

ELECTRICAL WORKS

TECHNICAL SPECIFICATIONS

SECTION GA-GG

TECHNICAL SPECIFICATION

HA MV SWITCHGEAR SYSTEMS

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GA.1 SCOPE: MV SWITCHGEAR SYSTEM

- GA.1.1 This specification comprises all aspects regarding the repair and maintenance and servicing of Medium voltage switchgear, Substation buildings and yards.
- GA.1.2 This specification shall form an integral part of the maintenance and servicing contract document and shall be read in conjunction with Part C, the Additional Specification included with this document.

GA.2 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

- GA.2.1 The latest edition, including all amendments up to date of tender of the following specifications, publication and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof.
- GA.2.2 **SANS Specifications**
 - SANS 1195
 - SANS 555
 - SANS 1874
 - Sans 10142-2
 - SANS 62271
 - SANS 1885
- GA.2.3 **Occupational Health and Safety Act of 1993 (OHS-Act)**
- GA.2.4 **Manufacturer's specifications and maintenance instructions**
- GA.2.6 **Additional Requirements**

Equipment and material installed shall be new and unused. Air and Oil switches, MV and LV switches and Protective relays shall bear the SANS stamp. The Contractor shall ensure that all safety regulations and measures are applied and enforced during repair and maintenance work.

GA.3 AS-BUILT INFORMATION AND OPERATING AND MAINTENANCE MANUALS

GA.3.1 Procurement of available as- built information. At the commencement of the contract, the Contractor shall obtain all available as-built documentation.

The Contractor shall be responsible for the verification of the correctness of all such information. The Contractor shall, in the probable case non-availability and correctness of such information be responsible for the compilation of a complete set of as-built drawings, inventory list and Operating and Instruction Manuals.

This shall be done in accordance with the Additional Specification SB Operating and Maintenance manuals.

The Contractor shall allow for the required tools and equipment to establish correct as-built information.

All information shall be recorded and reproduced in electronic format as well as supplying the Engineer with three sets of hard copies.

GA.3.2 Over and above what is specified in the Additional Specification – SB Operating and Maintenance manuals, the Operating and Maintenance Manual to be compiled shall be structured and shall at least include the following:

System Description

Complete system description of the distribution system. This shall be done for each Substation individually. The System Description shall contain detailed information regarding the supply configuration (substation, cabling, distribution kiosks, pole mounted switchgear), the system configuration (switchgear, cabling, metering, batteries) and the switchgear detail as well as the earthing and lighting protection arrangement.

Commissioning Data

Complete commissioning, test and inspection data of the MV switchgear. This shall be done for each substation installation individually.

Operating data

Safety precautions to be implanted.

Operating of MV system: Switchgear, relays, battery and charger sets.

Maintenance Instructions

Projected frequency of fuse replacement per substation.

Procedure to verify operation of circuit breaker – controlled circuits.

Trouble shooting diagram.

Equipment details, including manufacturer's brochures / pamphlets, order numbers and list of components.

Schedule of serviceable components of medium voltage switchgear.

Hoisting equipment specification, if applicable.

GA.4 TESTS AND INSPECTION FOLLOWING COMPLETION OF REPAIR WORK

GA.4.1 It is the responsibility of the Contractor to provide all labour, accessories and properly calibrated and certified measuring instruments necessary to record the following parameters:

- Phase voltages
- Current per phase
- Earth Resistance testing
- Contact resistance per phase

The Contractor is responsible for the arrangement of such tests. He shall give at least 72 hours' notice to the Engineer prior to the test date.

GA.5 LOGGING AND RECORDING PROCEDURES

GA.5.1 The Contractor shall as part of this Contract institute a Recording system as part of the Maintenance Control Plan as defined in the Additional Specification SA – General Maintenance. This shall consist of a Record book which shall be utilised to log and record all faults, system checks, breakdowns, maintenance visits, inspections etc.

GA.5.2 The logbook shall be stored in a safe place and shall only be utilised by the Contractor and Engineer. A copy of the monthly entries and recordings into this logbook shall be submitted by the Contractor together with his monthly report to the Engineer.

This logbook shall be structured to at least include the following:

Bi-annual inspection and testing of all systems.

Monthly lamp inspection and maintenance actions.

Annual earthing test report.

Bi-annual inspection and testing of distribution boards.

GA.6 MAINTENANCE TOOLS AND SPARES

GA.6.1 On commencement of the Repair and Maintenance Contract, the Contractor shall supply and deliver certain Tools and Spares to the User Client. These tools and spares will be the property of the Department of Public Works. Any deficiencies or short fall or damaged Tools and Spares during the contract shall be replaced with new equipment/material.

GA.6.2 The Tools and Spares shall be kept safe in a lockable store room on site. The Contractor shall provide his own lock for the designated store room. The inventory of the Tools and Spares shall be verified on a monthly basis. Any short fall shall be replaced by the Contractor as part of his responsibility under this contract.

GA.6.3 The Tools and Spares shall at least include the following:

Medium voltage switchgear operating tools.

MV fuses rated 25 A, 12kV, 40 kA.
Cut out fuse element 10 A & 20A

GA.7 **QUALITY ASSURANCE SYSTEM**

- GA.7.1** Following formal approval of his Quality Assurance system by Engineer, the Contractor shall implement the approved QA system.
- GA.7.2** Records of this QA system shall be kept throughout the duration of the contract and shall be submitted to the Engineer as required.

GA.8 **RE-COMMISSIONING OF INSTALLATION**

- GA.8.1** On completion of the repair work, the MV installations shall be put into operation.

GA.9 **MAINTENANCE AND SERVICING WORK TO MV INSTALLATIONS**

- GA.9.1** The various MV systems shall be maintained and serviced as measured in the bills of quantities during the first period of the repair and maintenance contract.
- GA.9.2** The scope of the repair work shall include, but shall not be limited to the activities listed below.
- GA.9.3** The Contractor shall record the repair actions in tabular format before the Contractor's responsibility for maintenance commences.
- GA.9.4** Repair work shall be executed within the approved period for repairs. This period shall be agreed at the start of the contract period.
- GA.9.5** New equipment and material (e.g. batteries, relays, contracts, etc) shall be supplied with a written guarantee confirming a defects liability period of 12 months from date of hand over. These guarantees shall be furnished in favour of the Engineer.
- GA.9.6** The maintenance phase of this contract shall commence once the repair work on the installation have been commissioned and handed over to the satisfaction of the Engineer.

GA.10 **MV INSTALLATION MAINTENANCE**

- GA.10.1** The various MV systems shall be maintained following the initial repair work. The maintenance contract shall run for the balance of the 36 month contract period.
- GA.10.2** The following maintenance actions will be required under this period of the contract:
- Routine preventative maintenance
 - Corrective Maintenance
 - Breakdown Maintenance

These actions are defined in the Additional Specification SA – General Maintenance.

GA.10.3 The maintenance schedules and frequency of services and maintenance activities shall be developed under the maintenance control plan which will be instituted by the Contractor. The Contractor's responsibility in this regard is specified in the Additional Specification SA – General Maintenance.

GA.11 **MEDIUM VOLTAGE SWITCHGEAR: TECHNICAL DETAILS**

GA 11.1 **Installation description**

This section describes the electrical distribution network that will be repaired and maintained in terms of this contract. The network is operated at 11 kV.

a) Distribution Substations

The electrical distribution network includes 1 distribution substation. The substation is brick built containing 3 rooms. The MV room contains an Alstom K1/AF circuit breaker and is connected to an incoming and 500 kVA transformer feeder MV cable.

b) Pole Mounted Transformer

Three pole mounted transformers form part of the distribution network.

GA.11.2 **Scope of repair work**

Clean, check and service 11 kV circuit breaker, replace tripping batteries, check charger and protection.

Check and repair oil leaks on cable boxes.

Recover redundant equipment not in use.

GA.11.3 **Repair work: Measurement and payment**

<u>Item</u>	<u>Unit</u>
(a) Service 11kV switchgear (bulk oil type)	No

The unit of measurement shall be the number of panels serviced.

The tendered rate shall include full compensation for the following:

Truck

Wipe down and clean carriage and circuit breaker framework.

Open circuit breaker and examine tabulators and contacts. Replace if necessary.

Clean insulation.

Clean and lubricate isolating contacts and check freedom of movement.

Remove insulating oil.

Clean tank and circuit breaker.

Replace insulating oil (oil to SANS 1555 specification)

Replace tank gasket.

Check, clean and lubricate mechanism.

Check, clean and lubricate the lifting screw and guides of the carriage.

Check interlocks.

Check interlocks.

Check opening and closing speeds.

Record contact resistance per phase.

Lubricate carriage wheels, locating bolt and linkage.

Clean and lubricate secondary isolating contacts and check freedom of movement.

Remove rust and repaint where necessary.

Use rust remover, sand thoroughly and apply neutralizer.

Apply primer before 2 coats of enamel paint with the thickness as per manufacturer specification.

Fixed Panel

Wipe down and clean externally.

Clean circuit breaker and panel compartment.

Remove all secondary fuses and clean contact surfaces.

Check auxiliary contacts and connections.

Check switches and connections in panel and CT Chamber.

Lubricate shutter mechanism.

Lubricate all hinges and handles.

Clean circuit and busbar insulators.

Clean busbar chamber.

Clean isolating plugs and re-grease.

Check operation of orifice shutters.

Check and lubricate selector gate mechanism.

Clean voltage transformer orifices.

Clean secondary and earth contracts of the voltage transformer.

Lubricate voltage transformer carriage.

Check and replace indication lamps.

Open, check and clean air insulated cable end boxes.

Remove rust and repaint where necessary. Use rust remover, sand thoroughly and apply neutralizer. Apply primer before 2 coats of enamel paint.

Reassemble, test and commission.

Close and trip manually and electrically several times.

Carry out thermal scan of busbars.

Check and repair vermin proofing.

	<u>Item</u>	<u>Unit</u>
(b)	Service battery and charger set. The unit of measurement shall be the number of battery and charger sets serviced.	No

The tendered rate shall include full compensation for the following:

Battery and charger sets

Replacement of batteries.
 Cleaning of connections and terminals.
 Measure and record Specific Gravity where applicable. Top up each cell.
 Check battery capacity, with an external load.
 Apply insulating grease to contacts.
 Check and test battery charger operation.
 Battery trip unit service and test.

<u>Item</u>	<u>Unit</u>
(c) Check protection relay	No

The unit of measure shall be the number of panels with relays tested.

The tendered rate shall include full compensation for the following:

11 kV panels with 3 x OC (IDMT) 1 x EF
 Current transformers; (3 x per panel)
 Primary injection
 Secondary injection and all other tests
 Protection relays per panel
 Testing and commissioning including test certificates
 Indication and metering
 Interlocking and scheme
 Control functions
 Supervisory functions
 General: Cleaning panels, fuse holders, relays, enclosures, instrumentation, check fuses,
 vermin-proofing, lubrication.

<u>Item</u>	<u>Unit</u>
(d) Add additional cable box oil.	Litre

The unit of measure shall be the number of litres of oil added.

The tendered rate shall include full compensation for ordering, supplying and adding additional oil. The oil must be as semi fluid grade of compound "Pentol" or equipment.

<u>Item</u>	<u>Unit</u>
(e) Replace neon lamps and capacitor diverters.	No

The unit or measure shall be the number of neon lamps and capacitor diverters replaced.

The tendered rate shall include full compensation for the replacement of faulty neon

lamps and capacitor diverters.

<u>Item</u>	<u>Unit</u>
(f) Re-tape MV busbars.	No
The unit of measure shall be a lump sum.	
The tendered rate shall include full compensation to re-tape the MV busbars to the bushings inside the MV panel using PVC insulation tape.	
<u>Item</u>	<u>Unit</u>
(g) Repair oil leak on cable box.	No
The unit of measure shall be the number of cable boxes repaired.	
The tendered rate shall include full compensation for the repairing of oil leaks.	

GA.11.4 Scope of maintenance work

GA.11.4.1 Monthly

Visual inspection of switchgear.
 Check for oil leaks.
 Check oil levels.
 Recording of current and voltage readings in and signing of record book.

GA.11.4.2 Annual

Service all medium voltage Switchgear.
 Record all test results in record book.

GA.11.5 Maintenance work: Measurement and Payment

Refer to clause SA 06 of the Additional Specification – SA General Maintenance.

GA.12 SUBSTATION BUILDING AND YARD

GA.12.1 Installation description

This section describes the electrical distribution network that will be maintained in terms of this contract.

(a) Distribution Substation

Distribution Substation consists of a three room brick building, containing MV switchgear, transformer and LV distribution boards all fenced in.

(b) Pole Transformer

Three pole mounted Transformers forms part of the distribution network.

GA 12.2 Scope of Repair Work

Open substation, clean substation and cut and replace duct covers.
Provide framed schematic in HV switch room.
Provide labels and markings on substations.
Check and report on condition of building elements.

GA.12.3 Repair Work: Measurement and Payment

<u>Item</u>	<u>Unit</u>
(a) Substation earthing.	No.

The unit of measurement shall be the number of substation earths checked.

The tendered rate shall include full compensation for the following:

Measurement of earthing system earth resistance.
Checking of earthing of all equipment.
Secure earth termination.
Re-tensioning of all earth connections.

<u>Item</u>	<u>Unit</u>
(b) Substation yard and building service.	No
(c) Provide labels, notices and schematics.	No.

The unit of measure shall be the number of substations labelled.

The tendered rate shall include full compensation for the following:

Provide substation number.
Mark room doors HV/TRF/LV/ESC, etc.
Provide OHS Act notice at each substation.
Provide an A3 laminated framed schematic in the medium voltage room.

<u>Item</u>	<u>Unit</u>
(d) Supply duct covers.	No

The unit of measure shall be the total sum for the replacement and cutting of covers.

The tendered rate shall include full compensation for the following:

- The Contractor shall manufacture and install sections of cable trench cover plates to fit the sections in substations where old cover plates have been removed. The contractor shall measure up the cable trenches and manufacture the plates to fit exactly in the required sections. The dimensions specified in this procedure shall only be used as a basis to determine the tendered rate.

- The cover plates shall be manufactured from mild steel chequered plate with a base thickness of 4.5 mm and a chequered stud thickness of 6.1 mm. Each cover plate shall have tow guiding lengths of angle iron welded in positions parallel to the length of the cable trench. The guiding angle irons shall be positioned at the edges of the plate, and shall form a tight fitting stop against the edges of the cable trench. The angle irons shall be mild steel with dimensions 40mm x 40 mm x 3 mm.
- Each cover plate shall be fitted with two steel lifting handles fitted at opposing ends of the plate (in line with the length of the cable trench.) The handles shall be fitted through holes drilled in the plate, and shall be such that they form irremovable parts of the plate.
- All metal edges shall be chamfered to remove all burrs so that the cover plates can be handled without injury.
- Each cover plate and its handles shall be painted with a suitable anti-corrosive primer after all welding and chamfering has been completed. All metal surfaces shall be cleaned (prior to painting) and painted in accordance with the paint manufacturer's recommendations.

<u>Item</u>	<u>Unit</u>
(e) Vermin proof cable ducts.	No

The tendered rate shall include full compensation for opening, cleaning vermin proofing and closing of duct covers.

<u>Item</u>	<u>Unit</u>
(f) Re-paint substation roof and gutters.	No

Report to site engineer for further action by others.

<u>Item</u>	<u>Unit</u>
(g) Provide MV ring schematic.	No

The unit of measure shall be the number of MV ring Schematic installed.

The tendered rate shall include full compensation for compiling, supply and installation of an A3 Laminated framed schematic in the substation.

<u>Item</u>	<u>Unit</u>
(h) Repair roof leaks in transformer room.	No

Report to site engineer for further action by others.

<u>Item</u>	<u>Unit</u>
(l) Re-label panels.	No.

The unit of measure shall be the number of panels re-labelled.

The tendered rate shall include full compensation for the re-labelling of panels with

engraved labels as specified in the bill of quantities.

<u>Item</u>	<u>Unit</u>
(j) Supply MV operating handles.	No.

The unit of measure shall be the number of operating handles supplied.

The tendered rate shall include full compensation for the supply of operating handles if and when instructed by the engineer.

<u>Item</u>	<u>Unit</u>
(k) Supply and install tool holders.	No.

The unit of measure shall be the number of tool holder installed.

The tendered rate shall include full compensation for the supply and installation of suitable tool holders that can accommodate all operating handles for the switchgear in the MV room of the substation. Tool holders must be installed inside the MV room of the substation.

<u>Item</u>	<u>Unit</u>
(l) Re-placement of 75 W Rapid start fluorescent lights.	No.

The unit of measure shall be the number of light fittings re-placed.

The tendered rate shall include full compensation for removal of the existing 2 x 75 W commercial type fluorescent light and supply and installation of a new 2 x 58 W switch start commercial fluorescent light fitting.

<u>Item</u>	<u>Unit</u>
(m) Re-paint substation louvers and doors.	No.

The unit of measure shall be the number of louvers or doors re-painted.

The tendered rate shall include full compensation for cleaning, de-rusting with a de-rusting agent, removal of loose paint, sand paper of surfaces, apply primer before two coats of enamel paint to the doors of louvers.

<u>Item</u>	<u>Unit</u>
(n) Re-paint substation rooms.	No.

The unit of measure shall be the number of rooms re-painted.

The tendered rate shall include full compensation for cleaning of walls and ceilings and applying one coat primer and two coats of paint to match the existing colour of the walls.

GA.12.4 Scope of Maintenance Work

GA.12.4.1 Monthly

Clean substation yard and buildings.

GA.12.4.2 Annual

Service substation building.

GA.12.5 Maintenance Work: Measurement and Payment

Refer to clause SA 06 of the Additional Specification – SA General Maintenance.

Remuneration for the Maintenance work shall form of the overall Medium and Low Voltage Installation.

TECHNICAL SPECIFICATION

GB STANDBY POWER SYSTEMS

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GB.1 SCOPE: STANDBY POWER SYSTEMS

GB.1.1 This specification comprises all aspects regarding the repair, maintenance and servicing of standby power systems. The standby power sources consist of:

- (a) Beitbridge Port of Entry
 - 1 x 250 kVA diesel generator at Substation No1
 - 1 x 150 kVA diesel generator at Substation No2
 - 1 x 60 kVA Containerised diesel generator at WWTP
 - 1 x 60 kVA Mobile diesel generator
 - 1 x 20 kVA UPS unit
 - 4 x 10 kVA UPS unit
 - 3 x 5 kVA UPS unit

GB.1.2 This specification shall form an integral part of the repair and maintenance contract document and shall be read in conjunction with other Additional Specifications included with this Document.

GB.2 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

GB.2.1 The latest edition, including all amendments up to date of tender of the following specifications, publication and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof.

GB.2.2 SANS Specifications

SANS 10400: NATIONAL BUILDING REGULATIONS
SANS 10142: WIRING CODE

GB.2.3 Department of Public Works Specification PW 774

GB.2.4 Occupational Health and Safety Act of 1993

All regulations and statutory requirements as laid down in the latest edition of the Occupational Health and Safety Act of 1993: Construction Regulations, 2003 as promulgated in Government Gazette No 2507 and Regulation Gazette No 7721 of 18 July

2003 shall be adhered to.

