Station

The Low-Lift Pumping Station is a National Key Point installation. The security requirements for a National Key Point installation are according to the document: “Manual on Physical Security Measures – Department of Water Affairs”.

(a) The CCTV and Access Control system is described as follows:

The Layout is shown on the Drawing CCTV and Access Control – Low-Lift Pumping Station – 2B-E2.4-010.

The Low-Lift Pumping Station shall have a 3-Tier perimeter fence; one outer fence, one middle fence and one inner fence. The middle fence shall be a non-lethal electric fence which shall have proximity detection sensors placed at strategic points around the entire perimeter. The sensors shall be able to detect any movement near the fence of any person trying to penetrate the fence. When a sensor is activated, a camera shall focus in on that area and the images shall be automatically displayed on a screen in the CCTV viewing room of the guard house.

There shall be one entrance point and one exit point for vehicles and one entrance / exit for personnel at the pump station. All shall be controlled. The personnel entrance shall be through the guard house building via a door.

A Biometric Access Reader shall be available at the personnel entrance to the guard house. This reader shall be used by all registered personnel entering the pump station area. All visitors wanting to enter the pump station area shall have to be added to the fingerprint data base of the system. The authority needed to add a person to the fingerprint data base must be given by the scheme manager.

All unregistered persons and/or visitors, shall first have to sign-in at the security window, giving reasons why they require access to the pump station area. Only after the scheme manager has been informed and has given his consent, shall the person's fingerprints be taken and added to the data base of the system. The person shall then be able to access the pump station area using the biometric reader.

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When the visitor(s) has completed his/her work in the pump station area, he/she shall immediately leave the area using the biometric reader at the entrance / exit door.

All requirements for Security Plant are detailed in Section 44 – Security Plant and Installation.

(b) The controlled access points for vehicles shall operate as follows:

When a vehicle needs to enter the pump station area, the procedure shall be different for vehicles driven by registered personnel to that for vehicles driven by visitors.

(c) For non-registered personnel and visitors, the procedure shall be as follows:

All visitors wanting to enter the pumping station area shall have to be added to the fingerprint data base of the system. The authority needed to add a person to the fingerprint data base must be given by the scheme manager.

All unregistered persons, visitors, shall first have to sign-in at the security window, giving reasons why they require access to the pumping station area. Only after the scheme manager has been informed and has given his consent, shall the person's fingerprints be taken and added to the data base of the system. The person shall then be able to access the pumping station area using the biometric readers at the vehicle outer entrance / exit gates.

At the outside vehicle gate there shall be two biometric access readers, one mounted above the other, one installed at the appropriate height for a light motor vehicle (approximately 1 metre above ground), the other at a height suitable for a heavy motor vehicle (approximately 2 metres above ground).

When personnel or visitors registered on the fingerprint data base want to enter the pumping station area, they shall press their finger on the biometric reader. They shall then be granted access and the outer gate as well as the electric fence gate shall open. They shall drive through until the inner gate and stop their vehicle.

Under normal circumstances, both the outer fence gate and electric fence gate shall open together and close together. Both outer and inner fence gates shall however have sensor beams across their closing and opening paths. If any vehicle, person or object obstructs the path of these beams the gates shall not close.

The inner fence gate shall never open under normal operating circumstances if the outer fence gate is open. The control philosophy shall be such that the inner and outer fence gate shall always open and close in opposition to each other. This safety measure is to ensure that one gate, either the inner fence gate or outer fence gate, shall be closed whilst the other is open.

When the vehicle reaches the inner gate, it shall stand in front of the inner gate. The access control system Controller shall check to see if the sensor beams of the outer fence gate and electric fence gate are healthy and, if both are healthy, shall close both the outer fence gate and electric fence gate.

If only the sensor beam of the outer gate is healthy then the Controller shall only close the outer fence gate. The electric fence gate shall remain open. The Controller shall then open the inner fence gate only on confirmation that the outer fence gate has closed. When the vehicle drives into the pumping station area, the electric fence gate shall close and the inner fence gate shall also close, both automatically.

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The same procedure shall be followed for a vehicle that wants to exit the pumping station area, except that the Control Philosophy shall operate in reverse. The inner fence gate and electric fence gate shall open after the biometric reader has recognised the fingerprint of the driver. The vehicle shall drive through and stand in front of the outer fence gate.

The Controller shall check if the sensor beams of both the inner fence gate and electric fence gate are healthy. If they are, the Controller shall close the gates. If only the inner fence gate is healthy, the Controller shall only close the inner fence gate. After the inner fence gate has closed, the Controller shall open the outer fence gate and the vehicle exits the area. The Controller shall check if both the sensor beams of the electric fence gate and outer fence gate are healthy and, if so close both the gates automatically.

Specials arrangements need to be made for long vehicles that exceed the distance between the outer fence gate and inner fence gate. A manual override of the system is needed in this case and special authority from the scheme manager of the site is required.

The same procedure shall be used for when the vehicle wants to exit. The scheme manager needs to be informed and his authority needs to be given to manually override the system.

This shall be part of the access control procedure document which shall be written by the scheme manager of the pumping station.

Under normal operation, the "Open/Close" function of the inner fence gate shall be disabled when the outer fence gate is open and vice versa. As this installation has been deemed a National Key Point Installation, the integrity of the access-controlled areas is of the utmost importance and under no circumstance shall the system be able to be bypassed or tampered with outside of the design parameters set out above.

A generator shall be supplied to provide power to the CCTV and Access Control Plant if and when the mains power is unavailable. The scope for the design of this generator falls outside of the scope of work defined in this Section. Please refer to Section 38 – Electrical General.

A break glass override shall be provided for emergency opening of doors in the guard house.

43.4.5 Break Pressure Reservoir Instrument Hut

The Break Pressure Reservoir is also classified as an Important Works installation.

(a) The CCTV and Access Control system is described as follows:

The Layout is shown on the Drawing CCTV and Access Control – Break Pressure Reservoir – 2G-E2.4-010.

All the CCTV, Access Control and instrumentation Plant shall be housed in the new instrument hut at the Break Pressure Reservoir. Access to the instrument hut shall be controlled. The door shall have an electronic lock with a keypad on it. Only registered personnel shall have access to the instrument hut. A digital camera shall be installed against the wall of the outside of the instrument hut focusing on the entrance / exit door. All CCTV footage of the facility shall be recorded continuously at the O&CC. The live video footage shall also be relayed over both the primary fibre optic network and broadband wireless radio network to the CCTV viewing stations at the High-Lift Pumping Station guard house and CCTV viewing stations at the O&CC.

When a person enters or exits the entrance to the instrument hut, (the “change of state” of the whisker type switches caused by the door opening) this live camera footage shall automatically appear without being chosen on one of the viewing screens in the CCTV viewing station at the High-Lift Pumping Station guard house and CCTV viewing stations at the O&CC. The appearance of this CCTV footage on the screen shall coincide with a loud and audible alarm. This precaution shall ensure that the event at the Break Pressure Reservoir instrument hut is noted by the security personnel on duty at the time of the event.

Upon exiting from the instrument hut the person shall be able to exit freely by means of a pushbutton door release mechanism.

A generator shall be supplied to provide power to the CCTV and Access Control Plant if and when the mains power is unavailable. The scope for the design of this generator falls outside of the scope of work defined in this Section. Please refer to Section 38 – Electrical General.

A break glass override shall be provided for emergency opening of doors.

All requirements for Security Plant are detailed in Section 44 – Security Plant and Installation.

43.4.6 Off-Take A Instrument Hut

Off-Take A is also classified as an Important Works installation.

(a) The CCTV and Access Control system is described as follows:

The Layout is shown on the Drawing CCTV and Access Control – Off-Take A – 2H-E2.4-010.

All the CCTV, Access Control and instrumentation Plant shall be housed in the new instrument hut at the Off-Take A site. Access to the instrument hut shall be controlled. The door shall have an electronic lock with a keypad on it. Only registered personnel shall have access to the instrument hut.

A digital camera shall be installed outside the hut focusing on the entrance door.

All CCTV footage of the facility shall be recorded continuously at the O&CC. The live video footage shall also be relayed over both the primary fibre optic network and broadband wireless radio network to the CCTV viewing stations at the High-Lift Pumping Station guard house and CCTV viewing stations at the O&CC.

When a person enters or exits the entrance to the instrument hut, (the “change of state” of the whisker type switches caused by the door opening) this live camera footage shall automatically appear without being chosen on one of the viewing screens in the CCTV viewing station at the High-Lift Pumping Station guard house and CCTV viewing stations at the O&CC. The appearance of this CCTV footage on the screens shall coincide with a loud and audible alarm. This precaution shall ensure that the event at the Off-Take A instrument hut is noted by the security personnel on duty at the time of the event.

Upon exiting from the instrument hut the person shall be able to exit freely by means of a pushbutton door release mechanism.

A generator shall be supplied to provide power to the CCTV and Access Control Plant if and when the mains power is unavailable. The scope for the design of this generator falls outside of the scope of work defined in this Section. Please refer to Section 38 – Electrical General.

A break glass override shall be provided for emergency opening of doors.

All requirements for Security Plant are detailed in Section 44 – Security Plant and Installation.

43.4.7 Off-Take B Instrument Hut

Off-Take B is also classified as an Important Works installation.

(a) The CCTV and Access Control system is described as follows:

The Layout is shown on the Drawing CCTV and Access Control – Off-Take B – 2H-E2.4-011.

All the CCTV, Access Control and instrumentation Plant shall be housed in the new instrument hut at the Off-Take B site. Access to the instrument hut shall be controlled. The door shall have an electronic lock with a keypad on it. Only registered personnel shall have access to the instrument hut.

A digital camera shall be installed outside the hut focusing on the entrance door.

All CCTV footage of the facility shall be recorded continuously at the O&CC. The live video footage shall also be relayed over both the primary fibre optic network and broadband wireless radio network to the CCTV viewing stations at the High-Lift Pumping Station guard house and CCTV viewing stations at the O&CC.

When a person enters or exits the entrance to the instrument hut, (the “change of state” of the whisker type switches caused by the door opening) this live camera footage shall automatically appear without being chosen on one of the viewing screens in the CCTV viewing station at the High-Lift Pumping Station guard house and CCTV viewing stations at the O&CC. The appearance of this CCTV footage on the screens shall coincide with a loud and audible alarm. This precaution shall ensure that the event at the Off-Take B instrument hut is noted by the security personnel on duty at the time of the event.

Upon exiting from the instrument hut the person shall be able to exit freely by means of a pushbutton door release mechanism.

A generator shall be supplied to provide power to the CCTV and Access Control Plant if and when the mains power is unavailable. The scope for the design of this generator falls outside of the scope of work defined in this Section. Please refer to Section 38 – Electrical General.

A break glass override shall be provided for emergency opening of doors.

All requirements for Security Plant are detailed in Section 44 – Security Plant and Installation.

43.5 SECURITY SYSTEM GENERAL REQUIREMENTS

All software packages shall be 100% locally supported and shall be suitable for the system installed.

It shall not be possible for the operator of any station to accidentally or intentionally destroy the database by entering faulty or erroneous instructions or messages.

The software shall be fully supported by easily understandable user manuals and documentation.

The Contractor shall be responsible for the provision of all security scan software, including all software required to provide a complete, operational data acquisition and recording and control system.

43.5.1 UPS Requirements

On-line Un-interruptible Power Supply (UPS) systems with a standby capacity of at least 2 hours each shall also be required for the below areas:

- a) Low-Lift Pumping Station;
- b) High-Lift Pumping Station;
- c) Operational and Control Centre;
- d) Break Pressure Reservoir Instrument Hut;
- e) Off-Take A Instrument Hut; and
- f) Off-Take B Instrument Hut.

The UPS systems shall provide power to all the security electronic Plant at these areas.

The below UPS signals and alarms shall be relayed back to the PLC at their specific areas. These signals shall be available for viewing and indication purposes on the SCADA system at the O&CC:

- a) General Fault Alarm;
- b) Bypass Alarm; and
- c) Healthy Indication.