GB.2.5 Manufacturer's specifications and maintenance instructions

GB.2.6 Additional requirements

Equipment and material supplied and installed shall be new and unused. The Contractor shall ensure that all safety regulations and measures are applied and enforced during repair and maintenance work on cabling, wiring, fuel tanks, batteries and diesel engines.

GB.3 OPERATING AND MAINTENANCE MANUALS

GB.3.2 Over and above what is specified in the Additional Specification – SB Operating and Maintenance manuals, the Operating and Maintenance Manual to be compiled shall be structured and shall at least include the following:

GB.3.2.1 Description of installation

- a) Complete system description of each standby power source. This shall be done for each installation individually. The system description shall contain detailed information regarding the supply configuration (cabling, distribution boards), the switching arrangement (change-over and override facilities) and the refuelling procedure as well as the earthing, fire and lightning protection arrangement.
- b) Service records

GB.3.2.2 Commissioning Data

- a) Complete commissioning, test and inspection data of standby power system. This shall be done for each installation individually. The commissioning data will comprise voltage and output current measurements, running hour meter readings, battery voltage during starting and engine compression tests.

GB.3.2.3 Operating Data

- a) Safety precautions to be implemented.
- b) Operation of systems; automatic, manual and bypass switching.
- c) Emergency starting and forced change-over procedure.

GB.3.2.4 Maintenance instructions

- a) Recommended service intervals with service descriptions.
- b) Projected service life of:
 - Diesel engine to next overhaul
 - Diesel engine starter batteries
 - Electronics on UPS units
 - Battery pack
- c) Trouble shooting diagrams.
- d) Schedule of consumable spares.
- e) Schedule of batteries comprising the battery bank.

GB.4 TEST AND INSPECTIONS PRIOR TO PRACTICAL COMPLETION OF REPAIR WORK

GB.4.1 It is the responsibility of the Contractor to provide all labour, accessories and properly calibrated and certified measuring instruments necessary to record the following parameters:

- a) output phase voltages
- b) output current per phase
- c) insulation testing at 500V
- d) system earthing resistance testing by means of Wheatstone bridge instrument
- e) load testing, utilising dummy loads

The Contractor is responsible for the arrangement of such tests. He shall give at least 72 hours' notice to the Engineer prior to the test date.

GB.5 LOGGING AND RECORDING PROCEDURES

GB.5.1 The Contractor shall as part of this Contract institute a Recording system as part of his Maintenance Control Plan as defined in the Additional Specification SA – General Maintenance. This shall consist of a Record book which shall be utilised to log and record all faults, system checks, services, overhauls, breakdowns, maintenance visits, inspections, etc.

GB.5.2 The logbook shall be stored in a safe place inside each generator room and shall only be utilised by the Contractor and Engineer. A copy of the monthly entries and recordings into this logbook shall be submitted by the Contractor together with his monthly report to the Engineer.

This logbook shall be structured to at least include the following:

- Monthly inspection and maintenance actions.
- Scheduled services.
- Breakdown / call out reports.
- Major overhaul or battery replacements.

GB.6 MAINTENANCE TOOLS AND SPARES

GB.6.1 On commencement of the Repair and Maintenance Contract, the Contractor shall supply and deliver certain tools and spares to the user client. These tools and spares will be the property of the Department of Public Works. Any deficiencies or short fall or damaged Tools and Spares during the contract shall be replaced with new equipment / material.

GB.6.2 The Tools and Spares shall be kept safe in a lockable store room on site. The Contractor shall provide his own lock for the designated store room. The inventory of the Tools and Spares shall be verified on a monthly basis. Any short fall shall be replaced by the Contractor as part of his responsibility under this contract.

GB.6.3 The Tools and Spares shall at least include the following:

- Distribution Board key (3 off)
- Distribution Board face plate square key (3 off)
- 20l HD diesel oil as per engine manufacturer's specification
- Oil funnel
- 25l distilled water

Battery hydrometer
12V diesel jockey pump
5m 20mm dia. diesel hose
10mm² battery jumper cables: 1 pair
First Aid Kit
Industrial type wall mounted (aluminium) mounted paper towel dispenser with paper cartridge per generator room similar or equal to "Kimberley Clark MP Wall Stand".

GB.7 **QUALITY ASSURANCE SYSTEM**

GB.7.1 Following formal approval of his Quality Assurance system by the Engineer to the Contractor shall implement the approved Quality Assurance system.

GB.7.2 Records of this Quality Assurance system shall be kept throughout the duration of the contract and shall be submitted to the Engineer as required by the Department.

GB.8 **RE-COMMISSIONING OF INSTALLATION**

On practical completion of the repair work, battery replacement and services, the installations shall be put into operation.

GB.9 **REPAIR WORK TO STANDBY POWER INSTALLATIONS**

GB.9.1 The various systems shall be repaired during the first phase of the repair and maintenance contract.

GB.9.2 The scope of the repair work shall include, but shall not be limited to the activities listed below.

GB.9.3 The Contractor shall record the repair actions in tabular format before the Contractor's responsibility for maintenance commences.

GB.9.4 Repair work shall be executed within the approved period for repairs.

GB.9.5 New equipment and material (e.g. batteries, fuel pumps, starter motor, etc.) Shall be supplied with a written guarantee confirming a defects liability period of 12 months from date of practical completion. These guarantees shall be furnished in favour of the Department of Public Works.

GB.10 **STANDBY GENERATORS: TECHNICAL DETAILS**

GB.10.1 **Installation description**

Item No.	Locality	Engine Description	Alternator Description	Output kVA	Auto/ Manual Switching	Operational Yes/No	Critical load	Last service
1	Substation No1	Volvo		250	Auto	New Unit to be installed under this contract	Main Customs Building, SAPS HRM Building; SAPS	Jan 2022

							Building, Ablution Facilities.	
2	Substation No2	Perkins		150	Auto	Yes	SARS offices, Customs Export and Import ramps	Jan 2022
3	Waste Water Treatment Plant	Unknown		60	Auto	Yes	Waste Water Treatment Plant, Plant Building and area lights	Jan 2022
4	Mobile Unit	Unknown		60	Auto	Yes	Unit Will be utilised for emergencies at the water pump scheme or water works	Jan 2022

GB.10.2 Scope of repair work: generators

GB.10.2.1 Clean plant room, clean and re-lamp luminaires. Seal all sleeves with chicken wire and builders foam. Put rodent poison inside cable trenches (2 x 500g).
Paint floor with epoxy paint.

Service diesel engine and steam clean engine, alternator as well as day tank.

Inspect all rubber hoses and wiring, replace if required.
Service existing battery.

Do cold starting volt drop test on prime mover starter battery; replace starter battery if required.

Clean slip rings and inspect brushgear. Open alternator terminal box, clean and tighten terminations. Check and record earthing value as measured with resistance measuring instrument.

Service alarm panel and clean internally and externally. Simulate and verify all alarm and shut down conditions. Replace all inoperative lamps, sirens and meters.
Check and complete all labelling and notices.

Repair lagging on exhaust system and reseal room exit port.

Reinstate fuel shut off system with fusible link.

Fit new padlocks on plant room.

Supply and install a fuel/water separator with automatic water dump feature in the fuel line from the tank to the generator. The separator shall be manufactured from robust corrosion resistant material and shall be similar to Duvalco MK3 series.

Supply and install a fuel modular filtration with automatic water dump feature at the bulk fuel tank. The fuel modular filtration shall be manufactured from robust corrosion resistant material and shall be similar or equal to Duvalco FSM series.

A drip tray approximately 100mm deep shall be mounted below the fuel tank and must be large enough to collect any fuel that drips from the tank. The drip tray shall be manufactured from black mild steel. The thickness of the drip tray sheet steel shall not be less than 2mm.

GB.10.2.2 Do witnessed dummy load test.

GB.10.2.3 Service change-over switchgear. Disassemble contactors and clean. Test operation following service.

GB.10.3 Generator repair work: measurement and payment

Item

Unit

GB.10.3.1 Repair plant room

Lump sum

The unit of measurement shall be a lump sum

The lump sum tendered shall include full compensation for the repair and upgrade of the plant room. Walls and ceilings shall be washed with sugar soap. Floors shall be washed (steam cleaned) and painted with grey 2-part Industrial self-levelling epoxy paint.

Cable trenches shall be cleaned and finally vacuumed. All cable sleeves shall be sealed with builders foam and chicken wire.

The repair work shall include luminaires, doors, and locks including the fitting of new padlocks.

Item

Unit

GB.10.3.2 Service Generators

No

The unit of measurement shall be the number of services performed on alternators up to 250kW range.

The tendered rate shall include full compensation for the complete mechanical / electrical service of the generator installation according to the manufacturer's instructions, replacement of wiring and hoses, opening and cleaning of alternator and alarm panel as well as the steam cleaning of the assembly as described in GB 10.02.

Item

Unit

GB.10.3.3 Service Diesel engines

No

The unit of measurement shall be the number of mechanical services performed on diesel engines up to 250kW range.

The tendered rate shall include full compensation for the execution of a full engine service as per the manufacturer's recommendations including air, fuel and oil filters, oil, replacement of wiring, V-belts and hoses as needed and other consumable items as described in **Clause GB 10.02** and the steam cleaning of the assembly.

The tendered rate shall further include for the supply and installation of a fuel shut off system with fusible link including all consumables such as pipes, cables, fittings and taps.

	<u>Item</u>	<u>Unit</u>
GB.10.3.4	<u>Replace starter battery</u>	No

The unit of measurement shall be the number of diesel starter batteries replaced.

The tendered rate shall include full compensation for the removal of the existing battery, the installation and reconnection of a new "Deltec Heavy-Duty Freedom"-type battery and final test of start-up volt drop.

	<u>Item</u>	<u>Unit</u>
GB.10.3.5	<u>Dummy load test</u>	No

The unit of measurement shall be the number of on-site dummy load tests performed.

The tendered rate shall include full compensation for the opening of the alternator terminal box, connection of dummy load, 30 minute full load test, recording of test results and disconnection of load and reconnection of site load.

	<u>Item</u>	<u>Unit</u>
GB.10.3.6	<u>Change-over switchgear service</u>	No

The unit of measurement shall be the number of assemblies serviced.

The tendered rate shall include full compensation for the disassembly of the change-over contractor pair, cleaning and reinstallation as well as the testing following completion of the test.

The tendered rate shall further include for servicing of the alarm and control gear including internal and external cleaning thereof. It shall further cover for replacement of all inoperative lamps, sirens and meters. Labelling and notices shall be checked and completed.

	<u>Item</u>	<u>Unit</u>
GB.10.3.7	<u>Supply and install padlocks</u>	No

The unit of measurement shall be the number of 75mm padlocks installed.

The tendered rate shall include full compensation for the ordering, supply, engraving and installation of the plant room padlocks.

	<u>Item</u>	<u>Unit</u>
GB.10.3.8	<u>Supply of diesel fuel</u>	litre

The unit of measurement shall be the quantity of diesel fuel supplied and transferred into day tanks upon instruction from the Engineer.

The tendered rate shall include full compensation for the supply, transport and transfer of diesel fuel.

<u>Item</u>	<u>Unit</u>
GB.10.3.9 <u>Supply of tools and spares</u>	No
<p>The unit of measurement shall be a lump sum.</p> <p>The tendered rate shall include full compensation for the supply and delivery of the Tools and Spares specified.</p>	
<u>Item</u>	<u>Unit</u>
GB.10.3.10 <u>Repair alarm sounder</u>	No
<p>The unit of measurement shall be the number of alarm / flasher units installed.</p> <p>The tendered amount shall include full compensation for the repair of the alarm and circuit and the supply and installation of the specified external alarm/flasher unit, in full working order including all cabling to and from the control panel.</p>	
<u>Item</u>	<u>Unit</u>
GB.10.3.11 <u>Supply and install fuel water separator</u>	No
<p>The unit of measurement shall be the number of Duvalco fuel/water separator units with automatic water dump installed.</p> <p>The tendered rate shall include full compensation for the ordering, supply, installation and commissioning of the fuel/water separator unit similar or equal to Duvalco MK3 series and Duvalco Modular Filtration System.</p>	
<u>Item</u>	<u>Unit</u>
GB.10.3.12 <u>Supply and install fuel drip tray</u>	No
<p>The unit of measurement shall be the number of fuel drip trays supplied and installed.</p> <p>The tendered rate shall include full compensation for the manufacturing, supply and installation of a fuel drip tray as described in Clause GB 10.03.</p>	
<u>Item</u>	<u>Unit</u>
GB.10.3.13 <u>Supply and install water jacket heater</u>	No
<p>The unit of measurement shall be the number of water jacket heaters supplied and installed.</p> <p>The tendered rate shall include full compensation for the supply and installation of a water heater complete with thermostat, element, connection of all water hoses including all couplings and taps, cabling to and from the control panel and testing and commissioning of the unit.</p>	
<u>Item</u>	<u>Unit</u>
GB.10.3.14 <u>Repair Exhaust</u>	No
<p>The unit of measurement shall be a lump sum for the removal of the existing exhaust and the supply and installation of the new exhaust similar to the existing.</p>	

The tendered rate shall include full compensation for supply and installation of the new exhaust including lagging, flexible connections and sealing of the room exit port.

Item Unit

GB.10.3.15 Recondition diesel engine **No**

The unit of measurement shall be the number of diesel engines re-conditioned according to the manufacturer's specifications.

The tendered rate shall include full compensation for the disconnection, removal and complete overhaul of the diesel engine at an approved mechanical engineering works.

The tendered rate shall further include for the replacement of all the internal components, seals, pipes, fittings, etc of the diesel engine.

GB.10.3.16 Replace Diesel engines

The unit of measurement shall be the number of diesel engines replaced.

The tendered rate shall include full compensation for the Supply, install and testing of a **fully operational diesel engine** rate should further include extended exhaust and ducting.

The tendered rate shall further include for the supply and installation of a fuel shut off system with fusible link including all consumables such as pipes, cables, fittings and taps.

GB.10.3.17 Decommission Diesel engines

The unit of measurement shall be the number of diesel engines decommissioned.

The tendered rate shall include full compensation for the decommissioning of a **diesel engine** rate should further include transportation to site storage facility

GB.11 UPS UNITS: TECHNICAL DETAILS

GB.11.1 Installation description

The UPS units listed below are installed at the Beitbridge Port of Entry:

Item No	Locality	Manufacturer	Model	Output		Operational Yes / No	Critical load supplied	Last service
				Single Phase	kVA			
1	Immigration Offices	Tower	1100	220	20 kVA	No	Computers	Unknown
2	SAPS Admin Offices	Tower	1100	220	10 kVA	Yes	Computers	Unknown
3	Main Building	Square One	QP5000	220	10 kVA	No	Computers	Unknown
4	Light Vehicle Inspection / Entry	Meissner	1100	220	5 kVA	No	Computers	Unknown

5	Light Vehicle Inspection / Exit	Tower	1100	220	5 kVA	Yes	Computers	Unknown
6	SARS	Tower	1100	220	10 kVA	Yes	Computers	Unknown

GB.11.2 Scope of repair work: UPS unit

GB.11.2.1 Remove cabinet cover / doors. Clean unit internally and externally. Check operation of ventilating fan and replace air intake filter, if fitted. Check and record earthing value with prescribed resistance measuring instrument.

GB.11.2.2 Record input voltage, frequency and current in Record book. Record battery voltage.

GB.11.2.3 Clean battery cabinet and tighten terminals. Do witnessed dummy load test and submit report on condition of batteries.

GB.11.2.4 Replace UPS batteries upon instruction from Engineer.

GB.11.3 UPS repair work: measurement and payment

Item

Unit

GB.11.3.1 Service UPS electronic and battery cabinet

No

The unit of measurement shall be the number of UPS systems open and serviced in accordance with manufacturer's instructions and as set out in Clause GB.11.2.

The tendered rate shall include full compensation for the opening, cleaning, visual inspection of cable terminations, ventilating fans, battery links and the recording of earthing resistance.

The tendered rate shall further include full compensation for the testing of all control cards and replacement of any defective control cards.

Item

Unit

GB.11.3.2 Dummy load test

No

The unit of measurement shall be the number of on-site UPS dummy load tests performed.

The tendered rate shall include full compensation for the connection of a UPS dummy load, 30 minute full load test recording of test results, including battery voltage and reconnection of site cabling as well as a written report on battery condition.

Item

Unit

GB.11.3.3 Replace UPS batteries

No

The unit of measurement shall be the number of batteries replaced.

The tendered rate shall include full compensation for the disconnection and safe disposal of old batteries and supply, installation and connection of new sealed "Willard Vantage" UPS batteries.

<u>Item</u>	<u>Unit</u>
GB.11.3.4 <u>Replace UPS Unit</u>	No

The unit of measurement shall be the number of UPS Units supplied and installed.

The tender rate shall include full compensation for the delivery, installation including all cabling and commissioning of the UPS unit.

<u>Item</u>	<u>Unit</u>
GB.11.3.5 <u>Replace UPS Inverter</u>	No

The unit of measurement shall be the number of defective UPS inverters diagnosed and replaced.

The tender rate shall include full compensation for the removal of the defective boards as well as the supply, installation and testing of the new Inverter board.

<u>Item</u>	<u>Unit</u>
GB.11.3.6 <u>Replace UPS Fuses</u>	No

The unit of measurement shall be the number of defective fuses replaced.

The tender rate shall include full compensation for the removal of the defective fuses as well as the supply, installation and testing of the new fuse.

GB.12 MAINTENANCE OF THE INSTALLATION

GB.12.1 Monthly maintenance responsibilities for each installation including all units and components as specified, shall commence with access to the site. A difference shall be made in payment for the maintenance prior to and after practical completion of repair work.

Maintenance responsibilities of the completed installation shall commence upon the issue of a certificate of practical completion for repair work, and shall continue for the remainder of the 36-month contract period.

GB.12.2 The following maintenance actions will be required under the contract:

- a) routine preventative maintenance
- b) corrective maintenance
- c) breakdown maintenance

These actions are defined in the Additional Specification SA – General Maintenance.

GB.12.3 The maintenance schedules and frequency of services and maintenance activities shall be developed under the maintenance control plan which will be instituted by the Contractor. The Contractor's responsibility in this regard is specified in the Additional Specification SA – General Maintenance.

GB.12.4 Generator maintenance: scope of work

GB.12.4.1 Monthly inspection

- (a) The following activities shall be executed during the monthly generator inspections:
- check oil level and top up as required.
 - check oil viscosity for dilution by water or fuel.
 - check starter battery terminals and apply contact grease.
 - check battery cables for damage and secure terminations.
 - check battery electrolyte.
 - check battery voltage and record.
 - check battery voltage drop during engine cranking and record.
 - check battery charger operation after cranking test.
 - check starter motor for abnormal noise.
 - check diesel engine while running for noise, vibration or loose components.
 - check all flexible hoses for leaks, corrosion and ageing.
 - check all engine V-belts.
 - monitor engine / alternator coupling for noise.
- (b) Verify that alarm functions are operational by simulation:
- Low oil pressure.
 - High engine temperature.
 - Low engine coolant level.
- (c) Test that following alarms trigger correctly by creating the alarm condition:
- Unit not in auto: turn selector switch to manual or test
 - Battery charger failure : switch off AC supply to battery charger
 - Auxiliary supply failure : switch off auxiliary power supply
- (d) Alternator shall be checked for accumulation of dust on the regulator and for any loose components.
- (e) Test run shall be undertaken, if possible on load, and volt, ampere and frequency readings recorded.
- (f) Alternator shall be cleaned and switched back into 'auto' mode.
- (g) Complete Standby Generator monthly log sheets
- (h) Record running hours, diesel consumption, etc.

GB.12.4.2 Annual inspection

The following activities shall be executed in addition to the monthly maintenance work after every twelve months.

- (a) Drain an oil sample and submit for analysis to establish need for an oil change. Fix test report in Record book.
- (b) Record output parameters while on load.
- (c) Record running hours.
- (d) Replace oil and fuel filters every 150 hours.

- (e) Flush engine and replace coolant.

GB.12.4.3 Every two years: inspection and service

In addition to the annual service, the cooling system shall be drained, flushed and refilled with water and prescribed water conditioner.

GB.12.5 Generator maintenance: measurement and payment

Refer to Clause SA 06 of the ADDITIONAL SPECIFICATION: SA GENERAL MAINTENANCE.

GB.12.6 UPS maintenance: scope of work

GB.12.6.1 Monthly inspection

- (a) The following activities shall be executed during the monthly inspections

- Record mains input voltage.
- Record unregulated DC voltage.
- Record battery charger voltage.
- Visually check appearance of DC capacitors.
- Visually inspect soft-start relays and resistors.
- Record power supply output voltage on 5V and on 12V tops.
- Measure "free running" frequency.
- Check phase-lock loop.
- Measure inverter output voltage and verify wave shape.
- Check fan operation
- Check and record phase error voltage.
- Mains failure test.

- (b) The following must be measured and recorded:

- Output voltage.
- Load current.
- Verify correct fuse ratings.

- (c) Clean cabinets externally and internally.

GB.12.7 UPS maintenance: measurement and payment

Refer to Clause SA 06 of the ADDITIONAL SPECIFICATION: SA GENERAL MAINTENANCE.

TECHNICAL SPECIFICATION

GC LOW VOLTAGE RETICULATION

CONTENTS

- GC.1 SCOPE: LOW VOLTAGE RETICULATION
- GC.2 STANDARD SPECIFICATIONS, REGULATIONS AND CODES
- GC.3 AS-BUILT INFORMATION AND OPERATING AND MAINTENANCE MANUALS
- GC.4 TEST AND INSPECTION FOLLOWING COMPLETION OF REPAIR WORK
- GC.5 LOGGING AND RECORDING PROCEDURES
- GC.6 MAINTENANCE TOOLS AND SPARES
- GC.7 QUALITY ASSURANCE SYSTEM
- GC.8 RE-COMMISSIONING OF INSTALLATION
- GC.9 LOW VOLTAGE RETICULATION
- GC.10 LOW VOLTAGE RETICULATION MAINTENANCE
- GC.11 LOW VOLTAGE DISTRIBUTION BOARDS: TECHNICAL DETAILS
- GC.12 DISTRIBUTION AND METERING KIOSKS: TECHNICAL DETAILS
- GC.13 LOW VOLTAGE OVERHEAD DISTRIBUTION SYSTEM: TECHNICAL DETAILS

GC.1 SCOPE: LOW VOLTAGE RETICULATION

GC.1.1 This specification comprises all aspects regarding the maintenance of low Voltage systems. Low voltage comprises:

- (i) Low voltage distribution boards
- (ii) Low voltage kiosks
- (iii) Low voltage overhead and underground distribution systems

GC.1.2 This specification shall form an integral part of the maintenance and servicing contract document and shall be read in conjunction with Part C, the Additional Specification included with this document.

GC.2 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

GC.2.1 The latest edition, including all amendments up to date of tender of the following specifications, publication and codes of practice shall be read in conjunction with this specification and shall deemed to form part thereof.

GC.2.2 SANS Specifications

- SANS 10142-1
- SANS 10142-2
- SANS 1411
- SANS 1091
- SANS 1195
- SANS 7846

GC.2.3 Department of Public Works Specification PW 774

GC.2.4 Occupational Health and Safety Act of 1993

All regulations and statutory requirements as laid down in the latest edition of the Occupational Health and Safety Act of 1993: Construction Regulations, 2003 as promulgated in Government Gazette No 2507 and Regulation Gazette No 7721 of 18 July 2003 shall be adhered to.

GC.2.5 Manufacturer's specifications and installation instructions

GC.2.6 Additional requirements

Equipment and material installed shall be new and unused. All equipment shall bear the SABS stamp. The Contractor shall ensure that all safety regulations and measures are applied and enforced during repair and maintenance work on low voltage distribution boards and kiosks.

GC.3 AS-BUILT INFORMATION AND OPERATING AND MAINTENANCE MANUALS

GC.3.1 The Contractor shall, be responsible for the compilation of a complete set of as-built drawings, inventory list and Operating – and – Maintenance manuals. The Contractor shall be responsible for the verification of the correctness of all such information.

This shall be done in accordance with the Additional Specification SB - Operating and Maintenance manuals.

The Contractor shall allow for the required tools and equipment to establish the correct As-built manuals.

All information shall be recorded and reproduced in electronic format as well as supplying the Engineer with three sets of hard copies.

GC.3.2 Over and above what is specified in the Additional Specification – SB Operating and Maintenance manuals, the Operating and Maintenance Manual to be compiled shall at least include the following:

GC.3.2.1 System Description

Complete system description of the low voltage system. This shall be done for each low voltage installation individually. The system description shall contain detailed information regarding the system configuration (system input, cabling system output), the installed components (circuit breaker ratings, meter configuration) as well as the earthing and lightning protection.

Complete details of LV distribution boards, panels and kiosks and overhead reticulation system.

GC.3.2.2 Commissioning Data

Complete commissioning, test and inspection data of the low voltage system.

This shall be done for each low voltage system individually. The commission data will

comprise of usual inspection sheets start up and running current measurements. Full data on equipment fitted with installation dates.

GC.3.2.3 Operating Data

Safety precautions to be implemented.

GC.3.2.4 Maintenance Instructions

- (a) Procedure to verify operation of circuit breakers.
- (b) Procedure to replace low voltage kiosk.
- (c) Trouble shooting diagram.
- (d) Equipment details, including manufacturer brochures / pamphlets, order number, list of components and equipment specifications.
- (e) Schedule of serviceable components per low voltage system.
- (f) Procedure to replace wooden poles for overhead reticulation.
- (g) Procedure to replace broken isolators for overhead reticulation.
- (h) Procedure to tension overhead conductors by adjustment of anchors.
- (i) Hoisting equipment specification, if applicable.

GC.4 TEST AND INSPECTION FOLLOWING COMPLETION OF REPAIR WORK

GC.4.1 It is the responsibility of the Contractor to provide all labour, accessories and properly calibrated and certified measuring instruments necessary to record the following parameters:

Phase voltages and current
Earthing resistance testing

The Contractor is responsible for the arrangement of such tests. He shall give at least 72 hour notice to the Engineer prior to the test date.

GC.5 LOGGING AND RECORDING PROCEDURES

GC.5.1 The Contractor shall as part of this Contract Institute a Recording system as part of his Maintenance Control Plan as defined in the Additional Specification SA – General Maintenance. This shall consist of a Record book which shall be utilized to log and record all faults, system checks, services, overhauls, breakdowns, maintenance visits, inspections, etc.

GC.5.2 The logbook shall be stored in a safe place inside the main substation and shall only be utilized by the Contractor and the Engineer. A copy of the monthly entries and recordings

into this logbook shall be submitted by the Contractor together with his monthly report to the Engineer.

This logbook shall be structured to at least include the following:

- a) Monthly low voltage equipment inspection and maintenance actions.
- b) Bi-annual inspection and testing of low voltage systems.
- c) Annual earthing and insulation test report.
- d) Breakdown / call out reports.

GC.6 MAINTENANCE TOOLS AND SPARES

GC.6.1 On commencement of the Maintenance Contract, the Contractor shall compile an inventory of the existing Tools and Spares in the presence of the User Client. Any deficiencies or shortfall or damaged Tools and Spares shall be replaced with new equipment / material as part of the contract.

GC.6.2 The Tools and Spares shall be kept in a lockable store room on site. The Contractor shall provide his own lock for the designated store room. The inventory of the Tools and Spares shall be verified on a monthly basis. Any shortfall shall be replaced by the Contractor as part of his responsibilities under this contract.

- a) The Tools and Spares shall at least include the following:
- b) DB Key
- c) DB face plate square key

GC.7 QUALITY ASSURANCE SYSTEM

- a) Following formal approval of his Quality Assurance system by the Engineer, the Contractor shall implement the approved QA system.
- b) Records of this QA system shall be kept throughout the duration of the contract and shall be submitted to the Engineer as required by the Department.

GC.8 RE-COMMISSIONING OF INSTALLATION

On completion of the servicing work, the low voltage reticulation shall be put into operation.

GC.9 LOW VOLTAGE RETICULATION

- a) The distribution boards, kiosks and overhead reticulation system shall be serviced as measured in the bills of quantities, during the first period of the maintenance contract.

- b) The scope of the repair work shall include, but shall not be limited to the activities listed below.
- c) The Contractor shall record the repair actions in tabular format before the maintenance phase commences.
- d) Repair work shall be executed within the approved period for repairs. This period shall be agreed at the start of the contract period.
- e) New equipment and material shall be supplied with a written guarantee confirming a defects liability period of 12 months from date of hand-over. These guarantees shall be furnished in favour of the User Client.
- f) The maintenance phase of this contract shall commence once the repair work on the installation has been commissioned and handed over to the satisfaction of the Engineer.

GC.10 LOW VOLTAGE RETICULATION MAINTENANCE

GC.10.01 The various low voltage systems shall be maintained for the duration for the 36 month contract period.

GC.11 LOW VOLTAGE DISTRIBUTION BOARDS: TECHNICAL DETAILS

GC.11.01 Installation description

This section describes the electrical distribution network that will be maintained in terms of the contract.

Generator Rooms

The low voltage supply is distributed from the low voltage rooms from the respective Sub Stations

This rooms contains floor standing low voltage panels that are installed over cable trenches. The enclosures contain low voltage circuit breakers and instrumentation equipment.

GC.11.02 Scope of Service work

GC.11.2.01 General Service work

- a) Service low voltage distribution boards: clean, secure circuit breakers, secure.
- b) Terminations, label circuit breakers and cables.
- c) Move circuit breakers: loosen circuit breakers move and secure in new position.
- d) Install circuit breaker.

- e) Re-paint front cover of emergency section.
- f) Disconnect and remove redundant switchgear.
- g) Replace circuit breakers.
- h) Disconnect and remove redundant area and security lighting control panel.
- i) Disconnect and remove redundant cables.
- j) Replacement of undersized jumper cables.
- k) Installation of trench covers.

GC.11.3 Repair work: measurements and payment

<u>Item</u>	<u>Unit</u>
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GC.11.03 (a) Service low voltage distribution boards	No
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The unit of measurement shall be the number of low voltage boards serviced.

The tendered rate shall include full compensation for the opening and cleaning of low voltage board, vermin protection, secure MCBs and terminations, fitting of engraved labels and blank covers.

<u>Item</u>	<u>Unit</u>
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GC.11.03 (b) Test ammeter and CT functionality	No
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The unit of measurement shall be the number of ammeters and CT's tested.

The tendered rate shall include full compensation for the removal, testing and replacement of meters.

<u>Item</u>	<u>Unit</u>
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GC.11.03(c) Re-paint cover on panel	No
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The unit of measurement shall be the number of front covers of panels re-painted.

The tendered rate shall include full compensation for the removal, de-rusting and degreasing of panel and re-painting, fitting of engraved labels and re-installation of the cover with dimensions as specified in the Bill of Quantities.

<u>Item</u>	<u>Unit</u>
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GC.11.5.03 (d) Removal of redundant switchgear	Lump sum
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Low voltage distribution board

The unit of measurement shall be a lump sum for removal of the equipment.

The lump sum tendered shall include full compensation for disconnection and removal of redundant equipment and jumpers.

<u>Item</u>	<u>Unit</u>
GC.11.03 (e) Remove redundant cable	No

The unit of measurement shall be the number of cables removed.

The tendered rate shall include full compensation for the complete removal of the cable from site.

<u>Item</u>	<u>Unit</u>
GC.11.03 (f) Supply and install power outlets	No

The unit of measurement shall be the number of power outlets installed.

The tendered rate shall include full compensation for the removal, supply and installation of single phase power outlets.

<u>Item</u>	<u>Unit</u>
GC.11.03 (g) Supply and install light switch	No

The unit of measurement shall be the number of light switches installed.

The tendered rate shall include full compensation for the removal, supply and installation of a 1-way 1-lever light switch.

<u>Item</u>	<u>Unit</u>
GC.11.03 (h) Label cables	No

The unit of measure shall be the number of labels installed

The tendered rate shall include full compensation for the installation of cable markers on both ends of all cables with a minimum font height of 18 mm. The marking system used shall be the Graftoplast type or similar approved equal.

<u>Item</u>	<u>Unit</u>
GC.11.03 (i) Install trench covers	No

The unit of measure shall be the number of covers installed.

The tendered rate shall include full compensation for the supply and installation of cable trench covers in sizes as specified.

<u>Item</u>	<u>Unit</u>
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GC.11.03 (j) Remove, Supply and install circuit breakers

No

The unit of measure shall be the number of circuit breakers installed.

The tendered rate shall include full compensation for the Removal ,supply, installation and connection of the circuit breakers as specified.

GC.11.04 Scope of Maintenance Work

GC.11.04.01 Monthly Inspection

- (a) Verify operation of volt and ammeters.
- (b) Check that access covers are secure.
- (c) Visually check distribution boards.
- (d) Check all connections.
- (e) Check operation of switching timers.

GC.11.04.02 Annual Inspection

- (a) Service all low voltage boards.
- (b) Measure phase voltages and line currents in low voltage distribution boards.
- (c) Record values in Record book.

GC.11.05 Maintenance work: measurement and payment

Refer to clause SA 06 of the ADDITIONAL SPECIFICATION: SA GENERAL MAINTENANCE.

GC.12 DISTRIBUTION AND METERING KIOSKS: TECHNICAL DETAILS

GC.12.01 Installation description

This section describes the electrical distribution and metering kiosks that will be maintained in terms of this contract.

This part of the distribution network consists of freestanding low voltage outdoor kiosks. The kiosks contain circuit breakers, switching and instrumentation equipment.

GC.12.02 Scope of work

- (a) Open distribution kiosk, check locks, door hinges, clean inside, provide rodent protection, secure circuit breaker and terminations, labels all kiosks, label circuit breakers, label cables and provide warning notices.

- (b) Measure earth resistance.
- (c) Touch up kiosks: Remove all rust with an anti-corrosion agent and repaint kiosk.
- (d) Replace handles and padlocks on distribution kiosks.
- (e) Remove and re-mount contactors.
- (f) Replace door hinges and latches.
- (g) Replace panel catches.
- (h) Repair burnt connections.

GC.12.03 Repair work: measurement and payments

<u>Item</u>	<u>Unit</u>
GC.12.03 (a) Service distribution kiosk	No

The unit of measurement shall be the number of distribution kiosks serviced.

The tendered rate shall include full compensation for the servicing of the distribution kiosk, vermin protection, cleaning of circuit breakers, general cleaning of the kiosk, earth testing, securing of MCB and terminations. The contractor shall submit a report on the general condition of kiosk (damage, rust etc.)

<u>Item</u>	<u>Unit</u>
GC.12.03 (b) Remove rust and paint kiosks	No

The unit of measurement shall be the total number of kiosks painted.

The tendered rate shall include full compensation for the removal of rust with anti-corrosion agent and the repainting of the whole kiosk.

<u>Item</u>	<u>Unit</u>
GC.12.03 (c) Label kiosks	No

The unit of measure shall be the total number of kiosks labelled.

The tendered rate shall include full compensation for the labelling of kiosks circuit breakers, cable and warning notification to be installed.

<u>Item</u>	<u>Unit</u>
GC.12.03 (d) Supply and install padlocks	No

The unit of measurement shall be the number of padlocks installed.

The tendered rate shall include full compensation for the ordering, supply, engraving and installation of the padlocks, locking devices and seals.

Lock shall be "keyed alike"

<u>Item</u>	<u>Unit</u>
GC.12.03 (e) Replace distribution meter and stubby kiosks	No

The unit of measure shall be the number of distribution kiosks replaced.

The tendered rates shall include full compensation for the removal, the ordering, supply and installation of the new meter boxes and stubbies.

<u>Item</u>	<u>Unit</u>
GC.12.03 (f) Replace door hinges on meter and distribution kiosks	No

The tendered rate shall include full compensation for the removal of damaged hinges, the supply, delivery and installation of new hinges.

<u>Item</u>	<u>Unit</u>
GC.12.30 (g) Supply and install handles	No

The unit of measure shall be the total number of handles installed.

The tendered rate shall include full compensation for the removal of the old handle, ordering, supply and installation of a lockable turn catch handle.

<u>Item</u>	<u>Unit</u>
GC.12.03 (h) Supply and install low voltage PVC/SWA/PVC	m

Cu cable and bare copper earth wire

The unit of measurement shall be the linear length of PVC/SWA/PVC supplied and installed.

The tendered rate shall include full compensation for the removal of the existing conductors, the supply, handling, installation, pulling in sleeves and termination of the specified type of conductor.

This rate shall further include for the supply of all cable ties, labelling, and other material necessary to ensure that the wiring conforms to the specification.

<u>Item</u>	<u>Unit</u>
GC.12.03 (i) Termination of low voltage PVC/SWA/PVC Cu Cables	No

The unit of measurement shall be the total number of terminations removed and new terminations made.

The tendered rate shall include full compensation for the supply and installation of cable glands and lugs.

<u>Item</u>	<u>Unit</u>
GC.12.03 (j) Jointing of low voltage PVC/SWA/PVC Cu Cables	No

The unit of measurement shall be number of cable terminations.

The tendered rate shall include full compensation for the cost for providing the kits, complete with compound, ferrules and cable lugs, the cost for cutting the cable, handling and fitting kits and the cost of testing the joints and terminations. Position of joints shall be indicated on as-built drawings.

<u>Item</u>	<u>Unit</u>
GC.12.03 (k) Excavations for cable trenches and meter boxes	m3

The unit of measurement shall be the total volume excavated and backfilled in dimensions as specified by engineer.