A bypass switch shall be provided on the UPS in case of failure to the UPS. The security Plant shall then be fed directly from the main 230 V supply.

43.5.2 Lightning and Surge Protection

The connection between the mains supply and Plant shall be equipped with adequate surge protection to prevent damage to the Plant caused by switching transients and static discharges.

The following shall be a minimum requirement:

- Fine protection: type VM 280 Dehn blitsduktor or similar.

Coarse protection should already be provided by the Isolation Transformer inside the UPS.

43.5.3 UPS Plant Housing

An approved type of battery cabinet shall be supplied if this is not housed inside the UPS cabinet. The UPS cabinet and battery cabinet shall be identical in size, colour and design.

All details for cabinets, stands and tables are to be accepted at Tender stage.

43.5.4 Installation

The Contractor shall ensure that the quality of the electronic Plant and the installation thereof is of the highest quality, suitable for the environment in which it is installed.

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Wires (signal and power), cables and connectors shall not be visible in their installed positions; neither shall they be accessible to unauthorized persons. All cables shall be installed in galvanized conduit, split trunking systems or below raised flooring for security reasons.

The Contractor shall supply such benches and brackets to ensure that all viewing screens and peripherals are easily accessible to the operator.

43.5.5 Input Types for Instrumentation Huts

Whisker-type switches shall be installed at the following areas:

- a) Balancing Reservoirs instrumentation hut;
- b) Break Pressure Tank instrumentation hut;
- c) Break Pressure Reservoir instrumentation hut;
- d) Repeater 1 (Link between HLPS and Off-Take B) instrument hut;
- e) Repeater 2 (Link between HLPS and Off-Take B) instrument hut;
- f) Repeater 3 (Link between HLPS and Off-Take B) instrument hut;
- g) Off-Take A instrument hut; and
- h) Off-Take B instrument hut.

These switches shall be used to detect entry into these instrumentation huts. The switches shall also be used as an input to the CCTV camera installed at the entrance to these instrumentation huts.

When the state of these switches is changed to a “1” or a “0” depending on the digital configuration, this “change of state” shall be used as an input to the CCTV camera to relay the footage of the entrance to that particular instrumentation hut to the CCTV viewing stations at the O&CC Security viewing room and security guard house.

The footage shall be recorded at all times 24/7, but when this contact triggers an input to the camera, the image shall automatically pop up onto one of the viewing screens at the CCTV viewing stations at the O&CC Security viewing room and security guard house.

43.5.6 Input Types for Balancing Reservoirs Instrument Hut and Perimeter Fencing

Whisker-type switches shall be installed to detect entry to the instrumentation hut at Balancing Reservoirs. These switches shall also be used as an input to the CCTV camera installed at the entrance to the hut.

When the state of these switches is changed to a “1” or a “0” depending on the digital configuration, this “change of state” shall be used as an input to the CCTV camera to relay the footage at the entrance to the instrumentation hut to the CCTV viewing stations at the O&CC Security viewing room and security guard house.

The footage shall be recorded at all times 24/7, but when this contact triggers an input to the camera, the image shall automatically pop up onto one of the viewing screens at the CCTV viewing stations at the O&CC Security viewing room and security guard house.

PIR / Microwave sensors or similar shall be used for the perimeter fencing area for movement detection. These sensors shall be suitable for outside use and have the appropriate IP rating.

43.5.7 Input Types for Break Pressure Tank Instrument Hut and Perimeter Fencing

Whisker-type switches shall be installed to detect entry to the instrumentation hut at Break Pressure Tank. These switches shall also be used as an input to the CCTV camera installed at the entrance to the hut.

When the state of these switches is changed to a “1” or a “0” depending on the digital configuration, this “change of state” shall be used as an input to the CCTV camera to relay the footage at the entrance to the instrumentation hut to the CCTV viewing stations at the O&CC Security viewing room and security guard house.

The footage shall be recorded at all times 24/7, but when this contact triggers an input to the camera, the image shall automatically pop up onto one of the viewing screens at the CCTV viewing stations at the O&CC Security viewing room and security guard house.

PIR / Microwave sensors or similar shall be used for the perimeter fencing area for movement detection. These sensors shall be suitable for outside use and have the appropriate IP rating.

43.5.8 Input Types for Break Pressure Reservoir Instrument Hut and Perimeter Fencing

Whisker-type switches shall be installed to detect entry to the instrumentation hut at Break Pressure Reservoir. These switches shall also be used as an input to the CCTV camera installed at the entrance to the hut.

When the state of these switches is changed to a “1” or a “0” depending on the digital configuration, this “change of state” shall be used as an input to the CCTV camera to relay the footage at the entrance to the instrumentation hut to the CCTV viewing stations at the O&CC Security viewing room and security guard house.

The footage shall be recorded at all times 24/7, but when this contact triggers an input to the camera, the image shall automatically pop up onto one of the viewing screens at the CCTV viewing stations at the O&CC Security viewing room and security guard house.

PIR / Microwave sensors or similar shall be used for the perimeter fencing area for movement detection. These sensors shall be suitable for outside use and have the appropriate IP rating.

43.5.9 Input Types for Repeater 1 (HLPS to Off-Take B Link) Instrument Hut and Perimeter Fencing

Whisker-type switches shall be installed to detect entry to the instrumentation hut at Repeater 1 (HLPS to Off-Take B Link). These switches shall also be used as an input to the CCTV camera installed at the entrance to the hut.

When the state of these switches is changed to a “1” or a “0” depending on the digital configuration, this “change of state” shall be used as an input to the CCTV camera to relay the footage at the entrance to the instrumentation hut to the CCTV viewing stations at the O&CC Security viewing room and security guard house.

The footage shall be recorded at all times 24/7, but when this contact triggers an input to the camera, the image shall automatically pop up onto one of the viewing screens at the CCTV viewing stations at the O&CC Security viewing room and security guard house.

PIR / Microwave sensors or similar shall be used for the perimeter fencing area for movement detection. These sensors shall be suitable for outside use and have the appropriate IP rating.