<u>Item</u>	<u>Unit</u>
GC.12.03 (l) Supply and installation bare copper earth conductor	m

The unit of measure shall be the total length of cable supplied and installed.

The tendered rate shall include the ordering and delivery to site of the cable (Excavations measured somewhere else.)

<u>Item</u>	<u>Unit</u>
GC.12.03 (m) Termination of bare copper earth conductor	No

The unit of measure shall be the total number of terminations removed and new terminations made.

The tendered rate shall include full compensation for the supply and installation of cable glands and lugs.

<u>Item</u>	<u>Unit</u>
GC.12.03 (n) Re-wiring of kiosk	No

The unit of measure shall be the number of kiosks re-wired.

The tendered rate shall include full compensation for removal of the existing wiring, re-wiring, labelling and commissioning of the kiosk.

<u>Item</u>	<u>Unit</u>
GC.12.03 (o) Reposition contactors on kiosk	No

The unit of measure shall be number of contactors repositioned.

The tendered rate shall include full compensation for removal of the existing wiring, removal of contactors, mounting in new positions re-wiring, labelling and commissioning of the kiosk.

<u>Item</u>	<u>Unit</u>
GC.12.03 (p) Supply and install front covers	No

The unit of measure shall be number of covers supplied and installed.

The tendered rate shall include full compensation for measuring, manufacturing, painting and installation of front covers.

<u>Item</u>	<u>Unit</u>
GC.12.03 (q) Supply and install cable sleeves	m

The unit of measurement shall be the linear length in meter of the cable sleeve supplied and installed.

The tendered rate shall include full compensation for the supply, delivery, handling and installing the specified sleeves including the all the required, couplings, steel draw wires and plugs.

GC.12.4 Maintenance Work

GC.12.4.1 Monthly

- (a) Inspect and secure access doors and covers.
- (b) Inspect distribution kiosks.

GC.12.4.2 Annually

- (a) Service all distribution and metering kiosks.
- (b) Measure phase voltages and line currents in distribution and metering kiosks and record in book.

GC.12.5 Maintenance work measurement and payment

Refer to clause SA 06 of the ADDITIONAL SPECIFICATION: SA GENERAL MAINTENANCE.

GC.13 LOW VOLTAGE OVERHEAD DISTRIBUTION SYSTEM: TECHNICAL DETAILS

GC.13.1 Installation description

The section describes the low voltage overhead distribution system that will be repaired and maintained in terms of this contract.

GC.13.2 Scope of repair work

- (a) Visual Inspection of overhead conductors, insulators, securing of terminations and connections, adjustment to stay assemblies to re-tension conductors, labelling of cables and provision of warning notices.
- (b) Measure earth resistance.
- (c) Clearing of all vegetation within.
- (d) Replacement of rusted distribution boards.

GC.13.3 Repair work: measurement and payments

<u>Item</u>	<u>Unit</u>
GC 13.03 (a) Service overhead distribution system	m

The unit of measurement shall be the linear length of three phase overhead distribution system network serviced.

The tendered rate shall include full compensation for visual inspection of conductors and insulators, clearing of vegetation, securing of connections and terminations. The Contractor shall submit a report on the general condition of the overhead reticulation system.

<u>Item</u>	<u>Unit</u>
GC.13.03 (b) Replace damaged Insulators	No

The unit of measurement shall be the total number of insulators replaced.

The tendered rate shall include full compensation for isolation of the overhead reticulation system, temporary suspension of conductors if required, removal of damaged insulators, provision and installation of new insulators and securing of conductors.

<u>Item</u>	<u>Unit</u>
GC.13.3(c) Re-tensioning of overhead conductors	No

The unit of measure shall be the total number of stays adjusted.

The tendered rate shall include full compensation for isolation of overhead conductors, attachment of wire tensioning equipment to stays and adjustment of stay wires.

<u>Item</u>	<u>Unit</u>
GC.13.03 (d) Supply and installation of wooden poles	No

The unit of measurement shall be the number of poles replaced.

The tendered rate shall include full compensation for isolation of overhead conductors, temporary suspension and disconnection of conductors and suspension assemblies, excavation, removal of existing pole, provision of new pole, backfilling and compaction, re-installation of suspension assemblies and connection of conductors and re-tensioning of conductors if required.

<u>Item</u>	<u>Unit</u>
GC.13.03 (e) Straighten skew light pole	No

The unit of measurement shall be the number of skew poles straightened.

The tendered rate shall include full compensation for isolation of overhead conductors, temporary suspension and disconnection of conductors and suspension assemblies, excavation, straightening of the skew pole, backfilling and compaction, re-installation of suspension assemblies and connection of conductors and re-tensioning of conductors if required.

<u>Item</u>	<u>Unit</u>
GC.13.03 (f) Replacement of existing distribution boards	No

The unit of measurement shall be the number of distribution boards replaced.

The tendered rate shall include full compensation for disconnection of existing cabling, removal of old distribution board, supply and installation of a new board as per specification including equipment.

<u>Item</u>	<u>Unit</u>
GC.13.03 (g) Supply and install low voltage circuit breakers	No

The unit of measurement shall be the number of circuit breakers supplied and installed.

The tendered rate shall include full compensation for supply of new circuit breakers with rating as specified, installation of the breaker in the distribution board and connection of the breaker.

<u>Item</u>	<u>Unit</u>
GC.13.03 (h) Supply and installation of Areal bundled conductors'	m

The unit of measurement shall be the linear length of the areal bundled conductors installed.

The tendered rate shall include full compensation for the removal of the existing conductors, the supply, handling, installation, pulling conductors and termination of the specified type of conductor. Connection of conductors and re-tensioning of conductors if required.

<u>Item</u>	<u>Unit</u>
GC.13.03 (i) Termination of Areal bundled conductors'	No

The unit of measurement shall be the total number of terminations removed and new terminations made.

The tendered rate shall include full compensation for the supply and installation of cable glands and lugs.

GC.13.4 Maintenance work

GC.13.4.1 Monthly

- (a) Inspect overhead conductors, insulators and poles.

GC.13.4.2 Annually

- (a) Service overhead distribution system.
(b) Measure phase voltages and line currents and record in book.

TECHNICAL SPECIFICATION

GD SUBSTATION TRANSFORMERS

CONTENTS

- GD.1 SCOPE: SUBSTATION TRANSFORMERS
GD.2 STANDARD SPECIFICATIONS, REGULATIONS AND CODES
GD.3 AS-BUILT INFORMATION AND OPERATING AND MAINTENANCE MANUALS
GD.4 TEST AND INSPECTION FOLLOWING COMPLETION OF SERVICING WORK
GD.5 LOGGING AND RECORDING PROCEDURES
GD.6 MAINTENANCE TOOLS AND SPARES
GD.7 QUALITY ASSURANCE SYSTEM
GD.8 RE-COMMISSIONING OF INSTALLATION
GD.9 SERVICE WORK TO TRANSFORMER INSTALLATIONS
GD.10 INSTALLATION MAINTENANCE
GD.11 LOW VOLTAGE DISTRIBUTION BOARDS: TECHNICAL DETAILS

GD.1 SCOPE: SUBSTATION TRANSFORMERS

This specification comprises all aspects regarding the maintenance and servicing of transformer systems. Transformer compromise:

- (i) Substation transformers
(ii) Pole mounted transformers

This specification shall form an integral part of the maintenance and servicing contract document and shall be read in conjunction with Part C, the Additional Specification included with this document.

GD.2 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

The latest edition, including all amendments up to date of tender of the following specifications, publication and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof.

GD.2.1 SANS Specifications

- SANS 0780

- SANS 10400
- SANS 10142
- SANS 10225
- SANS 01277
- SANS 1088
- SANS 1749
- SANS 1250
- SANS 1279
- SANS 1777
- SANS 1266
- ARP 035

GD.2.3 Department of Public Works Specifications

- PW 774

GD.2.4 Occupational Health and Safety Act of 1993 (OHS-Act)

All regulations and statutory requirements as laid down in the latest edition of the Occupational Health and Safety Act of 1993: Construction Regulations, 2003 as promulgated in Government Gazette No 2507 and Regulation Gazette No 7721 of 18 July 2003 shall be adhered to.

GD.2.4 Manufacturer's specifications and installation instructions

GD.2.6 Additional requirements

Equipment and material installed shall be new and unused. All equipment shall bear the SABS stamp. The Contractor shall ensure that all safety regulations and measures are applied and enforced during servicing and maintenance work on transformers.

GD.3 AS-BUILT INFORMATION AND OPERATING AND MAINTENANCE MANUALS

GD.3.1 No current "as-built" information on the installation is available.

The Contractor shall, be responsible for the compilation of a complete set of as-built drawings, inventory list and Operating – and – Maintenance manuals. The Contractor shall be responsible for the verification of the correctness of all such information.

This shall be done in accordance with the Additional Specification SB - Operating and Maintenance manuals.

The Contractor shall allow for the required tools and equipment to establish the correct As-built manuals.

All information shall be recorded and reproduced in electronic format as well as supplying the Engineer with three sets of hard copies.

Over and above what is specified in the Additional Specification – SB Operating and Maintenance manuals, the Operating and Maintenance Manual to be compiled shall at least include the following:

GD.3.2 System Description

Complete system description of the low voltage system. This shall be done for each low voltage installation individually. The system description shall contain detailed information regarding the system configuration (system input, cabling system output), the installed components (circuit breaker ratings, meter configuration) as well as the earthing and lightning protection.

Complete details of LV distribution boards, panels and kiosks and overhead reticulation system.

GD.3.3 Commissioning Data

Complete commissioning, test and inspection data of the low voltage system.

This shall be done for each low voltage system individually. The commission data will comprise of usual inspection sheets start-up and running current measurements. Full data on equipment fitted with installation dates.

GD.3.4 Operating Data

Safety precautions to be implemented.

GD.3.5 Maintenance Instructions

- (a) Projected frequency of replacement of drying agent.
- (b) Procedure to filter and purify oil.

GD.4 TEST AND INSPECTION FOLLOWING COMPLETION OF SERVICING WORK

It is the responsibility of the Contractor to provide all labour, accessories and properly calibrated and certified measuring instruments necessary to record the following parameters:

- No-load phase voltage
- Earth resistance testing
- Insulation resistance testing

The Contractor is responsible for the arrangement of such tests. He shall give at least 72 hour notice to the Engineer prior to the test date.

GD.5 LOGGING AND RECORDING PROCEDURES

- a) The Contractor shall as part of this Contract Institute a Recording system as part of his Maintenance Control Plan as defined in the Additional Specification SA – General Maintenance. This shall consist of a Record book which shall be utilized to log and record all faults, system checks, services, overhauls, breakdowns, maintenance visits, inspections, etc.

- b) The logbook shall be stored in a safe place inside the main substation and shall only be utilized by the Contractor and the Engineer. A copy of the monthly entries and recordings into this logbook shall be submitted by the Contractor together with his monthly report to the Engineer.

This logbook shall be structured to at least include the following:

- Monthly low voltage equipment inspection and maintenance actions.
- Bi-annual inspection and testing of low voltage systems.
- Annual earthing and insulation test report.
- Breakdown / call out reports.

GD.6 MAINTENANCE TOOLS AND SPARES

- a) On commencement of the Maintenance Contract, the Contractor shall compile an inventory of the existing Tools and Spares in the presence of the User Client. Any deficiencies or shortfall or damaged Tools and Spares shall be replaced with new equipment / material as part of the contract.
- b) The Tools and Spares shall be kept in a lockable store room on site. The Contractor shall provide his own lock for the designated store room. The inventory of the Tools and Spares shall be verified on a monthly basis. Any shortfall shall be replaced by the Contractor as part of his responsibilities under this contract.

GD.6.3 The Tools and Spares shall at least include the following:

Impact wrench

GD.7 QUALITY ASSURANCE SYSTEM

- a) Following formal approval of his Quality Assurance system by the Engineer, the Contractor shall implement the approved QA system.
- b) Records of this QA system shall be kept throughout the duration of the contract and shall be submitted to the Engineer as required by the Department.

GD.8 RE-COMMISSIONING OF INSTALLATION

On completion of the servicing work, the low voltage reticulation shall be put into operation.

GD.9 SERVICE WORK TO TRANSFORMER INSTALLATIONS

- a) The various transformer systems shall be serviced as measured in the bills of quantities, installation I, during the first period of the servicing and maintenance contract.
- b) The scope of the repair work shall include, but shall not be limited to the activities listed below.
- c) The Contractor shall record the repair actions in tabular format before the maintenance Phase commences.

- d) Servicing work shall be executed within the approved period. This period shall be agreed at the start of the contract period.
- e) New equipment and material shall be supplied with a written guarantee confirming a defects liability period of 12 months from date of hand-over. These guarantees shall be furnished in favour of the User Client.
- f) The maintenance phase of this contract shall commence once the repair work on the installation has been commissioned and handed over to the satisfaction of the Engineer.

GD.10 INSTALLATION MAINTENANCE

- a) The various transformer systems shall be maintained for the duration for the 36 month contract period.
- b) The following maintenance actions will be required under this period of the contract:
 - Routine preventative maintenance
 - Corrective maintenance
 - Breakdown maintenance

These actions are defined in Additional Specification SA – General Maintenance

- c) The maintenance schedules and frequency of services and maintenance activities shall be developed under the maintenance control plan which will be instituted by the Contractor. The Contractor's responsibility in this regard is specified in the Additional Specification SA – General Maintenance.

GD.11 LOW VOLTAGE DISTRIBUTION BOARDS: TECHNICAL DETAILS

GD.11.1 Installation description

This section describes the electrical distribution network that will be maintained in terms of the contract.

The transformer in the transformer room of substation is rated at 500 kVA and is of the dehydrating type. Three Pole transformers are also in use at the Top Residential area (200KVA), Commercial area (200KVA) and Waste Water Treatment Works (50KVA).

GD.11.2 Scope of Service work

Oil test: Specific tests to be carried out includes di-electric test, moisture content test, and acidity test and gas analysis, per random sample. Purification of transformer oil: oil to be drained purified and replaced.

Service transformer: Power wash at high pressure and high temperature. Check working of oil level gauge.

Clean and re-torque transformer bushings. Re-torque all loose bolts with impact wrench. Measure earth resistance.

Insulation resistance test: Perform at windings MV to LV, MV to earth and LV to earth.

Fit drier: Fit silica gel air drier.

Check drier: Check condition of drying agent and replace, if necessary.

GD.11.3 Service work

Item	Unit
(a) Service transformer	No

The unit of measurement shall be the number of low voltage boards serviced.

The tendered rate shall include full compensation for cleaning of the transformer, re-torque of bushings and bolts, check oil level gauge, refilling of oil, tightening of terminations, replace gaskets, seals, record tap changer settings, including all necessary accessories etc.

Item	Unit
(b) Oil Test	No

The unit of measurement shall be the number of oil test conducted.

The tendered rate shall include full compensation for the tests to be performed, which include the following tests and they should be accompanied by test certificates issued by an accredited lab:

- Di-electric tests
- Moisture content tests
- Acidity test and
- Gas analysis test

Item	Unit
(c) Oil Purification	No

The unit of measure shall be number of transformers which oil has been purified.

The tendered rate shall include full compensation for all labour, transport, draining, on site purification of transformer oil as per the oil test results or replacement of oil.

Item	Unit
(d) Supply and install Silica gel air drier	No

The unit of measure shall be the number of air driers installed.

The tendered rate shall include full compensation for the removal, supplying and installation of complete air driers to the supplier's specifications.

Item	Unit
(e) Replace drier gel	No

The unit of measure shall be the number of driers where the drying agent is replaced.

The tendered rate shall include full compensation for the ordering, supply and installation of drier gel.

Item	Unit
(f) Supply and refilling additional transformer oil	Litres

The unit of measure shall be the number of litres of oil added to the transformer.

The tendered rate shall include full compensation for ordering, supply and refilling additional oil (oil according to SANS 0555 specification) to be supplied in 25 litre containers.

Item	Unit
(g) Repair oil leak	No

The tendered rate shall include full compensation for the, isolation, draining of oil, and replacement of the transformer gasket if and when instructed by the engineer for all the substations.

Item	Unit
(i) Re-tape LV and MV bushings and MV busbars	No

The unit of measurement shall be the number of power outlets installed.

The tendered rate shall include full compensation to re-tape the LV and MV bushing and MV bush bars to the bushings of the MV panel using PVC insulation tape.

GD.11.4 Scope of maintenance work

GD.11.4.1 General

Refer to GD 10

GD.11.4.2 Monthly

Check oil levels
Check silica gel
Check for oil leaks
Visually inspect transformers and terminations.

GD.11.4.3 Annual

Service transformers
Record values in logbook
Test Oil
Purification if required

GD.11.5 Maintenance work: measurement and payment

Refer to clause SA 06 of the Additional Specification - SA General Maintenance.

Remuneration for the maintenance work shall form part of the overall Medium and Low Voltage Installation.

TECHNICAL SPECIFICATION

GE EXTERNAL LIGHTING

CONTENTS

GE.1	SCOPE: EXTERNAL LIGHTING
GE.2	STANDARD SPECIFICATIONS, REGULATIONS AND CODES
GE.3	AS-BUILT INFORMATION AND OPERATING AND MAINTENANCE MANUALS
GE.4	TESTS AND INSPECTIONS
GE.5	LOGGING AND RECORDING PROCEDURES
GE.6	QUALITY ASSURANCE SYSTEM
GE.7	RE-COMMISSIONING OF INSTALLATION
GE.8	EXTERIOR LIGHTING INSTALLATIONS
GE.9	AREA LIGHTING: TECHNICAL DETAILS
GE.10	SECURITY FENCE LIGHTING: TECHNICAL DETAILS
GE.11	MAINTENANCE OF THE INSTALLATION

GE.1 SCOPE: EXTERNAL LIGHTING

- a) This specification comprises all aspects regarding the repair and maintenance of external lighting systems. External lighting comprises:
- i) Area lighting
 - ii) Security lighting along perimeter fences
 - iii) Street lighting
- b) This specification shall form an integral part of the repair and maintenance contract document and shall be read in conjunction with Part C, the Additional Specifications included with this document.

GE.2 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

The latest edition, including all amendments up to date of tender of the following specifications, publication and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof.

GE.2.1 SANS Specifications

SANS 10400	National Building Regulation
SANS 10142	Wiring code
SANS 10225	Lighting masts
SANS 1277	Streetlight luminaires

SANS 1088	Luminaire entries and spigots
SANS 1749	Glass polyester poles
SANS 1250	Capacitors, ballasts and lamps
SANS 1279	Floodlighting luminaires
SANS 1777	Daylight switches
SANS 763	Galvanised coatings
SANS 1266	Discharge lamp ballasts
ARP 035	Streetlighting maintenance

GE.2.3 Occupational Health and Safety Act of 1993

All regulations and statutory requirements as laid down in the latest edition of the Occupational Health and Safety Act of 1993: Construction Regulations, 2003 as promulgated in Government Gazette No 2507 and Regulation Gazette No 7721 of 18 July 2003 shall be adhered to.

GE.2.4 Manufacturer's specifications and installation instructions

a) Additional requirements

Equipment and material supplied and installed shall be new and unused.

Luminaires, lamps and control gear shall bear the SABS stamp. The Contractor shall ensure that all safety regulations and measures are applied and enforced during repair and maintenance work on cabling, wiring, luminaires, lighting poles and high masts.

GE.3 AS-BUILT INFORMATION AND OPERATING AND MAINTENANCE MANUALS

a) The Contractor shall be responsible for the compilation of a complete set of Operating-and-Maintenance manuals.

This shall be done in accordance with the Additional Specification SB – Operating and Maintenance manuals.

All information shall be recorded and reproduced in electronic format as well as supplying the Engineer with three sets of hard copies.

b) Over and above what is specified in the Additional Specification – SB: Operating and Maintenance manuals, the Operating and Maintenance Manual to be compiled shall be structured and shall at least include the following:

Ge.3.2.1 Description of Installation

Complete system description of the lighting system. This shall be done for each lighting installation individually. The system description shall contain detailed information regarding the supply configuration (Distribution board, cabling, distribution kiosks, and pole-mounted distribution board), the switching arrangement (timers, photocells, override facilities) and the lighting (luminaire detail, lamp detail) as well as the earthing and lightning protection arrangement.

GE.3.2.2 Commissioning Data

Complete commissioning, test and inspection data of lighting system.

This shall be done for each lighting installation individually. The commissioning data will comprise start-up and running current measurements at each termination point e.g. distribution board, kiosk and mast. Full data on lamps fitted with installation dates.

GE.3.2.3 Operating Data

- a) Safety precautions to be implemented.
- b) Operation of lighting systems; automatic, manual and bypass switching.

GE.3.2.4 Maintenance instructions

- a) Projected frequency of lamp replacement per lighting system.
- b) Procedure to verify operation of photocell – controlled circuits.
- c) Procedure to verify operation of timer – controlled circuits.
- d) Trouble shooting diagram.
- e) Luminaire details, including manufacturers' brochures / pamphlets, order number, list of components and lamp specification.
- f) Schedule of serviceable components per lighting system. These schedules shall include lamps, starters, ignitors, ballasts, lenses, etc.

GE.4 TESTS AND INSPECTIONS

It is the responsibility of the Contractor to provide all labour, accessories and properly calibrated and certified measuring instruments necessary to record the following parameters:

- a) Phase voltages
- b) Current per phase
- c) Illumination levels in lux
- d) Insulation testing at 500V
- e) Earthing resistance testing by means of Wheatstone bridge instrument

The Contractor is responsible for the arrangement of such tests. He shall give at least 72 hours' notice to the Engineer prior to the test date.

GE.5 LOGGING AND RECORDING PROCEDURES

- a) The Contractor shall as part of this Contract institute a Recording system as part of his Maintenance Control Plan as defined in the Additional Specification SA – General Maintenance. This shall consist of a Record book which shall be utilised to log and record all faults, system checks, breakdowns, maintenance visits, inspections etc.
- b) The logbook shall be stored in a safe place and shall only be utilised by the Contractor and Engineer. A copy of the monthly entries and recordings into this logbook shall be submitted by the Contractor together with his monthly report to the Engineer.

This logbook shall be structured to at least include the following:

- Monthly lamp inspection and maintenance actions.
- Bi-annual inspection and testing of lighting systems.
- Annual earthing test report.

- Breakdown / call out reports.

GE.6 QUALITY ASSUARANCE SYSTEM

- a) Following formal approval of his Quality Assurance System by the Engineer, the Contractor shall implement the approved QA system.
- b) Records of this QA system shall be kept throughout the duration of the contract and shall be submitted to the Engineer as required by the Department.

GE.7 RE- COMMISSIONING OF INSTALLATION

- a) On practical completion of the repair work and lamp replacement, the lighting installations shall be put into operation.
- b) Lighting installations shall be energised for a minimum continuous period of 96 hours immediately prior to the Engineer's inspection to verify lamp stability and reliability of power reticulation

GE.8 EXTERIOR LIGHTING INSTALLATIONS

- a) The various lighting systems shall be serviced and repaired as part of Installation during the first phase of the maintenance contract.
- b) The scope of work shall include, but not be limited to the activities listed below.
- c) The contractor shall record the repair actions in tabular format before the Contractors responsibility for maintenance commences.
- d) Repair work shall be executed within the approved period for repairs.
- e) New equipment and material shall be supplied with written guarantee confirming a defects liability period of 12 months from date of practical completion. These guarantee shall be furnished in favour of the Department of Public Works.

GE.8.1 The following measurement and payment items shall apply to repair work:

GE.8.1.a Excavate in all materials for trenches, backfill, compact and dispose of surplus material (m3)

This rate shall apply to all the excavations.

The unit of measurement shall be the cubic metre of material excavated in trenches, classified according to the depth and width specified listed. The width classification shall be in accordance with the authorised dimensions and the depth classification in accordance with the total depth of the trench and not with the depth range in which the material is situated before excavation. The depth of excavation shall be measured to the underside of the bedding.

The tendered rate shall include full compensation for clearing and grubbing the trench areas and the temporary removal of improvements from the line of the trench, for

excavating the trench, preparing the bottom of the trench, separating material unsuitable for backfill, keeping the excavations safe, dealing with any surface or subsurface water, measuring, classification and keeping of all records and for separating topsoil and selected backfill material where necessary.

The rate shall furthermore cover the costs of installing the sand bed and sand cover, backfilling, compacting and disposing of the surplus material.

GE.8.1.b Extra over item GE 08.06(a) for excavating in hard material (m3)

The unit of measurement shall be the cubic metre of material excavated and classified as hard, in accordance with the classification set out hereunder.

The tendered rate shall be paid over and above the rate tendered for excavation in respect of items GE.8.1.a in full compensation for the additional cost of excavating in hard material instead of soft.

The tendered rate shall include full compensation for any overbreak as well as the additional backfilling required, reinstating the trench bottom, and for any other incidentals resulting from overbreak.

The materials excavated shall be classified as follows for payment purposes:
Hard material:

Material which cannot be excavated efficiently except with the use of pneumatic tools, blasting or wedging and splitting, and shall include boulders exceeding 0,15m³ in volume.

Soft material:
All material not classified as hard material.

Notwithstanding the above classification, all material excavated from previously constructed fills, embankments, pavement layers and from above existing services shall be classified as soft material.

The decision of the Engineer as to the classification of the material shall be final and binding and any objection as to the classification shall be made before the excavation has been backfilled.

GE.8.1.c Extra over item GE.8.1.a for excavating by hand in all Materials (m3)

The unit of measurement shall be the cubic metre of trench material excavated by conventional excavating equipment is either impractical or likely to cause damage to services, trees or property or where the electrical Contractor has to excavate by hand where he cannot excavate by machine.

The volumes of the trench excavation will be computed from the length and the depth to the bottom of the specified bedding layer and the minimum base widths specified in the drawings. The rate shall cover the cost of complying with the safety and protection requirements specified except where particular items are scheduled to cover particular costs for the excavation.

The tendered rate shall be paid extra over the rates tendered for item GE.8.1.a in full compensation for the additional expense of excavating by means of hand labour instead

of conventional trenching equipment.

GE.8.1.d Extra over item GE.8.6.a for using backfill material obtained from sources provided by the Contractor (m3)

The unit of measurement shall be the cubic metre of imported backfill material.

Item GE.8.6.d above will not be measured for payment unless importation has been ordered in writing. The volume will be computed from the trench width and the depth from ground level to the top of the sand bed cover as shown on the tender drawings.

The rate for material from designated borrow pits shall cover the cost of excavation and selection of suitable material, the moving of the material to the backfilling site, and the disposal of the material that becomes surplus as a result of the importation, all within 0,5 km.

	Item	Unit
GE.8.1.e	Supply and Install Cable Sleeves	m

The unit of measurement shall be the linear length in metre of cable sleeves supplied and installed.

The tendered rate shall include full compensation for the supply, delivery, handling and installing the cable sleeves including all the required couplings, steel draw wires and plugs.

	Item	Unit
GE.8.1.f	Supply and Install Plastic Warning Tape	m

The unit of measurement shall be the length in meter of plastic warning tape supplied and installed.

The tendered rate shall include full compensation for the supplying, handling and laying the plastic warning tape.

	Item	Unit
GE.8.1.g	Supply and delivery of low-voltage cable	m

The unit of measurement shall be the length of low-voltage cable supplied. The tendered rate shall include full compensation for the manufacture, supply and delivery of the specified cable to the site.

Separate items shall be scheduled under this payment item for each size and type of cable required.

	Item	Unit
GE.8.1.h	Lay LV-cable	m

The unit of measurement shall be the linear length in meter of LV-cable installed.

The tendered rate shall include full compensation for the handling, inspecting, laying, cutting and testing the cable. Cables shall be measured linearly over all lengths laid. Separate items shall be scheduled for each size and each type of cable laid.

GE.8.1.i Termination of LV-cables No

The unit of measurement shall be the number of LV-cable terminations.

The tendered rate shall include full compensation for providing the cable glands and shrouds, the cost of handling, fitting and cutting the cable. Separate items shall be scheduled for each size and type of cable.

**GE.8.1.j Unit
Supply bare copper earth conductor m**

The unit of measurement shall be the length in meter of bare copper earth conductor supplied.

The tendered rate shall include full compensation for procuring, furnishing and laying the specified earth continuity conductor.

**GE.8.1.k Unit
Installation of bare copper earth conductor m**

The unit of measurement shall be the length in meter of bare copper earth conductor installed.

The tendered rate shall include full compensation for procuring, furnishing and laying the specified earth continuity conductor.

**GE.8.1.l Unit
Terminate and connect bare copper earth conductor No**

The unit of measurement shall be the number of bare copper earth conductors terminated and connected.

The tendered rate shall include full compensation for supplying all the material required to terminate and connect the bare copper earth conductors and the connecting thereof to the earth bars.

**GE.8.1.m Unit
Jointing of low-voltage cable No**

The unit of measurement shall be the number of LV-cables joints.

The tendered rate shall include full compensation for the cost of providing the kits, the cost of cutting the cable, handling and fitting the kits and the cost of testing the joints.

**GE.8.1.n Unit
Re-lamp luminaire No**

The unit of measurement shall be the number of luminaire lamps replaced.

The tendered rate shall include full compensation for the supply and installation of the lamp according to the manufacturer's instructions. Separate items shall be scheduled for each type of lamp.

GE.8.1.o	Item Supply and installation of internal luminaire components	Unit No
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The unit of measurement shall be the number of internal luminaire components replaced.

The tendered rate shall include full compensation for the supply and installation of the components according to the manufacturer's instructions. Separate items shall be scheduled for each component.

GE.8.1.p	Item Internal wiring of luminaire	Unit No
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The unit of measurement shall be the number of luminaires rewired with silicone insulated wiring.

The tendered rate shall include full compensation for the supply and wiring of a luminaire with silicone insulated wiring where the wiring are specified separately.

GE.8.1.q	Item Supply and install circuit breakers	Unit No
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The unit of measurement shall be the number of circuit breakers supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the circuit breakers where the circuit breakers are specified separately.

GE.8.1.6.r	Item Supply and install isolators	Unit No
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The unit of measurement shall be the number of isolators supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the isolators where the isolators are specified separately.

GE.8.1.s	Item Supply and install contactors	Unit No
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The unit of measurement shall be the number of contactors supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the contactors where the contactors are specified separately.

GE.8.1.t	Item Supply and install of low tension fuses	Unit No
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The unit of measurement shall be the number of fuses supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the fuses where the fuses are specified separately.

	Item	Unit
GE.8.1.u	Supply and install photocell (plug-in type)	No
	<p>The unit of measurement shall be the number of photocells supplied and installed.</p> <p>The tendered rate shall include full compensation for the supply and installing of the photocells where the photocells are specified separately.</p>	
GE.8.1.v	Supply and install Heinemann QAT-R-Clip in timer	Unit No
	<p>The unit of measurement shall be the number of timers supplied and installed.</p> <p>The tendered rate shall include full compensation for the supply and installing of the timers where the timers are specified separately.</p>	
GE.8.1.w	Supply and install 0-30A HRC fuses	Unit No
	<p>The unit of measurement shall be the number of fuses supplied and installed.</p> <p>The tendered rate shall include full compensation for the supply and installing of the fuses where the circuit breakers are specified separately.</p>	
GE.8.1.x	Supply and install end connectors and insulating sleeves	Unit No
	<p>The unit of measurement shall be the number of end connectors and insulating sleeves supplied and installed.</p> <p>The tendered rate shall include full compensation for the supply and installation of the end connectors at the light pole or where cables forms a looping system.</p> <p>The end connectors shall be similar or equal to Pratley No 2 end connectors and insulating sleeves.</p>	
GE.8.1.y	Replace light pole	Unit No
	<p>The unit of measurement shall be the number of light poles replaced.</p> <p>The tendered rate shall include full compensation for the removal of all equipment from the existing pole, removal of the existing pole from site, ordering, supply, delivery and installation of the light pole in the position specified.</p> <p>The contractor shall install all existing equipment onto the new pole.</p>	
GE.8.1.z	Replace luminaire diffuser	Unit No
	<p>The unit of measurement shall be the number of luminaire diffusers replaced.</p>	

The tendered rate shall include full compensation for the removal of the diffuser from the existing luminaire, ordering, supply, delivery and installation of the new diffuser as specified according to manufacturer's instructions.

Item	Unit
GE.8.6.aa Replace pole mounted brackets	No

The unit of measurement shall be the number of pole brackets replaced.

The tendered rate shall include full compensation for the removal of the brackets from the existing pole, ordering, supply, delivery and installation of the new pole bracket including the connection of the equipment.

Item	Unit
GE.8.1.ab Replace pole cover	No

The unit of measurement shall be the number of pole covers replaced.

The tendered rate shall include full compensation for the removal of the pole cover from the existing pole, ordering, supply, delivery and installation of the new pole cover as specified according to manufacturer's specification.

Item	Unit
GE.8.6.ac Junction boxes including pole mount brackets	No

The unit of measurement shall be the number of junction boxes supplied and installed.

The tendered rate shall include full compensation for the supply and installation of junction box, brackets and strapping. The junction box must be fitted with a neutral bar, earth bar, din terminal rails and CBI circuit breaker clips to accommodate the maximum amount of termination and circuit breakers.

Item	Unit
GE.8.1.ad Remove rust and paint kiosks	No

The unit of measurement shall be the number of kiosks painted.

The tendered rate shall include full compensation for the removal of the rust with an anti-corrosion agent and the repainting of the whole kiosk.

Item	Unit
GE.8.1.ae Label kiosks	No

The unit of measurement shall be the number of kiosks labelled.

The tendered rate shall include full compensation for the labelling of kiosks circuit breakers, cable and the warning notification to be installed.

Item	Unit
GE.8.1.af Supply and install padlocks	No

The unit of measurement shall be the number of padlocks installed.

The tendered rate shall include full compensation for the ordering, supply, engraving and installation of the padlocks, locking devices and seals.

Item **Unit**
GE.8.1.ag **Replace distribution meter kiosks** **No**

The unit of measurement shall be the number of distribution kiosks replaced.

The tendered rate shall include full compensation for the removal, ordering, supply, engraving and installation of the new 6/4 way meter boxes complete with watt hour meters, circuit breakers, gland plate, labelling and concrete foot strip as specified. The distribution kiosks shall be similar or equal to Eprotech or Aluex.

Item **Unit**
GE.8.1.ah **Replace door hinges on meter distribution kiosks** **No**

The tendered rate shall include full compensation for the removal of damaged hinges, the supply, delivery and installation of new hinges.

Item **Unit**
GE.8.1.ai **Supply and install handles** **No**

(Perano type lockable turn catch door handle – heavy duty)

The unit of measurement shall be the number of handles installed.

The tendered rate shall include full compensation for the removal of the old handle and ordering, supply and installation of a lockable turn catch handle.

GE.9 **AREA LIGHTING: TECHNICAL DETAILS**

GE.9.1 **Installation description**

This section describes the electrical distribution network that will be repaired and maintained in terms of this contract.

Luminaires are suspended on fibreglass and/or galvanised steel poles of various heights. Area lights are controlled by means of photocells.

SITE	POLE / MAST INFORMATION		LUMINAIRE INFORMATION		
	MOUNTING HEIGHT	DESCRIPTION / MATERIAL	DESCRIPTION	SWITCHING	QUANTITY
Beit Bridge	25m	Galvanised Steel	1000W HPS Floodlight	Auto	3
	11m	Fibreglass	400W MH Floodlight	Auto	134
	9m	Fibreglass	250W HPS Floodlights	Auto	44
	3-5m	Fibreglass/ Galvanised Steel	PL26W Floodlight	Auto	36
	-	(Mounted on Walls	250W HPS Floodlight	Auto	12

GE.9.2 Scope of repair work

Service mast distribution boards and supply kiosks: Clean, label, check terminations and earthing. Replace all defective circuit breakers. Replace all badly done or damaged cable joints and terminations. Remove all redundant cable joints and tidy up remaining wiring. Provide insect and rodent poison.

Service each luminaire, open control gear enclosures and treat for moisture ingress and corrosion. Wash luminaires with detergent and clean lenses. Check and replace neoprene seals. Re-lamp luminaires.

Remove existing damaged luminaires, supply and install similar and approved luminaires complete with lamps and control gear, if applicable.

Check consistency of aiming angles and tighten mounting bracket bolts.

Verify operation of switching equipment and replace if defective.

Align light poles straight and ensure that they are not skew.

Check pole covers; measure earthing continuity and tighten foundation bolts. Replace all padlocks on distribution boards and kiosks.

Damaged poles shall be replaced with poles manufactured from glass filament wound polyester and shall be of the straight round cross-section tapered type. The poles shall be suitable for the mounting of post top type luminaires at a mounting height of 3.5-10 m.

Poles shall be of Beka manufacture.

Check and tighten high mast foundation bolts. Inspect foundation bolts and treat with dioxidene and zinc rich primer where required. Inspect gussets base plate and mast shaft.

Service high mast lowering gear and lamp cage:

Winch:

- Remove accumulated dirt and clean thoroughly.
- Check oil bath level.
- Check security of bolts.
- During lowering of lamp carriage – visually inspect winch rope for flays, kinks or corrosion.
- Inspect winch rope anchorage points in drum.

Wire ropes:

- Confirm 316 stainless steel.
- Visual inspection for obvious defects.
- Inspect and tighten all anchorage points.
- If required level luminaire carriage.
- Luminaire carriage:
 - Inspect alignment cones.
 - Inspect PVC protection guide.
 - Inspect cables and splitter box.
 - Visual inspection of trailing cable.
 - Tighten all nuts and bolts.

- Inspect for corrosion and treat with dioxidene and zinc rich primer.
- Clean photo cell, test and replace if defective.
- Weld on 1 m long 16 mm ø lightning finial.