43.5.10 Input Types for Repeater 2 (HLPS to Off-Take B Link) Instrument Hut and Perimeter Fencing

Whisker-type switches shall be installed to detect entry to the instrumentation hut at Repeater 2 (HLPS to Off-Take B Link). These switches shall also be used as an input to the CCTV camera installed at the entrance to the hut.

When the state of these switches is changed to a “1” or a “0” depending on the digital configuration, this “change of state” shall be used as an input to the CCTV camera to relay the footage at the entrance to the instrumentation hut to the CCTV viewing stations at the O&CC Security viewing room and security guard house.

The footage shall be recorded at all times 24/7, but when this contact triggers an input to the camera, the image shall automatically pop up onto one of the viewing screens at the CCTV viewing stations at the O&CC Security viewing room and security guard house.

PIR / Microwave sensors or similar shall be used for the perimeter fencing area for movement detection. These sensors shall be suitable for outside use and have the appropriate IP rating.

43.5.11 Input Types for Repeater 3 (HLPS to Off-Take B Link) Instrument Hut and Perimeter Fencing

Whisker-type switches shall be installed to detect entry to the instrumentation hut at Repeater 3 (HLPS to Off-Take B Link). These switches shall also be used as an input to the CCTV camera installed at the entrance to the hut.

When the state of these switches is changed to a “1” or a “0” depending on the digital configuration, this “change of state” shall be used as an input to the CCTV camera to relay the footage at the entrance to the instrumentation hut to the CCTV viewing stations at the O&CC Security viewing room and security guard house.

The footage shall be recorded at all times 24/7, but when this contact triggers an input to the camera, the image shall automatically pop up onto one of the viewing screens at the CCTV viewing stations at the O&CC Security viewing room and security guard house.

PIR / Microwave sensors or similar shall be used for the perimeter fencing area for movement detection. These sensors shall be suitable for outside use and have the appropriate IP rating.

43.5.12 Input Types for Off-Take A Instrument Hut and Perimeter Fencing

Whisker-type switches shall be installed to detect entry to the instrumentation hut at Off-Take A. These switches shall also be used as an input to the CCTV camera installed at the entrance to the hut.

When the state of these switches is changed to a “1” or a “0” depending on the digital configuration, this “change of state” shall be used as an input to the CCTV camera to relay the footage at the entrance to the instrumentation hut to the CCTV viewing stations at the O&CC Security viewing room and security guard house.

The footage shall be recorded at all times 24/7, but when this contact triggers an input to the camera, the image shall automatically pop up onto one of the viewing screens at the CCTV viewing stations at the O&CC Security viewing room and security guard house.

PIR / Microwave sensors or similar shall be used for the perimeter fencing area for movement detection. These sensors shall be suitable for outside use and have the appropriate IP rating.

43.5.13 Input Types for Off-Take B Instrument Hut and Perimeter Fencing

Whisker-type switches shall be installed to detect entry to the instrumentation hut at Off-Take B. These switches shall also be used as an input to the CCTV camera installed at the entrance to the hut.

When the state of these switches is changed to a “1” or a “0” depending on the digital configuration, this “change of state” shall be used as an input to the CCTV camera to relay the footage at the entrance to the instrumentation hut to the CCTV viewing stations at the O&CC Security viewing room and security guard house.

The footage shall be recorded at all times 24/7, but when this contact triggers an input to the camera, the image shall automatically pop up onto one of the viewing screens at the CCTV viewing stations at the O&CC Security viewing room and security guard house.

PIR / Microwave sensors or similar shall be used for the perimeter fencing area for movement detection. These sensors shall be suitable for outside use and have the appropriate IP rating.

43.6 SURGE PROTECTION

The Contractor shall make provision for and install surge protection Plant on all system input / output circuits, power supply input (dc, mains) circuits, and for the installation of the necessary earth mats and earth connections.

The following Plant shall be included as an absolute minimum required:

On all analogue / digital input and output circuits - DEHN BLITZDUCTORS TYPE LZ or equivalent with appropriate voltage ratings.

On all mains power supply circuits - DEHN type VA-280 surge arrestors or equivalent.

On all telephone lines - Telkom-approved protection network, containing gas arrestors, inductances, transorb type arrestors and 600 ohm/600 ohm isolating transformers. Loop and ringing current circuits shall be optically isolated.

The Engineer may allow the use of alternative types of surge arrestors, provided that equivalent or superior protection levels will be achieved. SABS and/or CSIR test reports to substantiate claims shall be provided for the alternative Plant.

The Contractor shall implement additional measures deemed necessary to achieve the required protection level on all connections between the main supply and Plant.

43.7 INSTALLATION AND SPARES

Each security installation shall be installed complete with all cabling, accessories and Plant required providing a functional and fully operational installation as per the layouts and as specified.

The Contractor shall ensure that the quality of the outstation Plant and the installation thereof is of the highest quality suitable for the environment in which it is installed.

Wires (signal and power), cables and connectors shall not be visible in their installed positions neither shall they be accessible to unauthorized persons. All cables shall be installed in bosal conduit or behind concrete walls for security reasons. Cabling between the camera and the power supply shall be protected.

The Contractor shall supply and install any other test equipment and instruments that, in his opinion, shall be required by maintenance personnel, to keep the Security and Control System in a fully operational status.

All interfacing and linking cables to perform the required maintenance shall be supplied by the Contractor.

43.8 CCTV SYSTEM

The CCTV and Automation systems will utilize both the primary fibre optic network and broadband wireless radio network to transfer data.

43.8.1 High-Lift Pumping Station CCTV System

The CCTV System is described as follows:

- a) The CCTV diagram Layout – CCTV and Access Control Layout – High-Lift Pumping Station – 2E-E2.4-010 refers;
- b) All cameras shall be mounted against the pumping station building and guard house;
- c) At the 2-vehicle entrance / exit gates, there shall be cameras installed per vehicle gate. One camera shall be mounted nearest the inner fence whilst another shall be mounted nearest the outer fence. Both cameras shall be mounted facing towards the perimeter fencing (vehicle exiting position). Another camera shall be mounted overhead to view the top of an incoming or exiting vehicle or truck;
- d) At all the entrance / exit areas, there shall be cameras installed. These cameras shall be installed against the walls of the buildings facing the entrance / exit area. The areas in question are the entrance / exit area of the reception / foyer part of the guard house and pump station building;
- e) Inside the guard house shall be cameras mounted in the CCTV viewing room and adjacent guard room. A camera shall provide a view of the CCTV viewing area including the entrance to the Server room at the O&CC. Another camera shall provide a view of the guard room where entrance to the High-Lift Pumping Station is controlled;
- f) Cameras shall be mounted against the buildings whilst facing towards the perimeter fencing. The height of installation shall be such that the cameras shall remain stable when strong winds are blowing. No distortion of the images shall be visible on the viewing screens;
- g) The height of installation shall also be such that an unobstructed view is maintained of the specific wide coverage area. The coverage area shall extend to beyond the 3-tier fencing to outside the perimeter fencing so as to show anyone/anything loitering outside the fenced area and who/which may pose a potential security breach; and
- h) For exact quantities, please refer to the Bill of Quantities.

43.8.2 Low-Lift Pumping Station CCTV System

The CCTV System is described as follows:

- a) The CCTV diagram Layout – CCTV and Access Control Layout – Low-Lift Pumping Station – 2B-E2.4-010 refers;
- b) All cameras shall be mounted against the pumping station building and guard house;

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- c) At the 2-vehicle entrance / exit gates, there shall be cameras installed per vehicle gate. One camera shall be mounted nearest the inner fence whilst another shall be mounted nearest the outer fence. Both cameras shall be mounted facing towards the perimeter fencing (vehicle exiting position). Another camera shall be mounted overhead to view the top of an incoming or exiting vehicle or truck;
- d) At all the entrance / exit areas, there shall be cameras installed. These cameras shall be installed against the walls of the buildings facing the entrance / exit area. The areas in question are the entrance / exit area of the reception / foyer part of the guard house and pump station building;
- e) Inside the guard house shall be cameras mounted in the CCTV viewing room and adjacent guard room. A camera shall provide a view of the CCTV viewing area. Another camera shall provide a view of the guard room where entrance to the Low-Lift Pumping Station is controlled;
- f) Cameras shall be mounted against the buildings whilst facing towards the perimeter fencing. The height of installation shall be such that the cameras shall remain stable when strong winds are blowing. No distortion of the images shall be visible on the viewing screens;
- g) The height of installation shall also be such that an unobstructed view is maintained of the specific wide coverage area. The coverage area shall extend to beyond the 3-tier fencing to outside the perimeter fencing so as to show anyone/anything loitering outside the fenced area and who/which may pose a potential security breach; and
- h) For exact quantities, please refer to the Bill of Quantities.

43.8.3 Balancing Reservoirs Instrument Hut CCTV System

- a) Cameras shall be mounted against the Instrument Hut. The cameras shall be mounted securely so that strong winds will not affect the video images when viewed. The installation height shall be at such a height that the cameras can view without any obstruction between itself and the viewing area.
- b) For exact quantities, please refer to the Bill of Quantities.

43.8.4 Break Pressure Tank Instrument Hut CCTV System

- a) Cameras shall be mounted against the Instrument Hut. The cameras shall be mounted securely so that strong winds will not affect the video images when viewed. The installation height shall be at such a height that the cameras can view without any obstruction between itself and the viewing area.
- b) For exact quantities, please refer to the Bill of Quantities.

43.8.5 Break Pressure Reservoir CCTV System

- a) The CCTV diagram Layout - CCTV and Access Control Layout – Break Pressure Reservoir – 2G-E2.4-010 refers.
- b) Cameras shall be mounted against the instrument and telemetry room. The cameras shall be mounted securely so that strong winds will not affect the video images when viewed. The installation height shall be at such a height that the cameras can view without any obstruction between itself and the viewing area.
- c) A camera shall be mounted on a pole near the vehicle entrance and exit gate. This camera shall view and record all vehicles and people entering and exiting the gate.
- d) For exact quantities, please refer to the Bill of Quantities.

43.8.6 Repeater 1 (HLPS to Off-Take B Link) Instrument Hut CCTV System

- a) Cameras shall be mounted against the Instrument Hut. The cameras shall be mounted securely so that strong winds will not affect the video images when viewed. The installation height shall be at such a height that the cameras can view without any obstruction between itself and the viewing area.
- b) For exact quantities, please refer to the Bill of Quantities.

43.8.7 Repeater 2 (HLPS to Off-Take B Link) Instrument Hut CCTV System

- a) Cameras shall be mounted against the Instrument Hut. The cameras shall be mounted securely so that strong winds will not affect the video images when viewed. The installation height shall be at such a height that the cameras can view without any obstruction between itself and the viewing area.
- b) For exact quantities, please refer to the Bill of Quantities.

43.8.8 Repeater 3 (HLPS to Off-Take B Link) Instrument Hut CCTV System

- a) Camera shall be mounted against the Instrument Hut. The cameras shall be mounted securely so that strong winds will not affect the video images when viewed. The installation height shall be at such a height that the cameras can view without any obstruction between itself and the viewing area.
- b) For exact quantities, please refer to the Bill of Quantities.

43.8.9 Off-Take A Instrument Hut

- a) The CCTV diagram Layout - CCTV and Access Control Layout – Off-Take A – 2H-E2.4-010 refers.
- b) One camera shall be mounted against the outside wall of the instrument hut facing the entrance / exit. The camera shall be mounted in such a manner that an unobstructed view of the door is achieved.
- c) For exact quantities, please refer to the Bill of Quantities.

43.8.10 Off-Take B Instrument Hut

- a) The CCTV diagram Layout - CCTV and Access Control Layout – Off-Take B – 2H-E2.4-011 refers.
- b) One camera shall be mounted against the outside wall of the instrument hut facing the entrance / exit. The camera shall be mounted in such a manner that an unobstructed view of the door is achieved.
- c) For exact quantities, please refer to the Bill of Quantities.

43.8.11 CCTV System Cameras**43.8.11.1 General**

The CCTV cameras shall be used for terrain surveillance and monitoring. The CCTV cameras shall be able to work in low-light conditions and shall be able to switch to black and white viewing

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automatically when extreme low-light conditions prevail. When lighting conditions improve, the viewing should automatically switch back to colour.