GE.9.3 Repair work: Measurement and payment

Item	Unit
GE.9.3.a Relamp luminaire	No

The unit of measurement shall be the number of floodlight lamps replaced.

The tendered rate shall include full compensation for the supply and installation of the lamp according to the manufacturer's instructions.

Item	Unit
GE.9.3.b Service luminaire	No

The unit of measurement shall be the number of luminaires opened and serviced.

The tendered rate shall include full compensation for the servicing of the luminaire, including washing, corrosion protection, checking of seals and glands, cleaning of the lenses, tightening of stirrup bracket bolts and the checking of earthing continuity and aiming angle.

Item	Unit
GE.9.3.c Service light distribution kiosk or DB	No

The unit of measurement shall be the number of distribution boards or kiosks serviced.

The tendered rate shall include full compensation for the cleaning and opening of kiosk or DB, vermin protection, checking of MCB's, checking and tightening of wire terminations, fitting of labels and blank covers, etc.

Item	Unit
GE.9.3.d Supply and install padlocks	No

The unit of measurement shall be the number of 65mm padlocks installed.

The tendered rate shall include full compensation for the ordering, supply, engraving and installation of the padlocks and locking devices as well as fitting each key with purpose made PVC labels.

Item	Unit
GE.9.3.e Service area light pole	No

The unit of measurement shall be the number of area light poles and masts opened and serviced.

The tendered rate shall include full compensation for the opening of pole cover, visual inspections, and straightening of pole.

GE.9.3.f	Item	Unit
	Replace luminaire	No

The unit of measurement shall be number of luminaires replaced.

The tendered rate shall include full compensation for the supply and installation of the specified luminaire complete with lamp and control gear according to manufacturer's instructions.

GE.9.3.g	Item Replace light pole	Unit No
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The unit of measurement shall be number of light poles replaced.

The tendered rate shall include full compensation for the removal of all equipment from the existing pole, removal of the existing pole from site, ordering, supply, delivery and installation of the pole in the position specified.

The contractor shall install all the existing equipment onto the new pole.

GE.9.3.h	Item Replace photo-electric switch	Unit No
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The unit of measurement shall be number of photo electric switches replaced.

The tendered rate shall include full compensation for the removal of the faulty photo electric switch, ordering, supply, delivery and installation of the photo electric switch in the position specified.

GE.9.3.i	Service high mast lowering gear and lamp cage	No
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The unit of measurement shall be the number of lowering gear units serviced and repaired.

The tendered rate shall include full compensation for the testing and servicing of winch, wiring ropes, luminaire carriage, photo cell and the installation of lightning finial.

GE.9.3.j	Item Replace wire rope	Unit No
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The unit of measurement shall be the linear length in meter of wire rope replaced.

The tendered rate shall include full compensation for the supply, delivery and replacement of the 316 stainless steel wire rope as specified.

GE.9.3.k	Item Replace 4 mm² 7-core trailing cable	Unit No
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The unit of measurement shall be the linear length in meter of cable replaced.

The tendered rate shall include full compensation for the supply, replacement and termination of the 4 mm² 7 core trailing cable.

GE.10 **SECURITY FENCE LIGHTING: TECHNICAL DETAILS**

GE.10.1 **Installation description**

This section describes the electrical distribution network that will be repaired and

maintained in terms of this contract.

Luminaires are suspended on Fiberglass poles of 9-11m height. Lights are controlled by means of photocells.

SITE	POLE / MAST INFORMATION		LUMINAIRE INFORMATION		
	MOUNTING HEIGHT	DESCRIPTION / MATERIAL	DESCRIPTION	SWITCHING	QUANTITY
Beit Bridge	9-11m	Fiberglass	400W MH Floodlight	Auto	62
	9-11m	Fiberglass	250W HPS Floodlight	Auto	38

GE.9.2 Scope of repair work

Open each junction box and inspect. Check earth bar and earth continuity. Check and fasten cable terminations, fit labelling and blank face-plate covers. Check locking mechanism and fit lock. Check and replace cover seal is required. Wash luminaire and lens, replace neoprene seal and re-lamp luminaires.

Replace luminaires: Remove existing damaged luminaires, supply and install similar and approved luminaires complete with lamps and control gear, if applicable. Check aiming angle and adjust, if necessary.

Service luminaires by washing with detergent and re-lamping where necessary. Clean lenses. Check condition of seals and glands and test for earth continuity. Replace luminaires: Remove existing damaged luminaires, supply and install similar and approved luminaires complete with lamps and control gear, if applicable.

Open upstream distribution board. Check and fasten cable terminations. Fit labelling and blank face-plate covers. Check locking mechanism and fit padlock.

Open distribution kiosk. Clean inside and add termite and rodent poison. Fit circuit labelling. Check locking mechanism and fit padlock.

Replace all defective circuit breakers.

Replace all badly done or damaged cable joints and terminations. Remove all redundant cabling and tidy up remaining wiring.

Verify operation of switching equipment and replace if defective.

Align light poles straight and ensure that they are not skew

GE.10.3 **Repair work: Measurement and payment**

Item	Unit
a) Service security light pole	No

The unit of measurement shall be the number of security light poles opened and serviced

The tendered rate shall include full compensation for the opening of pole box, visual



inspections, straightening of poles, treating of wooden poles with creosote and securing circuit breakers and terminations.

The Contractor shall give a general report on the condition of the pole and equipment. The report should indicate if poles were skew. Strap all cables to pole.

Item	Unit
b) Re-lamp luminaire	No

The unit of measurement shall be the number of security floodlight lamps replaced.

The tendered rate shall include full compensation for the supply and installation of the lamp according to the manufacturer's instructions.

Item	Unit
c) Service distribution kiosk	No

The unit of measurement shall be the number of distribution kiosks or boards opened and serviced.

The tendered rate shall include full compensation for the opening of kiosk, vermin protection, cleaning of circuit breakers, earth testing, etc.

Item	Unit
d) Replace luminaire	No

The unit of measurement shall be the number of security floodlight luminaires replaced.

The tendered rate shall include full compensation for the supply and installation of the specified luminaire complete with the lamp and control gear according to the manufacturer's instructions.

Item	Unit
e) Service luminaire	No

The unit of measurement shall be the number of luminaires serviced.

The tendered rate shall include full compensation for the service of the luminaire including washing, corrosion protection, checking of seals and glands, cleaning of lenses, tightening of bracket bolts. Checking of earthing continuity, checking of aiming angle and adjustment if necessary.

Item	Unit
f) Install photo-electric switch	No

The tendered rate shall include full compensation for the handling, inspection, fastening of the bulkhead enclosure and photo electric switch, connecting and testing of the switch.

This rate shall furthermore include full compensation for the cost of providing and installing all hardware, screws, wall plugs and other material required to install the photo electric light switch in accordance with the specification.

- a) The various lighting systems shall be maintained in perfect working order following the initial repair work. The maintenance contract shall run for the balance of the 36-month contract period.
- b) The following maintenance actions will be required under this phase of the contract:
- Routine preventative maintenance
 - Corrective maintenance
 - Breakdown maintenance

These actions are defined in the Additional Specification SA – General Maintenance.

- c) The maintenance schedules and frequency of maintenance activities shall be developed under the maintenance control plan which will be instituted by the Contractor. The Contractor's responsibility in this regard is specified in the Additional Specification SA – General Maintenance.
- d) The following shall be used as guidelines to ensure effective maintenance:
Scope of maintenance work on area lighting:

Monthly

- i) Verify operation of switching element
- ii) Check lamps
- iii) Check mast door for weatherproof seal
- iv) Check earth connection at footing, record value

Annual

- i) Service all luminaires
- ii) Measure earth resistance of electrode
- iii) Measure earth resistance of trench earth
- iv) Record values in record book

- e) Scope of maintenance work on security lighting

Monthly

- i) Verify operation of switching element.
- ii) Check lamps.
- iii) Check that all pole covers are secure.
- iv) Visually check distribution kiosk.

Annual

Measure phase voltages and line currents in distribution kiosk or local distribution board. Record values in record book. Do vermin protection. Service all luminaires.

- f) Maintenance shall include all repairs, replacing of components or materials, routine setting or any other actions necessary to ensure a perfect functional condition.

g) Maintenance work: Measurement and Payment

Refer to Clause SA 06 of the ADDITIONAL SPECIFICATION: SA GENERAL MAINTENANCE.

TECHNICAL SPECIFICATION

GF FIRE DETECTION AND ALARM SYSTEMS

CONTENTS

- GF.1 SCOPE: FIRE DETECTION AND ALARM SYSTEMS
- GF.2 STANDARD SPECIFICATIONS
- GF.3 OPERATING AND MAINTENANCE MANUALS
- GF.4 OPERATORS TRAINING
- GF.5 LOGGING AND RECORDING PROCEDURES
- GF.6 REPAIR WORK TO INSTALLATIONS, SYSTEMS AND EQUIPMENT
- GF.7 MAINTENANCE TO INSTALLATIONS, SYSTEMS AND EQUIPMENT

GF.1 SCOPE: FIRE DETECTION AND ALARM SYSTEMS

GF1.1 General

- a) This part of the specification covers the maintenance, repair, supply, installation and commissioning of all equipment for the fire detection. The entire installation shall function as a single integrated Fire Detection system.
- b) The fire detection system shall consist of a central control unit connected to field devices such as fire detection devices, monitoring and control devices and annunciation devices located throughout the protected area.
- c) The complete Fire Detection system, as approved by the engineer, shall be installed in a building as per instructed by the engineer and include but not limited to the following components:
 - i. Microcomputer based fire control panels, interfacing directly with field detection and control devices
 - ii. Communications network between the Fire Panels and Security IP Network
 - iii. Addressable fire detectors
 - iv. Addressable manual call points
 - v. Addressable zone loop isolators
 - vi. Addressable loop sounders
 - vii. Interface with air conditioning & ventilation systems (where required)
- d) All control, indication and monitor equipment related to the fire detection installation shall be produced by the same manufacturer.
- e) Comprehensive repair and maintenance for fire detection and alarm system installed at various buildings at Beitbridge facilities.
- f) For maintenance of Smoke detection system. Routine Service (Fortnightly)
 - i. General cleaning.

- ii. Detector communication test and checking of alarm system.
- iii. Battery power test.
- iv. Smoke detection test.
- v. Emergency light test etc.

GF.2 STANDARD SPECIFICATIONS

GF2.1 General Standard Specifications, Regulations And Codes

The latest edition, including all amendments up to date of tender, of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof.

- The panel shall also be manufactured according to ISO9001 Standards.
- Notwithstanding the above also where specifically required other relevant codes or standards as indicated in this specification
- SANS 10139: 2000, "Fire Detection and Alarm Systems for Buildings".

This specification shall form an integral part of the maintenance and servicing contract document and shall be read in conjunction with the additional and particular specifications compiled as part of this document.

This specification shall act as a guideline to the Particular Specification. In the event of any discrepancies between the Technical Specification and the Particular Specification, the Engineer shall be consulted to take a final decision.

GF2.3 Occupational Health and Safety Act of 1993: Construction Regulations, 2003 as Promulgated in Government Gazette No 25207 and Regulation Gazette No 7721 of 18 July 2003.

The Contractor is to comply with all requirements of the Occupational Health and Safety Act (Act 85 of 1993) and all subsequent revisions thereof. Further, the Contractor undertakes to employ only people who have been duly authorised in terms thereof and who have received sufficient health and safety training to ensure that they can comply therewith. In addition, the Contractor warrants that it shall enforce the terms of this clause on any sub-contractor employed by the Contractor in connection with the contract.

GF2.4 Manufacturers' specifications, codes of practice and installation instructions

All equipment and materials shall be installed, serviced and repaired strictly in accordance with the manufacturers' specifications, instructions and codes of practice.

In the event of a discrepancy between the statutory codes and the manufacturer's codes, the discrepancy shall be brought to the attention of the Engineer, who, in collaboration with the Employer and Local Authority, will prescribe the steps to be taken.

GF2.5 Municipal regulations, laws and by-laws

All municipal regulations, laws, by-laws and special requirements of the Local Authority shall be adhered to unless otherwise specified.

GF.3 OPERATING AND MAINTENANCE MANUALS

No operating and maintenance manuals will be developed for this section.

The contractor shall use the Maintenance Control Plan (see SA Maintenance) to schedule routine preventative maintenance activities.

Over and above the afore-mentioned, the Contractor shall also be responsible for the compilation of the following:

(a) Cataloguing of the fire-fighting equipment

All the fire-fighting equipment must be catalogued under the following headings:

- (i) Location and details of equipment
- (ii) Service date
- (iii) Service frequency
- (iv) Condition of equipment
- (v) History: Usage incidents, breaking, etc.

(b) Provision of a "Fire Plan"

The Contractor shall provide a Fire Plan indicating positions, and keeping up to date any changes of the equipment position, status and operation.

GF.4 OPERATORS TRAINING

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

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

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

GF.5 LOGGING AND RECORDING PROCEDURES

The Contractor shall under this repair and maintenance contract institute a logging and recording system as part of his maintenance control plan as defined in Additional Specification SA: General Maintenance. This shall consist of a log and record book, which shall be utilised to log and record all service records, system checks, breakdowns, maintenance visits, inspections, etc.

The logbook shall be stored in a safe place as agreed with the User Client and the Engineer and shall only be utilised by the Fire Protection Officer, the Contractor and the Engineer. The Contractor shall submit copies of the monthly entries and recordings into the logbook, together with his monthly report, to the Engineer.

The logbook shall be structured to include at least the following:

- (a) Service records
- (b) Inspection and maintenance actions
- (c) Breakdown reports
- (d) Fire safety officer's comments
- (e) Inspection and test comments and reports.

The Contractor shall also institute an attendance register, which shall be kept in a safe place as agreed with the User Client and Engineer. This register shall be completed by all persons visiting the installation, including:

- (a) Fire safety officer
- (b) Contractor
- (c) Inspectors
- (d) Department personnel
- (e) Engineer.

The register shall state the date, time-in, time-out, name, company and reason for visit.

A copy of the register shall be submitted by the Contractor together with his monthly report.

GF.6 REPAIR WORK TO INSTALLATIONS, SYSTEMS AND EQUIPMENT

GF6.1 AUDIO EVACUATION SYSTEM

GF.6.1.1 Audio Evacuation System Shall Be Installed Incorporation The Following:

- Zone selection unit for public announcements in individual zones or in all zones simultaneously.
- Booster amplifiers to feed evacuation to individual zones.
- Automatic and direct addressing from the main control room

GF.6.1.2 Zones are as indicated on the zone schematic:

- a) An electronic automatic messaging unit shall be incorporated. A fire signal from the fire panel shall automatically start the voice message.
- b) One main audio evacuation system shall be provided and installed to serve the different evacuation zones and areas. This evacuation rack shall be located in the main control room. It shall be possible to address all zones individually or simultaneously from the main control room.
- c) All equipment for the audio evacuation system shall be housed as per best practices or enclosures approved by the engineer. Suitable power supply units shall be provided in

- the evacuation panel to provide electrical power to all the audio evacuation equipment.
- d) The rack shall also be equipped with ventilation fan units to prevent overheating of the equipment installed in the panels.
 - e) The audio evacuation system shall be carefully integrated with the smoke detection system. When a fire condition is detected in a specific fire zone, the evacuation system shall generate and transmit evacuation message in the affected area automatically.
 - f) The transmission of alarm and/or evacuation tones in any specific evacuation zone, or in all of the zones simultaneously, shall also be possible through operator control from the main panel, or remote panel.
 - g) It shall also be possible to make public announcements over the evacuation system in any one, or in all of the different zones simultaneously. The sounding of announcement chimes shall precede public announcements. Suitable input modules located in the panel shall generate these chimes.
 - h) Backup batteries shall be provided and installed in the panel. These batteries shall be suitable to maintain the evacuation – and the smoke detection systems operational in the event of normal power failure to the panel.
 - i) The batteries shall be rated to maintain the evacuation system operational for a period of four hours after normal power failure. The batteries shall during this period of four hours also maintain all monitoring functions associated with the evacuation system and have sufficient power at the end of the four hours to transmit an evacuation tone, in all zones associated with the panel, simultaneously for a duration of five minutes. Suitable battery charging circuitry to maintain the batteries in a fully charged state shall be provided in the panel.

GF.6.2 REPAIR WORK TO EXISTING EQUIPMENT

The Contractor shall at the start of the repair and maintenance contract inspect, record and report on all the existing fire detection and alarm system listed in this specification.

This inspection and report shall comprise the following:

- (a) Establishing the condition of all equipment;
- (b) Reporting all defects to equipment;
- (c) Compliance of equipment in respect of the governing regulations at the start of the Contract;
- (d) Recording all equipment with an identifying system;
- (e) Details of all equipment;
- (f) Suitability of equipment regarding the purpose it serves;
- (g) Listing of latest service.

The Contractor shall report on the above in writing to the Engineer. No repair, service and/or replacement work shall commence prior to approval by or directives from the Engineer.

GF.6.3 REPAIR WORK: MEASUREMENT AND PAYMENT

GF.6.3.a	Item Replace, supply and install fire alarm panel	Unit No
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The unit of measurement shall be the number of fire alarm panel replaced.

The tendered rate shall include full compensation for the supply and installation of a fully operational fire alarm panel according to the manufacturer's instructions.

GF.6.3.b	Item Service fire alarm panel	Unit No
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The unit of measurement shall be the number of fire alarm panels opened and serviced.

The tendered rate shall include full compensation for the servicing of the fire alarm panel, including cleaning, corrosion protection, checking of seals and glands, simulation of alarms including battery power and smoke detection test.

GF.6.3.c	Item Replace, supply and install smoke detectors, manual call points, and strobes	Unit No
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The unit of measurement shall be the number of smoke detectors, manual call points, or strobes replaced.

The tendered rate shall include full compensation for the supply, installation and testing of a smoke detectors, manual call points or strobes according to the manufacturer's instructions.

GF.6.3.d	Item Service smoke detectors, manual call points, and strobes	Unit No
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The unit of measurement shall be the number of smoke detectors, manual call points, or strobes serviced.

The tendered rate shall include full compensation for the cleaning and opening of smoke detectors, manual call points or strobes, vermin protection, checking and tightening of wire terminations etc.

GF.6.3. g	Item Testing of fire detection system by a Specialist Contractor	Unit Lump sum
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The unit of measurement shall be a lump sum for testing of the installation by a specialist contractor.

The tendered lump sum shall include full compensation for the testing of the earth installation by a specialist contractor approved by the Engineer, and produce a test report for approval by the engineer. Report should be compiled by a suitably qualified personnel.

GF.7 MAINTENANCE TO INSTALLATIONS, SYSTEMS AND EQUIPMENT

GF.7.1 GENERAL

Annual maintenance responsibilities for each installation including all units and components as specified shall commence with access to the site. A difference shall be made in payment prior to and after practical completion of the work.

Maintenance of the completed installation shall commence upon the issue of a certificate of practical completion for repair work, and shall continue for the remainder of the 36-month contract period.