All the cameras shall be mounted against this building facing towards the perimeter. The cameras shall be mounted at an applicable height to ensure maximum coverage of the viewing area whilst being stable enough not to be affected by strong winds.

Where specifically specified, cameras shall be mounted on concrete poles that are hollow inside from the top to the bottom for cable entry or to building walls and shall be used to monitor key points at the High-Lift Pumping Station, Low-Lift Pumping Station, Break Pressure Reservoir, Operational Reservoir and Point of Supply (PoS) Instrumentation Huts.

In these instances, the pole mount option shall only be used due to the unavailability of a secure structure like a building wall against which the camera can be mounted.

The positions of cameras are given on the following layout diagrams:

- a) CCTV and Access Control – High-Lift Pumping Station – 2E-E2.4-010;
- b) CCTV and Access Control – Low-Lift Pumping Station – 2B-E2.4-010;
- c) CCTV and Access Control – Break Pressure Reservoir Instrument Hut – 2G-E2.4-010;
- d) CCTV and Access Control – Off-Take A Instrument Hut – 2H-E2.4-010; and
- e) CCTV and Access Control – Off-Take B Instrument Hut – 2H-E2.4-011.

All camera Plant offered shall be brand new and of the latest design and shall be manufactured according to the ISO 9002 Standard.

43.8.11.2 Housing of CCTV Fixed Cameras

The Contractor shall supply Plant that fits neatly and professionally into enclosures.

All cable (fibre optic / dc power, etc.) entries to enclosures shall be via suitable cable glands or enclosure - mount connectors, etc., and emphasis shall be placed on installing all wiring inside enclosures neatly and professionally.

Enclosures shall be rated IP 65 or better. The cable glands and connections shall not void the specific IP rating of the Enclosure of IP 65 or better.

Enclosures shall protect the camera Plant from heat, dust, moisture, rain, hail, frost and strong winds, by consisting of a heat sink type of shape to ensure that camera Plant will not fail due to extensive heat.

The Enclosure for the power supply and signal cable shall be separate from the camera Plant.

Where pole mounted cameras are specified, enclosures shall be mounted on the support poles in such a way that they are out of reach of intruders at a height of 4 metres above the ground.

43.8.11.3 Ancillary Plant

Cameras shall be complete and operational including all interconnections required between the NVR Plant and the power supply Plant.

43.8.11.4 Surge Protection

The Contractor shall take all necessary steps to protect the Camera Plant against surge (lightning) damage.

43.8.11.5 Power Supply for CCTV Plant

All Plant offered shall be equipped to operate from 230 VAC.

The Contractor shall ensure that Plant / cards installed can work from the existing supply of 230 VAC. For Plant that operates at a lower voltage and current, the Contractor shall ensure that he provides the step-down circuitry for this.

The power supplies used for the CCTV Plant shall be fitted with lightning and surge protection that can be easily accessible for maintenance purposes.

Where cameras are to be pole mounted, all 230 V power points shall be supplied by the Contractor within a metre of final camera positions. Power points shall be enclosed inside mast poles, with weatherproof and vandal resistant covers.

43.9 SECURITY STANDARD

Any service provider rendering a security service to the Department must be screened.

In terms of the Private Security Regulatory Act, no 56 of 2001, security service providers are required to be registered with the regulatory authority, in this instance the Private Security Regulatory Authority (SIRA).

All software packages shall be 100% locally supported and shall be fully equipped for this purpose.

It shall not be possible for the operator of any station to accidentally or intentionally destroy the database by entering faulty or erroneous instructions or messages.

The software shall be fully supplemented by easily understandable user manuals and documentation.

The C&I contractor shall be responsible for the provision of all security scan software, including all software required to make up a complete, operational data acquisition and control system.

43.10 OPTICAL FIBRE COMMUNICATION CABLE

The same fibre optic cable shall be used for both SCADA and security data communication. Dedicated fibres shall be made available for security. Refer to Section 40 - Control and Instrumentation General.

43.11 HANDBOOKS AND INSTRUCTION MANUALS

The Operation and Maintenance Manuals shall comply with the requirements of Clause 48.9 in Section 48.

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All documentation made available during the tests-on-completion shall be fully updated subsequent to successful Tests-on-Completion to include whatever final modifications are required to be made by the Contractor to his Plant, in order for it to gain acceptance by the Engineer for inclusion in the manual. Any such updates shall be made and supplied within three (3) months of the successful conclusion of the Tests-on-Completion.

43.12 TESTING AND TEST ON COMPLETION

43.12.1 General

The Test on Completing shall comply with the requirements of Section 48.

The Engineer reserves the right to instruct the Contractor for verification of all or some of his Plant to the SABS or other authorities including the Engineer. The Plant will be subjected to testing by authorised practitioners from the SANS for the following:

- a) Compliance with the regulations of SIRA, the Private Security Regulatory Authority;
- b) Satisfactory operation of the Plant at the extremes of the ambient operating conditions specified;
- c) Technical verification of the abilities of the Plant as per specifications; and
- d) Robustness and IP rating verification as specified by manufacturers.

43.12.2 Factory Acceptance Testing

All CCTV Plant, inclusive of hardware and software as well as Access Control Plant inclusive of hardware and software shall be set up at the Contractor's works for inspection and testing by the Engineer before any of the Plant is delivered to site. Any faults, deviations, etc., discovered during the inspection and testing at the Contractor's works shall be rectified fully before the Plant is transported to site.

The Contractor shall ensure that the system has been set up and is in proper working condition, including all the hardware and software, before making final arrangements with the Engineer for the Factory Acceptance Testing to take place. Should the testing prove unsatisfactory or should there be any hold-up or delay of whatever nature, which necessitates the Factory Acceptance Testing to be re-scheduled for another date, the cost incurred by the Engineer and/or his representative in attending the repeated Factory Acceptance Testing shall be for the Contractor's account. The Contractor shall not be held liable for the costs incurred by the Engineer and/or his representative in attending the first Factory Acceptance Testing session.