This part of the Contract shall include:

- (a) Routine preventative maintenance;
 - (b) Corrective maintenance, and
 - (c) Breakdown maintenance,
- as defined in Additional Specification SA: General Maintenance.

The maintenance work to be performed and executed shall be done strictly in accordance with Additional Specification SA: General Maintenance

The said maintenance work shall be executed in accordance with the relevant codes of practice, statutory regulations, standards, regulations, municipal laws and by-laws and the manufacturers' specifications and codes of practice.

The maintenance schedules and frequency shall be developed under the maintenance control plan to be instituted by the Contractor, as specified in Additional Specification SA: General Maintenance.

All new equipment, components and materials supplied and installed under the maintenance contract shall be furnished with a prescribed manufacturer's guarantee. The maintenance work and items are to be categorised for each maintenance activity under the following headings:

- a) Standby Power Supply
- b) Fire Panel
- c) Fire Sensor
- d) Monitoring Controllers

The Contractor shall be remunerated monthly, based on his performance, for maintaining the complete installation in a perfect functional condition.

GF.7.2 ROUTINE PREVENTATIVE MAINTENANCE

The routine maintenance of the installations, systems and equipment shall be done in accordance with Additional Specification SA: General Maintenance, and the Particular Specification related to this work.

The routine maintenance work to be performed and executed shall include, but not be limited to the items listed below under the respective headings. These actions and findings shall be logged and reported on the relevant approved schedules and reports.

The control panel shall keep statistics for each of the system sensors. These statistics shall be able to be displayed on demand by the operator.

GF.7.2.1 Automatic Monitoring

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

- Removal of Device
- Quiescent Value
- Contamination
- Circuit Failure
- Device Type
- Communication Quality
- Short Circuit
- Open Circuit

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

A description of the nature of the fault as well as the location of the faulty device shall also be displayed. The control panel shall also monitor all loops for earth faults which shall be reported as described above.

GF.7.2.2 Visual Monitors

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

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

- Actual Value
- Average Value
- Maximum and Minimum Values
- Contamination Levels
- Communication Quality

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

GF.7.2.3 Archive Facility

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

- All Events
- Fire Events Only
- Fault Events Only
- Conditions/Maintenance Events Only
- Soak Test Results

GF.7.2.4 Statistics

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

- Maximum and Minimum Value with Data
- Average Value
- Number of Alarms
- Communication Quality

GF.7.2.5 System Maintenance Reports

The following system maintenance reports shall be available on demand:

- Event Buffer Data
- Soak Test Results
- Test Reports
- Exception Reports

GF.7.2.6 Service/Commission Mode

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

GD.7.2.7 Zone Test Mode

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

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

GF.7.2.8 Sensor Test

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

GF.7.2.9 Soak Test

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

GF.7.2.10 Remote Maintenance

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

It shall be possible, once connected to the site, to:

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

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

GF.7.3 CORRECTIVE MAINTENANCE

This corrective maintenance of the installations, systems and equipment shall be done in accordance with Additional Specification SA: General Maintenance.

The Contractor shall inspect and check all equipment, materials, systems and installations for any pending breakdowns, maladjustments or anomalies of equipment.

The Contractor shall report and take actions to correct such shortfall.

GF.7.4 BREAKDOWN MAINTENANCE

Breakdown maintenance of the installations, systems and equipment shall be done in accordance with Additional Specifications SA: General Maintenance.

All breakdown problems experienced shall be acted upon within the time limitations allowed in the General Maintenance specifications.

All breakdown maintenance shall be done in accordance with the relevant specifications, standards, regulations and codes.

The Contractor shall have access to the necessary spares, equipment and tools for any possible breakdowns.



Public Works
& Infrastructure
Department
Public Works and Infrastructure
REPUBLIC OF SOUTH AFRICA

EE.75

TECHNICAL SPECIFICATION

GG BUILDING ELECTRICAL INSTALLATIONS

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GG.1 SCOPE: BUILDING ELECTRICAL INSTALLATIONS

- a) This specification comprises all aspects regarding the repair and maintenance of building electrical systems. Building electrical systems comprise:
- (i) Distribution boards and low voltage cable
 - (ii) Interior and exterior lighting of buildings
 - (iii) Small power and fixed appliances
 - (iv) Earthing and lightning protection system
- b) This specification shall form an integral part of the repair and maintenance contract document and shall be read in conjunction with portion 3, the Additional Specifications included with this document.

GG.2 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

The latest edition, including all amendments up to date of tender of the following specifications, publication and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof.

GG.2.1 SANS Specifications

General	Distribution and meter boards	LV cables and conductors	Lighting system	Earthing and lightning protection system	Small power installation	
					Power outlets	Conduits, power skirting, cable trays and ducting
SANS 10142	SANS 156	SANS 1411	SANS 10114	SANS 10313	SANS 164	SANS 507
SANS 0140	SANS 556	SANS 1507	SANS 890	SANS 10199	SANS 1085	SANS 950
SANS 10400	SANS 767	SANS 1574	SANS 1012		SANS 1239	SANS 1433
SANS 10222	SANS 1619	SANS 60227	SANS 1041		SANS 60309	SANS 60423
	SANS 1765	SANS 60502	SANS 1266		SANS 60670	SANS 60614
	SANS 1799		SANS 1464		SANS 60884	SANS 60670

	SANS 1973		SANS 1777		SANS 60906	SANS 61035
	SANS 60099		SANS 10114			SANS 61084
	SANS 60211		SANS 10389			SANS 61386
	SANS 60269		SANS 60188			
	SANS 60439		SANS 60192			
	SANS 60529		SANS 60228			
	SANS 60947		SANS 60598			
	SANS 61008		SANS 60923			
			SANS 60968			

GG.2.2 Department of Public Works Specifications PW 774 & PW 343

GG.2.3 Occupational Health and Safety Act of 1993: Construction Regulations, 2003 as promulgated in Government Gazette No. 25207 and Regulation Gazette No 7721 of 18 July 2003

GG.2.4 Manufacturer's specifications and installation instructions.

GG.2.5 Additional requirements

Equipment and material installed shall be new and unused. Luminaires, lamps, control gear, isolators and power outlets shall bear the SABS stamp. The Contractor shall ensure that all safety regulations and measures are applied and enforced during repair and maintenance work on cabling, wiring, distribution boards, luminaires, power points and fixed appliances.

GG.3 AS-BUILT INFORMATION AND OPERATING AND MAINTENANCE MANUALS

Procurement of available as-built information. At the commencement of the contract, the Contractor shall obtain all available as-built documentation.

The Contractor shall be responsible for the compilation of a complete set of as-built drawings, inventory list and Operating-and-Maintenance manuals.

This shall be done in accordance with the Additional Specification SB – Operating and Maintenance manuals.

The Contractor shall allow for the required tools and equipment to establish the correct as-built information.

All information shall be recorded and reproduced in electronic format as well as supplying the Engineer with three sets of hard copies.

GG.4 TESTS AND INSPECTIONS

- a) All systems are to be re-checked by the Contractor prior to re-commissioning. Copies of all checks for each installation shall be presented to the Engineer for approval before re-commissioning takes place.

- b) It is the responsibility of the Contractor to provide all labour, accessories and properly calibrated and certified measuring instruments necessary to record the following parameters:
- continuity of ring final circuit conductors
 - continuity of protective conductors, including main and supplementary equipotential bonding
 - earth electrode resistance
 - insulation resistance
 - polarity
 - earth fault loop impedance
 - operation of residual current devices
 - phase voltage
 - current per phase
 - illumination levels in lux
- c) The Contractor shall be responsible for the arrangement of such tests. He shall give 'at least 72 hours' notice to the Engineer prior to the test date.

GG.5 **LOGGING AND RECORDING PROCEDURES**

- a) The Contractor shall as part of this Contract institute a Recording system as part of his Maintenance Control Plan as defined in the Additional Specification SA – General Maintenance. This shall consist of a Record book which shall be utilised to log and record all faults, system checks, breakdowns, maintenance visits, inspections etc.
- b) The logbook shall be stored in a safe place and shall only be utilised by the Contractor and Engineer. A copy of the monthly entries and recordings into this logbook shall be submitted by the Contractor together with his monthly report to the Engineer.

This logbook shall be structured to at least include the following:

- Bi-annual inspection and testing of all systems.
- Monthly lamp inspection and maintenance actions.
- Annual earthing test report.
- Bi-annual inspection and testing of distribution boards.

GG.6 **MAINTENANCE TOOLS AND SPARES**

- a) On commencement of the Repair and Maintenance Contract, the Contractor shall supply and deliver certain Tools and Spares to the User Client. These tools and spares will be the property of the Department of Public Works. Any deficiencies or short fall or damaged Tools and Spares during the contract shall be replaced with new equipment / material.
- b) The Tools and Spares shall be kept safe in a lockable store room on site. The Contractor shall provide his own lock for the designated store room. The inventory of the Tools and Spares shall be verified on a monthly basis. Any short fall shall be replaced by the Contractor as part of his responsibility under this contract.
- c) The Tools and Spares shall at least include the following:

- 10 off 9W CF lamps (E27 Bayonet)
- 10 off 9W CF lamps (E27 Edison screw)
- 10 off 18W CF lamps (E27 Bayonet)
- 10 off 18W CF lamps (E27 Edison screw)
- 10 off 26W CF lamps
- 10 off 2TC 9W lamps
- 20 off 36W fluorescent lamps
- 40 off 58W fluorescent lamps
- 5 off 70W HPS lamps
- 5 off 250W HPS lamps
- 5 off 400W HPS lamps
- Distribution kiosk keys
- 3 off DB face plate square keys
- 3 off DB face plate triangular keys

d) Tools and Spares: Measurement and payment

Item	Unit
Supply of Tools and Spares	No

The unit of measurement shall be the number of Tools and Spares supplied.

The tendered rate shall include full compensation for the supply and delivery of the Tools and Spares as specified.

GG.7 **QUALITY ASSURANCE SYSTEM**

- a) Following formal approval of his Quality Assurance system by Engineer, the Contractor shall implement the approved QA system.
- b) Records of this QA system shall be kept throughout the duration of the contract and shall be submitted to the Engineer as required by the Department.

GG.8 **RE-COMMISSIONING OF INSTALLATION**

- a) On practical completion of the repair work, the contractor shall re-check and put all systems into operation.
- b) All commissioning shall be performed by the Contractor, to the satisfaction of the Engineer. The Contractor shall confirm in writing that all systems have been repaired according to specification and are fully operational.
- c) All installations shall be energised for a minimum continuous period of 96 hours immediately prior to the Engineer's Practical Completion inspection to verify lamp stability and reliability of power reticulation

GG.9 **REPAIR WORK TO LIGHTING INSTALLATIONS**

- a) The various electrical systems shall be repaired during the first phase of the repair and maintenance contract.

b) The scope of the repair work shall include, but shall not be limited to the activities listed below.

- The Contractor shall record the repair actions in tabular format before the Contractor's responsibility for maintenance commences.
- Repair work shall be executed within the approved period for repairs.
- New equipment and material shall be supplied with a written guarantee confirming a defects liability period of 12 months from date of practical completion. These guarantees shall be furnished in favour of the Department of Public Works.

GG.10 INSTALLATION TECHNICAL DETAILS

GG.10.1. Installation description

Repair and maintenance work of the building electrical systems shall be categorised under the following installations:

Installation E: BeitBridge Port of Entry
Entrance Gate house & canopy (x2)
Light vehicle inspection canopy, building & ablutions (x2)
Ablution block (x3)
Heavy vehicle inspection canopy & building (x2)
Clearing Agents Truck release building & ablutions
SAPS Logistics building
SAPS HRM building
Park home offices (x8)
Park home clinic (x2)
Customs / SARS/ Immigration building
Agriculture & SAPS building
Substation Buildings (x2)
Police cells
Police barracks
Police Vehicle inspection section building
Swimming pool pump & ablution buildings
Water purification works & storage tanks
WWTW pump room & ablutions
Water pump scheme (7km from Border)
Houses at Border Post (x29)
Houses in Mussina town (x28) (10km from Border)

GG.10.2. Scope of repair work

Distribution boards and cabling

- (a) Service distribution boards: inspect and clean the distribution boards, treat the enclosure for moisture ingress and corrosion.
- (b) Check for rigidity and fastening of equipment trays, panels, doors and handling devices.

- (c) Check locking mechanism and fit padlock. All padlocks shall be of local manufacture with brass bodies and 75 mm chrome shackles. Three keys (with PVC labels) shall be provided for each lock.
- (d) Replace damaged or missing faceplates, doors, mounting frames, handles, thumb catches, etc.
- (e) Check operation of distribution board equipment and meters, replace if faulty or damaged with an approved type.
- (f) Remove all obsolete equipment and meters.
- (g) Check and fasten wiring and cable terminations.
- (h) Re-arrange wiring and equipment to give a neat installation.
- (a) Trace outgoing circuits.
- (i) Fit labelling and blank face plate covers.
- (j) Replace the distribution boards if required and replacement is approved by
- (k) Engineer.
- (l) Check earth bar and earth continuity, record.
- (m) Label all wiring and cabling with Grafoplast Trasp PVC markers.

Lighting system

- (a) Indoor luminaires
- (b) Operational and complete luminaires
 - (i) Remove lamps and wash luminaire body with detergent. Clean polycarbonate diffusors with detergent. Clean polished pure aluminium diffusors / reflectors with benzene.
 - Check condition of luminaire seal, entrance gland, lamp-holder and internal wiring.
 - Ensure that earth stud and earth connection is sound.
 - Replace missing screws, catches, bolts and plugs.
 - Check condition of suspension cords of pendant luminaires.
 - Re-lamp.
 - (ii) Damaged or incomplete luminaires
 - Remove luminaire.
 - Replace luminaire and reconnect.

- Fit new lamps.
- (iii) Fluorescent luminaires 2400mm long, if any
- Remove luminaire.
 - Replace luminaire with 1500mm double fluorescent luminaire.
 - Fit new lamps.
- (b) Light switches
- Note: All light switches shall have steel face plates with permanent glued Traffolite labels.
- Remove switch cover.
 - Check continuity of earth connection.
 - Check operation of switch and replace if suspect.
 - Replace switch cover, fit new csk stainless steel screws if required.
- (c) Photocells
- Wash translucent body with detergent.
 - Cover photocell and verify operation.
 - Check bypass manual switching circuit.
 - Enclose all exposed wiring in 16 mm \varnothing sprague.
 - Install photocell in a dummy bulkhead
- (d) Floodlight and bulkhead luminaires
- Remove lens and lamp, wash lens thoroughly.
 - Wash luminaire body with detergent.
 - Clean polished pure aluminium reflectors with benzene.
 - Check condition of internal wiring, capacitor, ballasts and starters.
 - Check condition of neoprene seal and replace if worn or damaged.
 - Check condition of lampholder.
 - Seal conduit and wiring entry with silicone to eliminate water ingress.
 - Fit new lamp.
 - Check condition of earth stud and luminaire earth connection.

- Replace all missing screws, lens catches, bolts.
- Close cover securely, check stirrup bolts.

SCHEDULE OF LUMINAIRES

Item No.	Type	Description
1	Type A	2 x 58W open channel fluorescent luminaire
2	Type A1	1 x 58W open channel fluorescent luminaire
3	Type A2	2 x 58W open channel fluorescent luminaire with wings
3	Type B	2 x 36W open channel fluorescent luminaire
4	Type B1	1 x 36W open channel fluorescent luminaire
5	Type C	3 x 36W recessed fluorescent luminaire with LLB louvers
6	Type C1	3 x 36W Surface fluorescent luminaire with LLB louvers
7	Type D	2 x 58W IP65 fluorescent luminaire with clear diffuser
8	Type E	1 x 18W emergency fluorescent luminaire with clear diffuser
9	Type F	4 x 54W megabay fluorescent luminaire
10	Type G	3 x 11W decorative downlight luminaire
11	Type H	3 x 7W sport light luminaire
12	Type J	1 x 18W rectangular bulkhead luminaire (Lascon B30)
13	Type K	2 x 9W round bulkhead luminaire (Lascon B10)
14	Type L	2 x 18W round bulkhead luminaire (Beka 31 Series)
15	Type M	1 x 11W bowl type luminaire with opal glass diffuser
16	Type N	1 x 9W cheese type bulkhead luminaire with opal diffuser
17	Type O	1 x 9W oval bulkhead luminaire
18	Type P	1 x 26W blue Police Light (Bekaray with blue diffuser)
19	Type R	Flashing red beacon light with siren
20	Type S	1 x 70W bulkhead luminaire with diffuser (Lascon B40)
21	Type T	1 x 26W post top luminaire
22	Type U	1 x 70W post top luminaire (Bekaray)
23	Type V	1 x 250W rectangular lowbay downlight (Beka TEC)
24	Type W	1 x 250W floodlight (Bekamax)
25	Type X	1 x 400W floodlight (Bekamax)
26	Type Y	2 x 36W tamperproof fluorescent luminaire
27	Type Z	2 x 36W tamperproof fluorescent luminaire with LED night light

Power outlets and fixed appliances

Note: All power outlets shall have steel face plates with permanent glued Traffolite labels.

- (a) Inspect all power outlets and verify earthing.
- (b) Check contact points and tighten screws.
- (c) Replace missing screws and covers for outlet and draw boxes.
- (d) Replace missing, faulty or damaged socket outlets and plugs.
- (e) Check conditions and operation of local isolators and control switches for fixed equipment and replace if faulty, damaged or missing.
- (f) Check earthing of fixed appliances and test for earth continuity.
- (g) Inspect cable and wireways.
- (h) Check for rigidity and fastening of the cable ducts, ladders, ducting, power skirting and surface conduiting, fasten or replace if loose or damaged, check earthing and test for earth continuity.

Earthing, bonding and lightning protection

- (a) Check earthing and bonding of outlet points, equipment, cable and wireways, fixed appliances, water and gas pipes, etc.
- (b) Check installation and termination of protective conductors and earth electrodes
- (c) Test for earth continuity.
- (d) Provide 6 mm² copper earth wire jumper between roof cladding and all gutter downpipes. Fasten with lugs and galvanized zinc bolts. Typically ten downpipes per housing unit. Earth at least two gutter downpipes by means of 16 mm² green insulated earth wire connected to 1,2 m earth electrode by means of cadwelding. Typically two downpipes per 25 m long housing unit.
- (e) Install 50 mm² aluminium roof conductor in galvanised conduit from the roof cladding against the building to the earth electrode.

GG.10.3. Repair work : measurement and payment

Item	Unit
(a) Service distribution board	No

The unit of measurement shall be the number of distribution kiosks or boards opened and serviced as per clause AB 10.02.

The tendered rate shall include full compensation for the opening of the distribution board or kiosk, internal cleaning of the enclosure, cleaning of equipment and meters, removal of obsolete distribution board equipment, re-arrangement of equipment and wiring, treatment of the enclosure for moisture ingress and corrosion, vermin protection, fastening and / or replacement of wiring, tracing of outgoing circuits, labelling of outgoing wiring and MCB's and cable terminations and earth testing.