The Contractor shall ensure that sufficient time is allocated for the tests to be performed. It will be at the Engineer's discretion when the testing period is adequate. Only when the Engineer is satisfied that all aspects of the Plant have been successfully tested will the Factory Acceptance Testing be deemed complete.

At the Engineer's discretion, a pre-test on completion may be held directly after installation (or significant part thereof or, in the case of identical installations required at various sites, one completed installation) has been completed and before the system is put into operation. This pre-test on completion shall be conducted by the Engineer or his assistant and the Contractor shall accompany the Engineer to site during the pre-test. Any faults, deviations, etc. from the Specification discovered during the pre-test on completion shall be pointed out to the Contractor (in writing) and shall be fully rectified before Tests on Completion of the whole system takes place.

43.12.3 Tests on Completion

A date for the Tests on Completion of all stations shall be arranged once the Contractor has completed all the installation work required in terms of the Contract and once he is satisfied that the system as a whole is functioning correctly and has indicated so in writing to the Engineer.

Any faults, deviations from the Specification, etc.; discovered during the Tests on Completion will be pointed out to the Contractor and shall be fully rectified before a Taking-Over Certificate is issued.

Should it not be possible to issue the Taking-Over Certificate or should there be any hold-up or delay of whatever nature which is directly attributable to the Contractor and which necessitates the Tests on Completion to be re-scheduled for another date, the cost incurred by the Engineer in attending the further Tests on Completion shall be for the Contractor's account.

The Contractor shall ensure that he has allocated sufficient time for the testing to be performed.

Taking-Over Certificates will only be issued by the Engineer for each station when it is shown that the particular station is functioning correctly. The one-year Defects Notification Period shall commence upon the successful completion of the testing, commissioning and acceptance of the complete CCTV and Access Control Security System required in terms of this Contract and on the Issuing of the Taking-Over Certificate.

Any inherent faults, latent defects or degradation in performance of the CCTV and Access Control Security System Plant hardware and software discovered or becoming apparent during this one-year Defects Notification Period shall be repaired or replaced by the Contractor at his own expense.

The Contractor shall submit all test and calibration certificates received from specialist suppliers, to the Engineer for his approval. Such documents shall then be included in the Handbooks and Instruction Manuals.

The Contractor shall provide any additional testing software which, in his opinion, will be required for the effective and reliable maintenance of the security system supplied.

43.13 LABELLING AND NUMBERING

Plant shall be marked clearly in accordance with the descriptions shown on the Drawings.

Plant not designated or numbered on the layout Drawings shall be labelled by means of a unique numbering system for ease of identification. The Contractor shall submit a proposed numbering system as well as examples of the proposed labels for approval by the Engineer.

All cables shall be clearly labelled at both ends. Each end shall be labelled to identify the Plant it is connected to on its other end. More than one cable of the same type shall be distinguished by a second suffix in numerical order.

All cabling and wiring shall be marked with HELAGRIP PVC cable markers. Circuit as well as cable numbers shall appear on all "as-built" ("as installed") drawings.

Draw boxes and terminals shall be numbered and labelled.

All notices, labels and designations shall be in English. A list of wording, terms, designations etc., shall be submitted for approval before manufacturing of labels and notices commences.

Labels shall be permanent and indelible.

Numbering and labelling shall be such that, during maintenance, the wiring can be traced by using the “as-built” (“as installed”) drawings.

43.14 MANUALS

The development of Operation and Maintenance Manuals is described in Section 48. The security system manuals shall contain, as a minimum requirement, the following information:

43.14.1 CCTV and Access Control Plant

“As-built” drawings and operation and maintenance manuals for the applicable Plant shall be provided. The documentation shall also include all factory calibration certificates, IP rating test certificates and site test certificates and final calibration certificates as defined in the Technical Data Sheets.

43.14.2 Installation Record

The Engineer will provide the Contractor with a set of layout Drawings to mark up all the “As Installed” cable routes and Plant.

Sets of completed CCTV and access control cable schedules shall be provided, showing the “as installed” status, IP addresses, termination node numbers, sizes, quantities, cable and core numbering, core types and cable types of all cables installed, excluding cabling for single- and three-phase socket outlets. These shall include cabling installed for signals, pilots and for metering.

43.15 TOOLS AND ACCESSORIES

All tools, special tools and accessories required for the normal operation and maintenance of all the Plant and systems installed shall be supplied in compliance with the requirements of Section 48.

All keys, tools and special tools shall be in duplicate and handed to the Engineer upon completion. The Contract shall be deemed to be incomplete until this requirement has been met. The Contractor shall ensure that all tools and equipment required are available during inspections and testing. This includes two-way radios, meters, keys, manhole cover removers, and conductivity meters, bridging pieces, recorders and personnel as required.

43.16 SPARE PARTS REQUIREMENTS

The Contractor shall list and price the spare parts considered to be necessary as required for the continued operation of all mechanical, electrical and electronic Plant based not only on a reliability analysis of the Plant, but also on the reliability and availability of local suppliers of spare parts. The lists shall also include all long lead maintenance items and special maintenance tools that will be required during the maintenance of the Plant by the Contractor. The lists of additional critical spare parts must be submitted to the Engineer prior to achieving RFTO.

The total amount for spares derived from for each part of the Works shall be carried forward to the Bill of Quantities. A Provisional Sum will be allocated in the Bill of Quantity of Section 48 for the complete list of spare parts as listed by the Contractor.

43.17 QUALITY CONTROL FOR SECURITY INSTALLATIONS**43.17.1 Responsibility for Quality**

The Contractor shall implement the approved comprehensive Quality Control Plan and accept full responsibility for the quality of his workmanship and material used, irrespective of any quality surveillance that may be carried out by the Engineer or his appointed representative.

In keeping with the principles contained in the Quality Plan, the Contractor or any Subcontractor(s) shall:

- a) Be responsible for compliance with all the Clauses of this Specification in every respect;
- b) Carry out all Factory Acceptance and Site inspections and tests in the presence of the Engineer or his assistant. The cost of these inspections and tests shall be included in the Contractor's rates;
- c) Draft the Quality Control Plan for manufacturing indicating all the intended stages of testing during manufacture as well as hold points for independent quality surveillance and testing; and
- d) The Quality Control Plan shall not be altered once approved and shall be adhered to at all times.