The tendered sum shall further include for replacement of damaged, missing or faulty distribution board switchgear, meters, face plates, mounting frames, handling devices, doors, labelling with engraved Trifoliate labels, neutral bars, earth bars, etc. All downstream circuit breakers shall be rated at 6kA fault level.

Item	Unit
(b) Repair distribution board	No

The unit of measurement shall be the number of distribution boards opened and repaired.

The tendered rate shall include full compensation for the dismantling of the DB equipment, removal of the dilapidated enclosure, supply and installation of an epoxy painted new enclosure, mounting frames, plates, equipment, meters, tracing of outgoing circuits, labelling etc.

The tendered rate shall further include for re-wiring of the board, cable termination, cable labelling, remedial builders work and earth testing.

Item	Unit
(c) Replace distribution board	No

The unit of measurement shall be the number of distribution boards removed and replaced if replacement is approved by Engineer.

The tendered rate shall include full compensation for the dismantling of the DB equipment, removal of the dilapidated enclosure, supply and installation of an epoxy painted new enclosure, mounting frames, plates, equipment, meters, tracing of outgoing circuits, labelling etc.

The tendered sum shall further include for re-wiring of the board, cable termination, cable labelling, remedial builders work and earth testing.

Item	Unit
(d) Replace cabling	m

The unit of measurement shall be the linear length of cable supplied and installed.

The tendered rate shall include full compensation for the removal of the existing cabling; supply, handling, installation and termination of the specified type of cable.

This rate shall further include for the supply of all cable ties, clamps and other material necessary to ensure that the installation conforms to the specification.

Item	Unit
(e) Replace wiring	m

The unit of measurement shall be the linear length of conductors supplied and installed.

The tendered rate shall include full compensation for the removal of the existing conductors, the supply, handling, installation, pulling in conduit and termination of the specified type of conductor.

This rate shall further include for the supply of all cable ties, labelling, and other material necessary to ensure that the wiring conforms to the specification.

Item	Unit
(f) Jointing and termination of cables	No

The unit of measurement shall be number of cable joints or terminations.

The tendered rate shall include full compensation for the cost for providing the kits, complete with compound, ferrules and cable lugs, the cost for cutting the cable, handling and fitting kits and the cost of testing the joints and terminations. Position of joints shall be indicated on as-built drawings.

Item	Unit
(g) Supply and install padlocks	No

The unit of measurement shall be number of padlocks supplied and installed.

The tendered rate shall include full compensation for the ordering, supply and installation of the 75 m locally manufactured padlocks and locking devices as well as fitting each of the three keys with purpose-made PVC labels.

Item	Unit
(h) Excavate in all materials for trenches, backfill, compact and dispose of surplus material	m ³

The unit of measurement shall be the cubic meter of material excavated in trenches.

The tendered rate shall include full compensation for clearing and grubbing the trench areas, for excavating the trench, preparing the bottom of the trench, separating material unsuitable for backfill and dealing with any surface or subsurface water.

The tendered rate shall furthermore cover the cost of installing the sand bed and sand cover, backfilling, compacting and disposing of the surplus material.

Item	Unit
(i) Supply and install cable sleeves	m

The unit of measurement shall be the linear length in meter of the cable sleeve supplied and installed.

The tendered rate shall include full compensation for the supply, delivery, handling and installing the specified sleeves including the all the required, couplings, steel draw wires and plugs.

Item	Unit
(j) Supply and install plastic warning tape	m

The unit of measurement shall be the linear length in meter of the plastic warning tape supplied and installed.

The tendered rate shall include full compensation for the supply, handling and laying of the plastic warning tape.

Item	Unit
(k) Termination of the low voltage cable	No

The unit of measurement shall be the number of low voltage cable terminations.

The tendered rate shall include full compensation for providing the cable glands and shrouds, the cost for handling, fitting and cutting the cable.

Item	Unit
(l) Supply and install earth continuity conductor	m

The unit of measurement shall be the linear length in meter of the earth continuity conductor supplied and installed.

The tendered rate shall include full compensation for procuring, furnishing and laying the specified earth continuity conductor.

Item	Unit
(m) Termination and connect earth continuity conductor	No

The unit of measurement shall be the number of earth continuity conductors terminated and connected.

The tendered rate shall include full compensation for supplying all the material required to terminate and connect the earth continuity conductors and the connecting thereof to the earth bars, including label tags.

Item	Unit
(n) Supply and installation of circuit breakers	No

The unit of measurement shall be the number of circuit breakers supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type and size of circuit breaker, including printed PVC labelling.

Item	Unit
(o) Supply and installation of isolators	No

The unit of measurement shall be the number of isolators supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified isolator, including printed PVC labelling.

Item	Unit
(p) Supply and install contactors	No

The unit of measurement shall be the number of contactors supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type of contactor, including engraved labelling on rear tray.

Item **Unit**
(q) Supply and install switching timers **No**

The unit of measurement shall be the number of switching timers supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type of switching timer, including labelling.

Item **Unit**
(r) Supply and install earth leakage units **No**

The unit of measurement shall be the number of earth leakage units supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type of earth leakage units, including labelling.

Item **Unit**
(s) Supply and install fuses **No**

The unit of measurement shall be the number of fuses supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type of fuse, including engraved label indicating fuse rating.

Item **Unit**
(t) Supply and install surge arrestors **No**

The unit of measurement shall be the number of surge arrestors supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type of surge arrestors, with visual indication.

Item **Unit**
(u) Supply wire marker kit **No**

The unit of measurement shall be the number of specified wire marker kits supplied.

The tendered rate shall include full compensation for the procurement and delivery of the cable marker kit as specified.

GG.10.4. Lighting system

Item **Unit**
(a) Re-lamp luminaire **No**

The unit of measurement shall be the number of lamps replaced.

The tendered rate shall include full compensation for the supply and installation of the specified lamp according to the manufacturer's instructions. Replacement date must be written on lamp.

Item **Unit**
(b) Service luminaire **No**

The unit of measurement shall be the number of luminaires opened and serviced in accordance with Clause AB 10.02.

The tendered rate shall include full compensation for the servicing of the luminaire, including washing, checking of seals, glands, lamp holders, cleaning of diffusers, tightening of fixing screws and bolts, corrosion protection and the checking of earthing continuity and aiming angle if applicable. All external luminaire conduit entries are to be sealed with silicone, which cost is included in this payment item.

The tendered rate shall further include for replacement of the luminaire internal wiring where applicable and the tightening of all connections.

Item **Unit**
(c) Replace luminaire **No**

The unit of measurement shall be the number of luminaires replaced.

The tendered rate shall include full compensation for the removal of the existing luminaire and for the supply and installation of the specified type of light fitting complete with lamp and control gear, if applicable, according to manufacturer's instructions.

Item **Unit**
(d) Replace light switch **No**

The unit of measurement shall be the number of light switches replaced.

The tendered rate shall include full compensation for the removal of the existing light switch and for the supply and installation of the specified type of light switch to manufacturer's instructions. Light switch face plate shall be fitted with an engraved Traffolite label as per Nosa-standard, cost of which is included in rate.

Item **Unit**
(e) Replace photo-electric switch **No**

The unit of measurement shall be number of photocell units replaced.

The tendered rate shall include full compensation for the supply, connecting and testing of the switch.

The rate shall further include full compensation for the cost of providing and installing all hardware, screws, wall plugs, 16 mm ø Sprague and other material required to install the photo electric light switch in accordance with the manufacturer's specification.

The tendered rate shall further compensate for the supply and installation of the photocell inside a dummy B10 bulkhead.

Item **Unit**
(f) Replace luminaire diffuser **No**

The unit of measurement shall be number of luminaire diffusers replaced.

The tendered rate shall include full compensation for the supply and installation of the specified type of diffuser, including fixing screws and clips.

Item	Unit
(g) Service light switch	No

The unit of measurement shall be the number of light switches opened and serviced.

The tendered rate shall include full compensation for the servicing of the light switch, internal cleaning of the enclosure, inspection of the contact points, switching mechanism, earthing, etc.

The tendered sum shall further include for replacement of any missing outlet covers and fixing screw and earth testing. Light switch face plate shall be fitted with an engraved Traffolite label as per Nosa-standard, cost of which is included in rate.

Item	Unit
(h) Remove, clean, store and reinstallation of luminaire	No

The unit of measurement shall be the number of light fittings removed, cleaned, stored and reinstalled.

The tendered rate shall include full compensation for the removal, disconnect, cleaning, storage (4 weeks) reinstallation, reconnection and testing of the luminaire.

The rate shall further include full compensation for the installation of 2 x 700 mm supporting timber members above the ceiling (114 x 38 Par SA Pine) and the mounting of 63 mm ø round conduit outlet box complete with 2 x 4 x 60 mm galvanised screws.

Item	Unit
(i) Replace Lamp Holder	No

The unit of measurement shall be the number of lamp holders replaced.

The tendered rate shall include full compensation for the removal of the existing lamp holder and for the supply and installation of the specified type (ceramic) of lamp holder to the manufacturer's specifications.

Item	Unit
(j) Replace Luminaire Internal Components	No

The unit of measurement shall be the number of SABS approved internal luminaire components replaced.

The tendered rate shall include full compensation for the removal of the defective components and for the supply, installation and testing of the specified type of component to the manufacturer's instructions.

GG.10.5. Small power and fixed appliances

Item	Unit
(a) Replace socket outlet	No

The unit of measurement shall be the number of socket outlets replaced.

The tendered rate shall include full compensation for the removal of the existing socket outlet and the supply and installation of the specified type of socket outlet.

All socket outlets shall be supplied complete with cover plates and boxes where required. The tendered rate shall therefore include for the supply of the cover plates and fixing screws where applicable. Outlet face plate shall be fitted with an engraved, Traffolite label as per Nosa-standard, cost of which is included in the rate.

Item	Unit
(b) Replace isolator	No

The unit of measurement shall be the number of isolators supplied.

The tendered rate shall include full compensation for the supply and installation of the specified type of isolator or control unit.

The tendered sum shall further include for the provision of 4 wire, 3 phase connections to the fixed appliance. Isolator face plate shall be fitted with an engraved Traffolite label as per Nosa-standard, cost of which is included in the rate.

Item	Unit
(c) Replace plug tops	No

The unit of measurement shall be the number of plug tops replaced.

The tendered rate shall include full compensation for the supply and installation of the required type of plug top.

Item	Unit
(d) Replace conduit	m

The unit of measurement shall be the linear meter of conduit supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type and size of conduit, including all fixing accessories.

Item	Unit
(e) Replace wiring channel	m

The unit of measurement shall be number of linear meter of wiring channel replaced.

The tendered rate shall include full compensation for the supply and installation of the specified type of wiring channel with 6 x 60 mm fasteners, including the cover and all the necessary accessories.

Item	Unit
(f) Supply and install connections to fixed appliances	No

The unit of measurement shall be number of connections made.

The tendered rate shall include full compensation for the supply and installing of the connections to the fixed appliances.

Item **Unit**
(g) Service socket outlet **No**

The unit of measurement shall be the number of socket outlets opened and serviced.

The tendered rate shall include full compensation for the servicing of the socket outlet, internal cleaning of the enclosure, inspection of the contact points, switching mechanism, if applicable, earthing, etc. Outlet face plate shall be fitted with an engraved, Traffolite label as per Nosa-standard, cost of which is included in the rate.

The tendered sum shall further include for replacement of any missing outlet covers and fixing screw and earth testing.

Item **Unit**
(h) Service isolator **No**

The unit of measurement shall be the number of isolators opened and serviced.

The tendered rate shall include full compensation for the servicing of the isolator, internal cleaning of the enclosure, inspection of the contact points, switching mechanism, earthing and connections to the fixed appliance. Isolator face plate shall be fitted with an engraved Traffolite label as per Nosa-standard, cost of which is included in the rate.

The tendered sum shall further include for replacement of any damaged or missing outlet covers and fixing screw, connections to appliances including earth continuity testing.

Item **Unit**
(i) Replace power skirting **m**

The unit of measurement shall be the linear metre of power skirting supplied and installed.

The tendered rate shall include full compensation for the removal of the existing power skirting, the supply and installation of the specified type and size of power skirting including all accessories.

Item **Unit**
(j) Supply and install Pratley boxes **No**

The unit of measurement shall be the number of Pratley boxes supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type of Pratley box.

Item **Unit**
(k) Supply and install draw boxes **No**

The unit of measurement shall be the number of draw boxes supplied and installed.

The tendered rate shall include full compensation for supplying and installing the draw boxes including cover plates where no equipment is installed in the box.

Item **Unit**
(l) Supply and install draw box cover plates **No**



The unit of measurement shall be the number of draw box cover plates supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type and size of cover plates for draw boxes including the fixing screws.

Item	Unit
(m) Replace "stop-start" local control panel	No

The unit of measurement shall be the number of "stop-start" local control panels supplied and replaced.

The tendered rate shall include full compensation for the supply and installation of "stop/start" local control panel including emergency stop button and 32A 3 pole contactor in an IP55 polycarbonate enclosure. The rate shall include an engraved Traffolite label indicating load and supply DB.

Item	Unit
(n) Test and service ceiling mounted fan	No

The unit of measurement shall be the number of ceiling fans tested.

The tendered rate shall include full compensation for the servicing of the fan, disconnection, testing and inspection of the contact points, switching mechanism including earthing and reconnection of the ceiling fan.

Item	Unit
(o) Replace ceiling mounted fan	No

The unit of measurement shall be the number of ceiling fans supplied and installed.

The tendered rate shall include full compensation for the disconnection of the damaged ceiling fan and for the supply, installation and connection of the new ceiling fan.

Item	Unit
(p) Service ceiling mounted fan control switch	No

The unit of measurement shall be the number of control switches opened and serviced.

The tendered rate shall include full compensation for the servicing of the control switch, inspection of the contact points, switching mechanism if applicable, earthing, etc.

Item	Unit
(q) Replace ceiling mounted fan control switch	No

The unit of measurement shall be the number of control switches replaced.

The tendered rate shall include full compensation for the supply and installation of the new control switch.

Item	Unit
(r) Replace domestic stove components	No

The unit of measurement shall be the number of stove components.

The tendered rate shall include full compensation for the supply and installation of the specified components.

The rate shall further include the disconnection and removal of the faulty component and the installation and testing of the new component.

Item	Unit
(s) Replace geyser components	No

The unit of measurement shall be the number of geyser components.

The tendered rate shall include full compensation for the supply and installation of the specified components.

The rate shall further include the disconnection and removal of the faulty component and the installation and testing of the new component.

The rate shall also include the draining of the water from the geyser and refilling before testing.

Item	Unit
(t) Replace stove	No

The unit of measurement shall be the number of electric four plate stoves with oven and warm drawer supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the stove including connection and testing after approval of the Engineer.

Item	Unit
(u) Provide Certificate of Compliance	Lump sum

The unit of measurement shall be a lump sum for all Certificates of Compliance obtained from local authorities and issued to the Engineer for all the buildings under the installation.

The tendered rate shall include full compensation for the testing and all associated equipment to complete the Certificate and certification thereof.

GG.10.6. Earthing and bonding

Item	Unit
(a) Supply and install earthing and bonding for the installation	Lump sum

The tendered lump sum shall include full compensation for the provision of all material required for the earthing and bonding of the installation in accordance with the specification.

Item	Unit
(b) Testing of the earth installation by a Specialist Contractor	Lump sum

The unit of measurement shall be a lump sum for testing of the installation by a specialist contractor.

The tendered lump sum shall include full compensation for the testing of the earth installation by a specialist contractor approved by the Engineer, and produce a test report for approval by the engineer. Report should be compiled by a suitably qualified personnel.

Item	Unit
(c) Supply and install earth electrodes	No

The unit of measurement shall be the number of earth electrodes supplied and installed.

The tendered sum shall include full compensation for the supply and installation of the specified type and size of earth electrodes including termination by means of approved clamps.

Item	Unit
(d) Provide cadweld joint	No

The unit of measurement shall be the number of cadweld joints provided.

The tendered sum shall include full compensation for the supply and installation of the specified type and size of cadweld pyro joints.

Item	Unit
(e) Earth building roof structure	No

The unit of measurement shall be the number of roof structures earthed.

The tendered sum shall include full compensation for the supply and installation of the specified type and size of earthwire and the termination thereof onto a 1,2 m Cu earth electrode driven into the soil 1,8 m deep.

GG.10.7. Inspection of Electrical Installation

Item	Unit
(a) Inspection of building general	Lump sum
(b) electrical installation	

The unit of measurement shall be the lump sum tendered for the building inspected prior to commencement of the repair work phase.

The tendered lump sum shall include the visual and functional inspection and testing of all lights, switches, small power points and fixed appliances to determine the extent of repairs or replacements required.

The rate shall further include for the preparation of a schedule of items (report) requiring repairs or replacement, for approval by the engineer.

GG.11 MAINTENANCE OF THE INSTALLATION

The various electrical systems shall be maintained following the initial repair work at BeitBridge Border Post. Maintenance responsibilities of the completed installation shall commence upon the issuing of certificate of practical completion for the repair work and shall continue for the balance of the 36-month contract period.

GG.11.1. The following maintenance actions will be required under this contract:

- (a) routine preventative maintenance
- (b) corrective maintenance
- (c) breakdown maintenance

These actions are defined in the Additional Specification SA – General Maintenance.

- (d) The maintenance schedules and frequency of maintenance activities shall be developed under the maintenance control plan which will be instituted by the Contractor. The Contractor's responsibility in this regard is specified in the Additional Specification SA – General Maintenance.

GG.11.2. Scope of routine preventive maintenance

The routine maintenance work to be performed and executed shall include, but not be limited to the items listed below. These actions and findings shall be logged and reported on the relevant approved schedules and reports.

- (a) Monthly maintenance
 - Check operation of protective and monitoring devices.
 - Verify operation of switching elements and meters.
 - Check lamp operation
 - Measure phase voltages and currents in distribution boards and record values in Record Book
- (b) Inspect and repair the following:
 - (i) Any visible damage to the installation
 - (ii) Setting of protective and monitoring devices
 - (iii) Ensure presence of diagrams, instructions and similar information
 - (iv) Ensure upkeep of the labelling of the distribution board, equipment, cabling and wiring
 - (v) Ensure presence of Nosa-type engraved labelling on face plates or bodies of light switches, socket outlets and isolators.
- (c) Annual maintenance
 - Service all luminaires, distribution boards, socket outlets, isolators, light switches, etc.
 - Carry out all tests listed under section GG 04.02 above and record values in the Record Book
 - Witnessed testing of all earth leakage protection units on all socket outlet units.
 - Visually inspect the following and repair if required:



- (i) Connection of cables and conductors including earthing and bonding.
- (ii) Presence of appropriate devices for isolation and switching.
- (iii) Correct connection of socket outlets, light switches, isolators, lampholders, etc.

GG.11.3. Maintenance work: Measurement and payment

Refer to clause SA 06 of the ADDITIONAL SPECIFICATION: SA GENERAL MAINTENANCE