43.17.2 Notice of Inspection

The Engineer shall be notified at least seven (7) days in advance (or as otherwise agreed for him to make travel plans as required) of impending inspections or testing in terms of the Quality Control Plan.

43.17.3 Contractor Qualification

The Contractor shall satisfy the Engineer that his Subcontractors have the management, facilities and equipment, skilled staff, quality control procedures and required test methods and standards to carry out adequate quality control during manufacture.

The Contractor and his Subcontractors shall be subject to a Quality Audit.

43.17.4 Submission for Approval

The Contractor shall submit the following to the Engineer, including data sheets where applicable, for approval:

43.17.4.1 For Manufacture

- a) Drawings;
- b) A programme;
- c) A quality control plan; and
- d) A draft Operation and Maintenance manual.

43.17.4.2 For Corrosion Protection

- a) A programme;
- b) The Quality Control Plan for corrosion protection;
- c) Blast material;
- d) Coating products; and
- e) Pickling and passivating products.

43.17.5 Manufacture Programmes

The manufacture programs shall state the time and place when the following will be conducted:

- a) Inspection of enclosures and material; and
- b) Testing.

43.17.6 Substandard Quality Control

All material and certification records shall be subject to examination by the Engineer.

This shall include the checking and testing of the Plant. If any deviation from the specification is found, additional testing and quality surveillance shall be carried out.

If the additional testing confirms inaccurate quality control by the Contractor, all work shall be stopped and shall only proceed after remedial action has been implemented.

43.17.7 Access for Surveillance

For the purpose of carrying out quality surveillance, the Engineer or his representative shall be granted access to any part of the Contractor's premises relevant to the work being carried out, at any reasonable time.

The Contractor shall provide, at his own cost, any equipment or labour necessary to gain access to surfaces which are coated, to be coated or are in the process of being coated.

43.17.8 Cost of Quality Control

The cost of quality control shall be included in the Contractors rates.

- a) Non-compliance with the specification:
 - Plant, materials and services that do not conform to the requirements of this Section will be rejected;
 - Plant and materials so rejected shall be held at the cost and risk of the Contractor who shall, at his own cost, replace Plant or repair the defects or corrosion protection according to the Contract; and
 - Failing satisfactory repair of rejected Plant and materials shall be returned to their source at the Contractor's cost and risk without any opportunity to substitute the rejected Plant.

43.18 QUALITY CONTROL RECORDS

Refer to Clause 48.10 in Section 48 in this regard.

43.18.1 Coating and Material Records

Quality control, material and coating records for all stages of the work, including batch numbers of materials used, record of environmental conditions and all test data shall be recorded in terms of the approved Quality Control Plan for manufacture and the Quality Control Plan for corrosion protection.

Certificates for all materials used shall also be kept.

43.18.2 Data sheets, Specifications and Codes of Practice

The Contractor shall have available the latest issues of the following:

- a) A copy of this Section;
- b) Relevant Codes of Practice;
- c) Drawings; and
- d) Manufacturer's data sheets for materials to be used.

The above mentioned shall be available to all the Contractor's Quality Control and Production personnel.

43.18.3 Quality Control Records

Accurate and detailed quality control records shall be kept by the Contractor for all stages of the work.

All quality control records shall be available for inspection by the Engineer or his assistant.

Incomplete, inaccurate or inadequate records shall be regarded as non-compliance with the Specification.

Documents for each item of Plant shall be collated and bound in a logical manner and retained by the Contractor as proof of quality achieved. These shall be available on request for quality control auditing and part payment releases. The records shall be handed over to the Engineer on completion of the Works described in this Section.

The records shall be bound into the Operation and Maintenance manuals.

43.18.4 Provision for Testing

The Contractor shall at no additional cost to the Employer provide all material, samples, labour and the necessary calibrated instruments which may be required for the purpose of inspection, testing and analyses.

43.19 QUALITY SURVEILLANCE BY THE ENGINEER**43.19.1 Inspection by the Engineer and/or Approved Inspection Authority (AIA)**

Inspection of Plant shall be carried out at the manufacturer's works by the Engineer and/or an AIA.

The Engineer's and AIA's inspections shall in no way relieve the Contractor or his Subcontractors of any of their obligations to design, manufacture, test, inspect and supply Plant of superior quality and workmanship in accordance with this Section.

The Engineer and AIA's shall be given access to inspect any item included in the Contract at any stage of execution of the Contract.

Where imported supplies are to be inspected before shipment, the Contractor shall notify his suppliers abroad of the conditions applicable to inspections and also notify the Engineer and AIA when consignments are ready so that arrangements for inspection may be made.

43.19.2 Material Tests

The manufacturer's material test data, certification and the Contractor's quality records shall be subject to audit by the Engineer or his assistant.

43.20 DRAWINGS

Drawings shall be submitted for approval both in hard copy and electronically in PDF format.

The approval of drawings shall not relieve the Contractor of his responsibility to supply the Plant according to the requirements on this Section.

The following procedure for the approval of drawings shall be followed:

- a) Contractor prepares drawings for approval;
- b) Contractor checks drawings for compliance with all requirements of this Section and submits 3 copies, signed off as checked, to the Engineer for approval;
- c) Engineer returns 2 copies, stamped as approved or returned for resubmission, to the Contractor;
- d) Manufacture of Plant commences after approval of drawings by the Engineer; and
- e) A complete set of "as-built" drawings, certified as accurate, shall be submitted to the Engineer immediately after issue of the Certificate of Completion.

Layout drawings, issued for that purpose, shall be marked up by the Contractor showing all Plant installed dimensions of buildings and the routes of surface mounted and underground cables.

43.21 WORKMANSHIP

The Contractor shall only employ competent staff to execute the Works.

The Contractor shall be responsible for the correct and complete erection of the Installation. Inspections and approvals by the Engineer shall not release the Contractor from his responsibilities in terms of the Contract.

43.22 SUPERVISION

The Contractor shall provide full time supervision for the duration of this work.

43.23 MEASUREMENT AND PAYMENT

For measurement and payment refer to Section 44.